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LOGISTICS MANAGEMENT OPERATIONALISED IN A HEALTHCARE CONTEXT

Understanding care chain effectiveness through
logistics management theories and systems theory

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ABSTRACT

Healthcare improvements is constantly relevant and an important topic. Healthcare is frequently being called upon to be more cost-efficient and still fulfil demands regarding waiting times, quality and availability. Experience from structural changes in other contexts gives reason to be positive about the potential for logistics improvements in the healthcare sector as well. From a logistics perspective patients pass different care functions, units, organisations and health facilities. It is assumed that logistics management knowledge applied in healthcare can lead to lower costs, shorter waiting times, better patient service, shorter treatment times and increased capacity. This dissertation therefore presents *an exploration of how logistics management theories can be operationalised in a healthcare context to understand care chain effectiveness*.

Theoretically, the operationalisation is done by systems theory creating compatibility between logistics management theories and the healthcare context. As a first step, features for a logistics system forms features for achieving care chain effectiveness. High care chain effectiveness is thus a desired condition and the care delivery system is the tool to achieve it. As the final step in the operationalisation the features for care chain effectiveness are in turn used to analyse today's practices. Empirically, the research is based on qualitative data from a single case study with multiple units of analysis. It includes four care units at one of Sweden's university hospitals, where the data is gathered through interviews, insight into management systems and document analysis.

One of the main results is the 21 areas identified for analysing today's practices by means of features for care chain effectiveness. Another main result is the four important concepts revealed through the operationalisation:

- *Lead time* - the episode of care from order to delivery as the amount of time for patient cases between first contact with healthcare and the last.
- *Patient order fulfilment* - fulfilment of patients' needs, broken down into several smaller steps performed over time within different care units in one or several organisations, consisting of five sub-processes - *order handling, diagnosis, treatment, follow-up, and discharge*.
- *True demand* – patients' needs that is to be met and thus sets what care to deliver, i.e. the production plan and the subordinate resource plan.
- *System boundaries* - defines which care units to include when focusing on the care delivery system's performance as a whole and should be more important than the performance and productivity of each individual care unit.

A number of direct suggestions for care chain improvement can also be found in the concluding remarks, for example that objectives linked to economic influx or penalty narrow the system and that lead time data on an aggregated level is needed to cover episodes of care.

The theoretical contribution of the dissertation is to the field of logistics management through the methodological development of using these theories in a new context. The managerial contribution is to healthcare managers through providing opportunities to improve care chains primarily by means of a greater understanding of care delivery systems.

Keywords: Logistics management, Supply chain management, Logistics system, Systems theory, Operationalisation, Care chain effectiveness, Healthcare, Health services sector

LOGISTIKKUNSKAP OPERATIONALISERAD I EN VÅRDKONTEXT

Att förstå vårdkedjors effektivitet genom logistikteorier och systemteori

SAMMANFATTNING

Förbättringar inom vården ett ständigt relevant och ett viktigt ämne. Sjukvården uppmanas ofta att vara mer kostnadseffektiv och fortfarande uppfylla krav avseende väntetider, kvalitet och tillgänglighet. Erfarenhet av strukturella förändringar i andra kontexter ger anledning till att se positivt på potentialen för logistiska förbättringar även inom vårdsektorn. Ur ett logistikperspektiv passerar patienter olika vårdfunktioner, enheter, organisationer och hälsofaciliteter. Det antas att logistikkunskap tillämpad i vården kan leda till lägre kostnader, kortare väntetider, bättre patientservice, kortare behandlingstider och ökad kapacitet. Denna avhandling presenterar därför *en utforskning av hur logistikteorier kan operationaliseras i en vårdkontext för att förstå vårdkedjeeffektivitet.*

Teoretiskt sker operationaliseringen genom att systemteori skapar kompatibilitet mellan logistikteorier och vårdkontexten. I ett första steg utformas särdrag för ett logistiksystem följt av att dessa omformas till särdrag för att uppnå vårdkedjeeffektivitet. Hög vårdkedjeeffektivitet är således ett önskat tillstånd och vårdleveranssystemet är verktyget för att uppnå det. Som det sista steget i operationaliseringen används i sin tur särdragen för vårdkedjeeffektivitet för att analysera dagens vårdverksamheter.

Empiriskt bygger forskningen på kvalitativa data från en enfallsstudie med flera analysenheter. Den omfattar fyra vårdavdelningar på ett av Sveriges universitetssjukhus där data har samlats in genom intervjuer, insikt i ledningssystem och dokumentanalys.

Ett av huvudresultaten är de 21 områden som identifierats för att analysera vårdverksamheter med hjälp av särdrag för att uppnå vårdkedjeeffektivitet. Ett annat huvudresultat är de fyra viktiga begreppen som framkommit under operationaliseringen:

- *Ledtid* - episoden av vård från order till leverans som tid för patientärenden mellan första kontakten med vården och den sista.
- *Patientärendefullgörande* - uppfyllandet av patienters behov, uppdelat i flera mindre steg som utförts över tid inom olika vårdenheter i en eller flera organisationer, bestående av fem delprocesser - *orderhantering, diagnos, behandling, uppföljning, och avslut.*
- *Verklig efterfrågan* - patienters behov som ska uppfyllas och därmed anger vilken vård att leverera, d.v.s. produktionsplanen och den underordnade resursplanen.
- *Systemgränser* - definierar vilka vårdenheter som ska inkluderas vid fokusering på vårdleveranssystemets prestation som helhet, vilket är viktigare än prestation och produktivitet hos varje enskild enhet.

Ett antal direkta förslag till vårdkedjeförbättring återfinns i de avslutande kommentarerna, till exempel att mål som är kopplade till ekonomisk fördelning förminskar systemet och att ledtidssdata på en aggregerad nivå behövs för att täcka hela värdeepisoder.

Avhandlingens teoretiska bidrag är till logistikfältet genom en metodologisk utveckling av att använda dessa teorier i ett nytt sammanhang. Det praktiska bidraget är till ledande positioner inom vården genom att erbjuda möjligheter att förbättra vårdkedjors effektivitet i första hand genom en större förståelse för vårdleveranssystem.

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Bloody hell, bloody bloody, bloody mary, bloody dissertation. Here it is! Jippi! För att kunna ha fullt fokus och inte lämna några detaljer åt slumpen behövs ett team kring en. Och precis som bakom vilken annan prestation som helst har det funnits ett stort team runt mig.

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Malin Charlotta Wiger

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KVINNOKLINIKEN - Universitetssjukhuset i Linköping

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1st CHAPTER

INTRODUCTION

This dissertation presents how logistics knowledge can be comprehensible and useful for improving patient flows. It is an operationalisation of logistics management theories in a healthcare context. This first chapter gives a brief background to why this is an important field of research and how the healthcare context is approached. Thereafter, the theoretical relevance is presented by the potential for logistics management in a healthcare context. This background leads to the purpose of this dissertation, after which two research questions are developed. The chapter ends with a short description of the outline of the dissertation.

1.1 BACKGROUND

This dissertation presents how logistics knowledge can be comprehensible and useful for improving patient flows. It is a direct continuation of the licentiate thesis (Wiger, 2013), which acts as a starting point as regards both content and approach. The licentiate thesis took its starting point in the challenges of healthcare. Notably, the challenges for healthcare organisations and western society described back then still remain (OECD, 2017). Demographics, increased costs, strong technical and medical developments, new kinds of patient requirements, staff shortages and preventable adverse events are some of these challenges. In addition, there is a constant call on healthcare to be more cost-efficient while fulfilling demands regarding waiting times, quality and availability. A general way to handle these challenges, such as long waiting times, increased patient demands, and deficient accessibility, is to increase resources. However, studies have shown that it is typically not lack of resources causing long waiting times (Noon et al., 2003, Silvester et al., 2004, Walley, 2013). The main reason for waiting times is instead that resources are used inappropriately and that they are not adapted to variations that arise (Walley et al., 2006b, Allder et al., 2010b, Allder et al., 2011). An increased need for care must therefore be met with effective improvements. Improvements so that more patients can be treated in less time while quality is raised and secured (Parnaby and Towill, 2009, Aronsson et al., 2011, Meijboom et al., 2011, de Vries and Huijsman, 2011).

The challenge is to find successful application of efficient care delivery, flexible adaptation to fluctuating patients' demands and effectively taking care of patients throughout the whole period of care. Experience from changes in other contexts gives reason to be positive about the potential for logistics improvements in the healthcare sector as well. It is a matter of planning and organising resources so that bottlenecks and their associated queues can be minimised and resources given higher priority to be used in the active patient time (Silvester et al., 2004). It can thereby be assumed that logistics management knowledge applied in healthcare can lead to lower costs, shorter waiting times, better patient service, shorter treatment times and increased capacity.

1.1.1 Healthcare from a logistics perspective

Healthcare organisations aim to serve the population when citizens need help with a health problem, which in logistics terms is to meet customer demand. From a logistics perspective patients pass different care functions, units, organisations and health facilities. Logistics management traditionally concerns the flow of goods but the core of healthcare organisations concerns the flow of patients (Aronsson et al., 2011, Lillrank et al., 2011, Vissers and Beech, 2005). There are multiple perspectives of a patient's path through a healthcare system. In this dissertation the perspective is patient cases' path through the system. It covers the time from first contact to last contact with healthcare, i.e. the *episode of care* (e.g. in Peltokorpi and Kujala, 2006, Hellström et al., 2011).

Patient cases span a wide range, from telephone consulting to life-threatening states and from one-time visits to a lifelong need for care. In general, a person develops a symptom of some kind and hence has some kind of need. If the person contacts healthcare for help, an order for care is generated. The person becomes a patient and healthcare then fulfils this

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order for care and the patient is treated. Similar to a customer order cycle (e.g. Stock and Lambert, 2001) patient order fulfilment can be realised in a structured way through five sub-process, see Figure 1.

Furthermore, patient cases accomplished by several care providers each provider handles their own module of care (Sampson et al., 2015) here labelled a *service episode*. Care delivery can also be divided into two parts, where one involves contact with the patient and the other does not (Hill, 2005). When the patient has to be physically present to receive care, this requires synchronisation with the care provider (Berry and Seltman, 2008) here labelled a *service event*. An additional lower level of aggregation is *service activities*, see Figure 1. Such activities can take place in interaction with the patient, such as taking X-rays, or merely as administrative activities related to a specific patient's treatment, e.g. surgery scheduling or referral reviews.

Figure 1: Patient order fulfilment, service episodes, service events, and service activities

1.1.2 Care chains and the potential for logistics management

Care chains are complex with numerous interdependent parts contributing to solving the patients' health problems (Berry and Seltman, 2008). When several care units are involved in the solving, there is a risk of sub-optimisation and especially when units in these care chains are forced to optimise their own results. As an example, a care unit manager expresses frustration over how the national waiting time follow-up puts great pressure on them as a single care unit.

"And if you already are efficient then you have to work even harder. And so it has been for us, we've been efficient. So we have to be even more efficient, and even more efficient and there's a certain ... then you cannot be more efficient. So we feel, we cannot be more efficient."

(Operations manager, independently translated)

Since patients pass several care units, it is a *care chain* issue to shorten waiting times, not something a single care unit can overcome (Silvester et al., 2004, Eriksson et al., 2011, Alder et al., 2011, Villa et al., 2014). Similar to supply chains, sub-optimisations can thus be found in care chains. Accordingly, healthcare organisations face the challenge of delivering high-quality services at affordable costs, necessitating management of care chains to fulfil patients' needs (Aronsson et al., 2011, Alder et al., 2010b, Eriksson et al., 2011, Lillrank et al., 2011, Villa et al., 2014, Olsson and Aronsson, 2015, The Health Foundation, 2013a).

Logistics management includes knowledge regarding delivery processes and systems, flexibility, efficiency and high customer service. Related objectives are to decrease lead times and costs and to increase customer service as well as the organisation's revenues and profits. It is argued specifically that logistics management in terms of effectiveness applied to care chains can lead to lower costs, better patient service, and shorter waiting times, i.e. both clinical and financial benefits (Olsson and Aronsson, 2015, Sampson et al., 2015, Aronsson et al., 2011, Lillrank et al., 2011, Meijboom et al., 2011, Vries and Huijsman, 2011, Rahimnia and Moghadasian, 2010, Parnaby and Towill, 2009). A contextual adaptation along with a systems approach are thus critical to get maximum benefit from these improvement opportunities (Aronsson et al., 2011, Villa et al., 2014).

1.1.3 Operationalisation of logistics management

To go from something abstract to something concrete is of the essence to be able to apply theories at a practical level and make them workable for empirical studies, i.e. to operationalise. Some examples of concepts from logistics management operationalised in a healthcare context can be found. Examples include cellular operations to provide seamless patient flows (Parnaby and Towill, 2009), the decoupling point concept (Rahimnia and Moghadasian, 2010), supply chain as a unit of analysis (Lillrank et al., 2011), process-chain-networks (Sampson et al., 2015), and lean and agile to categorise managing of patient flows (Olsson and Aronsson, 2015). Although fruitful in specific concepts associated with logistics management, the presentation of research in journal articles is limited by space constraints. This dissertation is a monograph and goes further than contextualising *to* a healthcare context through applying a method, categorising actions or sub-process improvements. It is an operationalisation *in* a healthcare context - it develops an understanding of factors that make a healthcare organisation effective. Understanding of factors and their interrelations for effectiveness is considered to be a first step towards developing an organisation that will serve its customers (Stock and Lambert, 2001). By an operationalisation of logistics management theories in a healthcare context, a base can thus be created for understanding care chain effectiveness.

1.2 PURPOSE AND RESEARCH QUESTIONS

Based on the reasoning above, the purpose of this dissertation is to:

Explore how logistics management theories can be operationalised in a healthcare context to understand care chain effectiveness

Logistics management theories can be recognised in terms of their usefulness for describing or explaining observed or experienced phenomena of management of a cost-effective delivery

service. Further, one way to describe the essence of logistics management theories to make them useful in a healthcare context is made in the licentiate thesis (*Logistics management in a healthcare context – Methodological development for describing and evaluating a healthcare organisation as a logistics system*, see Appendix I). Systems theory is both in the licentiate thesis and in this dissertation used to create compatibility between logistics management theories and the healthcare context. This is in line with the interdisciplinary nature of the original Bertalanffy's General Systems Theory (Von Bertalanffy, 1968) and its ability to be generalised. More about the findings from the licentiate thesis in next sub-section.

1.2.1 A logistics system's features

Following the logic of systems (Ackoff, 1971), a logistics system is about the organising (division of labour) to perform cost-effective delivery service (a common purpose) by means of activities related to the main flow of the system. With this basic understanding about a logistics system, an ideal logistics system was developed in the licentiate thesis. It is expressed as seven features for describing components and behaviours of a logistics system. The first three features concern *strategic issues*, such as that a logistics system aims to meet customer requirements, that a logistic system transforms orders into a flow-oriented process, and that a logistics system has a flow-oriented structure. The following two features reveal *planning issues*, such as that a logistics system has a strategy to meet demand, and that a logistics system can control transformation of input into output. The last two features concern *measuring issues*, such as that a logistics system measures to capture the whole system's performance and that a logistics system uses feedback to regulate its behaviour. The features together aim to describe the ability of one or several organisations to meet customers' requirements by means of cost effective deliveries. See Table 1 below for all seven logistics system's features in full.

Table 1: A logistics system's features developed in the licentiate thesis

LOGISTICS SYSTEM'S FEATURES	
Strategic issues	1 A logistics system's purpose is to meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance.
	2 A logistics system transforms orders into customer services in a flow-oriented process.
	3 A logistics system has a flow-oriented structure.
Planning issues	4 A logistics system has a strategy to meet demand.
	5 A logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources.
Measuring issues	6 A logistics system is measured to capture the whole system's logistics performance, including total logistics costs, lead times and customer service.
	7 A logistics system uses logistics measurements as feedback to regulate its behaviour to reduce differences between actual and desired performance.

Further, the logistics system's features presented in the table above are in the licentiate thesis used to evaluate two different healthcare organisations. It tests whether healthcare organisations can be viewed as logistics systems to provide *potential improvements* of care chain effectiveness. It is assumed that knowledge regarding care chains can be obtained and potentials for improvements are highlighted. Logistics management theories are hence in a first step operationalised by describing a logistics system's features, see Figure 2.

Figure 2: A first step to operationalise logistics management theories has been taken in the licentiate thesis by presenting a logistics system's features (layout inspired by Abrahamsson, 1992 p. 101)

This dissertation begins where the licentiate thesis ends and takes the benefits from logistics management knowledge further by using it more pragmatically at a practical and applied level. Hence, a logistics system's features from the licentiate thesis can be further concretised and contextualised in a healthcare context. It takes its point of departure in viewing healthcare organisations as social systems.

1.2.2 Care delivery as a system and care chain effectiveness

The healthcare context, as a partly novel context for logistics management, is here approached by viewing healthcare organisations as social systems. When a healthcare organisation is considered as a social system, a system's basic components can be used to describe and analyse it. The components used in this dissertation are input and output, interrelated units, transformation, feedback, control and boundaries (Ackoff, 1971). The demands from patients are the input to the system, which is then transformed by the care units within the system and the output is treated patient. In systems theory output is described as the product of the interaction of the units created over time (Katz and Kahn, 1966). This output is chosen since a social system has the ability to choose behaviour (Katz and Kahn, 1966). Control is managers' way of trying to regulate an organisation's behaviour and thereby the output, to realise efficiency and/or effectiveness. Consequently, a healthcare organisation also has to be managed and controlled, i.e. resources need to be applied and used in the system and it has to be measured and regulated to perform its duties. Additionally, the feedback loop can be viewed as some kind of information about how well the healthcare organisation performs with the aim of making it continue to improve itself to achieve the desired output. An illustration of healthcare as a system can be found in Figure 3.

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Figure 3: Model of a healthcare delivery system

For clarification, care units delivering care are in this dissertation viewed as interrelated parts working in conjunction with each other in order to solve patients' health problems. Healthcare management has possibilities to make adjustments in the behaviour of the system towards reducing deficiencies. Thereby, the output of a care delivery system is chosen and forms care chain effectiveness.

Care chain effectiveness is in this dissertation *to deliver care to a pre-decided level of high patient service at the lowest cost possible*. It is the desired condition and the care delivery system the tool for achieving it. Hence, a care delivery system's components building this desired condition are important for understanding care chain effectiveness.

1.2.3 The research questions

A straightforward operationalisation of a logistics system's features is to describe each of them as a feature for care chain effectiveness. It can for example be a feature for the structure of a care delivery system, or a feature for demand management within healthcare organisations, or a feature for the measurements of care chain performance to obtain high care chain effectiveness. Logistics management theories can thereby be further operationalised in a healthcare context by describing components and behaviours expressed as features for care chain effectiveness. Through this, the following research question is formed:

RQ 1: How can features for care chain effectiveness be described?

These features together aim to describe a desired condition for healthcare organisation's to meet patients' needs cost-effectively. By describing features for care chain effectiveness, one step further can be taken to operationalise logistics management theories in a healthcare context - a logistics system's features operationalised to features for care chain effectiveness, see Figure 4 below.

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Figure 4: RQ 1 - a logistics system's features operationalised to features for care chain effectiveness

However, as described at the beginning of this chapter, the purpose of a full *operationalisation* is to make logistics management theories so practical as to be workable for empirical studies. The features for care chain effectiveness therefore have to be tested empirically. A further operationalisation can be accomplished by comparing today's practices with these theoretical features for care chain effectiveness. Today's practices can then be analysed by means of these features to fully operationalise logistics management theories. The second and last research question is therefore:

RQ 2: *How can the features for care chain effectiveness be used in analysing today's practices?*

By analysing today's practices, the final step can be taken to operationalise logistics management theories in a healthcare context. In other words, features for care chain effectiveness used to analyse today's practices, see Figure 5.

Figure 5: RQ 2 - analysing today's practices by the means of features for care chain effectiveness

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Further, in this dissertation operationalisation of logistics management theories aims to provide understanding about care chain effectiveness. *Understanding* here means having knowledge of how care delivery systems are structured and function as well as realising how care chain effectiveness is possible and why. The analysis intended to be made in the second research question provides that opportunity for understanding.

There are naturally different issues with regard to achieving care chain effectiveness in practice. A comparison in the analysis allows constraints for care chain effectiveness to be captured derived from how care delivery systems are managed, see Figure 6. This can be viewed as how a care delivery system is managed determining its structural constraints and thereby limiting care chain effectiveness. Structural constraints may for example arise from how care chains are designed, prioritisation of resources, how planning of resources is directed or what objectives govern the daily operations. Structural constraints are thus assumed to affect how care staff execute their respective job responsibilities, and by that determines the overall effectiveness of the care chains. Likewise, the action of employees performing logistics activities affect supply chains' effectiveness (Stock and Lambert, 2001).

Figure 6: Features for care chain effectiveness for analysing care delivery systems in today's practices

By identifying structural constraints within care delivery systems, the analyses of today's practices can be made rich and thick for understanding care chain effectiveness. In addition, if the analysis provides opportunities to understand how a care delivery system functions, it can be seen as full proof of the operationalisation of logistics management theories in a healthcare context.

To sum up, the research questions constitute two significant steps towards answering the purpose. It is illustrated in relation to the overall design of this dissertation in the figure below, see Figure 7. In addition, when identifying constraints for care chain effectiveness it is possible to get an understanding of how a care delivery system works and thereby an understanding of care chain effectiveness. In other words, the last step for understanding care chain effectiveness.

Figure 7: From logistics management theories to understanding care chain effectiveness - the overall design of this dissertation

1.3 OUTLINE OF THE DISSERTATION

This dissertation is a monograph and contains a main part consisting of five chapter and several appendices. As mentioned earlier, the dissertation takes its point of departure in the result derived from the licentiate thesis, which is also a monograph, see Appendix I. However, this section aims to give the reader an overview of this dissertation's structure and a brief presentation of the various chapters. The outline is illustrated in Figure 8.

Chapter 1 – Introduction

The first chapter gives a brief background to why this is an important field of research and describes how the healthcare context is approached. The theoretical relevance is then presented by means of the potential for logistics management in a healthcare context. This background leads into the purpose of the dissertation, after which two research questions are developed. The chapter ends with a short description of the outline of the dissertation.

Chapter 2 – Methodology

The second chapter presents the methodology behind the dissertation. It begins with the research design, followed by the research process and how the empirical data was collected. It ends with an overview of the literature reviewed in this dissertation.

Chapter 3 – The theoretical frame – Features for care chain effectiveness

The third chapter presents the theoretical frame of reference by contextualising a logistics system's features to describe features for care chain effectiveness. Both basic logistics management theories from a commercial context and applied theories in a healthcare context are used. Although it is logistics management theories aimed for care chain effectiveness that are presented, examples of shortcomings in the absence of "good" logistics management or care chain management are also given. The chapter hereby aims to answer RQ 1: How can features for care chain effectiveness be described?

Chapter 4 – The analysis – Analysing today's practices

The fourth chapter covers the analysis of features for care chain effectiveness and today's practices. Through this, the chapter aims to answer RQ 2: How can the features for care chain effectiveness be used in analysing today's practices? The analysis is performed by comparing four different care clinics' operations with the theoretical features developed in the preceding chapter. The results of the analysis are presented as structural constraints for care chain effectiveness.

Chapter 5 – Conclusions and contributions

The final chapter presents the conclusions drawn from the research presented in this dissertation and answers the purpose. The first section addresses operationalisation of logistics management theories, and the subsequent section concerns the understanding of care chain effectiveness. The theoretical contributions are thereafter presented along with the managerial implications. The dissertation ends with suggestions for further research.

Appendices

Several appendices are appended to the dissertation.

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Figure 8: The outline of the dissertation

2nd CHAPTER

METHODOLOGY

This chapter presents the methodology behind the research presented in this dissertation. It begins with the research design, followed by the research process and how the empirical data was collected. It ends with an overview of the literature reviewed for the research made in this dissertation.

2.1 THE RESEARCH DESIGN

The research design can be viewed as the plan for how the research will be conducted. It sets out how the purpose will be fulfilled and how identified questions will be answered (Patton, 2015). The design also involves procedures of investigation and selection of specific methods of data collection analysis (Creswell, 2014). The research design of this dissertation shall hence capture how logistics management theories shall be operationalised in a healthcare context to understand care chain effectiveness. An illustration of this can be found in Figure 9 below. The research design for the licentiate thesis can be found in Appendix I. The design thus has consequences for how the study can be carried out, how the purpose is answered, and determines what to be able to learn (Patton, 2015). The research in this dissertation aims to explore how to use logistics management theories to increase understanding of care chain effectiveness. This means that it is not the context that determines to what field of research the dissertation belongs, but rather the theoretical base defining the field of research of logistics management.

To recap, the purpose of this dissertation is to *Explore how logistics management theories can be operationalised in a healthcare context to understand care chain effectiveness*. The purpose has in turn been refined into specific research questions that have acted as a guide to how the study was designed and specify how the purpose has be answered. RQ 1: *How can features for care chain effectiveness be described?* And RQ 2: *How can the features for care chain effectiveness be used in analysing today's practices?*

Figure 9: The research design to answer the purpose of this dissertation

As can be seen from the figure above, the research design consists of several main parts, which together form the research design of this dissertation - *Modell from the licentiate thesis*, *Contextualising*, *Basic logistics*, *systems theory and care chain literature*, *Research question 1*, *Comparison*, *Single case with multiple units of analysis*, *Research question 2*, and *Generalisation*. Each of these parts will be presented in more depth in the sections below. The starting point is the theoretical model of a logistics system's features, which acts as a guide for the theoretical framework, process of gathering data and hence the analysis and closure of the dissertation. Hence, the role of the model from the licentiate thesis is first out to be described.

2.1.1 Modell from the licentiate thesis

The licentiate thesis has an important role in and impact on this dissertation as it is the starting point. It presents a developed method intended for evaluating a healthcare organisation by means of a logistics system's features. The model describes a logistics

system's features and their content is presented in Table 1 in chapter 1. The features of logistics systems are also the core of this dissertation, both in the design and also in the more practical research process.

2.1.2 Contextualising

The logistics management theories are here represented by the model of a logistics system's features. It is tested on healthcare operations in the licentiate thesis. In this dissertation the features are used to define literal areas for the contextualisation of logistics management theories in a healthcare context. It is a methodological challenge to make use of a research field's literature developed in another context. Companies have departments such as logistics, procurement, marketing, production, SCM, etc., and research can be hung up on these departments; they become carriers of stories and results. It is instead the underlying mechanisms, logics and supporting ideas in the literature areas that have been of interest to contextualise to the context of healthcare.

Compatibility between logistics management theories and healthcare context has been necessary. It has been created by highlighting the essence of logistics management theories expressed as a logistics system's features and considering healthcare organisations as social systems. *Systems theory* is used to create this compatibility between logistic management theories and the healthcare context, Figure 10. Systems theory provides a way to describe and analyse complex systems (Ackoff, 1971). It can be viewed as a meta-discipline whose subject matter can be applied within virtually any other discipline (Checkland, 1981) and as a practical philosophy of system management and a methodology of change (Van Gigh, 1991).

Figure 10: Systems theory as a compatibility bridge

2.1.3 Basic logistics, systems theory and care chain literature

The theoretical frame in this dissertation is based on literature that can be referred to as covering *basic logistics management*, *systems theory* and *care chain* issues. The explorative approach of the research design provides a theoretical frame that is partly shaped by the empirical data. It is, however, set by the logistics system's features. These features are not exclusive or generic to all logistics systems, and may have been expressed differently if the intention of the research were different.

The *basic logistics management* literature used in the theoretical frame concerns fundamentals of logistics and supply chain management. The focus is not on specific theories or methods; it is to operationalise already acknowledged knowledge in a healthcare contexts. In addition to the core of managing logistics systems, the basic logistics literature also motivates the usefulness of logistics management knowledge for healthcare organisations. Examples of

the basic logistics literature used include Cooper et al. (1997), Lambert and Cooper (2000), Stock and Lambert (2001), Mentzer et al. (2004), and Christopher (2005).

Systems theory can be described as trans-disciplinary theories of systems in general and their related principles can be applied to all types of systems (Ackoff, 1971). Example of systems theory literature used in the dissertation include Katz and Kahn (1966), Ackoff (1971), and Van Gigch (1991). The main theoretical frame of systems theory is developed and presented in the licentiate thesis, see Appendix I.

Care chain literature is not a defined field but is the common denominator in the literature used where the research concerns care chain issues. The literature is used to concretise and exemplify care chain and care delivery system issues for the contextualisation of logistics management theories. More about care chain literature can be found in the sub-section *The literature reviews* later in the chapter.

2.1.4 Research question 1

The first research question is answered by the closing of the theoretical frame. The description is conducted by a presentation of features for care chain effectiveness.

2.1.5 Comparison

The features for a care delivery system to exhibit high care chain effectiveness is in the analysis compared with today's practices, Figure 11. Care units are hence assumed to behave like social systems. The unfamiliar "messes" have thereby been described and modelled in a transferable manner and issues could be tackled from the knowledge base from the field of logistics (Towill and Christopher, 2005). It is a qualitative study which can be described in line with Patton (2015) as a systematic gathering of perspectives on what happens within a system, and how what happens has implications for those involved. Patton (2015) description of analysis strategy for a holistic perspective capture the essence of how the analysis is carried out in this dissertation: "*The whole phenomenon under study is understood as a complex system that is more than the sum of its parts; inquiry focuses on and capture complex interdependencies and system dynamics that cannot meaningfully be reduced to a few discrete variables and linear, cause – effect relationships*" (Patton, 2015, p. 47). The qualitative study design offers the possibility for context sensitivity by a focused and bounded phenomenon embedded in its context which then can be taken into account (Patton, 2015). In addition, the possibility for understanding latent, underlying, or non-obvious issues is also strong (Miles et al., 2014). The choice of a purely qualitative study design hence also has to do with the uncertainty in studying this new context of healthcare through logistics management theories and that healthcare organisations are highly complex (Glouberman and Mintzberg, 2001a, Dey et al., 2008, Vries and Huijsman, 2011).

Figure 11: Comparison in the analysis

2.1.6 Single case with multiple units of analysis

The case studied in this dissertation is four care units at the department of Obstetrics and Gynaecology at the University Hospital in Linköping. The design is a single-case embedded case study (Yin, 2014), i.e. multiple units are used within joint analysis. The care units are further presented later in this chapter. Just as it is important to have an explicit knowledge and understanding of supply chain for research within the logistics context (Lambert and Cooper, 2000), it is vital to have a deep understanding of the healthcare context. Otherwise it will be hard to understand care chain effectiveness (Bohmer, 2009). A case study is therefore suitable since such studies are rich in information, illuminative, and offer useful manifestations of the phenomenon of interest (Patton, 2015). A further argument for the case study design is that a case study can be described as focusing on a system, an entity with purpose and functioning parts (Bryman and Bell, 2011). The in-depth insight is then an instrument (Simons, 2014) for this research to understand care chain effectiveness. Hence, qualitative case studies are used for their richness and holism, with strong potential for revealing complexity. Additionally, the data provides “thick descriptions” that are vivid, are nested in a real context, and have a ring of truth that has strong impact on the reader (Miles et al., 2014). This has been taken into account by presenting full case descriptions, appended to this dissertation in addition to the quotes from the case presented in the analysis. As mentioned previously, more about the case and a description of it can be found later in this chapter.

2.1.7 Research question 2

The second and last research question is answered by the closing of the analysis. The case units are viewed as social systems and form care delivery systems. The comparison of features for high care chain effectiveness and today’s practices results in descriptions of what constrains them from high care chain effectiveness, see Figure 12. It is expressed as structural constraints. The structural constraints are identified by analysing how and first and foremost why healthcare staff perform their duties as they do. In line with Bryman and Bell (2011) recommendations, the research question has guided the analysis of the data.

Figure 12: The design for answering RQ 2

2.1.8 Generalisation

In this dissertation the case provides the empirical context for identifying constraints for high care chain effectiveness. Consequently, the conclusions can only be constructed by logical generalisation. The weight of evidence from a case permits logical generalisation and maximum application of information to other highly similar cases (Patton, 2015). However, the generalisability of case studies is questionable (Patton, 2015). The aim of the case is in this dissertation insights about phenomena, not empirical generalisation from a sample to

a population. Hence, the criticism is answered due to Patton (2015). The identified constraints for high care chain effectiveness by no means include all constraints that might exist. They are empirically based examples. By means of lessons drawn from these constraints and desired features for high care chain effectiveness it has been possible to attain understanding of care delivery systems. The understanding of care delivery systems also functions as a check to validate that logistics management theories have been successfully operationalised in a healthcare context.

2.2 THE RESEARCH PROCESS

It was a matter of course to build upon the licentiate thesis due to the rigorous theoretical basis. It shaped the research idea and formed this dissertation. A first contact with key informants at the case department was established during autumn 2014. Additional basic information about the case department was collected by insight into their management system. Thereby, the first data collection period was conducted. A thesis proposal was then presented for the research division of Logistics and Quality Management. In early 2015 an introductory interview was held with the management of the case department and the business developer to get an orientation about the business regarding patient flow issues. Partly parallel with the work on the interview guide, respondents were contacted and the interviews were planned. During the spring of 2015 the rest of the interviews were then held. The second data collection was thereby conducted. A first draft of the theoretical frame was presented at the beginning of 2016. The interviews were then processed and presented as a case description. The first draft of the analysis and conclusions was established and the dissertation was externally reviewed in late 2017. With the new insights, both the theoretical frame and the analysis were refined iteratively. Finally the final conclusions were established at the beginning of 2018! The research process is illustrated in Figure 13 below.

Figure 13: The research process illustrated in chronological order

2.3 THE EMPIRICAL DATA COLLECTION

A key element in gaining credibility for case study research is to make the procedures and its process explicit, so that the soundness and appropriateness of the methodology can be judged (Ellram, 1996). A case study investigator must have methodological versatility and must follow certain formal procedures to ensure quality control during the data collection (Yin, 2014). Therefore, *description of the case and selection*, the *contacting of key informants and field work arrangement*, *development of interview questions*, *case study protocol*, *the interviews*, *processing of data*, and *reflections of the interviewer* are presented in the following sub-sections. The empirical data collection process is illustrated in the figure below, see Figure 14.

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Figure 14: The empirical data collection process in chronologic order

2.3.1 Description of the case and selection

The case included in this dissertation are four care clinics belonging to the department of Obstetrics and Gynaecology at the University Hospital in Linköping. They receive women in need of gynaecological outpatient and inpatient care, maternity care, obstetric care, postnatal care and fertility treatment. The department is also responsible for cervical screening and contraceptive advice. Pregnant and birthing women are the largest group of patients at the department (Region Östergötland, 2016a). Highly specialised care is performed such as obstetrics, cancer surgery and complicated gynaecological conditions. The gynaecological surgeries can be conducted both during daytime and in inpatient surgical management. The department consists of five clinics and four of these are included as units of analysis in this dissertation; Outpatient Obstetrics and Contraceptive Woman Care clinic, Inpatient Obstetrics clinic, Outpatient Gynaecology clinic and Inpatient Gynaecology clinic. The fifth is a rather small specialised unit focused on fertility treatment and is not included. The four clinics in the case, two within obstetrics and two within gynaecology, are illustrated in Figure 15 below.

Figure 15: The Department of Gynaecology and Obstetrics illustrated by the four clinics included in this dissertation

Further, the University Hospital in Linköping has nearly 600 beds, over 40,000 patient visits per year and 5,000 employees (Region Östergötland, 2016b). The catchment area, for the assignment of highly specialised care, is a total of about one million inhabitants from the county councils in Östergötland, Kalmar and Jönköping. The hospital is also responsible for local health care for the central part of Östergötland and parts of the specialist healthcare services for the entire county. For the second consecutive year the hospital has been ranked the nation's top teaching hospital (Dagens medicin, 2016) and county councils have leading results within safe obstetric care (LiU, 2016).

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As the case is to give insights about how care delivery systems function, it is essential that the case covers different healthcare businesses. The case clinics businesses in this dissertation have therefore been defined by operating modes presented in Lillrank et al. (2010). They include: *prevention, emergency, one visit, elective, cure, care* and *project* modes. See Table 2 below for business definition per clinic and the description of care delivery at the case clinics in Appendix II for further details. It can be noted that the *project mode* is represented at all clinics but is a small part of their business; it is exceptional patients with complex conditions. Another important criterion for the selection of case was that they were positive to the research idea and interested in care chain issues, which meant support and was supported by the top management. It thereby secured access to invite respondents for interviews.

Table 2: Patient order mode per clinic

Operating mode Case clinics	Prevention (Secondary prevention)	Emergency (Urgent)	One visit (Minor ailment)	Elective (Stepwise improvement)	Cure (Unclear ailment)	Care (Chronic condition)	Project (Complex condition)
Outpatient Obstetrics and Contraceptive Woman Care	X		X	X	X		(X)
Inpatient Obstetrics		X	X	X	X		(X)
Outpatient Gynaecology		X	X	X	X		(X)
Inpatient Gynaecology		X	X	X	X		(X)

Hence, the case department represents different types of patient cases and large groups of patients, but also small. They have some care chains where they "own" the entire patient cases but they also perform surgeries where they are third or fourth in line performers. They can also be viewed as having an openness to changes since 2015 was also an eventful year when many organisational changes were implemented, took shape, or were in their opening phase. The cooperation for data collection is an independent arrangement with no organised or funded research project underpinning it.

2.3.2 Contacting key informants and field work arrangement

The procedure for contacting key informants and making field work arrangements, is according to Yin (2014) critical to the success of a case study. A pilot study can also be used to further refine the research regarding both content and procedure (Ellram, 1996). This was done in order to determine the suitability of the case, obtain access and learn about the case department's activities to be able to create more suitable interview questions and be prepared for the interviews.

The first contact with the case department, the department of Obstetrics and Gynaecology at the University Hospital in Linköping, was in September 2014. A meeting with the head of the department and the director of the superordinate department was arranged at which the research focus was presented. An insight into their management systems was then obtained through their business developer. The management system gave information about the department and that the department uses the management system in a structured manner. A further meeting with the head of the department was held about the empirical data collection. The meeting was based on the document sent earlier about the research design. The last meeting to ensure access for data collection was held in March

2015 with the head of the department and the business developer. This meeting was more like an interview about their business and what activities they conduct. The two respondents answered questions and drew pictures about their business organisation and patient flow. The meeting was recorded and summarised by facts about the business and activities conducted from the drawings and what was said through the entire interview. The meetings with key informants to make field work arrangements are summarised in Table 3 below.

This first overview orientation of the business was sent back to the respondents who clarified some facts. It gave an orientation in their operations, organisation, how they are organised, what patients they have and what activities they conduct. This document was also then the foundation for the other upcoming interviews and gave a hint to be able to specify what positions were of interest to interview. As the respondents should naturally match the defined subject of the research (Rubin and Rubin, 1995), all invited respondents received the document together with interview question to give them an idea of what was known about their activities and operations.

Table 3: Key informants and topics of meetings to make field work arrangements

Date	Key informant(s)	Topic	Duration
3/10 2014	Head of the department, and Director of the superordinate department	Research idea introduction	1 h
17/11 2014	Business developer	Insight into the management system	2 h
20/1 2015	Head of the department	Research design and empirical data collection	1 h
2/3 2015	Head of the department, Business developer	How the businesses work and what activities they conduct	1,5 h

2.3.3 Development of interview questions

The interview questions are exaggerated from the description model of a logistic system developed in the Licentiate thesis. All interview questions are linked to areas of the model by numerical coding, see Appendix V. All questions are of the open-ended type.

2.3.4 Case study protocol

A case study protocol has been established for the case study in this dissertation. It can be described as the formal document capturing the entire set of procedures involved in the collection of data for a case study (Yin, 2014). It is a way of securing reliability for case studies (Ellram, 1996). The case study protocol for this dissertation can be found in Appendix V and includes:

- Research design for key informants
- Link between description aspects of a logistic system and developed interview questions
- The interview questions
- Invitation to the respondents, letter of introduction and overview of the research

A case study is about contemporary human affairs, which means that ethical aspects have to be considered (Yin, 2014). The research in this dissertation have been guided by the classic principle of human conduct declared among others by Miles et al. (2014); *‘First, do no harm’* (p. 56). To avoid damage in all forms, proactive measures have been taken. All respondents have voluntarily participated by answering an invitation sent by e-mail individually from the researcher. The invitation consisted of detailed information about the aim of the research, background information about the project, the aim of the interview, presentation of me as a researcher, instructions about the procedure of the interview and all interview questions. The participants were protected from deception by sending them the part of the case report that they corresponded to. Additionally, none of the respondents are mentioned by name; the organisational position is used instead. It is of course possible to identify respondents anyhow. The research questions are thus considered to have low ethical risk due to the focus on how patient cases are organised where no controversial views are of interest. This is a genre of qualitative research where the main task is, as described by Miles et al. (2014) just to describe the way people manage their day-to-day situations. By that, ethical aspects are considered to have been taking into account to protect human subjects in line with Yin (2014).

2.3.5 The interviews

Interviews are the main method of the empirical data collection for the research in this dissertation. Interview as a method was chosen for several reasons. Especially, a case study with in-depth interviewing yields detailed, thick descriptions (Patton, 2015, Miles et al., 2014). It is suitable when seeking to understand behaviour in terms of the context in which the research is conducted (Bryman and Bell, 2011). Additionally, by finding out how and why people do what they do, the system they are within and of which they are a part can be captured (Patton, 2015). This can be done by interviews since an interview is seen as an inter-view, where knowledge is constructed in the interaction between the researcher and the respondent (Brinkmann and Kvale, 2015). Furthermore, the researcher must understand and be sensitive to unique conditions facing care providers and the research thus has to be conducted with an open lens to these issues (Dobrzykowski et al., 2014). This is considered to be captured by the interviews for the research in this dissertation with a combined approach of in-depth, focused interviews (Yin, 2014) and semi-structured interviewing (Bryman and Bell, 2011).

The pilot study and especially the interview with the head of the department and the business developer made it clear that operations managers and physicians with medical responsibilities for the four clinics could best answer questions about care chain issues. In addition, the manager of the administrative staff, the surgery planner at the inpatient clinic, was also invited, and later also the new business developer at both gynaecological clinics. In total, eleven respondents were invited. The respondents received an invitation by e-mail. The invitation was modified slightly for each respondent. Of those invited, three with medical responsibility were unable to participate due to lack of time or declined entirely on the grounds that the clinic’s managers could answer the questions. The interviews were held at the respondents’ workplace and all except two were tape-recorded. The eighth

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respondents and information about the interviews are presented in the table below, see Table 4.

Interviews are operated at two levels at the same time, the line of inquiry and the conversational question in an unbiased manner (Yin, 2014). Accordingly, the interview questions were the basis of the interviews but the interviews were rather held as a discussion about the topics that the questions concern rather than one at a time in strict order. This is common when interviewing and despite a consistent line of inquiry the actual stream of questions in an interview is therefore likely to be fluid rather than rigid (Rubin and Rubin, 1995). The conducted interviews can be described as to be primarily descriptive (Brinkmann and Kvale, 2015) by seeking key aspects of how patient cases are carried out from the respondent's point of view.

Further, interviewing is a tool of research as an intentional way of learning and one approach is to encourage the respondent to describe their worlds in their own terms (Rubin and Rubin, 1995). Hence, all respondents were asked at the beginning of the interview to illustrate their view of the patient flows through their clinic. A large sheet of white paper and coloured pencils were at their disposal. The images were evolved during the whole interviews and were also used as a visual support during the conversation, see Appendix IV for three examples. This was a way of creating a shared language, as recommended by Rubin and Rubin (1995), that both could relate to and made it easier to communicate. Documents and suggestions from other persons to interview and other sources of evidence were also asked for. The data from all interviews except one have given input to the case report. The interview about staffing for administrative duties turned out to be less about patient case issues.

All respondents can be described as very open when talking about their business, both in positive and negative issues. There was also a willingness to participate in interviews and answer additional questions and to share information and data about their business.

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Table 4: Respondents and interview information

Date	Respondent	Perspective of respondent	Input to the description	Illustr. of patient flow	Document sharing	Duration of interview
15/4 2015	Chief Physician	Medically responsible – Inpatient gynaecology clinic	The medical perspective on the business	Yes	-	Just over 1 hour
15/4 2015	Head of the departments secretariat	Manager of the administrative staff – overall department	Staffing administrative positions at the department and less about patient flow - kind of blind alley	No	Business plan and general information about the mission	45 minutes (not recorded)
21/4 2015	Operations manager Women's Health	Head of the entire outpatient obstetrics and contraceptive woman care clinic	Description of all their patient flow and insight into their various activities	Yes	Business plan, medical objectives and checklist pregnant bas program	Just over 1 hour
22/4 2015	Operations manager Inpatient unit	Staff responsibility - ward unit for patients before and after surgery	Responsibilities of the ward unit, staffing logic and patient flows	Yes	-	1 hour
22/4 2015	Operations manager Inpatient Obstetrics	Staff responsibility- childbirth and both aftercare units	Issues of patient flows, activities, staffing logic and organisation	Yes	-	1,5 hour
27/4 2015	Operations manager Outpatient Gynaecology clinic	Staff responsibility – visits and of outpatient surgery (not physicians)	Issues of patient flows, activities, and staffing logic	Yes	Business plan and process map of surgery day	Just over 1 hour
3/6 2015	Surgery planner Inpatient Gynaecology clinic	Schedules and coordinates all inpatient surgeries	Patient case, schedule logic	Yes	-	1 hour
16/2 2016	Business developer Gynaecology clinics	40% business developer for operative businesses and support to process managers	Duties as business developer, type of data available, how projects are run, ownership of patient cases, and references to medical results and change management	No	Annual reports and article about the inpatient obstetrics, see (Blomberg, 2016)	1 hour (not recorded)

Immediately after each interview I sat down in a calm place near where the interview took place. It was of importance that the place not be my office or near it. This was because I wanted to keep the focus on the just-completed interview and rest mentally. Being mentally and emotionally exhausted after interviewing is a good sign that good questions, good

listening and addictiveness have permeated the session (Yin, 2014). I allowed my thoughts to flow free and I sat until the interview was processed. Notes were then taken about my reflections on the interview as well as my thoughts about the content. This was an early stage of analysis by starting to arrange the data through the logistics lens.

In addition to the case study protocol, another key to reliability is to develop a case study database (Yin, 2014, Ellram, 1996). This has been done and the following files has been saved in the research database:

- Shared documents from respondents
- Records from the interviews
- Images painted by the respondents
- Individual case descriptions sent to the respondents for review

2.3.6 Processing of data

The processing of data is of importance since a well told and documented story opens the window into the world of case studies (Patton, 2015). Further, a following analysis depends on the particularity and quality of the description of the case (Miles et al., 2014). The case report thus has an important mission to fulfil these insinences. Recordings, notes, drawings of the patient cases through their clinic made by the respondents, documents and insights into the business system gave together inputs to the case report, see Appendix III. All interviews were processed by writing down the content of the interviews by listening them through. The interviews was systematically summarized into thick condensations through *systematically listening* to as labelled by Yin (2014). Each interview resulted in an individual case report that was sent by e-mail to the respondent to review it. This can be viewed as a *draft review by key informant* (Ellram, 1996), and an element to support construct validity. Two respondents commented on the information in their case report, and their report were added to or changed.

The final case report is descriptive, which means in this qualitative research to closely describe the raw material by just clarifying, structuring the facts and making minimal interpretation. It stays at the same level as the respondents and does not use interpretive concepts. The interpretation level is therefore low and consequently also the level of analysis in the case report. In the report citations are used to give a fair picture of how the respondents expressed themselves. The citations can also be motivated since they are considered to have an important role in case reports to maintain a chain of evidence (Yin, 2014) and to discover and understand what the respondents has said (Rubin and Rubin, 1995). However, data condensation as choices of topics, sorting, organisation and discarding are analytic choices and are therefore a part of the analysis. This is necessary to be able to do further analysis and finally draw and verify conclusions (Miles et al., 2014).

A second case description has also been made, presented in Appendix II. This case description is a closely empirical low abstract analysis. It aims to close the gap between the case report and the analysis. It describes the care delivery at the case clinics from a more logistics view. However, it contains the same basic information as the first report and is written in English.

2.3.7 Reflections of the interviewer

When doing qualitative research little standardised instrumentation is used (Miles et al., 2014). Instead, as a researcher I can be considered essentially the main instrument in the study according to Yin (2014). Personal experiences and insights are thereby important parts of the study and critical to understanding the phenomenon under study (Patton, 2015). A one-person research machine as express by Miles et al. (2014). Since the procedures are not routinized it also takes far more of your intellect, ego, and emotions to study than of any other research method (Yin, 2014). Therefore, it is of interest to reflect on myself as an interviewer.

During the interview period I continuously cogitated on my role as interviewer, how it affects the respondent and how the interviews turned out. This made me step by step slightly change the approach when interviewing. First, I learned to ask more questions about how things are really done practically to get closer to the “truth” about how they carry out the activities connected to the patient cases and not just a descriptions of how the department should operate. Second, giving the respondent time in the second half of the interview often leads to deeper and additional information about already answered questions.

My strategy has been, what Patton (2015) calls core strategies of qualitative studies, to have an empathic stance when interviewing by seeking vicarious understanding without judgment by establishing a rapport and showing openness, sensitivity, respect, awareness, and responsiveness. I also tried to be happy, relaxed, interested and have a sense of humour. This is an tool for the researcher when asking for openness from the respondent, since the interview is affected by the researcher’s personality and moods (Rubin and Rubin, 1995). I also had a strategy of asking why and how it turns out and what happens then and how you know that. I did this even on more simple questions. This often led to the interview turning to a more specific level of detail than before. One part of that can be that a term can take on different meanings in different contexts and that you cannot take for granted that you have understood or that stories communicate significant themes that explain a topical (Rubin and Rubin, 1995). Furthermore, how the respondent answers a questions or not gives an answer also says a lot. It is not always what they say that tells the story (Simons, 2014).

When listening and processing the data from the interviews I got the opportunity to reflect upon myself as an interviewer and designer of pre-interview material. The nature of the interviews is open-end, which has to be considered (Yin, 2014). Some extra effort has therefore been made to initiate the question field by presenting the viewpoint and put the questions in the right position. I hope to become even better at it because I have noticed that I sometimes put a short clear question that in the right context is clear but that can be interpreted in different ways unless the perspective is matched. A further lesson to be learnt is that background noises to confirm the respondent are not good for the quality of the recording.

As a final point, some pattern during the interviews has also been distinguished. The interview often goes on in intervals. Nice and polite at the beginning and the respondent wishes to answer the question with the “right” answer and say the right thing to “satisfy” me. Superficial responses without opinions and responses without clear facts by concrete examples. After a while, we are both warm and in deep concentration. Then things seem more complicated than first mentioned at the beginning of the interview. We have started to dig. The interview can then calm down and run off to unique stories or side-tracks that do not describe the general patient flow. The interview often then returns to fill in the big picture of patient cases and all relationships that are needed in order to manage all of them. In the end, it is often quite easy going, as if the person I interviewed passed a test or just relaxation after deep focus. Finally, when I am about to turn off the tape recorder or just did, a concluding and more personal opinion may come up.

2.4 THE LITERATURE REVIEWS

Several literature reviews have been used to find relevant literature for this dissertation and one structured literature review has been conducted, starting with seven Logistics and Supply Chain Management journals. This review has been updated three times during the doctoral study period: in Wiger and Aronsson (2012), Olsson et al. (2014) and the last update at the beginning of 2018, see Table 5. All the articles from the chosen journals from the last 18 years were scanned (first search phase). Articles announcing a *healthcare context* in either the title or in the keywords, e.g. healthcare, health services, hospital or patient, were classified as patient or physical product flow oriented. The choice to only include title and keywords in the scanning process is based on the fact that the context is rather rare; it is therefore expected to be announced already in these article elements. References concerning physical product flows, e.g. purchasing for hospitals, material handling in healthcare services or medical supplies, were not of interest; they are however included in Table 5, as *physical products flow*. Eight articles were categorised as concerning a *patient flow focus*.

Table 5: Overview of the structured literature review

Journal	Volume, issue, year		Reviewed articles	Number of articles with a healthcare context	
	From	To		Patient flow focus	Physical products flow focus
<i>International Journal of Logistics Management</i>	11, 1, 2000	28, 4, 2017	442	1	1
<i>International Journal of Logistics: Research & Applications</i>	3, 1, 2000	20, 6, 2017	496	1	5
<i>Journal of Business Logistics</i>	21, 1, 2000	38, 4, 2017	459	1	4
<i>Journal of Purchasing & Supply Management (European Journal of Purchasing & Supply Management up to year 2002)</i>	6, 1, 2000	23, 4, 2017	206+369	0	8
<i>Journal of Supply Chain Management</i>	36, 1, 2000	53, 4, 2017	562	0	1
<i>Supply Chain management: An International Journal</i>	5, 1, 2000	22, 6, 2017	690	6	6
<i>International Journal of Physical Distribution & Logistics Management</i>	30, 1, 2000	47, 10, 2017	1481	0	1
			Σ 4705	Σ 8	Σ 26

The snowball approach (going through references of articles already included) was thereafter used to trace the 8 articles' references (second search phase). If these articles had a patient flow focus they were also a part of the result, see Appendix VI for identified articles. All references that either included a healthcare word (e.g. healthcare, health services, hospital or patient) in the title or were published in a healthcare related journal (e.g. Journal of Health Care Quality Assurance, Journal of Health Organisation and Management, or The International Journal of Health Planning and Management) were then examined. Only articles published in academic journals were included in the final reading, thus excluding books, reports, non-reviewed conference papers and newspaper articles. Linköping University's library services, Google and Google Scholar were used to trace the references, although not all references could be found through the available search paths. A total of 141 (of 401) references were healthcare related and 34 references had a patient flow focus. An illustration of the literature review method is presented in Figure 16 below. See Licentiate thesis, Appendix I, for motivation of the used method of literature search.

Figure 16: The two search phases in the literature review

The second search phase shows that the articles in the reference list are published in a wide range of journals. It can be viewed as that there are publications that deal with logistics related issues, and patient flow issues. But they are not directly connected to the research field of logistics and supply chain management by publishing in that kind of journals.

Additionally, a major review from The Health Foundation with over 5000 scanned articles (The Health Foundation, 2013a) and the analysis of operations and supply chain management research in healthcare (Dobrzykowski et al., 2014) have also been used to find relevant literature. Unstructured searches by keyword (e.g. patient flow, care chain, logistics management and healthcare, patient case flow) via Google scholar and traced publications from some researchers in the field (e.g. Zoe Randahl, Lillrank, Paul Walley, Silvester, K. Jan Vissers, Vijai Kumar Singh, Villa, Steffano, Steven Alder, Bert Meijboom) have also been used. The traced authors have published in a wide range of journals and research fields but have a common industrial engendering approach to the development of healthcare businesses.

3rd CHAPTER

THE THEORETICAL FRAME – FEATURES FOR CARE CHAIN EFFECTIVENESS

This chapter presents the theoretical frame of reference by contextualising logistics systems' features to describe features for care chain effectiveness. Both basic logistics management theories from a commercial context and applied theories in a healthcare context are used. It is logistics management theories aimed at care chain effectiveness that are presented, but examples of shortcomings in the absence of "good" logistics management or care chain management also occur. Through this, the chapter aims to answer RQ 1: How can features for care chain effectiveness be described?

STRUCTURE OF THE THEORETICAL FRAME

Logistics management theories can be approached and operationalised in a number of ways. In this dissertation it is done by the seven *Logistics system’s features* developed in the licentiate thesis, see Appendix I. These features are in this chapter contextualised to describe features for care chain effectiveness. The logistics system’s features also structure this theoretical frame, see Table 6.

Table 6: The structure of the theoretical frame

Since the structure of this chapter follows the figure above, first out is *Strategic issue – Chains’ objectives*.

3.1 STRATEGIC ISSUES – CHAINS' OBJECTIVES

Logistics management is to support a firm's overall mission and stated objectives (Stock and Lambert, 2001) and logistics management is thereby objective-directedness depending on whatever inter- and intra-challenges to meet (e.g. Cooper and Ellram, 1993). This means that logistics management faces a multitude of issues and the operational solutions depend on what is to be achieved, which then requires trade-offs. For example, solutions probably differ depending on what is more important; low costs or high availability. The connection to systems theory can thereby be stressed by for example Ackoff (1971) as he defines organisations as to be purposeful and in that sense can change objectives to select output and thus displays will. Thus, all individuals within an organisation also perform purposeful activities which hopefully coincide with the purpose of the organisation. Further, an organisation is made for a purpose (Ackoff, 1971) and a logistics system's primary purpose is to manage an orderly flow of materials to find the most efficient way to offer the desired level of customer service (Stock and Lambert, 2001). The question of the purpose, what a logistics system should achieve is fundamental. Consequently, one of the prerequisites for a logistics system to exist is that the organisation in some way aims to deliver cost-effectively (Mentzer et al., 2004). A logistics system's purpose is of course only one part of an organisation's mission; it is thus the focus of this dissertation, and it is specified in the first feature of a logistics system quoted below:

1 *“A logistics system's purpose is to meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance”*

In general, the purpose of a healthcare organisation can be expressed as to meet the population's need for healthcare services. This corresponds to the superordinate national healthcare system's purpose of health and well-being of the nation. In the micro-system, a patient has needs that are to be met which may include healing, relieving and comforting but also prevention. The care delivery service hence involves many activities to meet patient requirements. Objectives then become important, as they drive activities and direct management's and other participants' behaviour (Mentzer et al., 2004) to fulfil the purpose of a national healthcare system. The mission and vision of organisations are other directions that can help involved activities to contribute to the care delivery system's total performance. They affect the procedures and practices of the organisation, which then determine organisational effectiveness. It is useful to separate them since they provide different applications (Thompson, 2001). Therefore, *mission, vision and objectives* are presented in the next section. In addition, it is pre-requested that the purpose of a logistics system must match the organisation's mission, vision and objectives, hence *cost-effective delivery service* is also presented. The section ends with reasoning around organisations' *true objectives* in contrast to stated objectives.

3.1.1 Mission, vision and objectives

The mission statement defines the basic purpose of an organisation and identifies the parameters under which it will operate and the effort thereby to fulfil the mission statement

(Stock and Lambert, 2001). Mission, vision and objectives can be described and defined differently. In this dissertation mission, vision and objectives are all related to the direction that an organisation takes, which requires coherence among them with the stated mission as the superior (Stock and Lambert, 2001). A mission is according to (Thompson, 2001), who describes strategic management in combination with systems theory, the answer to why the organisation exists. Further, vision can be described as reflecting the organisation's future state that ideally the organisation will achieve or what the organisation is to become (Thompson, 2001). Additionally, objectives are described as stating what is to be achieved and when results are to be accomplished, but not how these results are to be achieved (Thompson, 2001).

For example, H&M's mission can be interpreted to be as their business concept states: "Fashion and quality at the best price"¹. Additionally, their vision is to "use our size and scale to lead the change towards circular and renewable fashion while being a fair and equal company"². It is here possible to understand the importance of a logistics system striving for cost-effective delivery service in order to realise that mission and that vision. An example of supply chain objectives runs from the firm's marketing objective. Accordingly, the objectives that rationalise these should in some way be able to be evaluated by follow-ups.

However, there are certain challenges preventing coherence among mission, vision and objectives. Mission for healthcare is about good health and care for the entire population. Performance towards that type of mission is typically indirect to measure. Visions also tend to be more difficult to measure than performance in line with quantitative objectives. According to Thompson (2001) this can lead to attention being focused on aspects that are more easily measured (e.g. costs) and can therefore come to be perceived as the most important objectives. In contrast, financial measures will typically not be seen as the most essential in terms of missions for public organisations (Thompson, 2001). It is thus argued that organisations as a whole have a mission and managers have individual objectives (Thompson, 2001). Consequently, there can be a number of potentially conflicting objectives with concerns both for management's and staffs' actions. This is of special importance for healthcare staffs as their training and natural orientation are towards professional work based on evidence-based knowledge and science which can then result in feelings of conflict with regard to more resource-efficient objectives (Thompson, 2001). Vissers and Beech (2005) stress that different perspectives permeate managing healthcare organisations and it is therefore often a dual management by clinical professionals and administrative staffs and perhaps also business managers. It can therefore be a difficult task to find out what healthcare organisations really are to realise. As stated earlier, a logistics system is somehow to realise cost-effective delivery service. More about this in the next section.

¹ https://about.hm.com/content/dam/hmgroupp/groupsite/documents/en/hm-way/HM%20Way_en.pdf
[Online: 2018-02-01]

² <https://about.hm.com/en/sustainability/vision-and-strategy.html> [Online: 2018-02-01]

3.1.2 Cost-effective care delivery

Cost-effective delivery service is in this dissertation used as the purpose of a logistics system. The following section thus justifies cost-effective care delivery as the purpose of a care delivery systems.

It can be argued that public healthcare organisations do not have the same driving forces for development as commercial firms have. The purpose can thus be the same: to meet customers' demands. Effectiveness is then the common focus. Effectiveness, in contrast to efficiency, can simply be expressed as doing the right things in contrast to doing the things right. Effectiveness is also emphasised within Ellram et al. (2004) definition of service supply chain management as *“the management of information, processes, capacity, service performance and funds from the earliest supplier to the ultimate customer”*. The term ‘service performance’ underlines the importance of performing what is demanded from customers, and thus the ultimate test of effective service supply chain management. In addition to effective delivery service costs must be taken in to account since public healthcare organisations deliver care services to patients funded on public funds.

Based on the prior argumentation, cost-effective care delivery service can be valid and would be fertile as the purpose of care delivery systems when exploring care chains' effectiveness. In line with supply chain effectiveness, care chain effectiveness then relates to meet demands from the patient (end-consumer for supply chains) by cost-effective care delivery.

However, it is likely that just as within supply chain management (Mentzer et al., 2001) it is challenging when care managers have to think what is best for the care chain instead of their own care. This is probably enhanced by the fact that costs often replace profits as a commercial objective and that the cost attention forms a focus on an efficient use of resources (Thompson, 2001). A further challenge is that stakeholders managing healthcare often have different interests of quality versus costs or the issue of effectiveness versus efficiency (Thompson, 2001, Vissers and Beech, 2005). Lillrank et al. (2010) argue that conflicting priorities, objectives and performance metrics are the result of the organisational segmentation based on urgency and severity as well as disease type, bodily function, principal method, or population subgroup. Consequently, and in line with Thompson (2001), disagreement and confusion between medical staff and officers about key objectives are likely to occur. Additionally, physicians react negatively when business priorities are made by people other than those who are knowledgeable in their specific medical field (Eriksson, 2013). Due to the differences in perspective among these actors and no easily interpreted overall objectives lead to difficulties in communication and finding the “right” standpoint as input to discussion when making trade-offs between care units regarding care chain issues. The necessary conflict-resolving through bargaining should then of course be based on the overall objective of the organisation by management or board established objectives (Mentzer et al., 2004). However, established objectives do not automatically lead to individuals working towards achieving them since there is a discrepancy between stated objectives and true objectives. More about this in the next section.

3.1.3 True objectives

An organisation's stated objectives are not always consistent with the true objectives formed by what the individuals in the organisation strive for. This inconsistency is acknowledged in systems theory and further developed below.

An organisation's true objective is the output that provides the energy source which can maintain the same kind of challenge and reactivate the action patterns that transform input into output (Katz and Kahn, 1966). That means that the true objective an organisation strives for is what gives it the reward that allows it to continue doing what it does. Since energy must be added to the organisation in order to continue transforming input into output, the energy is a form of reward for performed product or results. It may originate from internal and external sources to a varying extent. For example, income through sales or financial compensation based on results. Energy should thus not be confused with an organisation's purpose, which will be very limited if the purpose is only to make money. Accordingly, it is not possible to identify the true objective of an organisation with its leaders' intentions. In that case it would be a closed system (Katz and Kahn, 1966). Instead, what the organisation's individuals actually do and accomplish state what the organisation's true objective is (Katz and Kahn, 1966). Churchman (2011) also makes this distinction by distinguishing between stated objectives and true objectives since an organisation's objectives usually are not the same as the challenge that triggers the action patterns.

For public organisations, objectives are complex and vague since many concerns, different requests and activities are prioritised simultaneously (Thompson, 2001, Christensen et al., 2005). However, vague objectives give an organisation more flexibility, for better or worse (Christensen et al., 2005). By observing what an organisation's individuals actually do, and not what is stated they do, it is possible to reveal what the true objectives are (Churchman, 2011). In other words, the output that reactivates the action pattern that transforms input into output (Katz and Kahn, 1966).

3.1.4 Summary of chains' objectives

The previous sub-sections provide the contextualisation of feature one of a logistics system to describe features of care chain effectiveness. It concerns aiming to deliver cost-effectively and has been contextualised to care chains through *Mission*, *vision and objectives*, *Cost-effective delivery service*, and *True objectives*.

The sections specify that the purpose of a care delivery system is to meet patient requirements by cost-effective care delivery. It then ought to be coherent with the healthcare organisation's mission, vision, and objectives. Within healthcare organisations there can be a number of conflicting objectives as well as complex and vague objectives with concerns for both management's and staffs' actions. It is also argued that there can be a discrepancy between stated objectives and true objectives.

Hence, the analysis of *Care chains' objectives* in chapter 4 will include the following:

- Coherent mission, vision and objectives
- Prioritisation of delivering care cost-effectively
- True objectives when delivering care

3.2 STRATEGIC ISSUES –TRANSFORMATION

Supply chain management is widely recognised as the management of key business processes across the network of organisations that comprise the supply chain for example in Croxton et al. (2001). Hence, an organisations processes are part of a wider setting, they are a part of a system. Since it is the interrelation over time between the system's units which forms the result the processes is of interested to be controlled and not the functions to be optimised. This is what the second **logistics system's features** is about, see citation below.

2 *“A logistics system transforms orders into customer services in a flow-oriented process”*

A contextualisation of this feature forms the transformation of orders to be the patient order fulfilment, from demand to fulfilled demand. Patients' demand for care is however sometimes urgent as well as patients' needs and preferences are diverse, hence requiring the organisation to have a portfolio of skills and other resources readily available (Berry and Seltman, 2008). Therefore, due to their different dynamics different patient groups require different processes. This is carried out through differentiation within patient order fulfilment to define a workable unit of analysis (e.g Bohmer, 2005, Allder et al., 2010a, Lillrank et al., 2010). One concern about patient order fulfilment is that care staff can have difficulties separating the process steps required to achieve each action to be able to transform order into delivery, from the actual delivery of care that is given to the patient (Grove et al., 2010). In other words, to see the episode of care, the whole handling of patient cases, and not only when meeting the patient for a service event. This is stressed in the next section, where feature two is contextualised through *Predictability*, *Specification* and *Coordination* of patient case processes.

3.2.1 Predictability

Predictability in demand is central for supply chain effectiveness issues (e.g. Christopher et al., 2006). In the same way, predictability is likewise central for care chain effectiveness since it adjusts operating modes. This is for example presented in Lillrank et al. (2010) by operating mode corresponding to supply chain strategies presented by Christopher et al. (2006). The notion of the operating modes means to meet different types of health problems (demand) that share generic constraints of production (supply) and thereby form an operating mode. In fact, it is stated by Vissers and Beech (2005) that predictability is one of the most important characteristics to take into account when designing a process. The distinction is that instead of predictability when demand comes up (in time) it is predictability in what to do to fulfil demand (from a specific patient) that is central for care chain effectiveness. It is about how predictable it is to know how to treat a patient with e.g. stomach ache and not the predictability in when the patient contacts the A&E to get help. Predictability when it comes to the precise patient demand. It is quite logic since the exact customer demand within a supply chain is known the instant the order is placed but the “exact” demand within a care chain is known when it is decided what to do with the patient's needs.

Predictability affects lead times in that the earlier an order is complete, it can take less time downstream to the completion of the order (Stock and Lambert, 2001). Accordingly, care units forward in a care chain should thus be given greater ability to run their operations as it is possible to communicate upcoming patient cases and their status. It is through information sharing, notification of other members within the supply chain, that the order fulfilment activities can go from a single-unit process to a supply chain process (Croxtton, 2003). Likewise, it should be a main objective to provide good conditions for handling patient cases for other members in the care chain by sharing information. It is important to remember that increased predictability shall lead to increased flexibility and the ability to adapt to true demand. Not increased control so that flexibility and adaptation capability decrease.

One central part of completing a patient order is to know how to treat the patient and medical knowledge and development contribute to the ability to predict the medical outcome (Bohmer, 2009). By reducing the uncertainty for the clinical activities, throughput time can decrease as it affects the time it takes to define a patient's health problem and thereby be able to start treatment execution, illustrated in Figure 17 below. It is the point in a process where there is a larger change in predictability as between an unpredictable diagnosis procedure and a predictable treatment process. Guven-Uslu et al. (2014) denote it as a decoupling point between these two phases, i.e. the treatment decision point. They found that the predictability that is then created can be used to create consensus between different professional groups, improve performance measurements and improve resource allocation.

Moreover, the episode of care includes the whole patient case and the lead time is thus connected to how well the included sub-process interact to fulfil the patient order. Every activity from first contact with healthcare to closed case is included in the lead time, meaning that predictability in demand must be used actively to shorten lead times. For example, shorter throughput time through shorter surgery time does not result in shorter lead time if the waiting time for the surgery is unchanged. This is also illustrated in Figure 17 below.

Figure 17: The effect of learning on clinical activities (modified from Bohmer, 2009 p. 158) and the decoupling point

Another aspect of predictability in demand is reliability in time, since predictability creates the ability to be reliable in time. The predictability in medical outcome hence creates reliability in when it is possible to know what to do purely clinically, i.e. the decoupling point. At least up to a point, it can actually be argued that reliability of deliver in time is more important than shorter lead time, i.e. length of order cycle, as the impact of failure to deliver on time is more severe than placing an order further in advance (Christopher, 2005). Similarly, it seems to be more advantageous for the overall healthcare delivery system to reduce variation in time of a particular task rather than speed it up (Noon et al., 2003). Hence, both predictability and reliability offer the possibility to work proactively instead of reactively. In addition, predictability also creates conditions for specifying patient case processes. More about this in the next section.

3.2.2 Specification

Like products in supply chains, patient cases can cross intra- and inter-organisational boundaries, independently of formal structure. Correspondingly, the care chain effectiveness is affected by the match between patient case process configuration and patient demand (Bohmer, 2005, Hopp and Lovejoy, 2012). In accordance with business processes within a supply chain (Lambert et al., 2005), patient case processes can be viewed as a means to structure activities between members of the care chain. Consequently, specified patient case processes provide the opportunity to, among other things, measure and follow up lead times.

A process can be detected by its significance according to, for example, the definition by (Cooper et al., 1997): “*a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs, a structure for action*”. Specified patient case processes can be configured in different ways depending on standardisation possibilities. In the face of patients’ need to be perceived as individuals and service events requiring customised healthcare, staff must seamlessly combine custom and standardised activities in their day-to-day patient care. Hence, patient case processes ought to be standard while at the same time allowing flexibility to customise care when necessary (Bohmer, 2005). The standard and custom processes thus use the same professionals, technologies, and locations, which complicates matters. Bohmer (2005) therefore advocates separation of custom and standard processes, and introduces three operational strategies for effectively combining standard and custom processes. These approaches to combine standard and custom processes are *Separation*, *Modularisation* and *Integration* processes. These processes should not be mixed up with medical standards or clinical pathways where the exact medical procedure is specified to narrow the medical outcome.

The process alternatives presented by Bohmer (2005) are just one option for operational strategy and the alternatives get a clearer meaning if they are matched to predictability in demand. This can be done by comparing them with Stabell and Fjeldstad (1998) value configurations *Chain* (transformation of input into products). Moreover, Stabell and Fjeldstad (1998) also present alternatives to process configuration by *Shop* (solving customer problems), and *Network* (linking customers). Similar to these alternatives is Hopp and Lovejoy (2012) version of Hayes and Wheelwright (1979) well-known process-product matrix adapted to healthcare. It includes *Job shop*, *Flow shop*, and *Self Service* as alternative

delivery processes depending on the product to produce, see Table 7 below. Job Shop can be compared to Shop, Flow Shop to Chain, and Self Service as a variant of Network as the care-giver links patient to use equipment, information or other patients to be able to deal with the care problem without evident involvement on the part of the care-giver.

Table 7: Healthcare product/process matrix (modified from Hopp and Lovejoy, 2012, p. 472)

		INTUITIVE MEDICINE Vague diagnosis Trial and error treatment	EMPIRICAL MEDICINE Statistical diagnosis Evidence-based treatment	PRECISION MEDICINE Exact diagnosis Rule-based treatment
JOB SHOP High skill professionals Flexible processes	Shop	Customized Care	Inefficient Care	INEFFICIENT Overkill Care
FLOW SHOP Moderate skill technicians Standardized processes	Chain	Over-standardized Care	APPROPRIATE Efficient Care	Over-institutionalized Care
SELF SERVICE Laypersons Facilitated processes	Network	Crackpot Self-Care INEFFECTIVE	Risky Self-Care	Facilitated Care

Specified patient case processes offer ability to also use different value configurations to match patient demand effectively. Coordination within patient case processes is hence relevant. More about this in the next section.

3.2.3 Coordination

Coordination within a supply chain can be describes as a strategic response to problems arising from inter- and intra-organisational dependencies within the chain (Xu and Beamon, 2006). Problems can for example be due to incomplete information for decision makers (Mentzer et al., 2006). Likewise, multiple care providers contribute to patients’ order fulfilment, hence necessitating coordination of their activities (Berry and Seltman, 2008). Lillrank (2012) defines coordination in healthcare service delivery as “*the arrangement of service elements into processes*”.

Each building block in Figure 18 represents a sub-processes. When added together, these generate the patient order fulfilment for delivering healthcare service to patients. These sub-processes, which may consist of several service episodes, are to be well coordinated for effective care chains. However, a consequence of perceiving organisations as open systems is that coordination and governance is a means of achieving a mission, not an end in itself (Katz and Kahn, 1966). Correspondingly, within the commercial context, not all links throughout a supply chain should be closely coordinated (Lambert and Cooper, 2000). Nevertheless, regardless of whether a patient case process consists of interdependent activities by sequential activities succeeding one another or not, care activities have a time dimension which therefore sometimes must follow closely in time (Noon et al., 2003).

Figure 18: Patient order fulfilment, sub-processes to coordinate for effective care chains

As stated earlier, patient order fulfilment may include numerous medical specialties. Each medical specialties may operate somewhat independently from other specialties, i.e. a modular design architecture of care chains (Sampson et al., 2015). Coordination between each specialist (service episode) across patient order processes is largely achieved by standard interfaces by means of pre-established protocols (Sampson et al., 2015). It can for example be prescription from physician to pharmacist, referral or surgery notification. The interfaces between process steps are previously codified and real-time coordination is therefore reduced because the interfaces between service episodes are standardised. If real time coordination is necessary it is often done by the patient herself (Sampson et al., 2015).

3.2.4 Summary of transformation

The previous sub-sections provide the contextualisation of feature two of a logistics system to describe the feature of care chain effectiveness. It concerns flow focused transformation and has been contextualised to care chains through *Predictability*, *Specification*, and *Coordination*.

The sections specify that transformation of orders refers to patient order fulfilment. It is further argued that predictability within care chains refers to the predictability in knowing what to do to fulfil patient demand. Specified patient order processes provide the opportunity to, among other things, measure and follow up lead times, to use the benefits of standardising as well as different value configurations to match patient demand effectively. In addition, coordination used for the typical modular design architecture of care chains is largely achieved by standard interfaces by means of pre-established protocols and the patient herself.

Hence, the analysis of *Patient case transformation* in chapter 4 will include the following:

- Predictability in demand
- Specification of patient case processes
- Coordination of patient cases

3.3 STRATEGIC ISSUES – DELIVERY STRUCTURE

The structure within supply chains refers to the relationship between various inter- or intra-functional areas (Stock and Lambert, 2001). Within the systems theory the structure is likewise referred to as the relationship between interrelated units performing transformation of input into output (Katz and Kahn, 1966). An organisation's structure is formed as labour is divided in order to reach the common purpose of the organisation (Ackoff, 1971). The supply chain structure affects the speed and consistency of delivery and communications, the control of the functions' performance, and the cost of operations (Stock and Lambert, 2001). A logistics system's structure should hence be formed by its main flow, which is specified in the third feature of a logistics system quoted below:

3

“A logistics system has a flow-oriented structure”

Within a healthcare context the structure is the networks of units/functions that are organised in various configurations in order to meet patients' demands. The care activities constitute a unit as they are completing or finishing something. Since the structure of supply chains imposes limits on costs and lead times of the fulfilment process (Croxtton, 2003), it is assumed that the structure of a healthcare delivery system affects delivery service, cost and lead times for patient cases. The structure is probably also the main external factor affecting the behaviour of an individual care provider (Visser and Beech, 2005). In addition, it is advocated to have an explicit knowledge and understanding of how your supply chain network structure is configured (Lambert and Cooper, 2000). The following sections therefore aim to contextualise the third feature of a logistics system. This is done by focusing on the management of relationships between care units in a care delivery system in order to achieve cost-effective care delivery. The next section therefore presents *Integration, Economies of scale, scope and integration, and Information in patient order fulfilment*.

3.3.1 Integration

Regardless of the formal structure chosen, inter-functional relationships remain a key within logistics management (Stock and Lambert, 2001). One goal of managing supply chains is to integrate cross-functional business processes (Lambert et al., 2005). Patient case processes can thereby be viewed as a means to integrate care functions between care providers.

The need for integrations within healthcare businesses comes from labour division in order to reach a common purpose. Healthcare businesses at hospitals are specialised in contrast to general healthcare businesses at general practices (GPs). This differentiation aims to advance efficiency in increasingly narrowing areas. The downside of this increased differentiation is that the delivery system tends to fragment. Hence, the more the differentiation the greater the need for integration (Lawrence and Lorsch, 1967), and joining of various specialised contributions into a systemic whole (Lillrank, 2012). However, there is a trade-off where too much differentiation leads to the whole being lost and too much integration to the specialised contributions being lost (Lawrence and Lorsch, 1967). In commercial business, outsourcing of various functions takes place, for example when entire logistics operations are being outsourced to third parties. This can be seen as specialising of tasks or functions to together meet customers' demands. Within the healthcare context specialisation also takes place in several steps when patient cases are handled by different medical specialties. Integration will thus play an important role.

Lillrank (2012) defines integration in healthcare service delivery as the “*merger of various service contributions into a common understanding*”. This is in line with a traditional supply chain idea, as integration with the aim to break the organisational boundaries between functions and between companies (Romano, 2003). Integration within healthcare is thus focused on a common understanding of a patient's situation by the fusion of various contributions including all relevant views and stakeholders (Lillrank, 2012). It implies crossing of boundaries, which needs to be facilitated. Consequently, organisational arrangements are needed to support the mobilisation of resources to achieve integration, such as venues for contributors to share, documentation, time for negotiation, and rapid feedback (Lillrank, 2012). Management will need to choose the level of partnership appropriate for particular

supply chain links. Vertical integration is another example, which is the extent to which an organisation owns the network of which it is a part (Romano, 2003). A successful integration is measured by how well the organisation supports integration on a patient case level (Lillrank, 2012). However, not all links throughout the supply chain should be closely integrated (Lambert and Cooper, 2000), which also seems reasonable for care chains.

The next section presents three different labour divisions to achieve economic benefits commonly labelled Economies of scale, scope and integration

3.3.2 Economies of scale, scope and integration

Commercial logistics management provides a shift in focus from business logic based on functional optimisation to a systems approach where internal and external resources upstream in the supply chain are integrated in the offerings to key customers (Abrahamsson et al., 2015). It is a transition from economies of scale to economies of scope and further to economies of integration.

The logic for economies of integration is not only to produce a unit or units at a lower cost with flexibility, it is also to produce the service or product that a customer wants (Abrahamsson et al., 2015). In other words, cost effectiveness instead of cost efficiency. Within a healthcare context, it is when the specialised functions contribute to the system's total performance. Focus is indeed the interface, both internally and externally, and through the ability to build a network of various types of specialised internal units and external suppliers and to coordinate their expertise and required resources. Increased effectiveness comes from integration, coordination and joint planning between the various internal and external units in the chain.

The primary driver of economies of scale is usually to bring the unit cost of a product or service down. High utilisation of existing resources through large volumes and achieved learning effect results in financial benefits (Aronsson, 2000). It is thus a lack of consensus in determining scale effects for hospitals in terms of costs (Svarts, 2017). Furthermore, the primary driver of economies of scope is instead usually flexibility, where the same resource can produce several different products and services (Abrahamsson et al., 2015). It is in a healthcare context motivated that care units can share resources to ensure high occupancy and productivity for reasons such as costs, quality and control of resources too (Visser and Beech, 2005). Both economies of scale and economies of scope are reported as advantageous for hospitals, though only by means of higher volumes performing better medical outcomes (Brommels and Vintmyr, 2015).

The impact can still be different for different types of healthcare services (Svarts, 2017) and economies of scale can be present in one type of service event but the benefits are consumed by diseconomies of another (Lillrank et al., 2015). This underlines the impotency of considering healthcare businesses as systems. Consequently, economies of scale and scope within hospitals seem to have a greater effect on professional skills than on cost reduction. In addition, Glouberman and Mintzberg (2001b) point out that when costs can be measured more easily than benefits there is a danger that economies of scale within healthcare “simply play into political pressures”. The Health Foundation (The Health Foundation, 2013b) also questions cost improvement programmes with the aim of

economies of scale instead focus on the ultimately more important “*economies of flow*”. Hence, this also motivates developments towards economies of integration where focus and benefits will be on the overall system’s performance and output instead, i.e. care chain effectiveness. Figure 19 below illustrates the shift in business logic by a stepwise approach towards economies of integration combined with reported benefits from healthcare businesses.

Figure 19: A stepwise approach from specialised functions to care chain management (modified from Abrahamsson and Karlöf, 2011 p. 80)

The management of relationships between care units is probably dependent on information sharing just like it is widely recognised that information sharing is core within logistics management. More about this in the next section.

3.3.3 Information sharing

The effectiveness of a supply chain is strongly influenced by the kind of information passed among channel members, timeliness and the frequency of information updating (Cooper et al., 1997). In addition, since logistics management includes processing large amounts of data, due to the embedded holistic view, IT is fundamental both as a control and a communication tool for a company’s logistics (Stock and Lambert, 2001). Information may well be the first component integrated across some or all parts of a supply chain (Cooper et al., 1997). It can therefore be stated that managing the flow of patients’ cases includes the associated flow of information.

Continuous information sharing is required when operating an integrated supply chain (Lambert and Cooper, 2000). In modern logistics much of the administration is also automated owing to the technology development, such as electronic data interchange (EDI), enterprise resource planning (ERP), and advanced planning and scheduling (APS). Hence, it is important to capture order information and feed it to functions that accomplish order and order fulfilment processes (Croxtton, 2003). It can then help to reduce the number of steps in the process; shorter lead times make the supply chain more transparent and reduce order errors (Lambert and Cooper, 2000, Croxtton, 2003, Mentzer et al., 2004).

Likewise, patient cases cross medical specialties and by that the care delivery system can be too complex to be handled by only human abilities. Proper support systems seem to be essential, for example automated administration and sharing patient order progress information.

The literature on health information systems identifies that IT has improved the quality of the healthcare service, cost reduction in care delivery, medical error prevention, and clinical outcome improvement (Ker et al., 2018). It is also reported that IT affects patient flow and can significantly affect the quality of patient care and financial performance (Devaraj et al., 2013). Information sharing is however not an aim in itself. It is to support aligned decisions to accomplish the system's objectives. Information sharing to support patient order fulfilment is thereby relevant to further investigate as it is considered to influence care chain effectiveness.

3.3.4 Summary of delivery structure

The previous sub-sections provide the contextualisation of feature three of a logistics system to describe the feature of care chain effectiveness. It concerns a structure formed by flow and has been contextualised to care chains through *Customer service*, *Total cost*, and *Lead time and Throughput time*.

Since cross-medical specialised patient cases take place integration aims to merge various service event contributions to fulfil patient orders. Hence, the need for integration depends partly on the care delivery structure. The focus here is on how well the organisation supports integration on a patient case level. Moreover, economies of integration occur when specialised functions contribute to the care delivery system's total effectiveness, in other words economies of flow. It is also argued that economies of scale and scope within hospitals seem to have a greater effect on professional skills than on cost reduction. It is therefore of interest to explore the use of economies of scale, scope, and integration. It is also argued that information sharing by means of proper support systems for automated administration and sharing patient order progress information to support patient order fulfilment are relevant to further investigate.

Hence, the analysis of *Care delivery structure* in chapter 4 will include the following:

- Integration support when delivering care
- The use of economies of scale, scope, and integration
- Information sharing to support patient order fulfilment

3.4 PLANNING ISSUE – DEMAND MANAGEMENT

Ideal flows consist of continuous movement and processing from supplier to customer but in reality this is not the case. Logistics is the response to that uncertainty. Uncertainty in demand, supply, manufacturing and environment also makes the supply chain difficult to manage (Davis, 1993). A high degree of uncertainty is also significant for services' supply chains (Ellram et al., 2004). Hence, based on the mission statement tactical plans for how to use capacity to meet customer demand is needed (Stock and Lambert, 2001). Given that patients require care with short lead times, there are some general tactical plans based on

logic from logistics systems to meet that demand. It is specified in the **fourth feature of a logistics system** that there should be a strategy to meet demand, see the quote below.

4

“A logistics system has a strategy to meet demand”

If a supply chain is to be as effective as possible it should be able to produce exactly what the customer wants at any given time. The ideal supply chain would then have the exact capacity for every activity along the chain. Balancing the capacity in every activity is therefore necessary but very difficult. Instead, the uncertainty stimulates functions to create safety buffers in time, capacity or stocks to be able to deliver (Vorst and Beulens, 2002). Balancing the capacity is also one of the constructs of logistics management presented by Aronsson (2000). Capacity and lead times are thereby of interest and the balancing of capacity also proves the importance of flexibility. Decoupling is also used in supply chains to address a particular management dilemma, e.g. to be able to shift strategy when balancing capacity (Christopher et al., 2006). Hence, the fourth feature is therefore contextualised to care chains through *Capacity and Lead time*, *Flexibility*, and *Decoupling*.

3.4.1 Capacity and lead time

Generally, there are two demand managing models: planned capacity with variable lead time or flexible capacity with fixed lead time (Aronsson, 2000), illustrated in Figure 20. This is also the important differences between constant and varying. In order for something to be constant, something must ensure that it continues to be constant by varying something else (Ashby, 1969). It is a trade-off between capacity levels within the service provider and the resulting variability in customer waiting and service times (Ellram et al., 2004). When capacity has an upper limit, the only way to manage differences between actual demand and planned capacity is hence to work with variable lead times. This can be done by requiring customers to wait for the service (Armistead and Clark, 1994), which controls demand to smooth the load (Crandall and Markland, 1996). This can lead to uncertainty both internally about delivery to the next function in the care chain and externally about when the service episode is finished. Consequently, planning with fixed capacity or by maximum available capacity results in longer, variable and imprecise lead times. Likewise, supply chain strategies, to ensure stable lead times in service chains flexible capacity is required by altering the capacity (Armistead and Clark, 1994) or having sufficient capacity to be able to serve maximum demand (Crandall and Markland, 1996). The latter can be made equal to Armistead and Clark (1994) option of operational control by holding inventory in anticipation of demand. Hence, inventory can be seen as capacity in a service context (Ellram et al., 2004).

Figure 20: Planned capacity and variable lead time or flexible capacity and fixed lead time (Aronsson, 2000 p. 149)

The demand managing model in Figure 20 above has conceptually been applied in a healthcare context (Aronsson et al., 2011). Fixed capacity has an inward cost reduction focus by using patient queues to protect sub-processes or be considered scarce resources (Aronsson et al., 2011). In contrast, handling demand through fixed lead times focuses on patient demand through quicker response and greater flexibility by protecting lead times (Aronsson et al., 2011). The possibility to make promises about the total lead time for patient order fulfilment therefore rests on the reliability of lead times of the included parts when delivering healthcare. Noon et al. (2003) recommend that care units with mostly random demand should keep to a lower level of capacity utilisation than departments with mostly scheduled demand. Care services with a very low tolerance for waiting should moreover only be assigned additional duties that can easily tolerate delays or, as stated above, for which additional resources can be quickly deployed (Noon et al., 2003). Hence, flexibility is of interest to be able to meet patient demand. More about this in the next section.

3.4.2 Flexibility

Flexibility concerns an organisation's ability to adapt to changes (Stock and Lambert, 2001). A demand-driven approach thereby focuses on flexibility to meet customer demand through responsiveness. This is in contrast to the more traditional forecast-driven approach which focuses on low manufacturing costs and high productivity (Abrahamsson et al., 2015), leading to unresponsive and unadaptable organisations which cannot be effective for a longer period of time (Stock and Lambert, 2001). Hence, the relationship between capacity and lead-time should therefore shift as lead time should drive capacity, instead of the other way round (Abrahamsson et al., 2015).

Investments in flexibility can be made just like investments in capacity (Abrahamsson and Karlöf, 2011). The choice between investment in flexibility or capacity is about the way in which the "new" capacity can be used. Hence, investment in flexibility is to invest in converting existing or new capacity to improve flexibility, capacity that can follow the true demand more easily and more closely (Abrahamsson et al., 2015). To invest in plain capacity is instead to extend existing work methods' capacity.

More flexible functions reduce the reliance on forecasts and the uncertainty that forecast targeting brings (Abrahamsson and Karlöf, 2011). The more flexible production, the closer the customer order, production can take place, and the smaller the inventory needed to meet customer requirements for a particular lead time. Already Katz and Kahn (1966) as

systems theorists emphasise the importance of flexibility to meet environmental changes, instead of concentrating on only integration and coordination to ensure stability. This is due to considering organisations as open systems. Within a healthcare context an investment in flexibility means that the care delivery can take place closer in time of patients announcing health problems. Each care unit with increased flexibility can deliver care with less queues, leading to shorter total lead times for patient cases. Investment in flexibility does not mean automatically increased cost; it depends of course on the type of investment. Moreover, this tactic often involves having a planned overcapacity of some critical parts of functions within the supply chain (Abrahamsson and Karlöf, 2011) which can then lead to reduced costs in other areas (or increased revenues). A further argument is that it is impossible for a system to be in use all the time as demand varies and there is a bottleneck effect on capacity (Silvester et al., 2004), which once again underlines the fact that the aim of a business cannot be to fully use resources.

Next section present the contextualisation of decoupling as used in supply chains to shift strategy when balancing capacity.

3.4.3 Decoupling

Decoupling points are used in supply chains by means of strategic inventories to be able to use a hybrid strategy (Christopher, 2005). By using decoupling points in specialised healthcare it is also possible to apply a hybrid strategy where lean and agile paradigms coexist (Güven-Uslu et al., 2014), for instance between the point within patient order fulfilment where there is a larger change in predictability than between an unpredictable diagnosis procedure and a predictable treatment process, see Figure 21. Hence, as Bohmer (2009) illustrate the uncertainty in the clinical process, the uncertainty is bigger before the treatment execution than after it. If this is true for the patient orders in progress and patients in treatment, different production strategies can be used for each of them, e.g. agile and lean.

Figure 21: Decoupling point can be used when choosing strategy for capacity planning for order fulfilment

Back to inventories, which can be used for other aims as well to secure production or to secure delivery to customer. For services, the latter aim can be handled by capacity level and flexibility (Ellram et al., 2004) and production can be secured by letting patients wait, i.e. form queues. It is stressed in the literature that patient queues are connected to management decisions, since capacity is designed to handle the demand that is currently handled (Noon et al., 2003, Silvester et al., 2004, Kujala et al., 2006, Walley et al., 2006a, Eriksson et al., 2011). It can therefore be described as a delay designed into the system (Allder et al., 2011). Hence, it is a balancing capacity issue. The reason for queues can of course vary, e.g. due to patients waiting to be batched to be processed, approvals or other administrative acts, and errors to be corrected (Kujala et al., 2006).

A queue can also be a decoupling point to ensure maximum use of a bottleneck resource (Visser and Beech, 2005). However, to use queues to make sure that costly resources are fully used is though stated by Eriksson et al. (2011) to be a misconception. This is because there is often one activity (and not the costly resource) that tends to be a bottleneck, which then governs the entire patient process output rate. In addition, the relationship between resource use and queue length is exponential (Silvester et al., 2004), meaning that to use a resource 100% the queue has to be disproportionately long. It is just realising that a system cannot be in use all the time as demand varies and there is a bottleneck effect on capacity. To avoid the false feeling of lack of capacity, activities that are not part of the bottleneck should have an over-capacity and thereby not experience significant queues. Queues are therefore first and foremost productive when the activity has a relatively predictable demand and procedure as well as a relatively high tolerance for waiting (Noon et al., 2003). From production it can be learned that the fewer queues in production, the more customer order focus (Mattsson and Jonsson, 2003).

Based on the previous discussion, given that care chain effectiveness is the main objective and not resource efficiency, decoupling points through queues should be used to shift strategy to balance capacity and not an effect of delays designed into the system. Decoupling points can then be used to plan where there should be a high capacity utilisation of the resources and high flexibility. Service events, functions and care units can thus be controlled in different ways.

3.4.4 Summary of demand management

The previous sub-sections provide the contextualisation of feature four of a logistics system to describe the feature of care chain effectiveness. It concerns capacity balancing within supply chains and has been contextualised to care chains through *Capacity and lead time*, *Flexibility*, and *Decoupling*.

By meeting patient demand with flexible capacity or sufficient capacity to serve maximum demand, fixed lead times can be obtained. Conversely, planning with fixed capacity gives variable lead times. It does not mean that staff should be idle but assigned additional duties that can easily tolerate delay. It is also argued that a demand-driven approach can be used to balance capacity, meaning focusing on flexibility to meet patient demand through responsiveness. Investment in flexibility can be made by capacity that can follow true demand more easily and more closely, in contrast to extending existing work methods' capacity. Lastly, it is discussed that decoupling points through queues should be used to shift strategy to balance capacity instead of queues occurring as an effect of delays designed into the system.

Hence, the analysis of *Demand management* in chapter 4 will include the following:

- Planning for fixed lead times
- Achieving flexibility
- Decoupling to shift strategy

3.5 PLANNING ISSUES – TRANSFORMATION PLANNING

Planning operations is key to moving an organisation or supply chain in the desired direction (Stock and Lambert, 2001). Organisations can choose behaviour and transform input into output (Ackoff, 1971). A logistics system thus delivers what customers request, which means that it can control the transformation from demand to customer service. It is in the most general sense the complete process from point of sales inquiry to delivery of a product to the customer. The transformation then has to be planned to manage delivery. The planning will realise the chosen tactic for the business and includes the ongoing tasks, daily decisions and procedures. Since resources are planned to perform the transformation, the planning also controls costs. It is specified in the **fifth feature of a logistics system** that:

5 *“A logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources”*

To control the transformation from customer demand (input) into customer service (output), the whole supply chain has to be managed, which includes joint planning (Cooper et al., 1997). Likewise, within healthcare demand and management decisions should start with what demand to meet (Walley, 2013). Thereafter the question of what care to deliver and how much capacity is then needed and finally what resources are therefore required. It is, thus, rather the classic public sector approach of a budget-based resource allocation that dominates healthcare planning decisions (Allder et al., 2011, Walley, 2013). In other words, what resources exist, what is the yield from these resources and what output can then be provided. Which is not the way to transform demand effectively. Hence, the fifth feature is contextualised to care chains through *Planning from demand to output*, *Delivery planning*, and *Capacity planning*.

3.5.1 Planning from demand to output

Joint planning has a significant impact on the supply chain's effectiveness (Stock and Lambert, 2001). A key is to widen the system by involving many entities within the chain when planning material flows (Cooper and Ellram, 1993). Likewise, within healthcare it is a whole system issue to control care chains since the whole system behaviour influences the ability to deal with patient demand (Walley, 2013), which means that their management should include planning from true demand to fulfilled patient order, i.e. output.

Patient demand spans from a minute visit to throughout life treatments, i.e. the extent of demand varies and exists over time. Demand requiring care services with different time and/or space becomes a system issue and the total care chain needs to be effective. In other words, the patient order fulfilment is performed in several service episodes by several care providers, see Figure 22. An example is from Allder et al. (2010b), showing that length of stay at an emergency department depends on bed-availability at the next care unit. Similar conclusions about whole system behaviour affecting ability to meet demand is presented by Walley et al. (2006b) and Eriksson et al. (2011). This can be further exemplified when

time varies instead but not space. Hence, if a care unit has both new visits and follow-up visits the demand for follow-up visits is triggered by the new visits (e.g. studied by Allder et al., 2011, Vissers and Beech, 2005).

Figure 22: Managing from demand to output includes the total episode of care

Interrelated functions determine the total service delivery performance and accordingly also the total lead time for a patient case to be handled. Consequently, coherent plans are emphasised for managing delivery of care. It is therefore vital to understand demand and its behaviour facing the system and each function (Allder et al., 2011). In addition, Eriksson et al. (2011) emphasise the need to properly understand accessibility and monitor demand and capacity variation. It is therefore necessary to collect accurate demand data and use it in planning of capacity (Allder et al., 2011, Walley, 2013). Knowing the true demand is a pre-requisite to be able to plan for a smooth follow demand. If not, just hoping that the available capacity will be enough and if it is not the lead times will be longer than necessary. Hence, the next section contextualises care delivery planning.

3.5.2 Delivery planning

The previous section underlines the fact that care delivery within each care unit should be driven by true demand. However, true demand seems not to be the easy to establish since care managers overlook advantageously supporting a typical resource-driven approach (Walley, 2013). Many studies show that emergency admissions experience less significant variation than elective patient admissions to hospital (Ham et al., 2003, Walley et al., 2006b), suggesting that the natural pattern of demand is distorted. This is for example due to prioritisation, activity measurement, delays, thresholds levels (Walley, 2013) or clinical schedules (Allder et al., 2010b) in order to match available resources and to maintain high utilisation of resources. Consequently, errors in planning decisions increase demand variability and the lead times are increased due to failure to keep demand rate.

Batching patients by specific treatment is another way of planning care delivery. This also increases the natural mix variation of what service events are required on a daily basis. It is also cumulative for care units or services downstream generating severe consequences for delays (Allder et al., 2010b) (for example waiting for test results etc.). This is also a well-known decision planning in the manufacturing sector which, according to Mattsson and Jonsson (2003), is labelled ‘controlling order release’. Another capacity planning strategy is to have daily or weekly cyclical activities, which forms patterns that also extend the length of lead times (e.g. described by Allder et al., 2010b). By introducing variation into the system

the effect is made worse by the known phenomenon of bullwhip or demand amplification (also known as “Forrester” named after Forrester, 1961). In contrast to demand amplification within a supply chain this works in the opposite direction referred to as the ‘Burbidge effect’ (Burbidge, 1961). The general recommendation when planning care delivery is thus not to split demand, where it is possible, unless there are clear process flow or process design benefits (Walley, 2007).

To meet true demand by delivering care demanded by patients, capacity is of course needed. More about capacity planning in the next section.

3.5.3 Capacity planning

Capacity can be seen as a replacement for safety stocks in that it allows a service supply chain to increase its level of production to respond to customer demand (Ellram et al., 2004). Adding capacity in services, like increasing safety stock when handling goods, has a buffering effect. It allows the supplier to be more responsive and flexible to meet unforeseen customer demand. Services cannot be stored as they are produced and consumed simultaneously (Hill, 2005). Unused capacity is therefore lost capacity, which makes it expensive, likewise safety stock, if customer demand is lower than planned. However, in practice non-utilisation of capacity may be a part of effective resource allocation but is often seen as waste (Walley, 2013). Hence, it is for care units to find mechanisms to translate demand into resource requirement profiles.

To match capacity to demand by using historical activity statistics (work completed) or based on average demand are two well-known planning strategies within healthcare, although both these strategies come with flaws, described for example by Walley (2013) and Alder et al. (2011). Historical activity statistics reflect what has been produced and not true demand. Since the production reflects the old capacity planning, the forecast is based on care units’ former professions’ schedule. This reflects historical rights of practitioners rather than real patient demand, also described by Villa et al. (2014). Furthermore, capacity planned to meet average demand results in patients having to wait (queue) when demand is higher than average and when demand is lower than average the unfilled capacity cannot be carried forward to the next care delivery. This is because random variation in demand and a random variation in capacity will lead to a mismatch on a frequent basis due to ‘Erlang’ queues (Noon et al., 2003). Hence, it is the variation in the way healthcare capacity is managed that causes queuing (Silvester et al., 2004).

3.5.4 Summary of transformation planning

The previous sub-sections provide the contextualisation of feature five of a logistics system to describe the feature of care chain effectiveness. It concerns demand-driven operational planning within supply chains and has been contextualised to care chains through *Planning from demand to output*, *Delivery planning*, and *Capacity planning*.

The entire care chain is to be effective and since patient demand requiring care services in different time and/or space it is a system issue. It is associated with great uncertainty to trust that available capacity is enough to meet patients’ needs and by that risking unnecessarily long lead times. Hence, joint planning based on true demand is considered to

be important to smoothly follow patient demand along episodes of care. Although it is reported that planning to deliver care is typically recourse-driven instead of demand-driven. It is also reported that the natural pattern of demand is distorted by operational management decisions when planning care delivery, for example batching patients by specific treatment or having daily or weekly cyclical activities. The general recommendation is hence to keep demand united where possible and not split it. In addition, two well-known planning strategies for care delivery are reported that do not match capacity to demand: historical activity statistics (work completed) and basing capacity on average demand. Hence, the unit is to find instruments to translate true demand into care delivery plans and thereafter draw up resource requirement profiles.

The analysis of *Care delivery planning* in chapter 4 will therefore include the following:

- Joint planning for system issues
- Demand-driven care delivery
- Demand-driven capacity

3.6 MEASURING ISSUES – CHAIN PERFORMANCE MEASUREMENTS

It was stated earlier that a logistics system's purpose is to meet customer requirements through cost-effective delivery service. It can be operationalised as the best performance metrics for measuring supply chain success. It is about measuring on a more structural level than operative recording efficiency and performance within operational units (Abrahamsson and Aronsson, 1999). Further, it can be argued that supply chain performance measurements is based in a combination of cost, customer service and lead times, see for example Gunasekaran et al. (2004), Beamon (1999) and Christopher (2005). Since financial control of logistics performance is essential, the total logistics cost should be captured (Stock and Lambert, 2001). Adding to that, lead times and throughput are the basis for improving customer service as well as central for finding structural problems resulting in unnecessarily long lead times, such as bottlenecks or an inappropriate supply chain structure (Christopher, 2005). Of course it is challenging to measure effectively the larger and more complex a system is but it indeed underlines the importance of it. It is specified in the **sixth feature of a logistics system** that:

6 “A logistics system is measured to capture the whole system’s logistics performance, including total logistics costs, lead times and customer service”

Performance management in a healthcare context means a strategic process that integrates measurement across functional boundaries to produce a consistently accurate and sustainable set of improvements over time (Walley et al., 2006a). By that, measuring the whole system's performance by total costs, lead times and patient service will enlarge the system's boundaries. Hence, the constant cost trade-off present for supply chain managers (Stock and Lambert, 2001) could probably also be valid for care management. The sixth feature is therefore specified as measuring chain performance and contextualised to care chains through *Customer service*, *Total cost*, and *Lead time and Throughput time*. It is further developed in the following sections.

3.6.1 Customer service

The network of businesses that are involved in a supply chain produce value for the ultimate customer (Christopher, 2005). It is the binding and unifying force for all of the logistics management activities and the output of the logistics system (Stock and Lambert, 2001). In that way, the effectiveness of a logistics system in creating time and place utility is measured by the customer service (Stock and Lambert, 2001). Hence, customer service is the ultimate measurement for supply chain and logistics management. The system's boundaries are thereby widened as measuring delivery service performance against the ultimate customer. Likewise, the system is widened when measuring patient service for the total episode of care. It is also the most central measurement since costs are valued against customer service, creating the arena for necessary and inevitable system trade-offs.

The healthcare delivery system's mission is in some way to meet the population's need for healthcare. Patient service should therefore be as highly relevant as customer service is for supply chain and logistics management. Receiving perfect care is one way of measuring patient service within healthcare. The Health Foundation (2013b) describes *perfect care* as the right care, first time, on time, every time, in full. This can certainly be related to the logistic perfect order concept (Christopher, 2005); on-time, in-full, error-free. The perfect order includes order delivered within requested time, completely, and error-free. Together they provide the likelihood that a perfect order is achieved. Since a patient journey may involve hundreds of clinical and administrative tasks a small percentage of errors in each step leads to a large number of patients not receiving "perfect" care. For example, if on-time = 90%, in-full = 80%, and error-free = 70%, then the likelihood that perfect care was achieved is 50.4 per cent ($90\% * 80\% * 70\% = 50.4\%$). Following the logic of logistics, the stated patient service level should be delivered at the lowest cost possible. More about total cost in the next section.

3.6.2 Total cost

The concept of total cost is key to logistics management. That is, attempts to reduce specific costs within functions may be less optimal for the system as a whole since it can lead to greater total costs. Hence, and as mentioned earlier, trade-offs between and among interrelated functions within a logistics system are essential (Stock and Lambert, 2001). Measuring logistics performance on a structural level is therefore to allocate cost to the flow instead of, metaphorically, to silos by departments (Abrahamsson and Aronsson, 1999). In the same way, patient cases cut across medical specialties with cost impacts on those functions, i.e. cost-effective care chains have a substantial impact on the overall healthcare costs. Meaning both control for resource allocation and interrelations since cost arising from managing a subsequent backlog borne by a care unit upstream of a constraint entails cost for the entire system. Hence, management must also be able to take into account costs associated with each function and how cost changes within each cost contribute to total cost to be able to make knowledgeable trade-offs (Stock and Lambert, 2001). Accurate and relevant cost data is hence highly critical to use in decision making (Stock and Lambert, 2001). Consequently, measurements have to capture the performance along the care chains as well as the performance of the functions to be able to do performance analysis.

Cost measurements to control and develop care operations is not aimed at politicians and officials controlling healthcare businesses by laws, rules and resource allocation. Cutting measurable costs at the expense of no measurable benefits can be a risk. It is therefore important to separate metrics for developing business and for evaluating the business. Rather it can go wrong as the cost can easily be turned into a "price" and neither can stand alone as costs are part of a context and must be valued contrary to output, i.e. effectiveness. Costs are associated with both lead times and throughput times. More about this in the next section.

3.6.3 Lead time and Throughput time

It is widely recognised within logistics management theories (e.g. Christopher, 2005) that it is important to shorter lead times in a supply chain over time for both higher customer service and to lower costs. The lead time for the total episode of care can be compared to the lead time for order to delivered order, i.e. from demand to fulfilment (e.g. by Croxton, 2003). From the patient's viewpoint there is only one lead time: the elapsed time from first contact until the need is met. Consequently, the lead time for an episode of care is a central part of the system's total performance. A patient order can still consist of a number of service episodes, i.e. sub-processes, which can be labelled throughput times. From commercial logistics Christopher (2005) underlines the interfaces between that kind of sub-processes to be extra fertile for lead time reduction. It is also reported from a healthcare context that measuring waiting time and throughput time (the time it takes a patient to pass through a sub-process) is crucial (Kujala et al., 2006). Likewise, the time between different care processes can be "unknown", which is reported by for example Allder et al. (2010b), who state that patients are 'buffered' at the A&E pending bed to pass the four-hour government target. The handover times are of great interest as the time it takes to perform different service events is rather short in comparison to the total lead time for the episode of care. Figure 23 below illustrates the interfaces between service episodes in relation to the total lead time for episodes of care and throughput time for each service episode.

Figure 23: Interfaces between service episodes

To be able to do adequate time-based analyses the total episode of care and involved sub-processes' duration have to be capture (Peltokorpi and Kujala, 2006). Hence, the lead times and throughput times must be measured in absolute terms and not just as a relative measurement (Christopher, 2005) although it is reported by Lillrank et al. (2011) that many patient information systems do not offer longitudinal data to group into patient episodes.

3.6.4 Summary of measuring chain performance measurements

The previous sub-sections provide the contextualisation of feature six of a logistics system to describe the feature of care chain effectiveness. It concerns measuring chain performance within supply chains and has been contextualised to care chains through *Customer service*, *Total cost*, and *Lead time and Throughput time*.

Following customer service as the ultimate measurement for supply chain performance, patient service will be the ultimate measurement for care chains. When measuring patient service as the output of order fulfilment the system's boundaries are widened, i.e. measuring patient service for the total episode of care. It can for example be measured by perfect care, similar to the perfect order concept, meaning care delivery on-time, in-full, error-free. Furthermore, it is also relevant to believe that healthcare managers need accurate and relevant cost data to use in decision making to achieve care chains' effectiveness. Consequently, measurements have to capture the cost performance along the care chains as well as the performance of the functions to be able to do performance analysis. It is also argued that lead times and throughput times must be measured in absolute terms to stimulate a focus on patient service. It is further emphasised that the interfaces between episodes of service are extra fertile for lead time reduction.

Hence, the analysis of *Care chain performance measurements* in chapter 4 will include the following:

- Patient service measurements
- Care chain costs
- Measuring lead and throughput times

3.7 MEASURING ISSUES – REGULATION OF CHAIN PERFORMANCE

A system uses feedback to regulate its behaviour and thereby its output. Control is exercised by setting targets of performance criteria and then monitoring actual performance for comparison with those targets. The discrepancy between these two then activates some behaviour of the system so that the output converges more closely to the target. That is negative feedback, which makes it possible for the system to correct deviations from the chosen direction (Katz and Kahn, 1966). (Positive feedback is instead when the system changes or grows in desired ways that amplify and enhance the system's current processes. Parallels can be made to Van Gigch (1991) system design). It is the control function's responsibility choosing from different courses of action (Ackoff, 1971). Hence, management uses feedback to regulate behaviour to ensure that the system behaves as hoped for – a reward structure that promotes desirable objective-oriented behaviour.

Logistics management should contribute to a firm's survival and further by competitive advantage resulting from a marketing orientation and operational efficiencies (Stock and Lambert, 2001). It is further elaborated by Abrahamsson and Karlöf (2011) as being a part of dynamic firms. This can straightforwardly be linked to the general features of an open system presented by Katz and Kahn (1966). Hence, the feedback makes it possible to correct errors or make changes in the business environment and the firm (system) can then maintain a dynamic stable state, i.e. homeostasis. Just like open systems, firms are not at

rest; they are constant moving towards differentiation and complexity, because of the dynamics of the sub-systems and because of the relationship between growth and survival. That is, to consider logistics management to be a part of a firm and then also a part of a social system. In so doing, logistics systems must deliver customer service in a cost-efficient way and should therefore use feedback to regulate its behaviour to meet that target. The specific feedback is in this dissertation considered to be logistics measurements. This is highlighted in the **seventh feature of a logistics system**.

7 **“A logistics system uses logistics measurements as feedback to regulate its behaviour to reduce differences between actual and desired performance”**

Likewise, in a healthcare context, measuring should provide a meaningful view of how well the system is doing and point towards appropriate courses of action for improvement (Walley et al., 2006a). Measurements can thus rarely stand solo since they are taken out of a context they should thus be interpreted in. Consequently, measurements are only to be used as indicators (Boland and Fowler, 2000). Hence, performance measurements should somehow be related to patients’ requirements over time and a healthcare delivery system should use that feedback to improve patient service. Hence, the seventh feature is specified as using measurements to deliver cost-effectively and contextualised to care chains through *Measurements for organisational development*, *Understanding a system’s behaviour*, and *Accessible assayable data*. This is developed further in the next sections

3.7.1 Understanding a system’s behaviour

One way of using feedback is to support the understanding of the system’s behaviour and in that way be able to regulate its behaviour. Feedback is therefore used in the sense of mirroring how your own part’s or several parts’ behaviour affects the superior system’s performance. This is also described within a healthcare context by Walley et al. (2006a) as the ideal role of performance management is one that encourages and facilitates an understanding of the care delivery system that is being managed. Creating a measurement process for sufficient data to arise from it and to knowing how it should be used are therefore important (Boland and Fowler, 2000). Hence, it is required to be able to make the transition from measurements to management. Performance data at operational level can then provide the information needed to really understand what happens to patient service along the episode of care and root causes of problems encountered. This has been shown by e.g. Walley et al. (2006a) and The Health Foundation (2013b) referring to overcrowded A&E departments as a hospital-wide issue and not an isolated A&E problem. Or the illustration of variation by emergency and elective demand over time presented by Walley (2007) as well as linkages between admission and discharge by Allder et al. (2010a), providing information about how variation is introduced into the system.

Another concern in relation to a system’s behaviour is the understanding of a system’s boundaries. The boundaries decide the scope and are therefore always created in some way. In relation to feedback, Katz and Kahn (1966) state that it is the negative feedback that defines a system’s boundaries. This means that depending on what feedback enters the

system, the system works to converge to the target. It thus defines within what boundaries the system performance should be evaluated. If the feedback narrows the scope of the system improperly there is a risk of sub-optimisation if the sub-system does not contribute to the larger supervisory system. The system's boundaries can thereby be expanded depending on what feedback regulates its behaviour.

When managers understand the system's behaviour it is possible to choose both performance targets and appropriate solutions that form proper behaviour for real system improvement (Eriksson et al., 2011). This is the critical connection between performance measurement and performance improvement initiatives (Boland and Fowler, 2000). Reasons for not understand system behaviour can be no training in doing so or no time to diagnose root causes of symptoms, as reported by Walley et al. (2006a). It indeed leads to a poor basis for analysis of problem situations and inadequate solutions based on incorrect reasoning. It is also reported that there is a naivety around how measures affect daily operations and that it can form irrational behaviour (Walley et al., 2006a). For instance described by Silvester et al. (2004), just adding capacity does not shorter waiting times, nor does planning capacity on average activities which do not match true demand, according to Eriksson et al. (2011). Accessible assayable data are thought necessary to be able to use performance measurement to understand of system behaviour and for performance improvement initiatives. More about this in the next section.

3.7.2 Accessible assayable data

Access to adequate data for logistics management is already highlighted as highly central. Opportunities to create data analysis support for various adequate analyses is predicated as the accessibility of assayable data on a more aggregated level than of an individual patient level. However, the use of performance measurements within healthcare has shortcomings partly because the performance data to support understanding of the care delivery system is missing (Walley et al., 2006a, The Health Foundation, 2014). Walley et al. (2006a) propose, for example, the use of time-series measurement, such as statistical process control (SPC) as run charts for learning. These measures are valuable in providing objective and accurate information about the behaviour of the system to measure performance and understand system behaviour (Walley et al., 2006a). A powerful database can then be build up to generate how the system behaves over time. This will enable understanding of where the problems lie and the impact of interventions both internal and external to the organisation. It can also be an organisation's memory of how decisions affect performance.

Another flaw in relation to the issue of assayable data for system regulation is that longitudinal data to group into patient episodes is hard to capture (Lillrank et al., 2011). The alternative, to review medical records, meaning that each individual file must be observed, is very laborious. It also requires person identifications that are not always available due to data security constraints. Hence, medical records in free text form are an example of an individual level with a low level of aggregation possibilities. Medical records using standardised options and codes provide opportunities for aggregation and the data are then accessible for comprehensive analysis and statistics.

Since the system's behaviour is affected by performance data fed back to the system, the next section discusses differences between measurements for internal control and external control.

3.7.3 Internal and external control

Performance measurement and management influence behaviour and thereby also affect care chain effectiveness since patient order fulfilments are carried out by healthcare staff (Eriksson et al., 2011). Care delivery are thus affected depending on what is measured and how. Referring to systems theory, the control function should therefore choose feedback to regulate the system so that the system's performance is improved rather than set output targets. However, the intended behaviour may not be obtained, but behaviour may instead be distorted and an opportunistic behaviour created. It is reported from a healthcare context that there is a constant risk that healthcare managers instead of achieving sustainable improvement distort the system or data to meet performance targets (Walley et al., 2006a). It is extra troublesome with statistics based on volume or ratio set and monitored externally to hold healthcare organisations accountable for the way in which they use their allotted resources (Boland and Fowler, 2000). In fact, it is stated that measurement systems encourage healthcare managers to make "symptomatic relief" when trying to improve performance metrics (Walley et al., 2006a). It can thereby lead to an overall deterioration of care chain effectiveness rather than holistic improvements.

For the above reason, Walley et al. (2006a) separate measures for internal control used for care chain improvements and measures for external control used for performance reporting. It is underlined by Boland and Fowler (2000) that these are not to be confused as this can lead to counterproductive activities and inefficiency as well as ineffectiveness. In this context, Boland and Fowler (2000) present the control locations and resultant action matrix, see Table 8. The independent dimensions are the location of authority for control action (source of control) and the controlling action (nature of resultant control action as being positive (supportive or beneficial) or negative (threatening or punitive)).

Table 8: Control location and resultant action matrix model (Boland and Fowler, 2000)

Resultant Action Control Location	Positive Action	Negative Action
Internal controls	1	3
External controls	2	4

3.7.4 Summary of regulation of chain performance

The prior sub-sections provide the contextualisation of feature seven of a logistics system to describe the feature of care chain effectiveness. It concerns using measurements to deliver cost-effectively within supply chains and has been contextualised to care chains through *Measurements for organisational development*, *Understanding a system's behaviour*, and *Accessible assayable data*.

It is promoted to use measurements that are in relation to patient demand and order fulfilment to understand what happens to patient service along the episode of care. In addition, since a system works to converge stated measurements it defines the system's boundaries, it can thereby expand depending on what feedback is used. Accordingly, healthcare managers who understand care delivery, i.e. their system's behaviour and patient order fulfilment, can choose both performance targets and appropriate solutions that form proper behaviour for improving care chain effectiveness. It is recommended that time-series measurement and medical recording through standardised options and codes be used to provide opportunities for data aggregation. Some shortcomings about accessible assayable data on care chains are however described in the literature. Both that assayable data to support understanding are missing together longitudinal data to group into patient episodes. In addition, there is also a risk that data will be tampered when targets are set to hold care units accountable for the way in which they use their allotted resources. It is therefore recommended to separate measures for internal control used for care chain improvements and measures for external control used for performance reporting.

The analysis of *Regulation of care chain performance* in the next chapter will therefore include the following:

- Understanding care delivery through feedback
- Accessible assayable data on care chains
- Internal control for care chain improvements

3.8 SUMMARY OF FEATURES FOR CARE CHAIN EFFECTIVENESS

The summary below is the main content of the contextualisation of a logistics system's features presented as features for care chain effectiveness. The features are also summarised in Table 9 below.

1. CARE CHAINS' OBJECTIVES

A logistics system's feature 1: A logistics system's purpose is to meet customer requirements by means of cost-effective delivery service through flow orientation by prioritising the total performance.

Feature for care chain effectiveness: To have the purpose to meet patient requirements by delivering cost-effective care and the purpose established in the organisation's mission, vision, and objectives. In addition also staffs' operational decisions regarding care delivery should fulfil that purpose.

2. PATIENT CASE PROCESS

A logistics system's feature 2: A logistics system transforms orders into customer services in a flow-oriented process.

Feature for care chain effectiveness: To have a patient case focused transformation and arrange the patient order fulfilment by using predictability. It then provides opportunities to use benefits of standardisation, coordination and value configuration to match patient demand effectively.

3. CARE DELIVERY STRUCTURE

A logistics system's feature 3: A logistics system has a flow-oriented structure.

Feature for care chain effectiveness: To have a care delivery structure formed by patient order fulfilment and specialised medical functions contributing to the care delivery system's total effectiveness, i.e. economies of patient flow. Information sharing is therefore central.

4. DEMAND MANAGEMENT

A logistics system's feature 4: A logistics system has a strategy to meet demand.

Feature for care chain effectiveness: To manage patient demand by balancing capacity and using decoupling points to shift between demand- and resource-driven capacities. Fixed lead times can thereby be obtained through flexible capacity, over-capacity, and/or flexibility through responsiveness.

5. CARE DELIVERY PLANNING

A logistics system's feature 5: A logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources.

Feature for care chain effectiveness: To have a demand-driven plan for the transformation of patient order fulfilment and delivering care and resource allocating based on true demand. Hence, it is to keep the natural pattern of demand and keep it united.

6. CARE CHAIN PERFORMANCE MEASUREMENTS

A logistics system's feature 6: A logistics system is measured to capture the whole system's logistics performance, including total logistics costs, lead times and customer service.

Feature for care chain effectiveness: To measure care chain performance and use patient service as the ultimate measurement and cost performance for patient order fulfilments. Hence, to achieve care chain effectiveness it is fundamental to manage by lead times and throughput times.

7. REGULATION OF CARE CHAIN PERFORMANCE

A logistics system's feature 7: A logistics system uses logistics measurements as feedback to regulate its behaviour to reduce differences between actual and desired performance.

Feature for care chain effectiveness: To use measurements to deliver cost-effective care and feed medical functions with information about care chains as well as their own performance. Thereby expanding the care delivery system's boundaries along episodes of care and governing to obtain care chain effectiveness.

THE THEORETICAL FRAME – FEATURES FOR CARE CHAIN EFFECTIVENESS

Table 9: Summary of features for care chain effectiveness

	LOGISTICS SYSTEM'S FEATURES		FEATURES FOR CARE CHAIN EFFECTIVENESS
Strategic issues	1 A logistics system's purpose is to meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance.	Aiming to deliver cost-effectively	1 To have a purpose to meet patient requirements by delivering cost-effective care and the purpose established in the organisation's mission, vision, and objectives.
	2 A logistics system transforms orders into customer services in a flow-oriented process.	Flow-focused transformation	2 To have a patient case focused transformation and arrange the patient order fulfilment by using predictability.
	3 A logistics system has a flow-oriented structure.	Structure formed by flow	3 To have a care delivery structure formed by patient order fulfilment and specialised medical functions contributing to the care delivery system's total effectiveness, i.e. economies of patient flow.
Planning issues	4 A logistics system has a strategy to meet demand.	Capacity balancing	4 To manage patient demand by balancing capacity and using decoupling points to shift between demand- and resource-driven capacity.
	5 A logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources.	Demand-driven operational planning	5 To have a demand-driven plan for the transformation of patient order fulfilment and delivering care and resource allocating based on true demand.
Measuring issues	6 A logistics system is measured to capture the whole system's logistics performance, including total logistics costs, lead times and customer service.	Measuring chain performance	6 To measure care chain performance and use patient service as the ultimate measurement and cost performance for patient order fulfilments.
	7 A logistics system uses logistics measurements as feedback to regulate its behaviour to reduce differences between actual and desired performance.	Using measurements to deliver cost-effectively	7 To use measurements to deliver cost-effective care and feed medical functions with information about care chains as well as their own performance.

Through the above summary of features for care chain effectiveness contextualised from a logistics system's features, RQ 1 is answered, see Figure 24. To recap, RQ 1 is *How can features for care chain effectiveness be described?* The next chapter is the analysis by comparing these features for care chain effectiveness and today's practices.

Figure 24: A logistics system's features have been contextualised by describing features for care chain effectiveness

4th CHAPTER

THE ANALYSIS – ANALYSING TODAY’S PRACTICES

This chapter covers the analysis of features for care chain effectiveness and today’s practices. The chapter thereby aims to answer RQ 2: How can the features for care chain effectiveness be used in analysing today’s practices? The analysis is done by comparing four different care clinics’ operations with the theoretical features developed in the previous chapter. The result of the analysis is presented as structural constraints for care chain effectiveness.

STRUCTURE OF THE ANALYSIS

This analysis is structured by the features for care chain effectiveness developed in the previous chapter, the theoretical frame, see chapter 3. A summarising table can be found below, see Table 10.

Table 10: The structure of the analysis

FEATURES FOR CARE CHAIN EFFECTIVENESS			SECTION
Strategic issues	1	To have a purpose to meet patient requirements by delivering cost-effective care and the purpose established in the organisation's mission, vision, and objectives.	Care chains' objective 4.1
	2	To have a patient case focused transformation and arrange the patient order fulfilment by using predictability.	Patient case transformation 4.2
	3	To have a care delivery structure formed by patient order fulfilment and specialised medical functions contributing to the care delivery system's total effectiveness, i.e. economies of patient flow.	Care delivery structure 4.3
Planning issues	4	To manage patient demand by balancing capacity and using decoupling points to shift between demand- and resource-driven capacity.	Demand management 4.4
	5	To have a demand-driven plan for the transformation of patient order fulfilment and delivering care and resource allocating based on true demand.	Care delivery planning 4.5
Measuring issues	6	To measure care chain performance and use patient service as the ultimate measurement and cost performance for patient order fulfilments.	Care chain performance measurements 4.6
	7	To use measurements to deliver cost-effective care and feed medical functions with information about care chains as well as their own performance.	Regulation of care chain performance 4.7

THE CASES IN THE ANALYSIS

The cases included in this dissertation are four care clinics belonging to the department of Obstetrics and Gynaecology at the University Hospital in Linköping. They receive women in need of gynaecological outpatient and inpatient care, maternity care, obstetric care, and postnatal care. *Outpatient Obstetrics and Contraceptive Woman Care clinic – case clinic I*, *Inpatient Obstetrics clinic – case clinic II*, *Outpatient Gynaecology clinic – case clinic III*, and *Inpatient Gynaecology clinic – case clinic IV*. See sub-section 2.3.1 in the methodology for further information, the case description in Appendix II, and the case report in Appendix III.

Since the structure of this chapter follows the figure above, first out is the analysis of *Care chains' objectives*.

4.1 STRATEGIC ISSUES – CARE CHAINS’ OBJECTIVES

This sub-section presents the analysis of today’s practices regarding *care chains’ objectives*. More specifically, the feature for care chain effectiveness is: *the purpose of a care delivery system is to meet patient requirements by delivering cost-effective care*. In the frame of reference, see chapter 3, it is discussed that a pre-requisite for a logistics system is that the purpose of it match the organisation’s mission, vision and objectives. This is because they are all related to the direction that an organisation aims to take. There can, however, be a number of conflicting objectives as well as complex and vague objectives within healthcare organisations, leading to concerns for both management and staffs’ actions. An additional issue is that there May also be discrepancy between stated objectives and true objectives when fulfilling patient orders within care chains. This sub-section therefore analyses *Coherent mission, vision and objectives*, *Prioritisation of cost-effective care delivery*, and *True objectives when delivering care* at the case clinics, see Table 11.

Table 11: Structure of sub-section 4.1 – Care chains’ objective

FEATURES FOR CARE CHAIN EFFECTIVENESS		SECTION
1	To have a purpose to meet patient requirements by delivering cost-effective care and the purpose established in the organisation's mission, vision, and objectives	<div>Care chains’ objective</div> <div>4.1.1 Coherent mission, vision and objectives 4.1.2 Prioritization of cost-effective care delivery 4.1.3 True objectives when delivering care</div>

4.1.1 Coherent mission, vision and objectives

The general mission for the case clinics is to receive women in need of gynaecological outpatient and inpatient care, maternity care, obstetric care, postnatal care and fertility treatment. They are also responsible for cervical screening and contraceptive advice.

The organisational objectives that were recurrently mentioned during the interviews and documented in the case clinics business plans are all expressed as visions for the clinics. This is in accordance with how Thompson (2001) labels vision: the organisation’s future state which ideally the organisation will achieve or what the organisation is to become. The quotes for the following three case clinics are thus labelled ‘visions’:

- “To offer Sweden's provably best preventive healthcare for women”*
(Case clinic I, independently translated)

“To offer Sweden's provably best childbirth and postnatal care”
(Case clinic II, independently translated)

“Sweden's provably best women's department”
(Case clinic III, independently translated)

Each case clinic has specific missions stated yearly by the county council as well as specification of how these missions are followed up. For instance, the mission at clinic III is about performing gynaecology and the follow-up is on operational activity level by maximum number of waiting patients for new visits. The quote illustrates the incoherence between mission and follow-ups expressed by one of the operations managers.

"We have a contract that says what to do, but it says nothing about how many patients we should have, it's just like gynaecology and blah, blah."

(Operations manager clinic III, independently translated)

Hence, clinic III is limited to having a maximum number of waiting patients for new visits. If they manage this, the council will receive money, the so-called “queue billions”³. This is an example of conflicting objectives, mission versus. costs, as described by (Thompson, 2001). An additional conflict is that priority is given to new visits since it provides money, but purely medically it may be more important to receive revisit patients according to the operations manager. The following quote expresses the operations manager’s frustration about the issue.

"It's devastating, it's dreadful,"

(Operations manager clinic III, independently translated)

In line with Thompson (2001), an immoral focus arises in the daily activities and operations. Employees experience a disorder in objectives that prevents them from doing their real work; to contribute to good health and care. According to Thompson (2001), the organisations (as a whole) have a mission and the individual managers feel forced to have non-coherent objectives to meet the follow-ups. One challenge mentioned by Thompson (2001) is then to not focus on the more easily measured aspects to prevent them being perceived as the most important objectives.

Another challenge mentioned in the literature is the dual leadership within healthcare organisations (Vissers and Beech, 2005). All case clinics have a joint leadership by operations managers and chief physicians who together govern their clinic. The majority of respondents emphasise this as a strength for effective patient flows. In contrast to Vissers and Beech (2005) picture of problems with divided management, this is a joint management with clearly defined responsibilities. The quote below illustrates the dual leadership at one of the case clinics.

"I and C [who have the medical management responsibilities] have staff and financial responsibility and we can make changes in the activities of the total that you cannot do on a small scale, because there are different managers. And I think it's just an advantage that we can see the whole. "

(Operations manager clinic I, independently translated)

Care delivery service consists of both medical and organisational skills and joint management seems to be beneficial as the objectives and visions then hopefully more naturally comprise both perspectives. However, in this dissertation the focus is on the cost-effectiveness when delivering care. More about how it is prioritised at the case clinics in the next section.

³ In Swedish: kömiljarden

4.1.2 Prioritisation of delivering care cost-effectively

In general, all three visions of the case clinics presented in the previous section relate to the overall mission of Swedish healthcare – a mission of health and well-being of the nation focused on both prevention and cure. The three visions all indicate a patient focus and a clear emphasis on being provably best. However, financial objectives cannot be detected in the visions, which are typically not the most essential issue for missions according to Thompson (2001). From a care chain effectiveness perspective, the focus should be to meet demand from patients through cost-effective care delivery throughout the total patient case processes.

However, the case clinics' visions are to offer the documented best care and the importance of measuring the clinics' medical results is underline by the operations managers. Compared to the definition of service supply chain management by Ellram et al. (2004), the focus is not on service performance, costs or lead times but on medical quality. The following quote represents the focus on medical objectives at case clinic II.

"And to show that we measure all things, and then, we have a huge focus on results of our work and we follow all the parameters, I would say. And I do not think we measure too much, I think that we are measuring the right things and that we are constantly drilled into the way of thinking and knowing how many caesareans we have, how many major bleedings, we, the breastfeeding rate we have, how many have been examined by a paediatrician. "

(Operations manager clinic II, independently translated)

It is common for stakeholders within healthcare to have different interests regarding quality versus costs or the issue of effectiveness versus efficiency (Vissers and Beech, 2005, Thompson, 2001). There would also appear to be a discrepancy as to what the objective of the shared function of surgery is. Clinic IV has obligations to fulfil the healthcare guarantee in terms of days, to accomplish surgeries within 15 days or two months. The resources to achieve this are negotiated for surgery hours per year equally distributed over each week with fewer hours during the summer. This is a typical conflict of priorities due to organisational segmentation as described by Lillrank et al. (2010). A chief physician expresses this as both ethically problematic and frustrating.

"It creates greater frustration, it also creates frictions of a more, one might say, ethical character, I think it's a bit tough for us to offer things within a certain period of time when we do not get the resources to do this. They speak with a forked tongue, so to speak, from politicians' and officers' quarters in this regard. On one side, we have to meet any demands for availability and at the same time, we lack the resources to do it. In the summertime it's like the law of the jungle ruling. "

(Chief Physician clinic IV, independent translated)

As stated by Christensen et al. (2005) and Vissers and Beech (2005), different perspectives manage healthcare organisations, which is noticeable at the case clinics. It is possible to detect disagreement between medical staff and officers as described by Thompson (2001)

on the subject of key objectives. According to a chief physician, the pressure of the time frames to stay within, 15 days or 2 months, is set by the officers, who do not understand the care business. The respondent expresses it as follows:

“It’s not about the time between decision for surgery and surgery day to be as short as possible, it’s about getting it right. That the surgery is performed by persons with the right skills. A patient with a malignancy wants of course to do it straightaway but there is nothing that affects the medical if you wait, for example, survival.”

(Chief physician clinic IV, independently translated)

A negative attitude is noticeable towards business priorities made by people other than those who are knowledgeable within the physician’s specific medical field as described by Eriksson (2013). Differences in perspective may cause difficulties finding the “right” standpoint as input to discussion when making trade-offs based on the overall objective of the organisation (Thompson, 2001). Hence, the vague objectives for how to fulfil their mission may contribute to the difficulty of communicating their objectives. A further challenge is that objectives are not adjusted through an authority structure as recommended by Mentzer et al. (2004) for that type of situation. There seems to be some disagreement about what to achieve between the involved care units even though they should have the same mission. One explanation may be discrepancy between stated objectives and true objectives. More about this in the next section.

4.1.3 True objectives when delivering care

Simply explained, the true objective an organisation strives for is what gives it the reward that allows it to continue doing what it does (Katz and Kahn, 1966). For example, the output (Katz and Kahn, 1966) and the challenge that triggers the action patterns (Churchman, 2011) that form the true objective for clinic IV appears to be to fulfil the healthcare guarantee. The quote below exemplifies this.

“The objective is that all should, that they should undergo surgery, i.e. cancer surgery, they should undergo surgery within 15 days and benign surgery within 2 months.”

(Operations manager clinic IV, independently translated)

Similarly, the surgery planner states, on the question about mission and objectives, that the clinic follows the waiting times to achieve the healthcare guarantee for all patients. If they have to prioritise between different patient groups, cancer patients are prioritised to receive the healthcare guarantee.

“The goal we strive for is, it is always to keep the health care guarantee. But the most important thing for the clinic is that cancer patients get their surgery within 15 days.”

“They are prioritised of course to get the best care. And it is about money too, the clinic will get money if you manage the care guarantee time. ”

(Surgery planner clinic IV, independently translated)

There is a clear focus on the care guarantee at case clinic IV, which is both measured and followed. In addition to that it triggers the clinic's action, as they are rewarded through the guarantee. It is also quantitative and easy to measure. The flexibility given the case clinics due to complex and vague objectives (Christensen et al., 2005) can also be an explanation for the healthcare guarantee focus. The requirement to fulfil the healthcare guarantee probably strengthens perceiving it as the most important objective – a consequence of what Thompson (2001) describes as attention focused on aspects that are most easily measured and therefore come to be perceived as the most important objectives.

In contrast, true objectives that are more in line with the stated visions for the case clinics are revealed. Case clinic I seems to work actively to achieve their objectives. They measure demand to some extent and change their procedures to achieve their objectives through for example phone consultation, phone booking, a cell sample bus and drop-in visits. The quote below illustrates that one of the true objectives seems to be to get as many called women as possible to take the cell test.

"Is this just right, are you going to work like this with these sample times as we do or can you find other solutions? Should this be like this relative to the other businesses? What do we do with those who do not come? In Västera Götaland, you call the patients who have not been for a check-up for more than 6 years, talk to them and hear why. Can you find any special solution for them, why don't you want to come, are you afraid? "

(Operations manager clinic I, independently translated)

In addition, the only accessibility objective at case clinic II, according to the operations manager, is the political objective to offer the partner an overnight stay the first night. The clinics also demonstrate what Christensen et al. (2005) call fragmented as well as vague visions and objectives. Which in turn gives the organisation flexibility, which thus seems to be occupied by the follow-up measurements. They are thereby once again in practice guiding. The reasoning above shows that medical management, political objectives and requirements in general govern the case clinics' everyday activities, i.e. true objectives.

4.1.4 Summary of care chains' objectives

The objectives that operationalise the case clinics' visions, according to their business plans and statements in the interviews, focus almost solely on medical results. Specific objectives in terms of cost-effective care delivery as patient service, lead times or costs linked to patient cases, have not to any significant extent been stressed. There seems to be a conflict within the organisation about what to achieve, a lack of organisational compatibility. One reason may be that there is a discrepancy between what it is desired to be achieved in terms of mission and the objectives to get there. The staffs' operational decisions testify that medical results and objectives linked to economic influx or penalties (e.g. lead times for healthcare guarantee and caesarean operations) seem to be the central measures for the case clinics. The national defined follow-up measures are mandatory and since they already exist they are easier to use. Hence, the staffs' actions are not in line with the stated vision. The vision then rather becomes a quest, a particular condition or a satisfactory level. Governance by

the expressed vision therefore aims more to create meaning rather than to achieve specific objectives. This will be extra problematic if there is also a lack of relevant objectives, a desired state to be achieved and when it should be accomplished, based on the business mission. This means that the healthcare guarantee, which is actually a follow-up measure, is a substitute for objectives that are missing. Follow-up measurements then become ‘de facto objectives’ and thus in practice guiding.

4.2 STRATEGIC ISSUES – PATIENT CASE TRANSFORMATION

This sub-section presents the analysis of today’s practices regarding *patient case transformation*. More specifically, the feature for care chain effectiveness is: *to have a patient case focused transformation and arrange the patient order fulfilment by using predictability*. It is specified in the frame of reference that transformation of orders refers to patient order fulfilment. Predictability within care chains refers to the predictability in knowing what to do to fulfil patient demand. In addition, identified patient case processes provide the opportunity to, among other things, measure and follow up lead times, to use the benefits of standardising as well as different value configurations to match patient demand effectively. Lastly, coordination used for the typical “modular” design architecture of care chains is largely achieved by means of standard interfaces through pre-established protocols and the patient herself. This sub-section therefore analyses *Predictability in demand*, *Specification of patient case processes*, and *Coordination of patient cases* at the case clinics, see Table 12.

Table 12: Structure of sub-section 4.2 – Patient case transformation

4.2.1 Predictability in demand

Predictability in demand is used at case clinic IV when they get information about an upcoming patient before the referral has arrived. That predictability is used to enlarge the time window to cope with the healthcare guarantee. However, lead time reduction by less time downstream to completion of order pointed out by (Stock and Lambert, 2001) is not fully used. The quote below illustrates that it is predicated that order handling and diagnostics throughput time is 1.5 weeks, i.e. the decoupling point is known.

"As soon as they have received a referral, e.g. from Jönköping, that they have a patient with a confirmed corpus cancer, for example, who is likely to have surgery. But all investigations, you have not received all PAD⁴ answers and you may not have received an X-ray response, they still send a fax to us about that patient so we know she exists. And then we can plan for her already preliminarily. And then you usually put them on for about a month, because we know it takes about a week and a half to complete everything. And then she will end up within these 15 days. "

(Operations manager clinic IV, independently translated)

Two and a half weeks is hence added to the decoupling point when planning surgery day. Consequently, the lead time could have been 2.5 week shorter if the patient gets a surgery time when it is expected that the order is completed. This is illustrated in Figure 25 below.

Figure 25: Illustration of possible shortening of lead time

According to the operations manager it is advantageous to get a hint that there are patients likely to undergo surgery. This indicates notification of other members within the care chain through information sharing. This is stated by Croxton (2003) to be crucial when order fulfilment activities are to go from a single-unit process to a supply chain process. However, as the quote below indicates, it is not a very widespread structured way of working. It seems rather to be the exception.

"It is thanks to a very close cooperation"

(Operations manager clinic IV, independently translated)

Moreover, shortcomings concerning information sharing are expressed, for example information about test results. Following the logic for supply chain effectiveness (Stock and Lambert, 2001, Croxton, 2003), it should be central for care chain effectiveness to provide good conditions for handling patient cases for other members in the care chain. However, shortcomings concerning information sharing lead to anxious patients and more phone calls as patients wonder why they are not being told their test results. This is according to one of the operations managers.

"Then it is sent to the pathologist. There we have waiting times. It is like a shortage of pathologists in Sweden. "

(Operations manager clinic III, independently translated)

⁴ patologanatomisk diagnostik (PAD)

The uncertainty leads to isolated parts deliveries since the next step cannot be planned before the test results arrive. Although the time taken for the test results is considered to be too long, the consequences for lead times are likely to be worse than if you knew when the results would come. This is because predictability provides a plannability and the reliability of delivery in time can be more important than shorter lead times (Noon et al., 2003, Christopher, 2005). The next step can in such case be planned based on the information that the test results should arrived at a specific time agreed between the involved units.

In contrast, predictability of demand seems to be practice at case clinic I. The basic programme for pregnant women shows that the predictability in demand can be used to standardise service episodes complemented by supplementary independent activities. The service episode is standardised through various activities and content. Hence, the predictability in demand is followed by specification of the patient case processes.

4.2.2 Specification of patient case processes

Care chain effectiveness is affected by the match between patient needs and patient case process configuration (Bohmer, 2005, Hopp and Lovejoy, 2012). Thus, the only patient case process that can be detected, consistent with the definition of processes by Cooper et al. (1997), is the basic programme for pregnant women at Clinic I. The programme is structured and described and has a specific order of work activities, see Appendix II chapter 2.1.3. It starts when the women contact the clinic and ends after the follow-up visit. In addition, the input is clearly identified, a woman at the beginning of a pregnancy, and the output is a healthy new-born child and a healthy mother. The basic programme gives structure for action defined by Cooper et al. (1997) as being central for processes. An additional argument for a basic programme to be identified as a process is that it structures activities between members of the care chain, first and foremost through the supplementary interdependent activities since some of them are performed by other care units. Hence, the statement is based on the fact that processes can cross intra- and inter-functions within supply chains (Lambert et al., 2005). Exceptions are thus handled with pre-established routines linked to specific competencies and equipment.

The basic programme can also represent, separate and select process alternatives presented by Bohmer (2005) as the process is standardised and those patients who need a customised process are selected and separated. In addition, some patients just need some customised activities and are therefore handled by adding supplementary competencies to the basic programme, as separate accommodations (Bohmer, 2005). Other options in handling patient cases are the value configurations by Stabell and Fjeldstad (1998). The basic programme can be an example of the value configuration *Chain* as labelled by Stabell and Fjeldstad (1998), consistent with *Flow shop* (Hopp and Lovejoy, 2012). In addition, Clinic I also creates opportunities for parents-to-be to meet to get support from each other, i.e. linking customers expressed as *Network* (Stabell and Fjeldstad, 1998) or *Self-service* (Hopp and Lovejoy, 2012). Exceptions that do not fit into the basic programme and require unique solutions during pregnancy are handled similarly to what Stabell and Fjeldstad, 1998) describes as *Shop* and Hopp and Lovejoy (2012) as *Job Shop*. In Table 13 below these types of processes are placed in the healthcare product/process matrix.

Table 13: Healthcare product/process matrix with example from clinic I (modified from Hopp and Lovejoy, 2012, p. 472)

		INTUITIVE MEDICINE Vague diagnosis Trial and error treatment	EMPIRICAL MEDICINE Statistical diagnosis Evidence-based treatment	PRECISION MEDICINE Exact diagnosis Rule-based treatment
JOB SHOP High skill professionals Flexible processes	Shop	Customized Care UNIQUE SOLUTIONS FOR EXCEPTIONS	Inefficient Care	INEFFICIENT Overkill Care
FLOW SHOP Moderate skill technicians Standardized processes	Chain	Over-standardized Care	APPROPRIATE Efficient Care THE BASIC PROGRAM	Over-institutionalized Care
Self Service Laypersons Facilitated processes	Network	Crackpot Self-Care INEFFECTIVE	Risky Self-Care	Facilitated Care TO-BE PARENTS GROUP MEETINGS

Other specified patient case processes beyond the basic programme have been hard to detect at the case clinics. Thus, several documented processes for service events are found. There is, however, a vital difference between these types of processes. The process maps at Clinic II on birth delivery process and Clinic III on surgery process are at an activity level only for service events and not for entire service episodes, to be compared with the basic programme, which covers several service episodes from demand by patients’ first contact to follow-up visit. The next section concerns the coordination of patient cases.

4.2.3 Coordination of patient cases

The handover from Clinic II to the child health clinics is done by means of medical records in free text format based on practice of how to write record text, i.e. standard interfaces are pre-established. It is typical a modular design architecture described by Sampson et al. (2015) since each specialist operates largely independently of the other specialists. The coordination is largely achieved through the medical records and can be classified as a pre-established protocol, also specified by Sampson et al. (2015). In other words, interfaces between these process steps have been previously codified.

Another example of coordination with pre-established protocols is from case clinic IV and the service episode of surgeries. The necessary coordination with other medical specialists and internal care units is likewise achieved through pre-establish protocols, e.g. referrals, surgery notifications, and medical records. All activities within the service episode are interdependent by sequential activities succeeding one another. This is illustrated in Figure 26 below and coordination by pre-established protocols is marked with circles.

Figure 26: Pre-established protocols sequentially coordinating the service episode of surgery and dictates the lead time

The handovers by pre-established protocols defines de facto each step in the patient case process and hence also the lead time. As a result, the patient order fulfilment becomes subordinate to the handover sequence of events. The reason can be, just like in supply

chains (Mentzer et al., 2006), lack of coordination due to incomplete information for decisions, e.g. predictability in throughput time for diagnostics. The quote below illustrates lead time reduction potential as it seems as if the surgery day can be decided parallel to the preparation for the surgery. It gives the opportunity for service events to follow more closely in time to cope with the time dimension that exists when delivering care (Noon et al., 2003).

"The surgery planner really has an eye every day that the patient she calls, that it actually, now it is ready to make acknowledgement and will she make it within the 15 days by the appointment we have preliminarily booked. Most often it does, but otherwise you have to rebook. Maybe it went a bit faster than we thought, and then you have to, and maybe you may move someone else who is not ready a bit further instead. So it's much giggling for that person every day. "

(Operations manager clinic IV, independently translated)

Another way of coordinating is by the patient herself (Sampson et al., 2015). An example from case clinic I illustrates this coordination when the patient should have been on a drop-in for tests before the next care occasion. Then the next care occasion can thereby be planned for directly without the caregiver needing to wait for the results of the tests. The activities are interdependent and should follow closely in time. But they do not have to be planned one step at a time. An operations manager comments on the implementation of drop-in visits for contraceptives, i.e. an interdependent service event, as follows:

"It has turned out very well and it's a very fun task think those who work with it and the patients are very happy with it, so it's win-win."

(Operations manager clinic I, independently translated)

Case clinic IV coordinates with the in-house gynaecology unit before the pre-established protocols are fully filled in. This coordination has emerged, as mentioned before, due to the short physical distance and the possibility of personal contact.

"We get a hint that they exist, are likely to have surgery but everything is not finished yet. Even then, we can give them a preliminary time here with us to get it done in time. "

(Operations manager IV, independently translated)

The information about the preliminary surgery day is however not communicated to either the patient or other care providers in the patient case process. It is pointed out that many patients wonder when they are going to have surgery, see the quote below.

"So there's a lot of phone calls too. Many patients call and wonder when they will get surgery and so on. "

(Surgery planner IV, independently translated)

Hence, the information is not fully used to coordinate with the aim to shorten lead times. It is instead used to create an extra time window for surgery panning. This means that it will only benefit their own function, and thereby does not contribute to the larger overall patient order fulfilment or the larger system of care delivery.

4.2.4 Summary of patient case transformation

The opportunities for shorter lead times or increased timeliness through predictability in demand is not fully used at the case clinics. The uncertainty created in the absence of using predictability leads to isolated part-deliveries as the next activity cannot be planned for before the previous activity is finished. One reason for this seems to be shortcomings in information sharing about patient cases’ progress. In addition, patient case processes according to process definition have been hard to detect at the case clinics. The lack of specified processes makes it problematic to measure, control and follow up lead times in a structured way. The one example found of specified patient case process reinforces the conception of possibilities with specified patient case processes. Moreover, the administrative workflow to fulfil a patient order is not separated from the service events (the actual delivery of care). The pre-established protocol coordinates the patient cases one step at a time as isolated part-deliveries. Hence, the workflow of the pre-established protocols dictates the lead times.

4.3 STRATEGIC ISSUES – CARE DELIVERY STRUCTURE

This sub-section presents the analysis of today’s practices regarding *care delivery structure*. More specifically, the feature for care chain effectiveness is: *to have a care delivery structure formed by patient order fulfilment and specialised medical functions contributing to the care delivery system’s total effectiveness, i.e. economies of patient flow*. It is specified in the frame of reference, chapter 3, that integration is how well the organisation supports integration on a patient case level. Since cross-medical specialised patient cases take place, integrations aim to merge various service event contributions to fulfil patient orders. Moreover, economies of integration occur when specialised functions contribute to the care delivery system’s total effectiveness, in other words “economies of flow”. It is also argued that information sharing to support order fulfilment can be investigated by the use of proper support systems, automated administration and the sharing of patient order progress information. This sub-section therefore analyses *Integration support when delivering care*, *The use of economies of scale, scope, and integration*, and *Information sharing to support patient order fulfilment* at the case clinics, see Table 14.

Table 14: Structure of sub-section 4.3 – Care delivery structure

4.3.1 Integration support when delivering care

Inter-functional relationships can be exemplified by order fulfilment for patient with cancer since it is performed by several care providers. The role of physicians at Clinic IV is to perform surgery for other units, both internal and external. The clinic is thereby never a first in line care provider. This makes them either first, second, third or maybe fourth specialised care provider depending on how many care providers the referral has crossed. In Figure 27 below, the whole department of gynaecology is regarded as a third specialised provider. The function of operating theatres and surgery staff has been “outsourced” to the centralised joint hospital surgical clinic. The quotation marks around outsourced marks a difficulty with the concept of outsourcing. It is difficult to define the owners of the patient cases and thus the outsourcer for the actual outsourcing. However, the structure in Figure 27 can be labelled a vertical sectioning in contrast to vertical integration as described by Romano (2003). It can further be pointed out that this delivery structure has a differentiation due to medical specialties, which indicates a need for integration (Lillrank, 2012).

Figure 27: A total patient order fulfilment conducted by several specialised care providers

When exploring the care chain delivery structure regarding inpatient operations it is clear that the patient case process is hard to overview. The trade-off between differentiation and integration (Lawrence and Lorsch, 1967) is probably an overweight to differentiation and hence that the whole is lost. Indeed, there are no indications of any integrated cross-functional business process (Lambert et al., 2005) when the patient order fulfilment for cancer patients is examined. The need for integration is thereby intensified. There seems, however, to be a lack of organisational arrangement at the case clinic that according to Lillrank (2012) means that mobilisation of resources to achieve integration is therefore needed, such as venues for contributors to share, documentation, time for negotiation, and rapid feedback. Moreover, a successful integration is measured on patient process level (Lillrank, 2012), which at the case clinic indicates that the surgery function contribution to patient order fulfilment is not fully integrated in the patient case process. The following statement by a chief physician illustrates the shortcomings and lack of integration in the care chain.

"We are constantly bound to ask to get something, we do not control it ourselves. Nor can we plan it ourselves. So when our surgery planner then does planning it is by a template, this much we can have; there is no flexibility."

(Chief Physician IV, independently translated)

Moreover, vertical integration as the extent of ownership in a network (Romano, 2003) can be exemplified by case clinic I. The fact that all women's health has been gathered together means that competence is also joint, unlike other women's activities in the country, which for example are placed across different healthcare centres. The comprehensive competences are considered to be a great benefit when meeting patient needs, see the quote below from the operations manager.

"That's the biggest advantage, that there's so much competence and experience so I always have someone to confer with. If I encounter problems with the patient, you only go out. And then you usually go to the coordinator because it is a senior but if she is not available there is someone else you can ask. I believe that is, sort of, the strength of the business, that we have a broad competence. "

(Operations manager clinic I, independently translated)

Furthermore, it is mentioned by all clinics that the dual leadership is a key to success with patient flow. However, this is just integration within the clinic itself, a merge of medical and organisational perspectives. Integration by crossing boundaries that needs to be facilitated, as also discussed earlier, is more difficult to identify. It can also be stressed that there is a need for integration to shorten unnecessary lead times concerning how incomplete referrals are handled at both clinic III and clinic IV. If an external referral is incomplete, the remitter is required to correct it and submit the requested information. This action affects the lead times as the order handling is delayed. A common understanding of service contribution to meeting patients' needs could hopefully include a more integrated dialogue about the embodiment of referrals.

The next section explores the three different labour divisions economies of scale, scope and integration at the case clinics to further develop understanding of how the delivery structure affects care delivery.

4.3.2 The use of economies of scale, scope and integration

Given that the case clinics belong to specialist care and that they have both regional and county patients it is assumed that economy of scale is desired in some sense. The centralised specialised function of inpatient surgery also seems to aim to achieve economies of scale but also scope. The focus appears to be on productivity and efficiency by both shared facilities and staff. Thus and likewise, as in the context of commercial logistics (Abrahamsson et al., 2015), it can be risky to rely on a fragmented chain, where multiple local decisions, based on local priorities, define the performance of the chain as a whole. Clinic IV is dependent on the centralised joint hospital surgical clinic doing their part of the order fulfilment in order to perform operations at the agreed time. From a centralised joint hospital surgical clinic's perspective, surgical hours per year is what matters but for case

clinic IV healthcare guaranties by days is what counts. However, clinic IV does not seem to be satisfied with dependence on common resources:

"They are like struts. They rarely say that we can do it then or then instead."

"You are committed to a patient when you have agreed to do a surgery. The patient has taken days off work and planned sick leave and then suddenly nothing is going to happen. And those who have the resource here they cannot even have the time to come and say when we will be able to do it instead. We can add a resource tomorrow, for example, can you do it then? So there is a lack of service thinking in that business. I think it's an impossibility to get that in. We shall own it ourselves. "

(Chief Physician IV, independently translated)

The economic gain seems to be uncertain for both economies of scale and scope within hospitals (Svarts, 2017) but medical outcome seems to benefit from it (Brommels and Vintmyr, 2015). This emphasises centralisation for increasing medical skills rather than a total cost reduction. During interviews it is also mentioned that there are international guidelines for the number of surgeons depending on the patient base to maintain good quality of surgery. This underlines the importance of having enough skill training, which is thus possible due to centralisation of specialised care.

"It is life-long learning we are doing, we as physicians. It never ends."

(Chief Physician IV, independently translated)

Economies of scope for improved flexibility (Abrahamsson et al., 2015) influences clinic IV as staff working at the centralised joint hospital surgical clinic assist in all types of surgeries. Thus, unlike the surgeon, other care staff only meet the patient in the operating theatre. Hence, it is not only fixed resources that the care units share but also care staff. This is indicated to have negative consequences for skill competences and team work at the centralised joint hospital surgical clinic, but not improved medical skills for all categories of medical staff. It could possibly affect the medical performance, unlike what is reported by Brommels and Vintmyr (2015). The quote below illustrates the issue of the medical staff producing many surgeries but just meeting the patients for a short part of the order fulfilment.

"And they just see the patient during this short period of time. We see them longer, we also see what is beneficial and what is a disadvantage. It can be said that they do not really understand this. I think it's better to have someone joining in several steps to perform it. "

(Chief Physician IV, independently translated)

It seems to be a challenge to both improve medical skills (economies of scale) and share fix resources (economies of scope) and combine them to effectively fulfil patient orders (economies of flow or integration).

4.3.3 Information sharing to support patient order fulfilment

Common to all four clinics is that they have poor IT support and use this poor IT support to a minor extent. This statement is based on the fact that there is no trace of automated administration, which is an indicator of supply chain effectiveness (e.g. Lambert and Cooper, 2000, Croxton, 2003, Mentzer et al., 2004). There is also an obvious lack of order information fed to care units. This is central to supply chains since it influences effectiveness (Cooper et al., 1997, Croxton, 2003). However, there is IT support at the case clinics, (e.g. Cosmic, Cosmic Intelligence, Linda, electronic patient records) but it does not support patient order fulfilment. It is still pencil and paper that are the source of origin and first choice for administration. For example, the surgery planner states that it is the physical calendar that serves as the fountainhead for the surgery schedule, see the quote below. This indicates that the IT support does not meet the needs of the daily operational activities.

"I try to fill in as far as possible but sometimes for sure I forget. So if they really want to know then, then they have to come and check. "

(Surgery planner IV, independently translated)

Since IT is a fundamental tool for both controlling daily activities and developing logistics management (Stock and Lambert, 2001), it can be argued that the poor IT support at the case clinics affects patient case lead times negatively. Information sharing may well be as important for care chain effectiveness as it is for supply chains. A premonition of this is seen in the literature, for example in Devaraj et al. (2013) and Ker et al. (2018). Hence, IT support is probably a very central part in care organisations' control on a daily basis, as well as to link care units and functions for patient order fulfilment.

4.3.4 Summary of care delivery structure

The care delivery structure at the case clinics demonstrates both high differentiation through vertical sectioning by several specialised care providers and high integration through vertical integration by merging all women's health together. The vertical sectioning at case clinic IV is a part of the report operational problems. The vertical integration at case clinic I is instead considered to be beneficial due to the merged medical skills and thereby comprehensive competences. However, there seems to be a compatibility issue with the concept of outsourcing as it is hard to define organisational main owners of patient cases. Who is then the outsourcer of the outsourcing? The analysis of the delivery structure also indicates much dependence on other care providers for the case clinics to fulfil patients' orders. Integration is therefore needed but there seems to be rather weak support for it. Surgeries are performed by several care providers, of which case clinic IV is one. The different care providers seem to have different opinions about service performance in terms of time. Likewise, there seems to be a disagreement between embodiment of referrals between clinics III and IV and the care providers earlier in the care chain. Hence, poor integration due to lack of common understanding of how to contribute to the common patient order fulfilment. No direct organisational support has been found to facilitate this type of integration. The minor use of poor IT support at the case clinics underlines this further.

4.4 PLANNING ISSUES – DEMAND MANAGEMENT

This sub-section presents the analysis of today’s practice regarding *demand management*. More specifically, the feature for care chain effectiveness is *to manage patient demand by balancing capacity and using decoupling points to shift between demand- and resource-driven capacity*. The frame of reference, chapter 3, discusses that by meeting patients’ demand with flexible capacity fixed lead times can be obtained. Conversely, planning with fixed capacity gives variable lead times. In addition, investment in flexibility can be done by capacity that can follow true demand more easily and more closely. It is also specified that decoupling points through queues should be used to shift strategy to balance capacity and not occur as an effect of delays designed into the system. This sub-section therefore analyses *Planning for fixed lead times*, *Achieving flexibility*, and *Decoupling to shift strategy* at the case clinics, see Table 15.

Table 15: Structure of sub-section 4.4 – Demand management

4.4.1 Planning for fixed lead times

Some of the case clinics use planned capacity for service events with variable lead times in accordance with Aronsson’s (2000) demand management model. This is in contrast to planning for flexible capacity with fixed lead times. For example, the number of visits at case clinic III is based on an average requirement of visits to physicians per week. This is based on history established by the operations managers’ experience. They have experienced that 22 surgery hours per week corresponds to demand since the queues then do not grow. Unlike what Crandall and Markland (1996) advocate, the effect of controlling demand does not seem to smooth load. It appears to be difficult to forecast average demand concerning visits to physicians per week, which is also emphasised in the quote below.

“A basic need we are trying to count on, which is very difficult.”

(Operations manager clinic III, independently translated)

Basically the same tactic is found at the inpatient ward at case clinic IV, which also uses a basic level for staffing:

“In fact, we have the same basic crew Monday to Friday but we try to man up with a resource on Wednesday and Thursday as far as possible.”

(Operations manager clinic IV, independently translated)

Thus, there is a difference between these two service events. The lead time at the inpatient ward does no vary depending on planned capacity. The fact that number of patients staying overnight varies during the week depends indeed on number of surgeries and the ward is included in the same service event as the surgery. Since the capacity of the ward is not considered when planning for surgeries, it cannot affect lead times for the service episode.

Consequently, the care load and therefore also the work load at the inpatient ward vary and perhaps also the throughput time. The operations manager reflects on the varying care load in relation to occupancy as follows:

"Then you just do not know, it can be fully occupied at the ward but it's not a particularly heavy care load. And that's what you do not know before actually. "

(Operations manager clinic IV, independently translated)

Moreover, case clinic II cannot regulate the lead time to better match the demand to the current capacity because of the emergency in the patient order (a birth-giving woman). Hence, they need flexible capacity or as recommended by Noon et al. (2003) additional duties that can easily tolerate delays. Alternatively, they have to accept varying workloads or as suggested by Crandall and Markland (1996) have sufficient capacity to be able to serve maximum demand all the time. Likewise, clinic I is required to have more or less fixed lead times and timeliness when meeting maternity care demand:

"Because the pregnant are impossible to postpone, they must come This Week. If you are in week 35 you must be here in week 35. "

(Operations manager clinic I, independently translated)

To summarise, case clinic III and inpatient surgeries at case clinic IV use planned capacity, resulting in variable lead times. As clinic I cannot use queues to a large extent when handling maternity care demand and clinic II cannot use variable lead times for handling birth-giving women, they have to have flexible capacity or flexible duties as a complement to these time-critical functions. The trade-off between capacity levels and service times emphasised by Ellram et al. (2004) is thereby disregarded. The inpatient ward at clinic IV has both planned capacity and fixed lead times, which means that the work load is going to vary due to varying demand. This strategy when meeting demand is similar to a black box; deal with what comes. These demand strategies in reference to Aronsson’s (2000) demand management model are illustrated in Figure 28.

Figure 28: Demand strategies at case clinics in reference to capacity and lead time (modified from Aronsson, 2000, p. 149)

The next section further analyses the use of flexibility and how the case clinics work to achieve flexibility.

4.4.2 Achieving flexibility

Flexibility as defined by Abrahamsson and Karlöf (2011) to adapt to unexpected circumstances can be discussed in terms of rescheduling of surgery appointments at case clinic IV. An example is when more seriously ill patients (e.g. malignant cancer) have to be prioritised, which limits the remaining capacity available for less seriously ill patients (e.g. benign cancer), who are consequently delayed for longer. This is also mentioned as a tough mission, when the surgery planner has to contact a patient to advise her that her surgery has to be moved further ahead.

"I think this is the worst. That you must move forward because there is someone else who needs it. And then thinking, some have understanding: - yes okay, yes it is a cancer, of course she will get it. But many have no understanding at all. They think, they've also troublesome, and I respect that as well, they have indeed pain and bleeding, all of them. But those with cancer, it is more or less about life and death than... So I think this is difficult and tough. "

(Surgery planner clinic IV, independently translated)

Having two operating theatres once a week is an investment in capacity more than in flexibility according to what Abrahamsson et al. (2015) mean by flexibility. To be able to perform varying numbers of surgeries per week is in their opinion to improve flexibility. It can also be done by planned overcapacity, thus leading to improved flexibility but lower utilisation of capacity. The two alternatives both mean using capacity to follow true demand more easily and more closely. Hence, as for supply chains, the relationship between capacity and lead time then shifts (Abrahamsson et al., 2015). Correspondingly, patients' lead times then drive capacity instead of the other way round.

Another issue is flexibility in the daily surgery scheduling. This affects lead times, as already mentioned, since patients have to be rescheduled if previous surgeries that day are delayed. Instead of being able to extend the surgery programme that day, i.e. capacity, fixed capacity is used another day. This strategy is probably a way to compensate for lack of flexibility. Of course, it is not conceivable to demand infinite flexibility. However, it stresses the difference in the principles of investing in capacity and investing in flexibility. Not only is the long-term capacity fixed but also daily flexibility at case clinic IV. In other words, that inflexible functions increase reliance on forecasts and the uncertainty that forecast targeting brings (Abrahamsson and Karlöf, 2011).

"This activity is not suitable to operate in this way, simply. For the simple reason that it may happen ... fluctuations in it and our surgery time are no standard thing to do. It's like no industrial process where you can say that it takes 5 minutes. Of course, we can say average times but its average times and then it's plus minus on them. "

"The bottleneck is that you do not have staff, you cannot do like if you one day need to operate on 4 patients, for example, and someone takes some extra time so you need to continue. But then we are ruled by the anaesthesia who owns it by themselves..."

(Chief Physician clinic IV, independently translated)

However, it is also emphasised by systems theorists that flexibility is needed to meet environmental changes (patient demand) and not only concentrate on integration and coordination to ensure stability (Katz and Kahn, 1966). The more flexible production, the closer to patient order service events can take place. Queues can then be shortened and shorter lead times follow. More about queues in terms of decoupling and how they are used at the case clinics in the next section.

4.4.3 Decoupling to shift strategy

Decoupling points in the form of queues are used before surgery at case clinic IV to batch patients to fit into the scheduled production. Queues are also used to make sure that the healthcare guarantee is met. The physicians decide when the referral is completed and then the days are counted, from that day to the planned surgery day. The surgery planner describes this as follows:

"When I get the ok then I count, yes she's within 15 days, or I'll move around. It's a puzzle, it's always a living puzzle"

(Surgery planner clinic IV, independently translated)

Kujala et al. (2006) mention some reasons for queues that are also detected at case clinic IV. Queues at the clinic are used when patient referrals waiting for weekly activities (batched to be produced) or referrals to be approved or other administrative acts. The following quote is about the number of referrals. The referrals waiting in different piles on the surgery planner's desk indicate that there are queues before each review activity.

"Yes now, yes it's diverse, right now, yes god how many are there now, in the clear to call maybe it's 20. There are many, it is thick. And in reviewed referrals, it is huge, huge, it is for sure 20 there too who, either they are waiting for examinations, or they'll have a slot, that's, surgery time. And the oncologist, maybe there are 15 women, oncology patients waiting for various things."

(Surgery planner, independently translated)

The use of queues at the case clinics is analysed in relation to strategy shifts. For example application of a hybrid strategy where lean and agile paradigms coexist (Güven-Uslu et al., 2014). It is first and foremost between the more unpredictable part of patient order in progress and the more predictable patient in treatment part, i.e. the decoupling point (Visser and Beech, 2005). Since both clinic III and clinic IV receive referrals from general practitioners (GPs) and specialised practitioners (SPs) their service episodes sometimes start before treatment execution. When the referral comes from an SP it has already been decided that there is going to be a surgery and thereby their service episode starts after treatment execution, see Figure 29. However, there are no indications that the procedures

in the referrals are carried out in dissimilar ways in reference to the decision on treatment execution and thus utilise different strategies for patient order fulfilment.

Figure 29: Service episode and a theoretical decoupling point

The exploration of decoupling at the case clinics indicates that the use of queues is a consequence of delays designed into the system. It is apparent that queues at case clinic IV are formed to ensure that the healthcare guarantee is met. Additionally, it also seems to be the aim to use resources 100% since they batch patients for production and queues are therefore necessary (Silvester et al., 2004). Lead times are extended by queues regardless of reason. It seems as if the case clinics overlook the chance to plan in a differentiated manner to use high capacity utilisation of resources and high flexibility for different service events and functions.

4.4.4 Summary of demand management

The exploration of how the case clinics balance capacity to meet patient demand shows that they both use planned capacity, leading to variable lead times. It is also found that some care units have both planned capacity and fixed lead times and the work load therefore has to vary. It is also discussed that to be able to perform varying numbers of service events per week flexibility has to be used. This can be done by using flexible resources or planning for overcapacity. The demand can then be met with fixed lead times. Patients' lead times then drive capacity instead of capacity deciding how long it will take to fulfil patient orders. It is also indicated that the use of queues is a consequence of delays designed into the system. It is apparent that some queues are formed to ensure that the healthcare guarantee is met and to fully use resources. The chances to plan in a differentiated manner are also unused since high capacity utilisation of resources is used but not high flexibility. The lead times are thus extended.

4.5 PLANNING ISSUES – CARE DELIVERY PLANNING

This sub-section presents the analysis of today's practices regarding *care delivery planning*. More specifically, the feature for care chain effectiveness is: *to have a demand-driven plan for the transformation of patient order fulfilment and care delivery and resource allocation based on true demand*. It is discussed in the frame of reference, chapter 3, that managing delivery is partly a system issue since patient demand requires care services within different time and/or space utilisation. Hence, joint planning based on true demand is considered to be important to smoothly follow patient demand along episodes of care. However, it is reported in the literature that natural patterns of demand are distorted by operational management decisions when planning care delivery, for example batching patients by specific treatment or having daily or weekly cyclical activities. In addition, two well-known planning strategies for care delivery are highlighted in the literature that do not match capacity to demand:

historical activity statistics (work completed) and basing capacity on average demand. Instruments therefore need to be found to translate true demand into care delivery plans and thereafter resource requirements profiles beneficial to the overall system performance. This sub-section therefore analyses *Joint planning for system issues*, *Demand-driven care delivery*, and *Demand-driven capacity* at the case clinics, see Table 16.

Table 16: Structure of sub-section 4.5 – Care delivery planning

4.5.1 Joint planning for system issues

It is in both logistics management literature (Cooper et al., 1997) and in a healthcare context (Walley et al., 2006b, Allder et al., 2010b, Eriksson et al., 2011, Walley, 2013) recommended that demand be managed as a whole system issue. The case clinics, however, show no attempt to manage demand as a whole system issue through joint planning. There is on the other hand a local awareness that care services upstream affect care services downstream in the patient order fulfilment. This awareness is probably due to time and space proximity. At case clinic II the birth-giving unit is dependent on available beds at the aftercare unit in order to be able to receive patients. They have a coordinator who decides when it is possible to take in new patients, which can be described as a local awareness. Local awareness can further be exemplified by the perception of surgery in two theatres on Wednesdays affecting the number of patients in the inpatient ward recovering from surgery.

"Then, on Mondays, we try to keep down so that we may have patients who, at least on paper, will go home the same day or the day after. So there should be available for these maybe six or eight patients coming on Wednesday. "

(Operations manager clinic IV, independently translated)

It can be concluded that the case clinics show no indication of triggers to impel action to collect accurate data about true demand to use for joint planning of capacity. It is recommended in the literature that the whole patient case process be handled for joint planning of capacity (Allder et al., 2011, Walley, 2013). Rather the opposite is confirmed at case clinic III, since they are encourage to prioritise new visits and not take follow-up visits into account as demanded for economic rewards through the “queue billions”. More about care delivery planning for each case clinic in the next section exploring demand-driven care delivery.

4.5.2 Demand-driven care delivery

There is evidence pointing to a typical resource-driven approach as described by Walley (2013) at case clinics III and IV when making planning decisions. The planning of care services is based on fixed capacity depending on weekday according to the physicians’ schedule. This is in in the extreme case scheduled almost 6 months in advance. The

physicians' schedule thus controls the number of appointments and surgeries at the clinics and thereby also decides what to produce and the number of patients receiving care services. The clinical schedules therefore distort the natural pattern of demand according to the reasoning by Alder et al. (2010b). The following quote underlines how central the physicians' schedule is when planning care services.

"I would say, if you do not have a good physician schedule and a good physician staffing everything will shit."

(Operations manager clinic III, independently translated)

When to produce batches of a particular kind of surgery it requires queues if the demand does not follow the fixed surgery schedule. A patient must wait for the right time instead of the nearest available surgery slot. Instead, the patient must wait for "the right day of the week" to be produced. In other words, a classic 'controlling orders release' described by e.g. Mattsson and Jonsson (2003). For example, if the patient order is a large cancer surgery it is referred to Mondays. Assuming that the first Monday already is fully booked and the next Monday too, it will take another week or two for the next chance for surgery to come. This means three opportunities in three weeks, while a flexible capacity means 21 times in 3 weeks (one opportunity per day). It also implies that the throughput time in the first example increases weekly, and in the latter example only per day. In addition, both the multidisciplinary conference and the X-ray round are also held once a week. A similar discussion is reported by Alder et al. (2010b), where weekly cyclical patterns increase length of stay but also risk a 'Burbidge effect' (Burbidge, 1961). The quotes below illustrate how the surgery planner thinks when scheduling patients.

"Like this, this week, then we have the tumour surgeons, tumour surgeon, tumour surgeon, and here we have no tumour surgeon and tumour surgeons. So then I fill up. It is the surgeons who decide. "

"We have a surgeon, he is doing surgery almost every day, so it is indeed often cancer and very difficult surgeries. And that I thought of that's filling, filling surgery time. And, yes, so it will be fine, it's a puzzle. "

(Surgery planner IV, independently translated)

The planning decisions are based on optimal batch sizes and uniform types of patients or a specific patient mix for each day. Which order to release to fulfil the main plan when performing the detailed planning is chosen based production considerations. It is identified that it is the physicians' schedule that decides what surgery to deliver. Demand is thereby split, which is not recommended unless there are clear process benefits (Walley, 2007). More about resource planning at the case clinics when exploring demand-driven capacity in the next section.

4.5.3 Demand-driven capacity

The case clinics have a fix level of staff. It may be a substitute for resource allocation based on true demand since neither clinic collects that kind of data. Hence, very limited demand

analysis can be made since there are no such data. Not determining capacity decisions on true demand comes with flaws (Walley, 2013). For example, case clinic III uses average historical activity based on experience and determines a capacity for visits to physicians to be 22 half-days per week, thereby allocating resources to meet an average demand. However, average demand cannot follow true demand as it is fixed (Allder et al., 2011), and consequently some periods there have “too low availability”. Hence, queues arise frequently due to ‘Erlang’ queues (Noon et al., 2003). To illustrate the shortcomings of capacity planning based on a fixed demand, a chart is presented in Figure 30 below. The bottom line shows the number of waiting patients.

Figure 30: Fictive patient demand for physician visits, specified average capacity, and resulting number of patients waiting

Even though the average capacity may be equal to average demand, a queue will develop due to the random nature of the fluctuation in demand and perhaps also fluctuation in capacity. A mismatch between demand and capacity results not only in increased lead times but also a poor working environment. Staff working under pressure associated with mismatched capacity is described as overwhelming when trying to meet patients’ needs. It is described by one of the operations managers as there being a “*horrible frustration*” among the staff who cannot offer phone callers a physician’s appointment.

"We have periods, thus those who sit on to the phone just head off: - Oh God, I do not want to, I do not want to sit on to the phone, I have no appointments to give."

(Operations manager III, independently translated)

Moreover, the capacity planning at the case clinics is twofold as the physicians’ schedules are centralised and other medical staff are handled at each care unit. It is considered problematic and tough to perform resource allocation for other medical staff that both covers pre-determined skills, duties that are to be done, and meet staffs’ requests. The allocation is described as a “*Sudoku*” or as expressed by another operations manager “*scheduling is so complex*”. There has been a one-off project about capacity planning with input from true demand analysis but it was not accepted by the staff.

4.5.4 Summary of care delivery planning

The analyses of how the case clinics plan their care delivery do not indicate any attempt to manage the planning as a whole system issue. However, there is awareness about care delivery upstream affecting care delivery downstream when fulfilling patient orders. This probably has to do with time and space proximity and not a sign of structured joint planning. Use of true demand data when planning has not been identified. Hence, a potential mismatch between demand and capacity probably leads to longer lead times than necessary. Furthermore, a classic ‘controlling orders release’ is used when planning surgeries. The main plan is defined by the physicians’ schedule and orders are selected for release to fulfil that main plan when perform the detailed planning. It is hence the physicians’ schedule that decides what surgery to deliver. In addition, capacity seems to be more driven to achieve the same production earlier than delivering the care demanded from current patients. There therefore seems to be no or few mechanisms to translate demand into resource requirement profiles at the case clinics. There are rather signs that it is the staffs’ requests that direct the capacity planning more than true demand. It is stressed that it is the capacity management that causes the queues or waiting times and not the demand from patients. This does not support care chain effectiveness but rather resource efficiency. It thereby strengthens the benefit of decoupling points. It gives opportunities to understand when it comes to optimising capacity or when delivery planning, overriding capacity planning, should be demand-driven.

4.6 MEASURING ISSUES – CARE CHAIN PERFORMANCE MEASUREMENTS

This sub-section presents the analysis of today’s practice regarding *care chain performance measurements*. More specifically, the feature for care chain effectiveness is *to measure care chain performance and use patient service as the ultimate measurement and cost performance for patient order fulfilment*. In the frame of reference, chapter 3, it is discussed that patient service is to be the ultimate measurement for care chain performance. When measuring patient service for the total episode of care, the system’s boundaries are widened. It is suggested that it can be measured by perfect care similar to the perfect order concept. Furthermore, it is also relevant to believe that measurements have to capture the cost performance along the care chains as well as the performance of the functions. In addition, it is argued that measuring lead times and throughput times in absolute terms will stimulate a focus on patient service. The interfaces between episodes of service are highlighted as extra fertile for lead time reductions. This sub-section therefore analyses *Patient service measurements*, *Care chain costs* and *Measuring lead and throughput times* at the case clinics, see Table 17.

Table 17: Structure of sub-section 4.6 – Care chain performance measurements

4.6.1 Patient service measurements

When it comes to actually measuring patient service it is rather scarce at the case clinics. It seems to be more important to measure the healthcare guarantee than measure to meet patients' needs. The following quote can illustrate the patient service of surgery, which seems to be based on the healthcare guarantee and not premises of patients' requests for services.

"The fastest we have is actually 3 weeks, 15 days on the total if we have a confirmed patient with a cancer. Then we have 15 days to call her and get her surgery. But then everything should be done. Then all PADs, all X-rays must be ready, there is a review and you have had a "dikon", a small surgeon conference if you need it."

(Operations manager clinic IV, independently translated)

In addition to the healthcare guarantee it seems to be purely medical premises that determine the time to surgery and not to perform a more general patient service. This is in contrast to the established view of customer service as, expressed by Stock and Lambert (2001), the effectiveness of a logistics system lies in creating time and place utility. The quote below specifies that it is first and foremost medical relevance that pushes towards shorter time to surgery and not patients' requests. The time to surgery seems to be considered acceptable as long as it is within the 15 or 20 days independently of what is requested or appropriate for the patient in question.

"Then, they may think that something that is benign as you think is a cyst, which is so big that you may want to remove it within a month, so they write 1 month."

(Operations manager clinic IV, independently translated)

Moreover, the case clinics follow telephone availability, which can only be determined as a measure of patient service if the patient's request is met there and then. Customer service should capture the output of the logistics system (Stock and Lambert, 2001) where availability can thus only be an included part. Two other measures mentioned at case clinic I are waiting time to visit a physician and waiting time to first visit for pregnant women. These measures do not correspond to the system's performance either since they measure accessibility to specific service episodes and not the performance of the total order fulfilment. Furthermore, there are no indications of use of the concept of perfect care (The Health Foundation, 2013b) at the case clinics, that can be related to the logistic perfect order concept (Christopher, 2005). More about measuring cost for total patient cases in the next section.

4.6.2 Care chain costs

To be able to make real cost savings in a care delivery system sub-optimisation must be avoided. From a commercial logistics viewpoint it is thus recommended that costs be allocated to the flow (Abrahamsson and Aronsson, 1999). However, the case clinics show no attempt to use cost data or be able to measure costs in relation to patient order fulfilments. It seems to be difficult to obtain information about costs for patient order fulfilment, service episodes and also service events. The lack of adequate cost data prevents

care management from making necessary cost analyses to control the costs for care chains. The non-use of accurate and relevant cost data, critical to flow issues (Stock and Lambert, 2001), results in decisions being made without taking into account how the total cost changes. Decisions concerning costs and care chain effectiveness are therefore being made without what Stock and Lambert (2001) refer to as the recommended knowledgeable trade-offs. A typical trade-off question can be exemplified by the issue of the centralisation of surgery service and the friction between case clinic IV and the joint hospital surgical clinic. Being able to make a proper total cost analysis could be an advantage here. The following quote illustrates the friction and the questioning of the current care chain design.

"We are hiring us surgery rooms. It is our biggest concern. That we do not own it ourselves, we do not own the staff or the resource there. And that's what's our bottleneck, you can say. And that's what makes our system quite inflexible."

(Chief Physician clinic IV, independently translated)

The next section provides an analysis of lead times and throughput times at the case clinics.

4.6.3 Measuring lead and throughput times

The elapsed time from first contact until the need is met is from the patient's viewpoint the only existing lead time. However, the time focused on at the case clinics is first and foremost the healthcare guarantee. As mentioned before, this refers to the number of days from the day the referral is completed, with all necessary information to make an adequate decision on surgery, to surgery day. One shortcoming is that the time is not measured in absolute terms, which is stated by Christopher (2005). Instead, the healthcare guarantee is measured in terms of relative units as the percentage of patients ending up within the time limit for care. The quote below illustrates case clinic IV's lead time target for the healthcare guarantee.

"We have actually a higher goal, now let's see here if I can the percentages in my head, I think it is that 80% should have a surgery within 15 days, and then it becomes a target of 85%. We try to stay a bit higher to really keep it there. "

(Operations manager clinic IV, independently translated)

Likewise, case clinic III mention that they follow time to treatment from medical assessment and the proportion of patients waiting more than 60 days. None of these measurements or the healthcare guarantee capture the total throughput time of a patient order at the clinics or the total lead time for the episode of care. They do not provide information about the time it takes for the patient case to pass through the clinic, only how many of them meet the healthcare guarantee. They instead provide a movable measurement by the size of the order book, which is in fact merely an illustration of the delay embedded in the system.

The examples show that the total episode of care and involved sub-processes' duration are not captured. Adequate time-based analyses can therefore not be made as recommended by Peltokorpi and Kujala (2006). Nor can the system's total performance be captured in terms of lead time. Opportunities to improve both customer service and lower costs

therefore probably remain undiscovered. Nor can a picture of how well the clinic follows demand be provided.

Even if there are no indications of measuring times regarded as lead times or throughput times at the case clinics, case clinic IV can be used to conceptually illustrate interesting interfaces between sub-processes. These times are extra fertile for lead time reduction if Christopher (2005) recommendations are followed. This has been illustrated in a healthcare context as well (Kujala et al., 2006, Alder et al., 2010b). Case clinic IV is never the first-in-line care provider and is therefore always a part of care chains, performing service episodes, of patients’ order fulfilments. Lead and throughput times from different perspectives can thus be illustrated as throughout of patient cases passing the clinic. The lead time, from first contact with a care provider to fulfilled order, covers all care providers’ throughput times. Lead times for the first care provider can thus be defined as the time from referral to next care provider until the patient’s case gets back to that care provider with fulfilled referral/order. The clinic’s throughput time is thus just the time from receiving a referral to case closed when the patient is handed back to another care provider. This throughput time can further be divided into time for preparatory and care procedure. The healthcare guarantee is a part of the total throughput time of a patient case at the clinic and a small part of the lead time in a total patient order process, i.e. episode of care. The healthcare guarantee and some of the lead times and throughput times for patient order fulfilment are illustrated in Figure 31 below.

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Figure 31: Lead and throughput times for total episode of care and the healthcare guarantee

The illustration above point to the fact that a lead time analysis could be made in order to shorten lead time for an episode of care. According Lillrank et al. (2011) it is thereby necessary to have information systems that offer longitudinal data to group into patient episodes but there is no indication of total leads time feedback to the case clinics.

4.6.4 Summary of care chain performance measurements

The analysis of how the case clinics measure their care chain performance indicates that their measurements seem to be influenced by how the case clinics are followed up rather than to validate patient service. Some measurements that could be a part of patient service are though identified, for example accessibility. However, there are no indications of performance for the total patient order fulfilment. The missing care delivery measurements undermine possibilities for necessary and inevitable system trade-offs between costs and delivery service. Decisions about care chain effectiveness are thereby left to issues concerning anything else. In addition, it also seems to be difficult to obtain information about costs for patient order fulfilment, service episodes and service events. Nor are there any indications of time measurement feedback to the case clinics leading to a lead times reduction focus. None of the identified time measurements or the healthcare guarantee capture the total throughput times of patient orders through the case clinics or the total lead times for episodes of care. It does however provide a picture of how many patients meet the healthcare guarantee. It is a movable measurement that captures the size of the order book, i.e. an illustration of the delay embedded in the system. Opportunities to improve patient service and lower costs are therefore probably remain undiscovered. Nor can a picture of how well the clinics follow demand be provided. Moreover, the non-existent lead time management also indicates that there is no supply chain captain in charge of patient order fulfilment. It is then not possible to make promises to the patients about lead times or timeliness.

4.7 MEASURING ISSUES – REGULATION OF CARE CHAIN PERFORMANCE

This sub-section presents the analysis of today’s practices regarding *regulation of care chain performance*. More specifically, the feature for care chain effectiveness is *to use measurements to deliver cost-effective care and feed medical functions with information about care chains as well as their own performance*. The frame of reference, chapter 3, discusses the use of feedback to understand what is happening to patient service along the episode of care – feedback by measurements related to patient demand and order fulfilment. The system’s boundaries can thereby be expanded depending on what feedback is used. It is also discussed that a healthcare manager who understands care delivery can choose performance targets that form proper behaviour for improving care chain effectiveness. Hence, it is recommended in the literature that measures for internal control used for care chain improvements and measures for external control used for performance reporting be separated. It is also recommended that time-series measurement and weighting patient records through standardised options and codes be used to provide opportunities for data aggregation. This sub-chapter therefore analyses *Understanding care delivery through feedback*, *Accessible assayable data on care chains*, and *Internal control for care chain improvements* at the case clinics, see Table 18.

Table 18: Structure of sub-section 4.7 – Regulation of care chain performance

FEATURES FOR CARE CHAIN EFFECTIVENESS		SECTION
7 To use measurements to deliver cost-effective care and feed medical functions with information about care chains as well as their own performance.	Regulation of care chain performance	4.7.1 Understanding care delivery through feedback 4.7.2 Accessible assayable data on care chains 4.7.3 Internal control for care chain improvements

4.7.1 Understanding care delivery through feedback

To be able to support understanding of care delivery, feedback should mirror each unit’s or several units’ effect on the superior system’s performance. The ideal role of performance management within a healthcare context is presented by Walley et al. (2006a) as one that encourages and facilitates an understanding of the care delivery system. It is however not found at the case clinics. For example, telephone availability and time to first visit with a physician are measured by the case clinics but no attempt to use them for an increased understanding of system behaviour has been identified. In addition, these kinds of performance measurements rather represent part-deliveries of service events, which makes it difficult to provide system understanding. For instance providing a picture of requested visits (demand) in relation to clinic capacity offers information on the number of patients waiting and thereby how flexible the care business is. Or to illustrate variation introduced in the system comparing emergency cases (true demand) and elective cases over time presented by Walley (2007). The performance measurements are then in relation to order fulfilment, which provides information about the system’s behaviour. Further, understanding can also be achieved by examining how, for example, the cyclical production at case clinic IV affects care units downstream in the care chain.

Indeed, it can be that both sufficient data and the ability to know how to use it to provide information about the system are missing at the case clinics, skills sufficient for system improvements (Boland and Fowler, 2000). The cause can be as mentioned by Walley et al. (2006a) a lack of training in understanding system behaviour or lack of time to diagnose the root cause of symptoms. An example is the quote below concerning how non-existent measuring with the aim of understanding how the system behaves over time is. The statement relates to the referral inflow at case clinic IV.

"This spring was calm, maybe in February, it was really calm. Then there were maybe four referrals a day or so. And sometimes it may come 10-15 so it's really fluctuating. Now it feels like it has increased because, I do not know if people are seeking before the summer. I do not know it goes up and down. Sometimes it's calm and sometimes it's a lot."

(Surgery planer clinic IV, independently translated)

However, there seems to be a will to find out how their system performs, but that the support for obtaining data and analysis is weak. One operations manager wished to study the throughput times from referral to surgery day as it is not the same as the time the health guarantee covers. However, it was not particularly easy to obtain the data since they had to enter each patient case in the business system and count days.

"It was also quite difficult, I sat with a secretary with it. And then it is possible to like look in Cosmic from referral to surgery day. Per patient yes, every patient we got to go into. It took a few hours I can say. What makes it feel, it should be much better, you think in such a system."

(Operations manager clinic IV, independently translated)

The quote above is also interesting as it highlights the effect of negative feedback (Katz and Kahn, 1966) on a system's boundaries. The feedback from the performance measurement by the healthcare guarantee narrows the boundaries to only include the system's performance between the day the referral is completed, with all necessary information to make an adequate decision on surgery, to the surgery day. More about accessible assayable data in the next section.

4.7.2 Accessible assayable data on care chains

Shortcomings with regard to assayable data for care chain analyses and to support understanding of the care delivery system can be found in the literature (Walley et al., 2006a, The Health Foundation, 2014). These shortcomings also seem to exist at the case clinics as well. Seemingly a quite simple question about which patient group is the largest in number is hard to answer.

"And then everyone will be checked, and it's an awful mass, it's huge" ... "it was a difficult question, it was a very tricky question, the biggest patient group, yes yes, that's a very difficult question. Because it may be this, this pain bleeding can be greater. I do not think any of us actually know. That was a good question. "

(Operations manager clinic III, independently translated)

Moreover, the review of the case clinics does not indicate any use of a database to generate system behaviour over time. For example, no indication of use of time-series measurement, such as statistical process control (SPC) as proposed by Walley et al. (2006a) as run charts for learning. In addition, the flaw here, that it is often hard to capture longitudinal data to group into patient episodes (Lillrank et al., 2011), can also be confirmed. The available data is hard to extract on an aggregate level as it is documented in the medical record system.

However, there is a great deal of data to report into different databases for the staff at the case clinics. In addition to the medical records, data is also compiled to provide information to the national quality register accumulated and presented at a national level. These measurements are targets for national healthcare and cannot respond to the need for assayable data for decision-making concerning care chain effectiveness. It seems to be difficult to obtain statistics.

"And there you can get very much statistics if you want, but it's not quite that easy as I understand."

(Operations manager clinic IV, independently translated)

An attempt to use demand data to match capacity has been made at case clinic II. It was a one-off project with external help to extract the data. The result was not accepted by the staff and therefore no permanent work method. The operations manager did, however, receive a lot of help, see the following quote.

"I got out of it, both hard and soft data you can say. We looked at how our flows are, when do we have patients, how many peaks and valleys are there. You could actually quite clearly see that ... the woman who helped us, a consultant named Nina, she looked at when they were approved, when they were discharged, how long they stayed, how long they were in maternity, when they give birth to their child, how long they took before they gave birth to their children, all of these things that it is possible to look at and then we monitored it."

(Operations manager clinic II, independently translated)

Moreover, the planning is done by pen and pencil with a lot of manual work and knowledgeable effort. Daily control of backlog and planning of surgeries at the case clinics are carried out by hand, which also leads to difficulties when it comes to statistical calculations and lead time analyses. A surgery planner refers to the physical paper calendar as the most important thing in the planning procedure, see the quote below.

"Yes this is everything [refers to the calendar] if it were to burn up then it would be tough. There is always a paper somewhere on the patient. But once the referrals are reviewed, we write them in by pencil because then there exist, if a paper were to blow away, no but then they are still somewhere. So yes this is ... "

(Surgery planner clinic IV, independently translated)

Indeed, it is likely that both sufficient data and the ability to know how to use it to provide information about the system are missing at the case clinics.

4.7.3 Internal control for care chain improvements

As discussed in the theoretical frame, performance measurements for external and internal control are to be differentiated depending on intention (Boland and Fowler, 2000, Walley et al., 2006a). Data for reporting performance result to one or several levels up in the hierarchy or to the national health register is thereby intended for external control. Likewise, data for internal control aims to improve the healthcare delivery system and care chain effectiveness at operational level. Regarding the case clinics, there are no indications of differentiation of performance measurements for internal and external control. Instead it seems that the performance data intended for external control for the two national financial compensation systems (new visit reimbursement ("queue billions") and healthcare guarantee) is used when trying to improve care chain effectiveness. For example, case clinic IV uses the healthcare guarantee as the objective for lead time. This is done by working for a higher number of patients within the time of the guarantee. It is thus only a rewrite of performance metrics since the data is intended for external control. The following quote refers to how case clinic IV gets feedback from the external control.

"And it is divided into quarters and there are statistics on it. And it's supposed to be 85% of all cancer patients to have surgery within this time."

(Surgery planer clinic IV, independently translated)

The performance measures referred to in the quote above are set and monitored externally and used to hold the case clinics accountable for the way in which they use their allotted resources. According to Boland and Fowler (2000), the healthcare guarantee statistics based on volume and ratio seem to counteract allocative efficiency. It governs the business practice by affecting the clinics’ priorities and production. The feedback which is then created regulating the system seems to encourage healthcare managers, as described by Walley et al. (2006a), to make “symptomatic relief” when trying to improve these kinds of performance metrics. This is done by self-determination of when the measurement of the guarantee time begins, in other words a type of distorting the system (Walley et al., 2006a). Likewise described by (Eriksson et al., 2011), there seem to be behavioural consequences in the case clinics operational businesses depending on what is measured and how. Case clinic IV strives to achieve the healthcare guarantee. However, the performance measurements do not help them to shorten the times to surgery day in a structured way. It is hard to use the healthcare guarantee to shorten throughput time since it only captures a part of the waiting time as well as it not being measured in absolute terms. At most it becomes appreciated encouragement.

"And then it's fun, when, like yesterday or the day before that we received an email about the latest waiting times. And then we were really great. So that's fun because then you get some black and white on it..., so it was the first quarter of this year. So it went really well. So it's fun, so I'll see it all worth it, to make it work."

(Surgery planner IV, independently translated)

The use of data for internal/external control can be summarised in the control location and resultant action matrix developed in Boland and Fowler (2000). Performance measurement for organisational development of chain effectiveness issues should therefore be represented in the first quarter. However, no indications are found of internal control resulting in positive action for lead times, see Table 19 below. On the contrary, the health guarantee encourages a negative behaviour in terms of lead times.

Table 19: Control location and resultant action matrix model (modified from Boland and Fowler, 2000, p.422)

Resultant Action (affecting lead time) Control Location	Positive Action	Negative Action
Internal controls	No indication	No indication
External controls	No indication	Healthcare guarantee & “queue billions”

4.7.4 Summary of regulation of care chain performance

The analysis of how feedback on performance is used shows that the detected performance measurements are not related to patient demand or order fulfilment. For example, there are no indications of monitoring or use of time-series measurement to illustrate demand, for example. On the other hand, there seems to be a will to find out how their delivery system performs, but that the support for obtaining data and analysing it is weak. Seemingly simple data about throughput times from referral to surgery day is laborious to extract on an aggregated level. They have to enter each patient’s medical record in the business system and count days to get this information. Hence, data concerning patient case processes seems to be scarce. Data exists on an individual patient level for each service episode but it is considered an issue to both extract it on an aggregated level and to form it longitudinally to cover the times of episodes of care. In addition, external control by for example the national financial compensation systems (new visit reimbursement (“queue billions”) and the healthcare guarantee) seem to govern business practice by affecting priorities and production. This is because measurements externally reported are used to hold the care units accountable for the way in which they use their allotted resources. They only include care chain performance between the day the referral is completed to surgery day as well as to only include time to the first visit. It is a short time compared to the total episode of care. It therefore narrows the care delivery system and is thereby also probably counterproductive for the overall delivery system’s performance. There is a focus on activities and functions instead of on patient order fulfilment.

4.8 CONSTRAINTS FOR CARE CHAIN EFFECTIVENESS

This is the summary of the analysis of today’s practices by features for care chain effectiveness. It is done by comparing four different care clinics’ operations with the theoretical features developed in the frame of reference. The analysis is directly linked to RQ 2: *How can the features for care chain effectiveness be used in analysing today’s practices?* The result of the analysis is presented as structural constraints for care chain effectiveness. It is the last step in operationalising logistics management theories, see Figure 32. The below summary is the main content of the above analysis. It can also be found in Table 20.

Figure 32: Logistics management theories have been operationalised when used in analysing today’s practices

1. CARE CHAINS’ OBJECTIVES

Feature for care chain effectiveness: To have a purpose to meet patient requirements by delivering cost-effective care and the purpose established in the organisation’s mission, vision, and objectives. In addition, staffs’ operational decisions regarding care delivery should also fulfil that purpose.

Constraints for care chain effectiveness: Purpose to deliver medical results and objectives linked to economic influx or penalty. Hence, disagreements about what to achieve occur between care units when delivering care to the same patients.

2. PATIENT CASE PROCESS

Feature for care chain effectiveness: To have a patient case focused transformation and arrange the patient order fulfilment by using predictability. It then provides opportunities to use benefits of standardisation, coordination and value configuration to match patient demand effectively.

Constraints for care chain effectiveness: Transformation of patient cases conducted by undefined patient case processes and coordinated one step at a time though pre-established protocol. Hence, these isolated part-deliveries are problematic to manage, control, and to choose value configuration to meet patients’ demands cost-effectively.

3. CARE DELIVERY STRUCTURE

Feature for care chain effectiveness: To have a care delivery structure formed by patient order fulfilment and specialised medical functions contributing to the care delivery system’s total effectiveness, i.e. economies of patient flow. Information sharing is therefore central.

Constraints for care chain effectiveness: Care delivery structure formed by medical skills and organisational membership. Hence, patient cases are chopped up to fit medical specialties and organisational functional divisions.

4. DEMAND MANAGEMENT

Feature for care chain effectiveness: To manage patient demand by balancing capacity and using decoupling points to shift between demand- and resource-driven capacity. Fixed lead times can thereby be obtained through flexible capacity, over-capacity, and/or flexibility through responsiveness.

Constraints for care chain effectiveness: Demand managed by pre-decided production hours, pre-decided resource levels or resource availability. Hence, patient lead times vary since capacity is not balanced by demand.

5. CARE DELIVERY PLANNING

Feature for care chain effectiveness: To have a demand-driven plan for the transformation of patient order fulfilment and delivering care and resource allocation based on true demand. Hence, it keeps the natural pattern of demand and keeps it united.

Constraints for care chain effectiveness: Production and resource plans based on physicians’ schedule, earlier performed production and non-existent mechanisms to translate demand into resource requirement profiles. Hence, the natural pattern of demand is distorted and lead times are driven by resources’ availability.

6. CARE CHAIN PERFORMANCE MEASUREMENTS

Feature for care chain effectiveness: To measure care chain performance and use patient service as the ultimate measurement and cost performance for patient order fulfilment. Hence, to achieve care chain effectiveness it is fundamental to manage by lead times and throughput times.

Constraints for care chain effectiveness: Care chain performance measured by functional medical measurements and as delays embedded in the system. Hence, the ultimate measurement is not patient service and lead time management is not possible.

7. REGULATION OF CARE CHAIN PERFORMANCE

Feature for care chain effectiveness: To use measurements to deliver cost-effective care and feed medical functions with information about care chains as well as their own performance, thereby expanding the care delivery system’s boundaries along episodes of care and governing to obtain care chain effectiveness.

Constraints for care chain effectiveness: Medical functions fed with information about performance relative to financial reimbursements and medical objectives. Hence, it narrows the care delivery system and governing to obtain sub-optimisation.

THE ANALYSIS – ANALYSING TODAY’S PRACTICES

Table 20: Summary of constraints for care chain effectiveness

5th CHAPTER

CONCLUSIONS AND CONTRIBUTIONS

This final chapter presents the conclusions of the research presented in this dissertation and answers the purpose. To recap, the purpose is to explore how logistics management theories can be operationalised in a healthcare context to understand care chain effectiveness. The first section addresses the operationalisation of logistics management theories while the subsequent section concerns the understanding of care chain effectiveness. The theoretical contribution is then presented along with the implications for practices. This chapter ends with suggestions for further research.

5.1 LOGISTICS MANAGEMENT THEORIES OPERATIONALISED IN A HEALTHCARE CONTEXT

The research within this dissertation is based on reasons to be positive about care being able to be delivered with shorter lead times, at lower cost, and with higher service to patients by means of logistics management knowledge. An exploration of how logistics management theories can be operationalised to be useful to healthcare organisations has therefore been made. Generally, this is done by systems theory creating compatibility between logistics management theories and the healthcare context. Systems theory refers to social systems where people work together and activities are carried out to achieve a common purpose. A logistics system is thus the system that is created when organising to deliver cost-effective service. Further, a care delivery system is viewed as the system that is created when organising to deliver cost-effective care. As a first step a logistics system's features forms features for achieving care chain effectiveness. These features are in turn used to analyse today's practices as a final step in the operationalisation of logistics management theories in a healthcare context. The 21 areas identified for analysing care chain practices and the main outcome of each step in the operationalisation are shown in Table 21 on the next page.

The operationalisation of logistics management theories is, as stated earlier, done in a series of steps. An illustration of the operationalisation can be found in Figure 33 below. The first step is a logistics system's features derived in the appended licentiate thesis, see Appendix I. The licentiate thesis acts hence as a starting point for the dissertation. The next step in the operationalisation corresponds to RQ 1: *How can features for care chain effectiveness be described?* This question is elaborated on and answered in the theoretical frame of reference, see chapter 3. The last step in the operationalisation is to identify constraints in practices and corresponds to RQ 2: *How can the features for care chain effectiveness be used in analysing today's practices?* It is elaborated on and answered in the analysis, see chapter 4.

Figure 33: The operationalisation of logistics management theories in a healthcare context

The exploration of how logistics management theories can be operationalised in a healthcare context here aims to provide understanding of care chain effectiveness. At the beginning of the dissertation it is stated that care chain effectiveness is viewed as the output of a care delivery system and its capability to produce a desired result. The analysis of today's practices has provided opportunities to understand how a care delivery system functions. It can thereby be seen as a proof of a complete operationalisation of logistics management theories and a validation of it. The conclusions about the understanding of care chain effectiveness are presented in the next section.

CONCLUSIONS AND CONTRIBUTIONS

Table 21: Logistics management theories operationalised in a healthcare context

5.1.1 Key concepts for the operationalisation

Operationalisation implies that some key concepts have to be defined to be able to use them for empirical investigations. It turned out that *lead time*, *patient order fulfilment*, *true demand* and *system boundaries* were important throughout the operationalisation of logistics management theories to healthcare organisations presented in this dissertation. These concepts were vital for the elaboration, investigation and analysis of the care delivery systems from a logistics management perspective.

Lead time

Lead time is one of the key concept for the operationalisation due to the care chain perspective. It is here related to the time dimension by striving for short access time, short throughput time and short waiting-times. For patient cases the lead time is the amount of time between first contact with healthcare and the last. It is the *episode of care* from order to delivery in terms of logistic management, see Figure 34. These times vary based on the patient, health problem and care delivery system. For the purposes of the dissertation it is assumed that patients prefer not to wait for examinations or treatment longer than medically justified. Lead times are hence considered to be as important a factor for patient service as it is for customer satisfaction. The lead time can however be irrelevant to certain patient cases. The timing of an examination or treatment is then instead vital since reliability in time of service is also considered to be highly essential for chronic diseases or maternity care for example. Lead time is therefore both the perspective since this dissertation follows patient cases through care delivery systems and vital for patients. Additionally, the literature used in the dissertation is in some ways based on the concept of lead time. In logistics management theories concerning manufacturing, assembly, and commerce the concept of lead time has a direct relationship to the amount of inventory that exists at different points in the overall supply chain. In other words, back to the basics of logistics, high service and low costs. Lead time is thus here considered to be vital for managing and controlling care chains and has thereby functioned as a key concept for the operationalisation of logistics management theories in a healthcare context.

Figure 34: Total lead time is the episode of care for a patient

Order fulfilment

The concept of order fulfilment has been used to operationalise the task for healthcare organisations from a logistics perspective. In this dissertation it is considered that the fulfilment of patients' needs can be broken down into several smaller steps performed over time by individuals within different care units in one or several organisations. A general description of this process has been made by dividing it into five sub-processes, for several examples see Appendix II. The sub-processes are: *order handling*, *diagnosis*, *treatment*, *follow-up*, and *discharge*, see Figure 35.

CONCLUSIONS AND CONTRIBUTIONS

- **Order handling:** A patient order sets the patient order fulfilment in motion with the aim to generate and communicate the order. The receipt of the demand is handled quite differently depending on care business. It varies from invitation, such as for cervical checks, to order handling in combination with the meeting with the patient, appointment by phone or web, notification from in-hospital clinic or referral handling. This sub-process has a longer lead-time for planned businesses compared to natural demand business such as emergency orders, service by phone or business with a drop-in appointment system.
- **Diagnosis:** The diagnosis sub-process can be described as the medical part of the order handling. It might also be the same activity. For some cases diagnosis is almost non-existent, for example phone advice, and the diagnosis sub-process and the other sub-processes are merge together. A patient calls and a caregiver answers and by means of the conversation both order handling and diagnosis are handled, which then leads to advice and a check before the conversation ends. On the other hand, the diagnosis sub-process can be on-going for years as for unusual and difficult-to-diagnose diseases.
- **Treatment:** This sub-process, as for the other sub-processes, can vary in number of steps to treat a patient. Some treatments are just a phone call and some are at regular intervals over a lifetime. Likewise, the proportion of lead time for this sub-process related to the total lead time of patient order also differs between patient cases. Emergencies has a short lead time until treatment begins, as for drop-in visits, i.e. when the order handling comes with the meeting with the patient. For a patient undergoing surgery, the treatment lead time is over a day but the total lead time can be a matter of several months.
- **Follow-up:** As in the other sub-processes, the follow-up part of the patient order fulfilment can be integrated or have specific steps. It may be just a check before the patient leaves a visit to be sure that the case can be closed or it may be a patient who stays overnight for recovery after surgery or a stated follow-up visit.
- **Discharge:** Discharge is an important end point of the patient order fulfilment, providing prerequisites to measure lead times and results. This means the results of the whole overall patient order fulfilment, which then may include several caregivers.

In addition, the *decoupling point* has during the operationalisation turned out to be central in relation to patient order fulfilment. It is the point when there is a larger change in predictability than between an unpredictable diagnosis procedure and a predictable treatment process. If the unpredictability in the diagnosis procedure is high, the demand can be characterised as unpredictable. Predictable demand is thus the reverse. This in combination with emergency in time to begin treatment gives demand/supply characteristics in line with Christopher et al. (2006). The decoupling point thus divides the patient order fulfilment into two parts with different characteristics. Characteristics to take into account in, for example, design of care processes, planning of care activities, lead time management, performance management and measurement.

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Figure 35: Patient order fulfilment covers the episode of care

True demand

This dissertation is based on the premise that it is a person's need for healthcare that is the true demand. The concept of true demand is vital for care chain effectiveness as it is this demand that is to be met. True demand thus sets what care to deliver, i.e. the production plan. Subordinate to this, the resources are planned. However, there are some transactions from a person needing help from healthcare to a treated patient, see Figure 36. A patient need becomes an order for care, which becomes fulfilled, thereafter a fulfilled order and at the end a treated patient. Between these transitions differences can occur as it is not clear that the patient's needs are "correctly translated" to the care order. Likewise, it is not obvious that the order of care can be met. Above all, it is not evident that a patient's needs have been met even if the patient is a treated patient. If the case is not closed on the basis of the patient's perspective, the patient will probably return (Baker et al., 2009). A patient who has to contact healthcare once again to get help for the same problem is from a logistics perspective an incorrect delivery. It then creates further demand for healthcare services.

Figure 36: True demand and differences that may occur in transactions

Due to the basis of logistics management being to meet customer demand, it has been necessary to have some certainties of demand for operationalisation of the logistics management theories in a healthcare context. True demand has been considered according to the following assumptions:

- The demand is a patient's needs when contacting healthcare
- The mission of care is to meet the demand for service

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- A care provider that is not available or cannot interpret the demand correctly cannot meet the demand
- No patient requests medical service unnecessarily
- The demand ceases when it is met
- It is only the patient who can determine when the demand is met

By considering the above assumptions in combination with a logistics perspective it becomes clear that it is true demand that should determine the boundaries of a care delivery system. This is also the last key concept in the operationalisation presented in this dissertation, i.e. system boundaries.

System boundaries

The essence of logistics management theories that have been operationalised in this dissertation concerns in some ways factors that may affect system boundaries and interrelations in care delivery systems. Expanding system boundaries means including more care units in relation to each other. The opposite is to view each care unit as a solitary isolated device. This means focusing on the integration of the care organisation's care units where the care delivery system's performance as a whole is more important than the performance and productivity of each individual care unit. Accordingly, performance is measured in terms of total patient service, lead times and costs for the defined system as a whole. The care delivery system's performance is hence not the sum of each care unit's productivity. In addition, it also means that the performance of each care activity has in this dissertation been valued against what the care delivery system is to achieve. Hence, system boundaries have been important for how the healthcare businesses have been studied: they are to contribute to the total patient order fulfilment. Focusing on the performance of a service activity like new visits for selected patients can thereby be considered as the scope of the system is quite narrow, see Figure 37. Further, service events such as functions like surgeries or visits include a larger scope of patient cases. It is nonetheless only a part of the total episode of care. When the focus shifts from internal coordination to, to a certain extent, external integration and measures for a greater part of patient cases, the care delivery system's boundaries are expanded further. Including all patient cases throughout the episode of care widens the system's boundaries further. This is similar to the scope of supply chains, i.e. from the source of supply and to the point of consumption. Since numerous care chains can be part of the care delivery system, a care unit delivering care within different care chains therefore has to cope with the potential split when performing in various care chains.

Figure 37: Expanding system boundaries

The four key concepts, *lead time*, *order fulfilment*, *true demand*, and *system boundaries*, for operationalisation of logistics management theories close this first part of answering the purpose of this dissertation. The next section concludes the understanding of care chain effectiveness obtained through this dissertation.

5.2 UNDERSTANDING CARE CHAIN EFFECTIVENESS

Understanding care chain effectiveness is the second part of the purpose of this dissertation and the aim of the operationalisation of logistics management theories to the healthcare context. The operationalisation builds up an understanding of care chain effectiveness through a theoretically based analysis of today’s practices. To understand here means to have knowledge of how care delivery systems are structured and function as well as to realise how care chain effectiveness is possible and why. Care chain effectiveness is in this dissertation viewed as *to deliver care to a pre-decided level of high patient service to lowest cost as possible*. High care chain effectiveness is thus a desired condition and the care delivery system is the tool for achieving it. The understanding has been obtained by investigating and comparing seven features for care chain effectiveness and examples from today’s care delivery systems, see Figure 38. The next section presents the conclusions from each of the seven analysed areas. The structural constraints revealed by the comparison suggest improvements for increased care chain effectiveness. Through this, the purpose of this dissertation is considered to be answered.

Figure 38: The last part in this dissertation and for understanding care chain effectiveness

5.2.1 Understanding care delivery systems

1. Care chain objectives

Having a shared purpose for the care delivery system concerning delivery of cost-effective care is critical to care chain effectiveness. Accordingly, care departments' and care units' missions, visions, and objectives must be coherent and match that purpose. Since care units contribute to the same patient order fulfilment, disagreements about what it is desired to achieve between missions, visions and the objectives to get there can otherwise occur. Moreover, the daily operational decisions when fulfilling patient orders are shaped by how care units are rewarded. If quantitative objectives are then established that do not support the mission or the vision of the business it curtails care staffs' and care units' ability to perform their duties. Medical objectives stated by national quality levels and objectives linked to economic influx or penalty narrowing the system can then not be decisive objectives. These kinds of follow-up measures become a substitute for objectives that are missing and thus in practice guiding. It does not mean that these kinds of follow-up measures are incorrect or inappropriate. It means that other objectives are needed to govern the daily operational decisions. By extension, the rewarding follow-up measures will naturally be achieved. Hence, it is for the management to form objectives representing cost-effective care delivery. Objectives linked to performance of patient order fulfilment in terms of patient service, lead times and costs.

2. Patient case processes

Patient case process begin at the time of the first contact with any care provider and end when the case is closed. Using predictability for patient case progress gives opportunities to pre-define how patients' orders are to be fulfilled. Knowing which sub-processes lead to patient order fulfilment can therefore arrange the patient case process. Unused predictability creates undefined patient case processes and isolated part-deliveries since the next step cannot be planned before the current step has been completed. It is about predictability in time – being able to predict when crucial medical evidence will be available for decisions about content within up-coming sub-processes, i.e. when can service activities or events be done? Not about knowing how the exact review of x-rays, treatment or examination are to be performed. Predictability then provides the opportunity to pre-define general patient case processes, such as the well-known basic programme for pregnant women. Benefits as analysis options then arise when there is a general version of a process to compare with. Structural development opportunities and choosing value configurations to match patient demand effectively can then also be used. Increased ability to communicate patient case progress also occurs. It then simplifies coordination between different care units and medical specialties in the order fulfilment. Through predictability it is possible to decouple sequential activities and thereby utilise reliability of part-delivery at scheduled times. The next step can be planned based on the knowledge that necessary information is in place when needed. Coordinating patient order fulfilment by means of pre-established protocols can therefore not be used. This coordination is done one step at a time like isolated part-deliveries and dictating the lead times. A separation of service activities where the patient is not present and the service events where the patient is present provides opportunities for lead time reduction. Information sharing about patient cases' progress is hence a prerequisite.

3. Care delivery structure

Care delivery structure is the networks of functions that are organised in various configurations in order to meet patient demand. Through integrations the different functions contributing to the same patient order fulfilment are merged into a common understanding of the output. Merging various medical specialties through cross-functional services is to form an output that is going to meet patients' needs. The opposite is an input focus when the orders are functionally divided by medical specialty, meaning that patient cases are chopped up to fit the medical specialties and organisational functional divisions without any organisational main owner. In other words, the input focus is to define the needs of the patients by medical specialty, e.g. we treat patients with a need for gynaecological out- and inpatient care. The output focus is insisted to define the business by the needs of the patients. The challenge seems to be to take advantage of centralisation to improve/maintain medical skills (economies of scale), in combination with flexibility to share fixed resources (economies of scope) and quickly perform care by contributing to the patient order fulfilment (economies of integration). In other words, from optimising resources in one function to optimising patient order fulfilment at less cost, i.e. care chain effectiveness. A central issue is then the question of patient cases owner and proper IT support. This is key when handling patient orders that are going to be fulfilled in different places and at different points in time. IT support does not solve the structural problems brought about by functional orientation, but it may be a good catalyst to shift to care chain focus. A good understanding of patient order fulfilment and the systems' performance is therefore necessary to be able to specify requirements to set up such supportive IT.

4. Demand management

The true demand is the demand of patients needing help, i.e. both new patient cases and patient cases in progress. Good forecasts provide good indications of true demand, but probably not excellent enough to fully work with a demand strategy by means of locked capacity. Demand managed by pre-decided production hours, pre-decided resource levels or resource availability thereby leads to patient lead times or work load needing to vary. It is not possible to follow a dynamic demand through predetermined maximum available capacity or fixed capacity. Hence, a high level of fixed capacity or production to fulfil maximum capacity probably leads to increased lead times for patients. One example is when work tasks are decided long in advance, as the physicians' schedules can be, thereby causing inflexibility in care delivery. A high resource utilisation can never be the purpose of a care operation. One way to prevent this kind of demand management is to avoid follow-up measures encouraging large batches or to achieve levelled production. Instead, measurements should push the businesses towards small batches and mirror patient demand. This means, shorter planning horizons and shorter setup times. Increasing flexibility by regulating production instead of allowing available resources to regulate what care services to deliver. Demand management by lead times, however, requires awareness of true demand. In addition, queues are a sign of delays designed into the system. They can, though, be used as decoupling points to shift strategy when balancing capacity. Shifting between using high capacity utilisation of resources or high flexibility for different types of service events or care functions. Hence, it can be necessary to have acceptance of overcapacity in some care units to adjust for dynamics in demand.

5. Care delivery planning

Care delivery planning is the planning of production of care services and resource allocation. It involves planning for the total episode of care and finding mechanisms to translate demand into production and resource requirement profiles. When patient order fulfilment is performed by several care units over time it becomes a care delivery system issue. Hence, data on true demand and structured joint planning are to be used for care chain effectiveness. Decoupling points give opportunities to understand when it comes to optimising capacity or when delivery planning, overriding capacity planning, should be demand-driven. Demand-driven capacity planning means planning to follow demand dynamically. The planning can then not be done on attempts to produce the same number of service events defined by history, i.e. produce what was produced last year. Nor can it be based on an average production determined by experience, experience saying that the queues then do not grow. Nor can the planning be based on production batches or weekly cyclical production patterns. For example, using a main plan defined by the physicians' schedule and then selecting surgeries to be done to fulfil that main plan. It is then the physicians' schedule that decides what surgery to deliver, i.e. lead times are driven by resources' availability rather than efforts to reduce patients' lead times. All these examples exemplify fixed production plans where the natural pattern of demand is distorted. It is a production-optimised way of managing care delivery based on high capacity utilisation. Queues are then considered to be good as they simplify production and resource planning. Capacity management can cause queues and waiting times. To avoid queues and waiting times the demand from patients is to be handled by dynamic planning.

6. Care chain performance measurements

Measuring a care chain involves capturing the total performance of care delivery. It involves measuring patient service and costs for patient order fulfilment for episodes of care - for example, measuring perfect care (like the concept of perfect order) and allocating costs to patient case processes. The system is then defined by the episode of care. Using lead time management stimulates a focus on lead time reduction and timeliness. It is a base for increasing patient service and also gives opportunities for cost reductions. In contrast to chasing hours or minutes in service events, e.g. surgeries or visits, lead time reduction aims to shorten waiting times in days. Measuring lead times provides opportunities to change the structure, for example structural problems such as bottlenecks causing unnecessary delays for patients. Prioritising lead times stimulates flexibility in time compared to stimulating resource utilisation by prioritising cost metrics at a functional level. Measures such as cost per surgery or changing times between surgeries do not provide the total performance of care delivery. They are functionally based measurements and can therefore not capture the effectiveness of the care chain. Moreover, patient service and costs for patient order fulfilment create an arena for necessary and inevitable system trade-offs. Hence, by not measuring these, care managers are prevented from making necessary cost analyses, resulting in less control of the costs for care chains and decisions being made without taking into account how the total cost changes. For example, issues regarding shared use of fixed resources, i.e. economies of scale and scope. Cost performance along the care chains and cost performance of included care units will hopefully stimulate development towards economies of patient flow, i.e. economies of integration.

7. Regulation of care chain performance

Regulating care chain performance means to feed medical functions with information about care chain performance as well as their own performance. Performance measurements therefore need to be related to patient demand or orders to provide information about how the care delivery system behaves when delivering care over time. Data exists on a patient individual level for each service event through patient records. It is considered an issue to extract it on an aggregated level and to form it longitudinally to cover the time of episodes of care. Nor can the national quality register for the national healthcare correspond to the need for assayable data for decision-making concerning care chain effectiveness. The lack of information aggregated from the operational level about patient case processes is an indication that episodes of care on a system level are probably unclear. It creates difficulties in understanding how the care delivery system works. Hence, oversight of how patients' lead times can be affected and decisions being made that risk care chain effectiveness gains. Moreover, when measurements by ratio or volume for a short part of the episode of care are used to hold the care units accountable for the way in which they use their allotted resources it narrows the care delivery system. For example, new visit reimbursement ("queue billions") and the healthcare guarantee can govern business practice by affecting priorities and production. It can encourage healthcare managers to make "symptomatic relief" when trying to improve these kinds of performance metrics. Prioritising new visits and exhibiting opportunistic behaviour to achieve the healthcare guarantee instead of changing work methods. In other words, distorting data or the system to meet national requirements in the "easiest" way. It is probably counterproductive for the overall delivery system's performance. It is then a question for the managers to resist managing their business by performance measurements for external control on national level - and instead managing by measurements for internal control, which in turn then leads to the external objectives being met.

5.3 THEORETICAL CONTRIBUTION

The theoretical contribution of this dissertation is to the field of logistics management through a methodological development of using logistics management theories in a new context. A distinction between patient flows and supply chains related to physical products needs to be addressed in the context of healthcare (Vries and Huijsman, 2011). This dissertation concerns the relatively novel research area of care chain management where the focus is on flow of patients. This *new context* is considered to enrich the field of logistics management research. It is a contribution by overcoming difficulties implied with approaching a novel research area.

Further, the research in this dissertation stresses the importance of logistics management research in a healthcare context and encourages transfer of knowledge of efficient logistics management to this sector. This has previously been represented by for example (Aronsson et al., 2011, Lillrank et al., 2011, Olsson and Aronsson, 2015, Meijboom et al., 2011). Besides these examples there appears to be relatively limited research being done within logistics management focusing in some way on care chain effectiveness issues.

This dissertation specifically contributes to an improved understanding of operationalisation of logistics management knowledge in the healthcare context. Previous

work shows superficial operationalisation of logistics management to a healthcare context. It is done by conceptual reasoning (Aronsson et al., 2011, Meijboom et al., 2011) as well as operationalisation of specific concepts such as lean and agile (Olsson and Aronsson, 2015) and decoupling point (Rahimnia and Moghadasian, 2010) or is based on a production unit perspective (Parnaby and Towill, 2009). The exploratory design of this dissertation in combination with the literary volume as a monograph gives affordable advantageous opportunities. The research contributes through operationalisation of logistics management theories through a true care chain perspective as well as closely and empirically justifying what can be interpreted as the essence of logistics management theories.

Finally, previous research, not published strictly in logistics or SCM journals, require using a systems approach to realise the full potential of logistics management knowledge when operationalising it in the healthcare context (Aronsson et al., 2011, Villa et al., 2014, Walley, 2013, Walley et al., 2006a). The system approach is a critical concept within logistics management and is considered fundamental but few researchers have applied the systems approach concretely and distinctly in their research (Wiger, 2013). The research in this dissertation has literally embraced the requirement by consistently maintaining a system perspective. From systems theory the basics of social systems' components and behaviour have been used actively to understand how care delivery system function. This contributes by clearly considering logistics as a system and that logistics management theories originated from practical excellence can be verified by systems theory. An additional contribution comes from the methodology that makes it possible to transfer already developed logistics management knowledge to new contexts. More about the managerial implications can be found in next section.

5.4 IMPLICATIONS FOR PRACTICES

The results of the research presented in this dissertation have several implications for practices. They are primarily addressed to department managers or managers higher up in the healthcare organisational hierarchy. Since organisations exhibit equivalency, there is no one best way to organise but all ways of organising are not equally effective (Ackoff, 1971). The most important managerial contribution is therefore to healthcare managers, giving great opportunities to improve understanding of care delivery systems not presenting general improvement solutions initiating quick fixes. The ambition is that care managers will find the features for care chain effectiveness and the related analysis of today's practices instructive and see them as a tool for developing understanding of how their own care delivery system functions.

First, one of the major findings of this research is the 21 areas for analysing care chain practice based on a desired condition for care chain effectiveness, see Table 21. It is important to note that these 21 areas do not purport to be exhaustive to discover care chain effectiveness improvements. They are, however, by this dissertation both theoretically and empirically founded. The analysis following these 21 areas gives a purposive understanding of what can be done to improve care chain effectiveness within healthcare organisations. And hopefully also an increased understanding of healthcare businesses as systems since systems theory is core in the theory base that this dissertation builds on.

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Second, a number of direct suggestions for improvement can be seen in the concluding remarks from the analysis of today's practices presented in sub-section 5.2.1 above. Based on the developed understanding of care delivery systems, seventh categories are presented. However, these suggestions may not be general for every healthcare organisation. They are nonetheless considered to be of interest for practice and can provide a more practical view of some parts of the reasoning found in the Swedish government's official investigation, Effective care (Effektiv vård) (SOU 2016:2, 2016). Examples of suggestions to improve care chain effectiveness that could be made on the basis of the analysis include:

- Medical objectives stated by national quality levels and objectives linked to economic influx or penalty that narrow the system cannot be decisive objectives.
- Unused predictability creates undefined patient case processes and isolated part-deliveries since the next step cannot be planned before the current step has been completed.
- Patient cases are chopped up to fit the medical specialties and organisational functional divisions without any organisational main owner.
- Pre-decided production hours, pre-decided resource levels or production planning by resource availability leads to patient lead times needing to vary.
- To focus on reducing patients' lead times, the daily resource planning cannot be based on what was produced last year or an average production determined by experience, experience that says that the queues then do not grow, nor based on production batches or weekly cyclical production patterns or defined by the physicians' schedule.
- Using lead time management can stimulate a focus on lead time reduction and timeliness and thereby managing by measurements for internal control which in turn leads to the external objectives being met.
- Data on an aggregated level are needed that can be formed longitudinally to cover the time of episodes of care.

Finally, this dissertation illustrates the importance of a common parlance that is then also a contribution for practice. It can be seen as a base to in some way execute care chain management and work with improving care chain effectiveness. A common parlance is a tool for thinking, communicating and learning. It is therefore important in order to understand and act. Some of the concepts are *lead time*, *patient order fulfilment*, *true demand* and *system boundaries*, presented in sub-section 5.1.1.

5.5 SUGGESTION FOR FURTHER RESEARCH

Based on the findings from this research, some directions for further research are here discussed. In chapter 4, several improvement suggestions can be found in relation to the analysis of today's practices. The focus of the dissertation is not to provide improvement suggestions for care chain effectiveness but that step is not that far away. It can however be concluded that some of these improvements' potential can be realised without questioning the design. This is what Van Gigch (1991) refers to as system improvements, i.e. improvements within the set design. This is in contrast to system redesign, where the design is to be questioned. Some of the desired features for care chain effectiveness probably involve redesign of healthcare organisations to be achieved. For example, based on a pre-decided patient service level and defined lead-times to ensure that the process is

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designed to adhere to them. If the capabilities cannot support the requirements, it must be determined whether the care delivery system could be redesigned to resolve the gaps.

Redesign provides the opportunity to initially build a flow-oriented system - which may be easier than rebuilding an existing system with much culture and tradition. The same applies to industry and commercial business, where new fast-paced companies, initially built for high flow efficiency, tend to quickly win market shares through profitable growth. It is therefore important that the logistics knowledge according to this dissertation be a natural part from the beginning when new care units or hospitals are built up. They can thereby be designed to provide care chain effectiveness. An example from the Swedish care delivery system is the new care unit at Trelleborg hospital⁵. This is a project for developing new methods, methods of work and collaboration forms supported by technical and digital solutions for innovation work in the care chain for multi-sick elderly patients. Care chains for chronically and multi-sick patients are not represented in the study included in this dissertation, making it of interest in further research to investigate whether these types of patient cases have additional benefits from logistics knowledge than those presented by the results of research carried out in this dissertation.

Additional understanding of care delivery systems is one of the main points of the research in this dissertation. While supply chain orientation is seen as a prerequisite for supply chain management (Mentzer et al., 2001), it is an educational challenge to first increase the knowledge of care chain management. This is in order to put these sets of beliefs into action later within healthcare organisations – actions undertaken to realise care chain effectiveness.

⁵ <https://vard.skane.se/lasarettet-trelleborg/om-oss/nyheter/framtidens-vardavdelning-har-oppnat/> [Online: 2018-04-08]

REFERENCES

- ABRAHAMSSON, M. 1992. *Tidsstyrd direktdistribution : drivkrafter och logistiska konkurrensfördelar med centrallagring av producentvaror*, Linköping : Univ. ; Lund : Studentlitteratur, 1992.
- ABRAHAMSSON, M. & ARONSSON, H. 1999. Measuring Logistics Structure. *International Journal of Logistics: Research & Applications*, 2, 263.
- ABRAHAMSSON, M., CHRISTOPHER, M. & STENSSON, B.-I. 2015. Mastering Supply Chain Management in an Era of Uncertainty at SKF. *Global Business and Organizational Excellence*, 34, 6-17.
- ABRAHAMSSON, M. & KARLÖF, S. 2011. *Det dynamiska företaget - Om följsamhet och flödesorienterade affärsmodeller*, Malmö, Liber AB.
- ACKOFF, R. L. 1971. Towards a system of systems concepts. *Management Science*, 661-671.
- ALLDER, S., SILVESTER, K. & PAUL, W. 2010a. Understanding the current state of patient flow in a hospital. *Clinical Medicine*, 10, 441-444.
- ALLDER, S., SILVESTER, K. & WALLEY, P. 2010b. Managing capacity and demand across the patient journey. *Clinical medicine*, 10, 13-15.
- ALLDER, S., WALLEY, P. & SILVESTER, K. 2011. Is follow-up capacity the current NHS bottleneck? *Clinical Medicine*, 11, 31-34.
- ARMISTEAD, C. & CLARK, G. 1994. The "Coping" Capacity Management Strategy in Services and the Influence on Quality Performance. *International Journal of Service Industry Management*, 5, 5-22.
- ARONSSON, H. 2000. *Three perspectives on supply chain design*. Doctoral thesis, Linköpings Universitet.
- ARONSSON, H., ABRAHAMSSON, M. & SPENS, K. 2011. Developing lean and agile health care supply chains. *Supply Chain Management: An International Journal*, 16, 176-183.
- ASHBY, W. R. 1969. Självreglering och nödvändig variation. In: EMERY, F. E. (ed.) *Systemteori för ekonomer och samhällsvetare*. Falköping: Gummessons Boktryckeri.
- BAKER, D. R., PRONOVOST, P. J., MORLOCK, L. L., GEOCADIN, R. G. & HOLZMUELLER, C. G. 2009. Patient flow variability and unplanned readmissions to an intensive care unit*. *Critical care medicine*, 37, 2882-2887.
- BEAMON, B. M. 1999. Measuring supply chain performance. *International Journal of Operations & Production Management*, 19, 275-292.
- BERRY, L. L. & SELTMAN, K. D. 2008. *Management Lessons from Mayo Clinic: Prescriptions for Service Success*, McGraw-Hill
- BLOMBERG, M. 2016. Avoiding the first cesarean section—results of structured organizational and cultural changes. *Acta Obstetricia et Gynecologica Scandinavica*, 95, 580-586.
- BOHMER, R. M. J. 2005. Medicine's Service Challenge: Blending Custom and Standard Care. *Health Care Management Review*, 30, 322-330.
- BOHMER, R. M. J. 2009. *Designing Care - aligning the nature and management of health care*, Boston, Massachusetts, Harvard business press.

- BOLAND, T. & FOWLER, A. 2000. A systems perspective of performance management in public sector organisations. *International Journal of Public Sector Management*, 13, 417-446.
- BRINKMANN, S. & KVALE, S. 2015. *InterViews : learning the craft of qualitative research interviewing*, Thousand Oaks, Sage Publications.
- BROMMELS, M. & VINTMYR, U. 2015. Bör liten bli stor? Sjukhusstorlekens betydelse för vårdens resultat och kostnadseffektivitet. En sammanställning och analys av vetenskaplig evidens. S 2014:11. Stockholm: Swedish Government Official Reports.
- BRYMAN, A. & BELL, E. 2011. *Business Research Methods*, Oxford University Press.
- BURBIDGE, J. L. 1961. The "new approach" to production. *Production Engineer*, 40, 769-784.
- CHECKLAND, P. 1981. *Systems thinking, system practice*, Bath, John Wiley & Sons Ltd.
- CHRISTENSEN, T., LÆGREID, P., RONESS, P. G. & ROVIK, K. A. 2005. *Organisationsteori för offentlig sektor*, Malmö, Liber ekonomi.
- CHRISTOPHER, M. 2005. *Logistics and supply chain management: creating value-added networks*, Great Britain by Biddles Ltd, King's Lynn, Pearson education.
- CHRISTOPHER, M., PECK, H. & TOWILL, D. 2006. A taxonomy for selecting global supply chain strategies. *The International Journal of Logistics Management*, 17, 277-287.
- CHURCHMAN, C. W. 2011. *System analys*, Stockholm, Norstedts.
- COOPER, M. C. & ELLRAM, L. M. 1993. Characteristics of supply chain management and the implications for purchasing and logistics strategy. *The international journal of logistics management*, 4, 13-24.
- COOPER, M. C., LAMBERT, D. M. & PAGH, J. D. 1997. Supply Chain Management: More Than a New Name for Logistics. *International Journal of Logistics Management*, 8, 1-14.
- CRANDALL, R. E. & MARKLAND, R. E. 1996. DEMAND MANAGEMENT-TODAY'S CHALLENGE FOR SERVICE INDUSTRIES. *Production and Operations Management*, 5, 106-120.
- CRESWELL, J. W. 2014. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, Thousand Oaks, SAGE Publications.
- CROXTON, K., GARCIA-DASTUGUE, S., LAMBERT, D. & ROGERS, D. 2001. *The Supply Chain Management Processes*.
- CROXTON, K. L. 2003. The Order Fulfillment Process. *The International Journal of Logistics Management*, 14, 19-32.
- DAGENS MEDICIN. 2016. Här är landets bästa sjukhus – se hela topplistan [Online]. <http://www.dagensmedicin.se/artiklar/2016/03/23/har-ar-landets-basta-sjukhus-se-hela-topplistan/>: Dagens medicin. [Accessed March 27th 2016].
- DAVIS, T. 1993. Effective supply chain management. *Sloan Management Review*, 34, 35-46.
- DE VRIES, J. & HUIJSMAN, R. 2011. Supply chain management in health services: an overview. *Supply Chain Management: An International Journal*, 16, 159-165.

- DEVARAJ, S., OW, T. T. & KOHLI, R. 2013. Examining the impact of information technology and patient flow on healthcare performance: A Theory of Swift and Even Flow (TSEF) perspective. *Journal of Operations Management*, 31, 181-192.
- DEY, P. K., HARIHARAN, S. & DESPIC, O. 2008. Managing healthcare performance in analytical framework. *Benchmarking: An International Journal*, 15, 444-468.
- DOBZYKOWSKI, D., SABOORI DEILAMI, V., HONG, P. & KIM, S.-C. 2014. A structured analysis of operations and supply chain management research in healthcare (1982–2011). *International Journal of Production Economics*, 147, Part B, 514-530.
- ELLRAM, L. M. 1996. The use of the case study study method in logistics research. *Journal of Business Logistics*, 17, 93-138.
- ELLRAM, L. M., TATE, W. L. & BILLINGTON, C. 2004. Understanding and managing the services supply chain. *Journal of Supply Chain Management*, 40, 17-32.
- ERIKSSON, H., BERGBRANT, I. M., BERRUM, I. & MÖRCK, B. 2011. Reducing queues: demand and capacity variations. *International Journal of Health Care Quality Assurance*, 24, 592-600.
- ERIKSSON, N. 2013. Vad händer när läkare genomför verksamhetsutveckling och förbättringsarbete? In: ERIKSSON, N., HOLGERS, K.-M. & MÜLLERN, T. (eds.) *Att utveckla vården - Erfarenheter av kvalitet, verksamhetsutveckling och förbättringsarbete*. Lund: Studentlitteratur AB.
- FORRESTER, J. W. 1961. *Industrial Dynamics*, Massachusetts Institute of Technology Press.
- GLOUBERMAN, S. & MINTZBERG, H. 2001a. Managing the Care of Health and the Cure of Disease--Part I: Differentiation. *Health Care Management Review*, 26, 56-69.
- GLOUBERMAN, S. & MINTZBERG, H. 2001b. Managing the Care of Health and the Cure of Disease--Part II: Integration. *Health Care Management Review*, 26, 70-84.
- GROVE, A. L., MEREDITH, J. O., MACINTYRE, M., ANGELIS, J. & NEAILEY, K. 2010. UK health visiting: challenges faced during lean implementation. *Leadership in Health Services*, 23, 204-218.
- GUNASEKARAN, A., PATEL, C. & MCGAUGHEY, R. E. 2004. A framework for supply chain performance measurement. *International Journal of Production Economics*, 87, 333-347.
- GUVEN-USLU, P., CHAN, H. K., IJAZ, S., BAK, O., WHITLOW, B. & KUMAR, V. 2014. In-depth study of 'decoupling point' as a reference model: an application for health service supply chain. *Production Planning & Control*, 25, 1107-1117.
- HAM, C., YORK, N., SUTCH, S. & SHAW, R. 2003. Hospital bed utilisation in the NHS, Kaiser Permanente, and the US Medicare programme: analysis of routine data. *Bmj*, 327, 1257.
- HAYES, R. H. & WHEELWRIGHT, S. C. 1979. Link manufacturing process and product life cycles. *Harvard business review*, 57, 133-140.
- HELLSTRÖM, A., ELG, M. & LINDMARK, J. 2011. Process orientation in healthcare services: tracking the patient's journey through the healthcare system. Sweden, Europe.

- HOPP, W. J. & LOVEJOY, W. S. 2012. *Hospital Operations: Principles of High Efficiency Health Care*, Pearson Education.
- KATZ, D. & KAHN, R. L. 1966. Allmänna egenskaper hos öppna system. In: EMERY, F. E. (ed.) *Systemteori för ekonomer och samhällsvetare*. Falköping: Gummessons Boktryckeri.
- KER, J.-I., WANG, Y. & HAJLI, N. 2018. Examining the impact of health information systems on healthcare service improvement: The case of reducing in patient-flow delays in a U.S. hospital. *Technological Forecasting and Social Change*, 127, 188-198.
- KUJALA, J., LILLRANK, P., KRONSTRÖM, V. & PELTOKORPI, A. 2006. Time-based management of patient processes. *Journal of Health Organization and Management*, 20, 512-524.
- LAMBERT, D., GARCIA-DASTUGUE, S. & CROXTON, K. 2005. *An Evaluation of Process-Oriented Supply Chain Management Frameworks*.
- LAMBERT, D. M. & COOPER, M. C. 2000. Issues in Supply Chain Management. *Industrial Marketing Management*, 29, 65-83.
- LAWRENCE, P. R. & LORSCH, J. W. 1967. Differentiation and Integration in Complex Organizations. *Administrative Science Quarterly*, 12, 1-47.
- LILLRANK, P. 2012. Integration and coordination in healthcare: an operations management view. *Journal of Integrated Care*, 20, 6-12.
- LILLRANK, P., CHAUDHURI, A. & TORKKI, P. 2015. *Economies of scale in cardiac surgery*.
- LILLRANK, P., GROOP, J. & VENESMAA, J. 2011. Processes, episodes and events in health service supply chains. *Supply Chain Management: An International Journal*, 16, 194-201.
- LILLRANK, P., GROOP, P. J. & MALMSTRÖM, T. J. 2010. Demand and Supply-Based Operating Modes—A Framework for Analyzing Health Care Service Production. *Milbank Quarterly*, 88, 595-615.
- LIU. 2016. *Statsministern besökte Universitetssjukhuset i Linköping* [Online]. <http://liu.se/medfak/nyheter/nyhetssidan?l=sv&newsitem=681338>. [Accessed April 28 th 2016].
- MATTSSON, S. A. & JONSSON, P. 2003. *Produktionslogistik*, Lund, Studentlitteratur.
- MEIJBOOM, B., SCHMIDT-BAKX, S. & WESTERT, G. 2011. Supply chain management practices for improving patient-oriented care. *Supply Chain Management: An International Journal*, 16, 166-175.
- MENTZER, J. T., DEWITT, W., KEEBLER, J. S., SOONHOONG, M., NIX, N. W., SMITH, C. D. & ZACHARIA, Z. G. 2001. Defining Supply Chain Management. *Journal of Business Logistics*, 22, 1-25.
- MENTZER, J. T., MIN, S. & BOBBITT, M. L. 2004. Towards a unified theory of logistics. *International Journal of Physical Distribution & Logistics Management*, 34, 21.
- MENTZER, J. T., MYERS, M. B. & STANK, T. P. 2006. *Handbook of Global Supply Chain Management*, SAGE Publications.
- MILES, M. B., HUBERMAN, A. M. & SALDAÑA, J. 2014. *Qualitative Data Analysis: A Methods Sourcebook*, Thousand Oaks, California, SAGE Publications.

- NOON, C. E., HANKINS, C. T. & CÔTÉ, M. J. 2003. Understanding the impact of variation in the delivery of healthcare services. *Journal Of Healthcare Management / American College Of Healthcare Executives*, 48, 82-97.
- OECD 2017. *Health at a Glance 2017*.
- OLSSON, O. & ARONSSON, H. 2015. Managing a variable acute patient flow – categorising the strategies. *Supply Chain Management: An International Journal*, 20, 113-127.
- OLSSON, O., WIGER, M. & ARONSSON, H. 2014. Developments in the field of healthcare logistics and SCM : A patient flow focus. *NOFOMA - 26th Conference of the Nordic Logistics Research Network*. Copenhagen Business School, Denmark
- PARNABY, J. & TOWILL, D. 2009. Engineering cellular organisation and operation for effective healthcare delivery supply chains. *International Journal of Logistics Management*, 20, 5-29.
- PATTON, M. Q. 2015. *Qualitative Research & Evaluation Methods*, Thousand Oaks, Sage.
- PELTOKORPI, A. & KUJALA, J. 2006. Time-based analysis of total cost of patient episodes: A case study of hip replacement. *International Journal of Health Care Quality Assurance*, 19, 136-145.
- RAHIMNIA, F. & MOGHADASIAN, M. 2010. Supply chain leagility in professional services: how to apply decoupling point concept in healthcare delivery system. *Supply Chain Management: An International Journal*, 15, 80-91.
- REGION ÖSTERGÖTLAND. 2016a. *Kvinnokliniken i Linköping* [Online]. Available: <https://www.regionostergotland.se/Om-regionen/Verksamheter/Barn--och-Kvinnocentrum/Kvinnokliniken-i-Linkoping/> [Accessed May 13th 2016].
- REGION ÖSTERGÖTLAND. 2016b. *Universitetssjukhuset i Linköping* [Online]. <http://www.regionostergotland.se/Halsa-och-varld/Vara-sjukhus/Universitetssjukhuset-i-Linkoping/>. [Accessed March 3th 2016].
- ROMANO, P. 2003. Co-ordination and integration mechanisms to manage logistics processes across supply networks. *Journal of Purchasing and Supply Management*, 9, 119-134.
- RUBIN, H. J. & RUBIN, I. S. 1995. *Qualitative interviewing: The art of hearing data*, Thousand Oaks, CA: Sage.
- SAMPSON, S. E., SCHMIDT, G., GARDNER, J. W. & VAN ORDEN, J. 2015. Process Coordination Within a Health Care Service Supply Network. *Journal of Business Logistics*, 36, 355-373.
- SILVESTER, K., LENDON, R., BEVAN, H., STEYN, R. & WALLEY, P. 2004. Reducing waiting times in the NHS: is lack of capacity the problem? *Clinician in Management*, 12, 105-109.
- SIMONS, H. 2014. Case study research: In-depth understanding in context. In: LEAVY, P. (ed.) *The Oxford handbook of qualitative research*. New York, NY, US: Oxford University Press.
- SOU 2016:2 2016. Effektiv vård. In: STATENS OFFENTLIGA UTREDNINGAR (ed.). Stockholm Elanders Sverige AB.
- STABELL, C. B. & FJELDSTAD, Ø. D. 1998. Configuring value for competitive advantage: on chains, shops, and networks. *Strategic Management Journal*, 19, 413-437.

- STOCK, J. R. & LAMBERT, D. M. 2001. *Strategic logistics management*, New York, McGraw-Hill Companies
- SVARTS, A. 2017. Healthcare managers' perception of economies of scale. *Journal of Health Organization and Management*, 31, 317-330.
- THE HEALTH FOUNDATION 2013a. Improving patient flow across organisations and pathways. *Evidence scan*. London
- THE HEALTH FOUNDATION 2013b. Improving patient flow. *Learning report*. London.
- THE HEALTH FOUNDATION. 2014. *Flow Cost Quality homepage* [Online]. London: The Health Foundation. Available: <http://www.health.org.uk/areas-of-work/programmes/flow-cost-quality/> [Accessed September 18th 2014].
- THOMPSON, J. L. 2001. *Strategic Management*, London, Thomson Learning.
- WALLEY, P. 2007. Managing variation through system redesign. *International Journal of Healthcare Technology & Management*, 8, 589-602.
- WALLEY, P. 2013. Does the public sector need a more demand-driven approach to capacity management? *Production Planning & Control*, 24, 877-890.
- WALLEY, P., SILVESTER, K. & MOUNTFORD, S. 2006a. Health-care process improvement decisions: a systems perspective. *International Journal of Health Care Quality Assurance*, 19, 93-104.
- WALLEY, P., SILVESTER, K. & STEYN, R. 2006b. Managing variation in demand: lessons from the UK National Health Service. *Journal of healthcare management/American College of Healthcare Executives*, 51, 309.
- VAN GIGCH, J. P. 1991. *System design modeling and metamodeling*, Springer.
- WIGER, M. 2013. *Logistics Management in a Healthcare Context : Methodological development for describing and evaluating a healthcare organisation as a logistics system* Licentiatavhandling, Linköpings Universitet.
- WIGER, M. & ARONSSON, H. Healthcare logistics - a patient flow focus, what has been done? NoFoMa Conference 2012, 24th NOFOMA Conference, 7-8 June, 2012 Turku, Finland. 827-842.
- VILLA, S., PRENESTINI, A. & GIUSEPI, I. 2014. A framework to analyze hospital-wide patient flow logistics: Evidence from an Italian comparative study. *Health Policy*, 9.
- VISSERS, J. & BEECH, R. 2005. *Health operations management: patient flow logistics in health care*, London; New York, Routledge.
- VON BERTALANFFY, L. 1968. *General system theory: Foundations, development, applications*, George Braziller New York.
- VORST, J. G. A. J. V. D. & BEULENS, A. J. M. 2002. Identifying sources of uncertainty to generate supply chain redesign strategies. *International Journal of Physical Distribution & Logistics Management*, 32, 409-430.
- VRIES, J. D. & HUIJSMAN, R. 2011. Supply chain management in health services: an overview. *Supply Chain Management: An International Journal*, 16, 159-165.
- XU, L. & BEAMON, B. M. 2006. Supply Chain Coordination and Cooperation Mechanisms: An Attribute-Based Approach. *Journal of Supply Chain Management*, 42, 4-12.
- YIN, R. 2014. *Case study research: Design and methods*, Thousand Oaks, California, USA, Sage publications, INC.

APPENDIX I

THE LICENTIATE THESIS

Linköping Studies in Science and
Technology, Thesis No. 1602
LiU-TEK-LIC 2013:36

LOGISTICS MANAGEMENT IN A HEALTHCARE CONTEXT

Methodological development for describing and evaluating
a healthcare organisation as a logistics system

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2013

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ABSTRACT

This thesis tests whether logistics knowledge, theories and principles can be used to provide potential patient flow efficiency improvements. By emphasizing an ideal logistics system by means of its main features and then using these to evaluate two different healthcare organisations, it is assumed that knowledge regarding patient flows can be obtained and potentials for improvement highlighted. Hence, this licentiate thesis presents a *developed method intended for evaluating a healthcare organisation by means of a logistics system's main features*. The purpose rests on the assumption that effective management and real flow-efficient improvements can only be accomplished by viewing logistics as an integrated system.

Demographics, increased costs, strong technical and medical developments, new kinds of customer requirements, stressed staff and preventable adverse events are some of the challenges the Swedish healthcare system is currently facing. In addition, there is a constant demand on healthcare to be more cost-effective while fulfilling demands as regards waiting times, quality and availability. Experience from structural changes in other industries gives reason to be positive about the potential for long-term productivity leaps in the healthcare sector. The challenge is to simultaneously find successful application of efficient production and flexible adaptation to changing patients' demands and requirements. Taking advantage of the logistics expertise that already exists can be a way to meet these challenges. It can be assumed that logistics knowledge applied in healthcare can lead to lower costs, shorter waiting lists, better patient service, shorter treatment times and increased capacity. Nevertheless, flow-oriented design of healthcare delivery systems is novel and positions much currently isolated research on a conceptual level or within single wards (Wiger and Aronsson, 2012).

The research is part of a three-year project, "Lean and agile – logistics driven improvement in health and social care", funded by Vinnvård, a collaboration between the Department of Management and Engineering at Linköping University, Hässleholm Healthcare Organisation and the Medical Management Center at Karolinska Institutet in Stockholm. This thesis is partly a theoretical development of logistics models. This is done in order to create an ideal logistics system's main features and description aspects to describe a system to be able to evaluate it using these features. The two cases are used to test the adequacy of the developed method and its associated models and to identify potential for improvement towards a more flow-oriented business. Four series of interview sessions were conducted with a total of 23 respondents and 18 interviews and over 500 Excel files were collected from the business system.

It is suggested that a healthcare organisation can be evaluated by the developed logistics main features. These features, listed below, together provide a possibility to complement a healthcare organisation's ability to meet patient requirements by flow-efficiency and demonstrate logistical operational excellence.

1. A logistics system's purpose is to meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance
2. A logistics system has a flow-oriented structure
3. A logistics system transforms orders into customer services in a flow-oriented process
4. A logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources
5. A logistics system measures to capture the whole system's logistics performance, including total logistics costs, lead times and customer service
6. A logistics system has a strategy to meet demand
7. A logistics system uses logistics measurements as feedback to regulate its behaviour to reduce differences between actual and desired performance

The analysis of the two cases confirms the picture of an organisational design driven by medical specialties. This implies a possibility to change perspective to a more holistic view with the patient flow in focus. The fact that there are very few possibilities to control the transformation has partly to do with ownership of patient flows being less well-defined than clearly defined medical responsibilities within each specialty. It also has to do with the inability to distinguish between the uncertainty regarding unique patients on a low level of aggregation and at the higher level where there should be complete and explicit specifications of the end-product requirements and delivery requirements. The lack of demand strategies that support the total logistics performance ultimately leads to both clinics having to use a sacrificing work effort rather than working systematically to be able to meet the demand. At the case hospital, there is a lack of information aggregated from operational level about patient processes that is made available for strategic decision-making. Neither of the two cases measure on the basis of improving patient flow efficiency, especially not the total patient flow costs or the total logistics costs.

The major contribution is the analysis based on the logistics system's main features, which gives a more purposive understanding of what can be done to improve flow efficiency within a healthcare organisation to make healthcare organisations progress in their ability to be more flow-oriented. A further contribution is a more clearly defined field of healthcare logistics research and the stressed importance of the "new" research field of logistics management.

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Då är ”boken” färdigskriven och tryckt. Den blev ju riktigt fin. Men vissa dagar har den snarare kallats för den där dumma boken. Prestationens sötma är just söt för att det alltid hör till en ansträngning. Här har den till största del bestått av att tvingats till begränsning och fokusering. Att inse att min bok inte kommer att förändra världen, den är bara en liten, liten pusselbit. Tillika inse att varje mening betyder nått och att de alla dessutom ska sträva åt samma håll. Det finns ju så mycket att upptäcka och ju mer jag upptäckt desto mer har jag velat gräva och finna nytt. Graviditeten fick mig att sätt spiken i kistan. Bättre kniv mot strupen finns nog inte. Jag älskar dig lilla Jack, tack för att du kom!

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Linköping, maj 2013-05-08

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APPENDICES

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1 INTRODUCTION

This is a methodological thesis that practically interprets general logistics theories and the systems approach applied to the healthcare context. It is described, modelled, and exemplified how a hospital can be viewed as a logistics system. The thesis is the first step in making a proper logistics analysis of healthcare systems; it is a description of what a healthcare provider looks like when viewed with a pair of logistical glasses. Consequently, the intention is not to propose definitive solutions to problems as much as to promote a new mindset whereby they can more easily be solved.

“The scientific mind does not so much provide the right answers as ask the right questions.”

(Claude Levi-Strauss)

This chapter begins with a background that highlights and addresses the challenges currently facing Swedish healthcare and the starting point for the research. The background then leads into the purpose and the research questions followed by the main contents of this licentiate thesis. The relevance of the research and the need of logistics research and knowledge within the healthcare sector are also further motivated in chapter two.

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1.1 BACKGROUND

In almost every developed country the healthcare is facing several challenges. This has partly to do with an aging population leading to increased need for interventions, both treating and caring efforts as well as prevention (Socialstyrelsen, 2009). The number of 75 year olds and older in Sweden will increase by approximately 100% between 2010 and 2050 according to Statistics Sweden (Socialdepartementet, 2010). Furthermore, medical progress with expanded, advanced treatment options and new pharmaceuticals also increases the need for interventions. The costs of the Swedish healthcare are therefore expected to increase by about 80 percent by 2050 due to new treatment options, a higher level of ambition and number of patients (Socialdepartementet, 2010). Another challenge is the number of preventable adverse events. 3,000 people die every year because of deficiencies in Swedish healthcare (Vårdförbundet, 2011). Information and communication technology also provides patients, relatives and citizens access to medical knowledge and information regarding care units' performance and quality (Hallin and Siverbo, 2003). This strengthens the patients' position and increases their ability to act as active and aware customers. In addition, forecasts indicate that the demands and requirements on the healthcare sector will grow faster than the financing possibilities (NUTEK, 2007). This means higher demands as regards efficiency and effectiveness on healthcare organizations to develop their own organization in order to meet society's increasing demands.

Industrial development has resulted in productivity gains and economies of scale, but the same degree of efficiency and innovation has not been presented within the healthcare sector (NUTEK, 2007). A symptom of not properly functioning healthcare organizations is the limited time that physicians and nurses spend with their patients (Svenskt-Näringsliv, 2005). This is partly because of the lack of running organizational structure for how the patient's path through the chain of care should be controlled. Instead, too much time is spent on re-organizations, politically motivated or driven by short-run savings requirements. Another general call to handle these challenges, such as long waiting times, increased patient demands, and deficient accessibility, has been to increase the overall design capacity. Many studies, however, have shown that there is no correlation between organizational capacity and patient waiting time or between waiting time and level of patient demand (Silvester et al., 2004). The main reason is instead that resources are used inappropriately and that they are not adapted to variations that arise (Walley et al., 2006). The challenges the healthcare organisations are facing should rather, as a first step, be handled through understanding of its processes and systems, to be able to improve it and thereby make it better for patients, staff and funders (Arvidsson, 2007). However, increased resources can perhaps handle some of the disadvantages reported almost daily in the news but resources cannot increase in line with needs. Consequently, an increased need for medical care must be met with efficiency improvements in addition to medical development. The flow of patients through the care process and the associated flows of information, resources and materials, must then be improved so that more patients can be treated in less time while quality needs to be raised

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and secured (Parnaby and Towill, 2009, Aronsson et al., 2011, Meijboom et al., 2011, de Vries and Huijsman, 2011).

Although the traditional logistics research field is that of manufacturing and distribution companies, the healthcare can benefit from the lessons learned in the industrial sector (de Vries and Huijsman, 2011). As a research area, logistics and supply chain management in a healthcare context has attracted increased attention in recent years (Lillrank et al., 2011, Meijboom et al., 2011, Aronsson et al., 2011, de Vries and Huijsman, 2011, Parnaby and Towill, 2009). It is suggested that systematic logistical thinking can help to improve the well-known problems in healthcare such as access, quality, efficiency and effectiveness. This includes knowledge regarding process and flow orientation, flexibility, efficiency and enhanced customer service. Related objectives are to decrease lead times and costs and to increase customer service and throughput and the organisation's revenues and profits. However, flow-oriented design of healthcare delivery systems is novel and positions much currently isolated research on a conceptual level or within single wards (Wiger and Aronsson, 2012).

The "hard core" within the logistics discipline, what logistics knowledge is all about, can be formulated as follows:

"Directed towards the flow of materials, information and services; along the vertical and horizontal value chain (or supply chain) that seeks to coordinate the flow and is based on; system thinking (a holistic view), where; the unit of analysis essentially is the flow. "
(Arlbjørn and Halldorsson, 2002)

Hence, the "flow thinking" is a central element in the "hard core" of logistics and it is the substance and the context that determines what is meant by "flow" (Arlbjørn and Halldorsson, 2002). Furthermore, logistics is a system in itself, and the system approach is also a critical concept within logistics (Stock & Lambert, 2001). The systems approach includes creation of conditions to intertwine functions and processes towards effective systems and it embrace more than the meaning of process orientation. As early as the mid-1970s Gregson (1976) stated that logistics within a company could be represented as a system because it portrays a total pattern of phenomena whose components are interrelated. A logistics system as a model is simply a representation, in such a way that the relationship between inputs and outputs may be clearly seen (Christopher, 1971). Viewing an organisation or a supply chain as a logistics system is in this thesis the basis for controlling and managing to improve e.g. for redesigning flows, increasing efficiency, decreasing lead-times, improving accessibility and so on. There are many logistics tools to benefit from once the logistics system is known, such as parallel activities, postponement, backwards planning, activities that can be removed, investments in bottlenecks, process analysis, lead time analysis, etc. The underlying question is then how to view a healthcare organization to take advantage of logistics theories, concepts, rules, mindsets, principles, tools, models and solutions with the aim of understanding and improving flows' effectiveness and efficiency. Therefore, the logistics approach has to be more specific than viewing an organisation as a system to be able to apply a logistics approach to healthcare management and benefit from

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the discipline's development, The main features of a logistics system and how to describe it are thus critical, which is surprisingly scarcely mentioned in the literature. It is in this specific approach that the possibility to transform an already developed discipline into to a new context lies.

To summarize, demographics, increased costs, strong technical and medical developments, new kinds of customer requirements, stressed staff and preventable adverse events are some of the challenges the Swedish healthcare is currently facing. In addition, there is a constant demand on the healthcare to be more cost-effective while fulfilling demands as regards waiting times, quality and availability. Compared to other countries, however, Swedish healthcare is very cost-effective but there is nonetheless a significant potential for improvement (NUTEK, 2007). Experience from structural changes in other industries gives reason to be positive about the potential for long-term productivity leaps in the healthcare sector. The challenge is to simultaneously find successful application of efficient production and flexible adaptation to changing patients' demands and requirements. Taking advantage of the logistics expertise that already exists can be a way to meet these challenges. It can be assumed that logistics knowledge applied in healthcare can lead to lower costs, shorter waiting lists, better patient service, shorter treatment times and increased capacity. This licentiate thesis thus presents a methodological development to describe healthcare organization(s) by means of a logistics system's description aspects and evaluate it by means of a logistics system's main feature.

1.2 PURPOSE AND RESEARCH QUESTIONS

Based on the previous discussion, the purpose of this thesis is:

To develop a method intended for evaluating a healthcare organisation by means of a logistics system's main features

The purpose rests on the assumption that effective management and real flow-efficient improvements can only be accomplished by viewing logistics as an integrated system. By emphasizing an ideal logistics system by its main features and then evaluating healthcare organisations by means of these, it is assumed that knowledge regarding patient flows can be obtained and potentials for improvements highlighted. For this reason, the following research question appears to be unavoidable:

RQ 1: *What are the main features of a logistics system?*

This will be an elaboration from systems approach, organisational orientation of systems approach and core of logistics to the substance of a logistics system. The outcome of this research question is the analysis model which will be further used in the evaluation of a healthcare organisation.

The next research question is motivated by the following discussion. According to Van Gigch (1991), there are two ways to improve a system; *system improvement* ("the transformation or change that brings a system closer to standard or to normal operating

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condition”) and *system design* (“it demands a completely new outlook and approach in order to produce innovative solutions with the immense capability of bringing a cure for present-day ills”). The system design can be compared to the Quantum-leap Improvements presented in Abrahamsson and Aronsson (1999). Both systems improvement and systems design require a model of the real world in order to provide solutions and to be able to evaluate them (Van Gigch, 1991). As an conceptual model there can be different real world implementations of it in which the importance of each of these components, with respect to the others, can differ, this is called the power of abstraction (Caddy and Helou, 2007). A model for describing logistics systems will thus probably lead to different kinds of real-world examples of logistics systems in different businesses and contexts. The question of how to describe a logistics system is indeed critical. The second research question thus provides greater understanding of what aspects to consider when describing a general logistics system.

RQ 2: *What description aspects represent a logistics system?*

This will be an elaboration from both the substance of the main features of a logistics system (result from RQ1) and main features of an organisation towards description aspects for how to describe a logistics system. The outcome of this research question is the description model which will be further used to describe a healthcare organisation to be able to analyse it by means of a logistics system’s main features (RQ 1). The research questions, however, correspond to logistics in new contexts and are not associated with the specific context of healthcare.

However, according to Parnaby and Towill (2009), the healthcare delivery supply chain, i.e. to take care of patients in need, must rest on a systems approach. In this thesis, this is done from a logistics point of view, which means focusing on patient flows and the fact that individual elements and subsystems must fit together. The system must then be controlled to achieve the overall system purpose in the most effective way at the lowest overall cost, and with a minimum of complexity. As mentioned earlier, the first step towards benefiting from the logistics discipline’s development is to describe the studied object from a logistics point of view. The model of how to describe a logistics system (result from RQ2) is used to describe a healthcare organisation by means of a logistics system’s aspects. However, to be able to this, there has to be an understanding of the reality. Van Gigch (1991) expresses this very clearly: “Unless we understand the nature of reality, we cannot model successfully”. Therefore, the empirical world is in this thesis exemplified by two cases; two different types of clinic within a Swedish hospital. The cases will partly be used to test the adequateness of the developed method and its associated models, i.e. the outcome of RQ1 and RQ2, and hopefully, by the evaluation of the cases, also identify potential for improvement towards a more flow-oriented business. An outline of the research questions and the purpose is presented in Table 1.

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Table 1 Outline of the research questions and purpose in this thesis

	RQ1 <i>What are the main features of a logistics system?</i>	RQ2 <i>What description aspects represent a logistics system?</i>	Purpose <i>To develop a method intended for evaluating a healthcare organisation by means of a logistics system's main features</i>
Type of study	Theoretical	Theoretical	Case studies
Theoretical framework	The systems approach applied to the field of business, organisations and management. Core of logistics	System theory Basic principles of logistics Basic logistics literature	Logistics literature related to healthcare issues Healthcare literature related to logistics issues
Analysis	Developed from the definition of a system together with an organisational perspective, a synthesis is done by the core of logistics.	Based on the definition of a logistics system, basic principles of logistics are added along with basic logistics literature to create the model for describing a logistics system.	Based on the model for describing a logistics system and healthcare conditions the cases are described. Further, analyses based on the main features of a logistics system.
Partial conclusion	Main features of a logistics system Analysis model to evaluate a system's fulfilment of logistics' main features	A model for describing a logistics system, i.e. description model	Two example of how healthcare organisations can be evaluated by fulfilment rate of logistics system's main features.
Concluded in	Chapter 5	Chapter 5	Chapter 8

The research presented in this thesis obviously has two aspects; logistics research in a new context and an aim to contribute to a needing sector. The relevance and motivation of the research, from both a logistics research and a healthcare perspective, is further described and elaborated in chapter 2.

1.3 OUTLINE OF THE LICENTIATE THESIS

Chapter one - Introduction

The thesis begins with a background that highlights and addresses the challenges currently facing Swedish healthcare. This background then leads into the purpose and the research questions of this thesis. The outline is illustrated in Figure 1 below.

Chapter two – Logistics research in a new context

Since there is an extra need to motivate the relevance of the research in this thesis due to the new context of logistics studies. Likewise, there is an extra call to motivate the need of logistics research and knowledge within the healthcare sector. This chapter therefore motivates the study by presenting the relevance of the research, the need for logistics research in the healthcare context and a short overview of the history of logistics.

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Chapter three – Research approach

This chapter describes the methodology of this study. It includes sections such as research design, research method and data collection. The relevant research methods in this thesis are literature reviews and case study including interviews, business systems scanning and observations. For each of these methods, a detailed description is provided in order to inform the reader how these methods have been applied in this study.

Chapter four – Logistics systems

This chapter presents one part of the frame of references. The emphasis is on how systems are described and characterised, e.g. description aspects to describe systems and general system features. It begins with a brief presentation of literature concerning the systems approach in general, from an organisational point of view and the systems approach within logistics. The chapter ends in the base for further development of a logistics system's main features. This chapter also presents a short history over the development of the system approach.

Chapter five – Main features and description aspects of logistics systems

The fifth chapter presents the theoretical models used in this thesis and their development, i.e. the logistics system's main features and description aspects. It is an elaboration with selected main features of an organization viewed as a system and linked to the logistics literature focusing on areas central to “good” logistics management. The chapter ends with a summary of a logistics system's main features and how to describe a logistics system to be able to analyse it by means of the formulated main features, i.e. the analysis and the description model.

Chapter six – Description of the case hospital

In this chapter, two different healthcare organisations (both included in the case hospital) are described by means of the description aspects developed in previous chapter.

Chapter seven – Analysis- The case hospital as a logistics system

The seventh chapter presents an analysis based on the case description in the preceding chapter. The two different care organisations are evaluated by means of the main features of a logistics system and rated based on how well they can fulfil the main features.

Chapter eight – Conclusions and contribution

The final chapter presents the main conclusions from this study, the adequateness of the developed method and its associated models, i.e. the outcome of RQ1 and RQ2, and also the identified improvement potentials towards a more flow oriented business. The contributions and a discussion of the results are presented as well as suggestions for further research.

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Figure 1 Outline of the licentiate thesis

2 LOGISTICS RESEARCH IN A NEW CONTEXT

There is an extra need to motivate the relevance of the research in this thesis due to the new context of logistics studies. Likewise, there is an extra call to motivate the need for logistics research and knowledge within the healthcare sector. This chapter therefore presents the relevance of research from a logistics research perspective, the first part. In addition, the second part presents the need and opportunity for the healthcare sector to develop towards flow orientation via knowledge from the field of logistics.

2.1 THE RELEVANCE OF THE RESEARCH

Much research and development of knowledge, of how to provide effective ways to organize and manage businesses, has over the past decades been focused on successful companies in an industry and trade context. This is noted by Ellram et al. (2004) who stress that in academia there is a concentration on using examples, models, research and anecdotes obtained from the manufacturing sector. The operations, supply chain, and marketing literature have also been criticized for their manufacturing-centric focus (Ellram et al., 2004). In addition, Berry and Bendapudi (2007) encourage service operations, management, and marketing academics to become more involved by for example covering healthcare service issues in focused research programmes and education. Despite this criticism and encouragement, the logistics management research field has only recently turned its attention to the important change and improvement opportunities in healthcare organisations (Wiger and Aronsson, 2012). The following quote encourages more emphasis on service as context.

“Universities should also give attention to the service sector and service supply management in educating future practitioners and in conduction research. The area of service supply management affords great research opportunities”

(Ellram et al., 2007)

2.1.1 Healthcare is substantial and complex

Many countries spend a lot of their available capital on their national healthcare. In 2003 Swedish healthcare cost more than SEK 225 billion. This is a significant proportion - 9.2% - of Sweden's total GDP (Sveriges Kommuner och Landsting, 2005). This is one of the reasons why the healthcare sector is relevant to study with a view to improving its efficiency. The healthcare sector is also a major industry in terms of number of employees. The fourth largest employer in the world is a healthcare organization, the NHS (National Health Service) in the United Kingdom (NHS, 2011). Only the Chinese People's Liberation Army, the Wal-Mart supermarket chain and the Indian Railways directly employ more people. A third reason of interest is complexity. Clinical methods used in healthcare and disease cure can be “easily” understood but when they are combined into institutions and broadened into social systems, their management becomes surprisingly convoluted (Glouberman and Mintzberg, 2001).

2.1.2 The main flow of patients

The concept of logistics management is flow-oriented (Christopher, 2005). Despite the fact that the flow of goods is the traditional unit of analysis this is not the situation in a healthcare context (Aronsson et al., 2011, Lillrank et al., 2011). This because the ‘core service’ that provides benefits to the customer is instead treatment, cure, or care (Baltacioglu et al., 2007). The quote below stresses a patient-focus by the flow of patients.

“The core process of healthcare organisations is concerned with the flow of patients who need treatment, while the flows of material are secondary”

(Vissers and Beech, 2005)

Consequently, the patient flow is central to an organization's capacity to provide service; other operations are supportive of creating conditions for an efficient patient flow.

“Focus on patient flow is to make healthcare delivery both effective and efficient.”

(Parnaby and Towill, 2008).

The Council of Supply Chain Management Professionals (CSCMP) is a worldwide professional association, with over 8,500 members from 67 countries, with the mission to develop and disseminate research and knowledge of supply chain management (CSCMP, 2011). One of the most academically cited and established definition of logistics management is the one from this association:

“Logistics management is an integrating function, which coordinates and optimizes all logistics activities, as well as integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology.”

(CSCMP, 2011)

One of few definitions of healthcare logistics is Arvidsson's (2007) attempt to translate the logistics management definition above:

“Healthcare Logistics includes effectively planning, fulfilling and controlling all activities of the patient path through the healthcare, from request to completion of the care commitment to satisfy the patient's care needs and preferences. It also includes the flow of information that is needed for the patient's care chain to work.”

Independent translated from Arvidsson (2007)

2.1.3 Healthcare, a special kind of service

Service supply chain management has become a concept in recent years and elaborated conceptually in a service context (Ellram et al., 2004), conceptually in a healthcare context (Baltacioglu et al., 2007), and as a survey in the municipal sector (Arlbjørn et al., 2011). A hospital, health centre or geriatric care is a special kind of service organization, a resource-oriented service organization (Visser and Beech, 2005). Healthcare production characteristics are closer to production of services than manufacturing industry production operations. For instance, health professionals always make a judgment as a basis for decisions on further treatment. Manufacturing or service industries strive to meet their customers' demands without asking if it is necessary to have the product or service. Berry and Bendapudi (2007) call these reluctant services, customers need but may not want. There are some others notable dissimilarities between healthcare and other services. The customers, i.e. the patients, are sick, they are relinquish privacy, they need “whole person” service and they are at risk (Berry and Bendapudi, 2007).

In general, there are three characteristics of services: (1) services are more likely to consist of linked activities (intangible) than goods (tangible); (2) services are produced and consumed at least partly at the same time; (3) the customer participates at least partly in the service production process (Grönroos, 2007). This is evolved further by Grönroos and Ravald (2011) who argue for a split customer's process of value creation; one part open and the

other closed, see Figure 2. The open part is where the interaction takes place and the supplier can access the customer process of value creation. A joint value creation with the customer is then possible. The opposite is true in the closed part; the supplier is not co-creator of value or present as a subject. The supplier's process is also divided into two parts; a production phase aiming at facilitating value creation and an interaction phase.

Figure 2 Value creation and co-creation in a supplier-customer relationship (Grönroos and Ravald, 2011)

Pure services are also labour intensive, difficult to resell, difficult to automate, not able to be stored and transported due to simultaneous production and consumption, are often perishable (unused capacity is capacity lost forever), and have a quality dimension that is difficult to evaluate (Arlbjörn and Halldorsson, 2002). Vissers and Beech (2005) listed the major differences between a healthcare (e.g. a hospital) and a manufacturing environment. As mentioned earlier, the core process of healthcare organizations is concerned with the flow of patients instead of material, which is secondary. There is also much less price-performance interaction than in most production environments. Product specifications are often subjective and vague compared to manufacturing's production control approaches that presuppose complete and explicit specifications of end-product requirements and delivery requirements. Furthermore, healthcare organizations do not have a simple line of command; instead there are many different interest groups (management, medical specialists, nursing staff, and paramedics) that each have ideas about what should be targets for production performance. The educational status in healthcare is generally very high and many key operators in the core process are highly trained medical professionals. Due to the service orientation, care is not a commodity that can be stocked. Table 2 summarizes the similarities and differences between manufacturing and healthcare organizations.

Table 2 Similarities and differences between manufacturing and healthcare characteristics
(Visser and Beech, 2005)

Characteristics	Manufacturing	Healthcare
Object	Material flow	Patient flow
Specification of end-product requirements	Up-front specified	Subjective and fuzzy
Means of production	Equipment and staff	Equipment and staff
Buffers	Stock or lead-times	Waiting times and lead-times
Financial goal	Profit	Cost control
Market environment	Market competition	Limited market competition

2.1.4 The potential of logistics management in a healthcare context

Aronsson et al. (2011) show that supply chain management has potential to work well as a philosophy for a patient flow focus. Likewise, Towill and Christopher (2005) argue for the “power of analogy”. They show that material flow concepts developed and used successfully for commercial products and services can equally well form the architectural infrastructure of effective healthcare delivery systems with a patient flow focus. It is a matter of planning and organizing resources so that bottlenecks and their associated queues can be minimized and resources given higher priority to be used in the active patient time (Silvester et al., 2004). Towill and Christopher (2005) (originally in Towill and Christopher, 2003) believe that:

“... there is evidence indicating a number of opportunities where new thinking in commercial and industrial logistics and supply chain management are being transformed into healthcare deliver to good effect”

The field of healthcare logistics is still in its infancy and few articles have so far been published in traditional logistics journals (Wiger and Aronsson, 2012). On the other hand, *Supply Chain Management: An International Journal* recently published a special issue on supply chain management in health services (Issue 3, 2011). The editor also concluded that the health sector can benefit from the lessons learned in the industrial sector (de Vries and Huijsman, 2011).

As mentioned earlier, healthcare has several differences compared to industrial activities; it is a special kind of service. This means that it is not possible to just copy the industrial knowledge; it must be adapted and developed into a unique knowledge that is specific to the health sector. Ellram et al. (2004) exemplify this by defining Service SCM suited to service organisations in a way that differentiates it from traditional SCM because of the inherent differences in services. A contextual adaptation along with a systems approach are thus critical to get the full effect out of these industrial improvement opportunities that face the healthcare sector today (Aronsson et al., 2011).

2.1.5 Swedish healthcare

This thesis’s case hospital is part of the Swedish public sector. Compared to other countries, the whole Swedish healthcare system is highly decentralized (Sveriges Kommuner och

Landsting, 2005). The main part is managed and financed in their respective areas by 20 county councils and 290 municipalities. The main responsibility for health policy on a national level lies with the Swedish Government and Parliament. The Swedish Health Service Act (1982:763) states that the main goal of healthcare is good health and care on equal terms for the entire population. Care shall also be provided with respect for all human beings and human dignity. Those who are most in need of health care should be given priority access to care (Sveriges_Riksdag, 1982). All counties can contract private providers, who deliver approximately 10% of all healthcare in Sweden (Sveriges Kommuner och Landsting, 2005). Privately funded healthcare, however, is marginal; only a few per mille of the total cost of healthcare.

2.2 A NEW APPROACH TO HEALTHCARE – THE NEED FOR LOGISTICS RESEARCH

As in the previous section, there is an extra call to motivate the need for logistics research and knowledge in healthcare. The following sections are therefore dedicated to this issue.

Healthcare systems are one of the most complex systems known to contemporary society. In particular, hospitals are considered to be particularly complicated organizations (Glouberman and Mintzberg, 2001). No country seems to be satisfied with the current state of its healthcare system. Many countries try to deal with their problems through repeated reforms. “A major trouble with many hospital systems is that they often lack reliable design mechanisms for the vital step of integrating the individual elements into a coherent and effective organizational whole” (Parnaby and Towill, 2009). Alongside the healthcare sector’s evolutions towards more process oriented business models, interest in healthcare logistics management has increased. This can be illustrated by the increase literature on using industrial processes or applied business concepts in the healthcare delivery systems (Wiger and Aronsson, 2012). This is probably an indication that some researchers have discovered the potential of using already developed knowledge in a new context. Further, a flow-oriented organisation is based on knowledge of what drives costs and time in the overall supply chain (Abrahamsson and Karlöf, 2011). This of course impacts on the possibility to reduce the total costs of the organisation while improving customer service.

Increasing revenue (by selling more or increase margins) or reducing costs are the two most obvious options for a company to increase its profits. Effectiveness, efficiency and competitive advantages are key words in the logistics management field. Companies either have a cost advantage, a value advantage or both. Competition between companies and businesses pushes organisations to create competitive advantages. These firms’ development has contributed to create theories, models and mindsets. This thesis takes the standpoint that this knowledge can be used to develop of non-profit organizations even if they often have other incentives than profit-making organizations. In most cases in Sweden, a healthcare organization cannot increase its revenue but it can reduce its costs.

2.2.1 Managing complex systems

Coordinating activities in a healthcare organisation can be difficult. The difficulties can partly be traced to the complexity caused by the large number of related and interdependent activities in the organisation. Complexity also increases if the effects of certain actions are separated from their cause in time and space. “By all accounts, complexity is the result of the multiplicity and intricacy of man’s interaction with the systems” (Van Gigch, 1991). Within healthcare organisations responsibilities are often functionally divided or a fact when patients are moved between different healthcare settings. This increases the complexity. Understanding the interdependencies and the complex causal relationships within a healthcare organisation is crucial to successful management of the organisation. A common mental model for a new approach can only be formed after the members have been given sufficient knowledge and understanding of the underlying ideas along with a possibility for dialogue on the topic (Senge, 2006). Like a business organisation, a healthcare organisation is a system of interrelated parts working in conjunction with each other in order to accomplish a number of goals. This is one of the main statements in systems theory; that no single function can act independently of another in a system. Systems theory has its origins in the political science/sociology discipline and is used as logistics applications in for example cost trade-offs, logistics engineering and supply chain management (Stock, 1997). It was during the 1970s that the systems approach had its breakthrough, but a great deal of research using a systems orientation certainly took place as early as the 1960s and even before that (Arbnor and Bjerke, 1997). It was also during this time that this approach within the logistics field was highlighted (see for example Gregson (1976), Christopher (1971), Geisler and Steger (1963)). Nowadays this view is more or less built-in or implied in the logistics research. Stock & Lambert (2001) emphasize this by stating that the system approach is a critical concept within logistics management. Logistics is also a system in itself (Stock and Lambert, 2001). The systems approach is clearly dominant in both qualitative and quantitative logistics studies, compared to the analytic and actors approaches. This is shown by Vafidis (2007) in his doctoral dissertation on Finnish and Swedish logistics doctoral dissertations published between 1994 and 2003.

2.2.2 Measuring flow efficiency

More attention to and time and money for performance management, measurement and evaluation are allocated to the public sector (McAdam et al., 2005). Many healthcare organisations have implemented performance measurement systems, for example Balanced Scorecard. The healthcare sector differs from manufacturing and distribution industries in that precision and safety are very high due to the fact that the healthcare sector handles human lives. The healthcare system is considered to be complex and challenging to measure (Dey et al., 2008, Dey et al., 2006). However, many things are measured and measurements are used in healthcare with an emphasis on medical outcomes and quality (see for example Dulugacz (2006), and SKL and Sosialstyrelsen (2011)). The focus is thus on the end results. But measurements should fully capture the logic of the underlying logistic system (Aronsson and Andersson, 2002). It is also essential to measure the right things at the right time in a supply chain to improve the business outcome related to the organisation’s stated objectives (Kaplan, 1990).

International and national organisations, like WHO, OECD and SALAR (Swedish Association of Local Authorities and Regions), are constantly working to measure health from a social perspective. The health-related result responds to long and short term effectible circumstances (Janlöv et al., 2009). Arah and Westert (2005) state that socioeconomic factors, like living and working conditions, and environmental factors are significant for a person's health status. Some of these performance measurements are typical quality indexes, for example avoidable mortality per 100,000 inhabitants or the proportion of diabetic patients with antihypertensive drug procedure. As described previously, the measurements used in the logistics field traditionally operate on a lower level than both the international and national level. From a logistics point of view, the socioeconomic factors can be seen more as context. To summarise, the focus in the healthcare sector is at a strategic level with quality indexes for the end results, but scarcely to facilitate or support the work methods to get there. The measurements provide a poor picture of patient flows due to the end result orientation. Measurements to control and monitor efforts to achieve the desired quality may be lacking. The business's specific quality measurements are not to be used as decision-making support or follow-ups or to control the business at a management level.

2.2.3 Power of analogy – a learning opportunity

Newer disciplines seem to be developed from the usage of concepts, definitions, theories, rules and principles from other disciplines (Stock, 1997). This is also the case in logistics research, which has its roots in theories borrowed from more established disciplines, e.g. accounting, computing, economics, management, marketing, mathematics, philosophy, political science, psychology and sociology (Stock, 1997). Another example is SCM, which also has approaches from different disciplines (Arlbjørn et al., 2011).

Towill and Christopher (2005) argue for the “power of analogy”, i.e. mapping the unfamiliar “messes” onto an established model. They show that material flow concepts developed and successfully used for commercial products and services can equally well form the architectural infrastructure of effective healthcare delivery systems. Moreover, if a problem can be tackled by a knowledge base built up from another discipline where it is possible to describe the problem scenario using a “model” familiar to the contemplated discipline, then a wide range of proven solutions become available. Examples of this can be found in the literature, but not published strictly in logistics or SCM journals. Rahimnia and Moghadasian (2010) explore a combination of the two strategies Lean and Agile; of how supply chain *leagility* can be applied in hospitals by applying the decoupling point concept in a healthcare delivery system. Another example is the theory of *swift and even flow* which is used to analyse the internal service supply chain of a preoperative surgical services department in Fredendall et al. (2009). Another example can be found in Chow-Chua and Goh's (2000) paper concerning quality improvement methods, viz. *business process re-engineering* (BPR) and *continuous improvement* (CI). They evaluate which of the two (or both) is better for process improvement in hospitals. As a further example, Parnaby and Towill (2009) study the implementation of cellular operations to provide seamless patient flows in a healthcare delivery process.

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“... scholars determine that there is no reason to reinvent the wheel and therefore, search out those things which can or might apply to their respective area of study”.

(Stock, 1997)

Scholars use the power of analogy and also businesses. (Ellram et al., 2004) highlight that different businesses can benefit from applying best practice from other businesses. The three benefits of applying “borrowed” theories to logistics, presented in Stock’s (1997) article, are also suitable when logistics theory is to be translated to a healthcare context:

1. “Learning from the experience of others;
2. advances in knowledge and understanding, which might not have occurred otherwise, or perhaps taken longer, could occur more quickly; and
3. the inclusion of theories from other disciplines further enhances the linkages between logistics and those disciplines.”

These benefits came primarily because scholars in logistics research have different perspectives than traditional medical management or organizations research in that context (due to varying backgrounds, orientation and or environmental impacts).

2.2.4 The whole system in focus

Several methods, models, principles, philosophies, etc. originating in the manufacturing industry are being introduced as improvement efforts in the healthcare sector, e.g. Balance Score Card, Breakthrough, Total Quality Management, Six Sigma and Lean (see for example Hellström et al. (2011)). Some of these are used as “quick fix” concepts focusing on orderliness and used as practical and operational toolboxes. The conceptualisation and focusing on a lower level of abstraction has contributed to their being taken out of their original context. As a consequence, the overall system performance has been overlooked. To be able to organize for quick response and flexibility in an efficient way where cooperative efforts by the supply chain members should synchronize and converge operational capabilities into a unified whole, a systems approach is necessary (Aronsson et al., 2011).

A system is a network of related functions or activities and has to be understood as a whole. The object is to operate the whole system effectively and not just the individual parts (Langley et al., 2008). This approach is generally absent in healthcare organizations, in particular the desire to improve at functional levels. Without considering the impact of decisions on the larger system, sub-optimization often occurs (Stock & Lambert, 2001). Increasing the efficiency of a unique patient flow or a production flow is one thing, but the question should rather be what it means for the system’s performance as a whole and how the entire system will be influenced when utilisation of resources such as physicians or operating theatres is optimised. The patient flow of a particular care group is rarely isolated; it is rather included in a network with other patient flows, and to prioritize one patient group over another group’s health needs is not always accepted. One example is the objective as regards hip and knee arthroplasty patients:

“osteoarthritis patients shall receive optimal treatment through the entire care chain by following the medical AM”

(independent translation, (Hässleholmssjukhusorganisation, 2007))

There is a constant risk of sub-optimization of functions, resources or specific flows when the studied system's boundaries are too narrow. The system must be viewed as a whole to understand the opportunities for improvement (Stock & Lambert, 2001). A key question is how to design an organization that can handle several unique patient flows in a structured and standardized manner since there are a number of different patient flows within healthcare organizations.

“System problems” require “system solutions”, which means that we must aim at solving the larger system problems with solutions that not only satisfy the subsystems' objectives but also provide for the global system's survival”

(Van Gigh, 1991)

The function of logistics in economy in organizations interface with marketing, total cost analysis, and logistics strategy is built on a systems approach, which is a key to understanding the role of logistics (Stock & Lambert, 2001). Hence, one way of designing cost-effective but also time-flexible healthcare systems is to apply an interdisciplinary systems approach, where the production processes and flow of patients are in focus (Aronsson et al., 2011).

2.3 A LOGISTICS OVERVIEW- LOGISTICS HISTORY AND DEVELOPMENT UP TO TODAY

This section presents a short overview of the logistics discipline's development and logistics history with focus on business and logistics management. There must be an awareness of the inevitable bias that enters into the construction of any historical record. However, the following quote justifies this recap:

“To understand the important role of logistics management in today's business enterprise, it is worthwhile to examine its historical development”

(Stock and Lambert, 2001)

The quote from Stock and Lambert (2001) highlights the importance of having an orientation of the logistics roots. The earliest form of organized trade which was a kind of logistics activity and is by that, literally, thousands of years old (Grant et al., 2006, Stock and Lambert, 2001). However, it is said that logistics owes its origins to the military, where the term *logistics* encompasses supply items (food, fuel, spare parts) as well as personnel (Langley et al., 2008). As an area of study, logistics first began to gain attention in the early 1900's (Grant et al., 2006, Stock and Lambert, 2001). It was in the distribution of farm products, as a way to support the organization's business strategy and as a way of providing time and place utility.

During the Second World War logistics began to receive increased recognition and emphasis (Grant et al., 2006) and also further developed and refined (Stock and Lambert, 2001).

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However, the first dedicated logistics texts began to appear in the early 1960s (Grant et al., 2006). In 1963, the National Council of Physical Distribution Management was formed (renamed the Council of Logistics Management in 1985 and in 2004 the Council of Supply Chain Management Professionals) “to develop the theory and understanding of the [logistics] process, promote the art and science of managing [logistics] systems and to foster professional dialogue and development in the field operating exclusively without profit and in cooperation with other organizations and institutions (Stock and Lambert, 2001).

The potential of the systems concept was indicated by a number of studies, especially within physical distribution, during the 1950s and 1960s (Langley et al., 2008). One example is a 1956 study of the economics of air freight that added this new dimension to the field of logistics: the concept of total cost analysis (Stock and Lambert, 2001). The focus of physical distribution was also on the total systems cost and analysing trade-off scenarios to arrive at the best or lowest system cost (Langley et al., 2008). Langley et al. (2008) stated that the rationale for logistics management was precisely the underlying logic of the systems or total cost concept. During the remainder of the 1960s and all the way into the 1980s, a multitude of textbooks, articles, monographs, journals, and conferences followed, dedicated to the subject of logistics management (Stock and Lambert, 2001).

The exploration of the link between accounting and logistics begun during the 1970s and one of the earliest writings was Michaels Schiff's *Accounting and control in Physical Distribution Management*, published in 1972 (Accounting and control in physical distribution management, Chicago: National Council of Physical Distribution Management, 1972). The study was influential in the establishment of the awareness that accounting and financial information are vital to logistics activities (Stock and Lambert, 2001). Costs related to customer service are fundamental in logistics and logistics management, and the first detailed exploration of the topic of customer service was published in 1976 by La Londe and Zinszer (LaLonde and Zinszer, 1976). Their landmark study, and other studies on that issue, have since then continued to influence the logistics profession (Stock and Lambert, 2001).

A new term associated with logistics arose in the beginning of the 1980s, the *supply chain management* concept (Langley et al., 2008, Stock and Lambert, 2001). In recent decades, computer technology and globalization have had a major influence on logistics and contributed to the development of logistics management and also caused organisations to become more interested in the field of logistics management. During the 1990s, the great interest in process orientation led to a wide range of literature in the field and has since then been a fundamental principle of business development (Rentzhog, 1998).

In early 2011, one of the most respected logistics journals, *Journal of Supply Chain Management*, had a special topic forum on service supply chains. The motive is that “services play a dominant role in most developed economies, but are underrepresented in academic research agenda”(Sampson and Spring). The interest of this call is not in studies centred on the provision of goods in service sectors, but in settings focused on the provision of service between organizations.

LOGISTICS RESEARCH IN A NEW CONTEXT

This licentiate thesis is intended for a service context from an industrial perspective by systems approach and flow-orientation. The healthcare context is both substantial and complex with potential as research area within logistics management. A contextual adaptation is thus needed. The patient flow is in focus in this thesis when studying the special kind of service as the healthcare sector is. This chapter also provide the picture of that healthcare organisations are complex to manage as systems and that there is a learning opportunity by the power of analogy.

3 RESEARCH APPROACH

This chapter begins with the research design and methods followed by the literary basis and case studies and ends with the development of the theoretical models. It is written to explain the motives behind different choices that have been made and provide an understanding of the development of this research but also prior research which provided a solid base for this thesis.

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3.1 RESEARCH DESIGN

The research in this thesis is based on the researcher's conviction that it is extremely unnecessary to reinvent the wheel. There is so much knowledge in this highly developed world so why not use it!? Over the years the field of logistics has been and continues to be strongly influenced by other disciplines (Stock, 1997). This thesis's basic research design is the reverse; to bring already known logistics knowledge into a new context to and thus avoid reinventing the wheel. The unfamiliar "messes" has then to be described and modelled in a transferable way (i.e. established model), then the problem could be tackled from the knowledge base from other research fields, e.g. the field of logistics (Towill and Christopher, 2005).

The type of research that is to be conducted influences the data to be collected and hence the research design. The research design is the logic behind the combination of collected data and the type of research question that is of interest to the researcher. The type of research should thus be clarified before the decision on the most appropriate research design or data collection method (Yin, 2009). This thesis has two distinct parts, see Figure 3. The first is purely theoretical, where the knowledge in the field of logistics that would be applied in the new context of healthcare is defined. The focus is on what main features a logistics system has and how to describe such a system. Little was known about what type of logistics knowledge is suitable for contexts other than the traditional one of manufacturing and distributing companies. This research is based on the idea that the theory of logistics has a core in the systems approach. The first part of the research is thus deductive; exploring the word of theories, compiling the information and structuring it depending on its content. The content is also analysed to make the outcome to contribute to the logistics field of system theory. However, the selection of theories and literature as well as the gathering of information from these sources are selective. A researcher with a systems approach search for a problem solution that works in practice, which makes it pragmatic in nature (Arbnor and Bjerke, 1997). The objective is not to search for an absolute truth. The world cannot be understood fully, it can nevertheless be modelled or a theory of reality formulated made to seek solutions that supposedly apply to the real world (Van Gigch, 1991). Hence, the essentials in the sprawling field of logistics management to be able to apply knowledge to new contexts are explored in the first part of this thesis. This part answers the two research questions and provides the foundation for the rest of the research.

The preferred method when using a systems approach is case studies, both quantitative and qualitative (Arbnor and Bjerke, 1997). Consequently, the second part of this thesis is that of a case study, focusing on how to describe healthcare organisations by means of logistics description aspects and to evaluate these systems by means of a logistics system's main features. Van Gigch (1991) states that researchers must remain practically minded, and that their role is to solve problems and offer constructive and lasting solutions. In a systems approach, the researcher's task is to create an understanding of a given part of the world, to identify the system's parts, links, goals and feedback mechanisms in order to improve the

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system (Gammelgaard, 2004). For that reason, Gammelgaard (2004) concludes that theory in the systems approach is contextual rather than universal. Two different healthcare organisations are therefore used to test and create understanding about applying logistics knowledge to a new context. This part of the research is thus descriptive and explanatory, describing the reality from a logistics point of view and analysing it to see how well healthcare organisations fulfil the main features of a logistics system. This explanatory part of the research provides a picture of the contribution from the logistics management field to other contexts.

When the purpose is answered a system analysis has in fact been performed according to Arbnor and Bjerke's (1997) definition of *system analysis*; "System analysis means to depict a real system in a systems model without changing the real system, and to make clear to oneself the internal and external factors influencing this system". In other words, systems analysis has both a descriptive and an explanatory (possibly understanding) purpose and is as much a question of *synthesis* as of analysis. This model is then the basis for *System construction*; to depict a potential real systems model for constructing a new real system, for example when redesigning flows to make them more efficient. Both analysis and construction of systems are parts of developing new *systems theories*, where system models and producer-product relations are valid for more than one real case. (Arbnor and Bjerke, 1997). However, this study has no ambition to develop systems theory. Its contribution is to use the systems approach concretely to find real-world problems and potential for flow efficiency.

Figure 3 The overall research design and its two parts.

3.2 RESEARCH METHODS

In this thesis, two different research methods have been used; literature reviews and case studies of two different healthcare organisations. As illustrated above the research design is divided into two chronological parts. However, the data needed for the research is collected in a totally different order. In contrast to the deductive approach, as in the first part of the research, the empirical data was collected first. This is a consequence of the choice of doing research within a new field. The field of healthcare logistics is in its infancy, which required a basic understanding of the context before the actual research was designed. Consequently, the study began before the actual study for the thesis. The research design of this thesis therefore takes its starting point in initial insights based on prior theoretical logistics

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knowledge followed by observations, interviews and scanning of the business system at the case hospital. Four series of interview sessions were conducted with a total of 23 respondents and 18 interviews and over 500 Excel files were collected from the business system. A more detailed description of the empirical data collection is presented later. Several literature reviews is also conducted in order to build up a knowledge base with the aim of finding interesting inputs and research issues to be able to design the research. A total of three structured or more iterative literature reviews are accomplished; logistics research in a healthcare context, along with systems approach and basic logistics research. An overview of the data collection process is presented in Figure 4 and the theoretical data collection is described in more detail in the next section.

Theoretical world

Empirical world

Figure 4 The data collection process, both theoretical and empirical data

As illustrated above (Figure 4), the data collection began in the empirical world but the first research method applied to this licentiate thesis was literature reviews. This method has been used during the whole research process. The reason for the literature reviews in this thesis was partly to obtain basic knowledge about what has been done in the field and partly to answer the two research questions. This was followed by case studies, along with the results of additional literature reviews. The use of these two methods was to be able to apply the theoretical outcome from the research questions to an empirical context. Table 3 below shows which of the research methods are applied to which research question and purpose.

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Table 3 Research methods applied to the research questions and purpose

	Literature review	Case study
RQ 1	System theory and basic logistics literature	
RQ 2	System theory and basic logistics literature	
Purpose	Logistics research in a healthcare context	Interviews, observations, and scanning business database

3.3 LITERATURE REVIEWS AND CHOICES

Literature studies were made in order to build a knowledge base concerning logistics management research in a healthcare context and the systems approach in organisational and logistics research. Literature reviews have the potential to play a role in creating and building bodies of knowledge and also forming policy and practice and play a critical role in doctoral theses (Tranfield et al., 2003). Therefore, these studies were needed throughout the whole thesis. Choices of and searches for basic logistics literature were needed for the frame of reference. The literature reviews and choices are further presented below.

3.3.1 Logistics literature in healthcare context

This thesis concerns logistics in new contexts and especially in a healthcare framework. The objective of the first literature review was to identify the healthcare field in the logistics and supply chain management literature. The literature review was initially conducted by means of a thorough review of seven SCM/logistics management journals:

- *International Journal of Logistics Management*
- *International Journal of Logistics: Research & Applications*
- *Journal of Business Logistics*
- *Journal of Purchasing and Supply Management*
- *Journal of Supply Chain Management*
- *Supply Chain management: An International Journal*
- *International Journal of Physical Distribution & Logistics Management*

All articles from the last six years were scanned on the 21st of April 2011 and 13th of February 2012, see Appendix I for more details. Articles announcing a healthcare context in either the title or in the keywords, e.g. healthcare, health services, hospital or patient, were classified as patient or physical products flow oriented. The division is inspired by De Vries and Huijsman's (2011) grouping of considered elements of exchange within supply chain management in health services. It could be concluded that the logistics and supply chain management field has taken an interest in the healthcare sector and its issues. The choice to only include title and keywords in the scanning process is based on the fact that the context is rather new; it is therefore expected to be announced already in these article elements. References concerning physical product flows, e.g. purchasing for hospitals, material handling in healthcare services or medical supplies, were not of interest; they are however

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included in Appendix I, as *physical products flow*. The reason for excluding physical flow articles is that they support flows to the main flow. Furthermore, the sourcing and distribution of products in a health care setting are basically not that different from other industries.

The “snowball approach” (going through references of papers already included) was thereafter used to trace the six articles’ references. All references that either included a “healthcare word” (e.g. healthcare, health services, hospital or patient) in the title or were published in a “healthcare related journal” (e.g. Journal of Health Care Quality Assurance, Journal of Health Organization and Management, or The International Journal of Health Planning and Management) were then examined. A total of 118 (of 281) references were healthcare related. Only articles published in academic journals were included in the final reading, thus excluding books, reports, unreviewed conference papers and newspaper articles. Linköping University’s library services, Google and Google Scholar were used to trace the references, although not all references could be found through the available search paths. Six articles were identified as relevant in the first search phase and twenty references were included as a result of the second phase. An illustration of the literature review method is presented in Figure 5 below.

Figure 5 The method of the literature review, logistics literature in a healthcare context

This literature review resulted in a paper presented at the NOFOMA Conference 2012 Turku, Finland (Wiger and Aronsson, 2012). Naturally the results have also been used throughout the whole research process, especially in the introductory chapter and to explain the relevance of the research. The review concludes that interest has increased in logistics research in a healthcare context but it is still in its infancy.

The useful method of literature search presented above is a result of other search methods that have been tested in the past which did not capture any useful literature. Using keyword search methods on business databases resulted in an unworkable number of hits. This was due to the combination of the word logistics, flow or supply chain together with terms connected to a healthcare context. It resulted in capturing predominantly types of articles on

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medicine and biology, e.g. logistic regression, blood flow, humanitarian logistics and distribution of pharmaceuticals. It can thus be concluded that the field of healthcare logistics is not defined. The second search phase showed that the articles in the reference list were published in a wide range of journals. The review of references suggest that there are publications that deal with logistics related issues, and patient flow issues but not connected to the research field of logistics and supply chain management.

3.3.2 Systems approach

This thesis concerns logistics systems and it is assumed that the systems approach is core within logistics research. The second literature review was necessary to develop a framework which was used for the development of the theoretical models; the main features of a logistics system and description aspects of a logistics system. The *systems approach* is used as an umbrella concept in this thesis and includes other systems issues such as systems thinking, systems theory, systems analysis and systems critical thinking.

Literature on systems approach directed at the field of business, organizations and management was studied during a PhD course in systems approach literature. More was learned about a total of 15 researchers and their most distinguished work in the field of systems approach. Appendix II provides a more detailed picture of which researchers and the studied literature. The course was held in spring 2012. The literature was utilised for finding more literature in the field, by looking up references in the course literature, to learn more about description components and features of organisations as systems. The basic knowledge concerning systems approach introducing in chapter 4 is also collected from this literature.

When the course began, the researcher based the systems description aspect used in this thesis on Churchman's (1979) five basic considerations which must be kept in mind when thinking about the meaning of a system. These basic considerations do not cover all descriptions aspects to make a system description; they aims more to help managers in systems thinking. That finding made the search for a more suitable and explicit framework more intensive. This resulted in Ackoff (1971), Van Gigch (1991), Von Bertalanffy (1950a) and Checkland (1981) in particular being used as basic references in the framework of general organisations as systems. The framework of the more specified logistics systems was developed by iterative literature searches concerning description aspects, what a logistic system is and/or the core of logistics systems; see Appendix III for more details.

3.3.3 Basic logistics literature

Literature regarding basic logistics research was a natural choice since this literature concerns the fundamentals of logistics and supply chain management. The reason is that this thesis captures a new research field of logistics where the main focus is to transfer already acknowledged knowledge to new contexts. The literature was used primarily to develop the theoretical models, main features of a logistics system and description aspects of such a system. In other words, it was used to find knowledge about the connection between general systems and the specific theoretical models of logistics systems. These models are presented

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in chapter 5 and are specific for logistics systems in none specific contexts, which corresponds to the two research questions.

Suitable literature related to fundamental logistics and supply chain management was chosen on the premises of basic, elementary, and comprehensive educational books. Consequently, thick and in particular American books from the late 1900s and early 2000s were selected. This literature was to a great extent basic literature and very well known to researchers in the field of logistics management. This refers to a very wide field of literature. In this thesis the literature chosen is relevant to the concept of order and delivery cycle, flow oriented structure, management control, the concept of total cost analysis, and logistics performance measurements.

3.4 CASE STUDIES

This thesis aims to contribute to the sector of healthcare and the field of logistics by transfer logistics knowledge to new contexts. The nature of this research therefore made it an easy choice to use a case study approach.

3.4.1 Selection and description of cases

The case organisation in this thesis is the hospital in Hässleholm, which is a part of Hässleholm's hospital organisation (Hässleholms sjukhusorganisation). They operate in four towns in Skåne (a province in the south of Sweden) and have about 500 employees and a turnover of just over SEK 600 million (Hässleholmssjukhusorganisation, 2013). They have responsibility for all internal medicine, orthopaedics, psychiatry, diagnostic imaging and rehabilitation in Hässleholm's catchment area (70,000 inhabitants) and for all orthopaedics and psychiatry in Kristianstad catchment area (100 000 inhabitants) and main responsibility for orthopaedic artificial joint surgery and highly specialized psychiatry in half of Skåne (500,000 inhabitants). Hässleholm hospital is the largest part of the organisation and the organization operates the entire hospital. The case hospital is represented by two different care organisations and thus the two used cases.

The case hospital has not been chosen by the researcher herself. However, the research group behind the corporation with the hospital organization has, of course, chosen its partner with care. The case organisation has in the past pursued a long-term, dedicated improvement. The work done has thereafter been evaluated by members of the research group and the results obtained were considered to be of high-quality, see for example Carlsson (2003) and Carlsson and Sarv (2001). A further reason for the cooperation was the possibility to get access to unique empirical data. The researchers were able to access well-documented and versatile data covering a decade, but also had full access to prospective studies. Another reason was the organisation production results, especially within knee and joint plastic surgery, which were significantly better than comparable hospitals.

3.4.2 The interviews

The empirical data, as mentioned earlier, were collected before the actual research design of this thesis was set. The intention of the data was partly to get a sense of the new context, to learn more about the healthcare sector's mechanisms, and to be able to create a cost accounting patient flow oriented model. To build that model, both knowledge of the patient flow at the hospital and an understanding of how the costs were linked to these flows were needed. An early version of the model was presented in a paper presented at the EurOMA Conference in Cambridge in the UK (Wiger and Aronsson, 2011). However, even if the intention of the data collection had a somewhat different purpose than the focus of this thesis, the data needed is by nature broader and more comprehensive than needed for this study. Nevertheless, regardless of advancements in modelling, the object's behaviour must be understood (Pidd, 2004). A basic understanding of the whole and the parts of the case hospital are therefore essential. Consequently, more empirical data than necessary for the purpose of this licentiate is collected and it has given the author a good understanding of and insights into the hospital's business. Most of the collected data has been used to give the author a holistic view of the case hospital, details about all functions, duties and planning and control mechanisms, patient flows, follow-up work, measurements, etc. It is thus hard to distinguish the exact method collecting the data used in this thesis. This will be observed, for example, in the reported interview questions.

Respondents and interview questions

In order to capture the whole business of the case hospital a total of four interview sessions were held with managers at every level as well as administrators. The first (1) session was a group interview with the hospital manager and three clinical department managers. Several members of the research group were present at this interview, which lasted for three hours and was recorded and transcribed. The questions focused on control, planning, coordination, tools and methods, responsibilities, measurement, flexibility, follow-up, and etcetera. All respondents had access to the questions before the interviews and all details about the questions can be found in Appendix IV.

The second (2) interview session was performed with unit managers, schedulers, and administrators linked to the clinical operations. The author and another researcher were present at these interviews, which were recorded, and notes were also taken. Interviews with a respondent lasted about 1 hour and for the last about 1.5 hours. The focus was on forming a picture of the organisation and its activities. Respondents were asked to sketch their view of reality from a patient flow perspective on a large piece of paper. This helped and supported the discussion during the interview as all present had identical pictures of the business before their eyes. An example of a business sketch is shown in Figure 6. All respondents attending this session and the questions are to be found in Appendix V. All respondents also had access to the questions before the interviews.

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Figure 6 Respondents' picture of his/her "reality"

The third (3) interview session was held, similar to the second but with only the author present with the respondents. All interviews were however individual this time. Additional questions regarding interview session 2 and questions concerning resources and time allocation for activities and tasks were in focus at this session. Further details about the questions and respondents of this session can be found in Appendix VI. An overview of the respondents (sessions 1-3), their professions and the total number of professionals is shown in Table 4.

The respondents were selected on the basis of manager and key employees for the business. This was done in consultation with individuals involved in the research project with

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extensive knowledge of the case hospital's business. The respondents' professions represent a breadth that covers large parts of the business from different perspectives. The hospital manager and the clinic managers are, in this case, all physicians, working both as executives and clinically at the case hospital. The unit managers are for the most part nurses. The care administrative staffs usually have a central position and follow the patient process through information but also through contact with patients. The physicians' schedulers also have a great deal of knowledge about the business due to their central planning role. The process owner is not always stated, but physicians are considered to be closest to having this role.

Table 4 Selection of respondents

	Hospital Manager	Clinic Manager	Unit Manager	Physicians' Schedulers	Administrative Employees
Respondents (Total)	1 (1)	3 (3)	6 (20)	2 (2)	8

The final interview session (4) was conducted via e-mail and phone. Another nine individuals were spontaneously interviewed in order to obtain information that needed to complete from previous interview sessions.

3.4.3 The observations

Several observations have been conducted in order to “get to know” the case hospitals' business and employees. By observing activities in different parts of the hospital while being shown round the author was able to create an overall framework, which was a great help in sorting information during the interviews and to be able to ask additional questions or make clarifications. All kinds of activities, e.g. surgery unit, emergency department, wards, outpatient care, and planning, were visited and opportunities to ask spontaneous questions were always given. On every tour one or more employees guided the researcher(s), which made it possible to gain more contacts in the form of their colleagues and obtain specific information about the units.

3.4.4 The scanning of the business system

One of the case organisation's business systems was also scanned and the information was compiled and structured depending on its content. The business system consists of information on production, occupancy, costs, employees, patient lead time etcetera. Over 500 Excel files were collected with raw data from their business system, for example employee costs, production, number of hospital beds and occupancy, laboratory and X-ray costs, number of referrals, and number of outpatient visits.

3.4.5 Processing of the empirical data

All empirical data has been processed to create a holistic view and knowledge about the details of the case hospitals business. All answers from the respondents have been processed and grouped by mapping activities and general descriptions of the business and its parts. Based on respondents' pictures the author has reworked them by adding facts found during other interviews. All empirical data processing was intended to create an overall and objective picture of the business.

3.5 DEVELOPMENT OF THE THEORETICAL MODELS

This thesis focuses on how to evaluate healthcare organisations by means of the main features of a logistics system. The logistics systems concept is used in the field of logistics and supply chain management but little was known about the specificity and uniqueness of a logistics system. The first research question therefore relates to how to describe a logistics system and thereby provide the description model used to describe the two healthcare cases. The second research question provides a logistics system's main features and thus the analysis model used to evaluate the two cases' fulfilment of the purpose of a logistics system. The development of these two models is further described in the next section. However, some key concepts need to be explained in order to clarify the focus of the study, i.e. logistics, systems, objectives of logistics systems, and models.

Logistics

The term *logistics* has a central role in this thesis. The Council of Supply Chain Management Professionals (CSCMP) logistics management defines logistics management as follows.

Logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements.

(CSCMP, 2012)

This definition refers to the management of logistics and provides an idea of the meaning of the concept of logistics. The concept is further elaborated and explored when the theoretical models are developed, see chapter 5. However, in the literature the terms logistics (management) and supply chain management are sometimes separated and sometimes used interchangeably. The models that this thesis aims to develop are meant to be applied on businesses or organisations that typically are a part of a greater supply chain. Hence, the term logistics is used in this thesis but it should be noted that the term supply chain management might be used in the original source.

Systems

Several terms are used around the concept of systems, for example systems approach, system theory, systems analysis, systems thinking, and system construction. Some researchers make a distinction between these but most do not, which means that the terms are used synonymously. In this thesis, a distinction is made where the *systems approach* is used as an umbrella concept. It is a way of viewing the world that helps us cope with its complexity. The system approach is also a way of depict, explain, and understand the "real" world (Arbnor and Bjerke, 1997). More about system terms in chapter 4.

Objective of logistics systems

This thesis takes a stance in that the overall objective of the logistics system is to reduce overall costs, shorten lead times, balance flows and deliver the required level of customer

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service. Consequently, there needs to be a balance between customer service and total cost to reap the greatest benefit from flow orientation.

Models

There are many ways to build models for situations in which irregularities and novelty dominate. Pidd (2004) demonstrates different ways to explore this spectrum of approaches, see Figure 7. On one hand, models can be used to support routine decision making, including automation of decision making and routine decision support. On the other hand, models can be used to support people who are thinking through difficult issues either by presenting possible system designs and changes or insights for debate. Models in this thesis fall into the latter.

A logistics system is here considered to be soft. This because the idea is to support debate explicating insights and worldviews, the system is then considered as soft (Pidd, 2004). A soft system is traditionally a system in which the number of factors affecting its elements and the relationships between them are so complex that it is not possible to turn them into a mathematical model which calculates an optimum. The star in Figure 7 represents the aim of the models developed in this thesis.

Figure 7 A spectrum of systems modelling approaches (Pidd, 2004).

3.5.1 The main features of a logistics system – RQ1

The first research question concerns the development of a logistics system's main features. This is a purely theoretical study based on the literature presented in sub-chapter 3.3.2 (systems approach) and 3.3.3 (basic logistics literature). This is done to be able to evaluate the degree of characteristics of a logistics system, i.e. this thesis' analysis model. The base from which to answer this research question is presented below.

Further, a system model is a generalisation of the reality. The whole is in focus, but you cannot see everything. The question, though, is what does a researcher see when he or she studies a logistics system's main features? The answer is that the objective differs depending on the viewer. Ackoff (1971) describes this as the system and its environment being *objective*

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things to a researcher but also *subjective* because the particular configuration of elements that form both is dictated by the interests of the researcher.

“Not even science and scientists, in all their wisdom, are agreed about the nature of reality”
(Van Gigch, 1991)

Consequently, the main features of a logistics system are formed by the author’s ability to shape the subjective perception of the essence of logistics into something objective that can represent adequacy with regard to the purpose of this thesis. The author’s ambition has always been to develop features that should provide a sufficiently comprehensive picture of a logistics system to be able to perform useful analyses.

However, using systems to model reality has two kinds of creators of knowledge: those who believe that reality in itself *is* system-like and that the task therefore is to reproduce it as such, and “on the other hand, there are those who see no reason to take a definite position for or against the way reality is ultimately constructed, but nevertheless find it useful, interesting, or both, to reproduce it *as if* it behaved like systems” (Arbnor and Bjerke, 1997). The author of this thesis finds it both interesting and, hopefully, useful to reproduce logistics as if it behaved like an ideal system by means of established logistics theory. If the conclusions show usefulness in reproducing logistics as an ideal logistics system, the question of whether reality is or is not system-like becomes a non-issue.

3.5.2 The description aspects of a logistics system – RQ2

The second research question concerns the development of description aspects for logistics systems. This is also a purely theoretical study based on the same literature as in RQ1. It can be noted that both research questions are generic to context and their theoretical contribution is therefore not solely related to a healthcare context. Unlike RQ1, which represents “good” logistics, requires the description aspects only a representation for what needs to be described in order to perform proper analysis. The base from which to answer this research question is presented below.

The aim of this research question is to present a description model to use for describing the reality sufficiently as a base for analysing it by means of the features developed in RQ1. Moreover, a simplified representation of the reality in order to understand it and predict or impact its future behaviour is made using a model (Arbnor and Bjerke, 1997, Van Gigch, 1991). The model is the representation of the entities concerned and it can therefore have multiple views, both horizontally along the flow and vertically from strategic to operative activities. The description model in this thesis is used to describe the reality, which itself then becomes a model. Furthermore, the description can always be conducted more or less in detail depending on the purpose of the description (Aronsson, 2000). No model of a system will include all features of the “real world” of concern, hence inclusions and exclusions have to be done depending on the intentions of the modeller. The delimitation cannot be true or false but it can be more or less complete for its aim. Thus, the description of the real system should be complete enough for the researcher to feel that it is explained or understood in relevant aspects (Arbnor and Bjerke, 1997). The answer to this, if the developed description

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aspects provide an adequate picture of the reality, represented by the description of the two healthcare organisations, will be represented by the conclusions. By critically examining the usability of the description aspects, by their providing the desired basis for the analysis, the question of whether they are more or less adequate for their aim can be answered.

Further, a logistics system naturally has people who perform activities but the system's structure is not dependent on specific individuals. Therefore, there is no need for a description from an actor's perspective or intentions. Katz and Kahn (1966b) express this as the organisation's functions or goals not being regarded as the intentions of the organisation's leaders or members, but as the results which represent the ability that allows the system to maintain the same type of output. Consequently, and as mentioned earlier, it is the flow that is the focus of the analysis. It is assumed that systems are unpopulated, i.e. have no players, but implied that someone has to perform the system's tasks.

3.6 THE RESEARCH PROJECT

This research is part of a three-year project, "Lean and agile – logistics driven improvement in health and social care", funded by Vinnvård, a collaboration between the Department of Management and Engineering at Linköping University, Hässleholm Healthcare Organisation and the Medical Management Center at Karolinska Institutet in Stockholm, and aims to clarify how and under what circumstances a healthcare organisation can develop dynamic efficiency by applying logistics models and methods from industry. This means both adapting flexibly to changes in demand and external businesses conditions, and improving resource utilisation, performance and quality. Based on the results achieved by industry, the intention is to apply logistics concepts, approaches and methods to initiate, monitor, analyse and conceptualise how adaptability and efficiency can be achieved simultaneously in healthcare (Brommels, 2008).

4 LOGISTICS SYSTEMS

This chapter addresses logistics systems from the base of organisations as systems. The systems issue is processed by Systems Approach, System Thinking, & Systems Theory, directed to the field of business, organizations and management. The emphasis is on how systems are described and characterised, e.g. general system features and description aspects to describe systems. It starts in general system, then organisations as systems and ends in the more specified logistics systems. According to Arbnor and Bjerke (1997) there is a distinction in the systems approach between objective reality (reality itself, i.e. real systems) and representations/reproductions of this reality (i.e. systems models). This thesis therefore focuses on systems models, to represent logistics as a system by means of its main features and description aspects. This chapter also gives a short history of the development of the system approach.

4.1 INTRODUCTION TO SYSTEMS

There are many fields where general properties of systems are studied, e.g. general systems theory, systems dynamics, cybernetics, thermodynamics and complex systems. It was during the 1970s that the term *system thinking* and the development of systems theories had their breakthrough in a number of different academic activities as well as in industry, everyday language and the media (Arbnor and Bjerke, 1997). However, research using a systems orientation was certainly going on as early as the 1960s and even before that. One of those who had the greatest influence on the origins of the general system theory movement is Von Bertalanffy (1950a, 1950b). The quote below exemplifies the shift in thinking that he represented.

“in the past centuries, science tried to explain phenomena by reducing them to interplay of elementary units which could be investigated independently of each other. In contemporary modern science, we find in all fields conceptions of what is rather vaguely termed ‘wholeness’”
(Von Bertalanffy, 1950a)

Ackoff (1973) explains the “system” evolution, which ended in what he calls the Systems Age, through the previous phase, the Machine Age. The step from the Machine Age to the Systems Age did not take place over night; the beginning in the 1940s was just the beginning. The Systems Age was a respond to the Machine Age’s two basic ideas of the nature of the world and its way of seeking understanding of it. The first is *reductionism*, which consists of the belief that everything can be reduced, decomposed or disassembled into ultimately simple elements. This gave rise to the analytical way of thinking about the world. The parts that could be explained were disassembled down to the independent, invisible parts of which it was composed and then the behaviour of these parts were explained and finally aggregated into an explanation of the whole. If the analyst succeeded in decomposing a problem he faced into simpler problems that were independent of each other. The solution to the problem was the sum of the solutions to its independent parts to an aggregated whole. This made it possible to divide the labour of seeking to understand the world into a number of virtually independent disciplines. The other basic idea of the Machine Age was *mechanism*, where all phenomena were believed to be explained by *cause-effect*. The cause was taken to be sufficient for its effect, and consequently the quest for cause was environment-free. The prevailing view of the world was *deterministic* and *mechanistic*. Science found no need for teleological concepts, such as functions, goals, purposes, choice and free will when explaining any natural phenomenon. This was also the time of mass production and assembly lines, which affected the nature of work left for men to do, each man and machine performing one or a small number of elementary tasks repetitively. So, the more machines came to be used as substitutes for men working, the more men were made to behave like machines.

The System Age was the time when the analytical mode of thought was supplemented by the doctrines of expansionism, teleology, and a new synthetic (or systems) mode of thought.

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Expansionism is the doctrine where all objects and events, and all experiences of them are parts of larger wholes. This new way of viewing the world turned attention from ultimate elements to a whole with interrelated parts, a system. According to Ackoff, it arose through philosophers and mathematicians, and after the biologist Ludwig von Bertalanffy's famous book (1968) it has been widely recognised as science's new organising concept.

To summarise, the first step in building systems theory arose when a need arose for the parts to be related to the wholes. The next step was when wholes had to be related to their environments. This led to open-system models, such as that introduced by Von Bertalanffy (1950b, Emery and Trist, 1965). It was developed to overcome some of the perceived shortcomings of previous approaches and it offers an alternative methodology which can cope with solving some of the problems of complexity (Van Gigch, 1991).

Nowadays, the word *system* exists in many contexts, e.g. solar system, education system, computer system, and steering system. All these systems have common principles which are applicable to all kind of systems. However, when systems are studied in detail, there are differences in their contributory elements, behaviour, patterns and so forth. In this context the word *systems* is used to refer specifically to organisations.

4.2 SYSTEM APPROACH

There are many similar definitions used in business and management contexts of what a system is, see Table 5. Emerging from these definitions is the common theme that a system is composed of elements or components and that these elements are combined to form an integrated whole. Figure 8 illustrates a very simple system, its elements and the relationships between them.

Table 5 Definitions of system from a business and management perspective

Author	Definitions
Johnson et al. (1964)	<i>"A system is an organized or complex whole; an assemblage or combination of things or parts forming a complex or unitary whole"</i>
Ackoff (1974)	<i>"A system is a set of two or more elements of any kind and can be divided into parts."</i>
Churchman (1979)	<i>"Systems are made up of sets of components that work together for the overall objective of the whole" and "a system is a set of parts coordinated to accomplish a set of goals"</i>
Van Gigch (1991)	<i>"A system is an assembly or set of related elements"</i>
Arbnor and Bjerke (1997)	<i>"A system is a set of components and the relations among them"</i>

A system is also made of other smaller systems called sub-systems. Every component in a system is a potential system of its own and every system is a potential element in a larger system (Arbnor and Bjerke, 1997). These sub-systems are strongly non-separable from the system as a whole and are thus interactive. This means that when each part of a system performs as well as possible the system as a whole seldom performs optimally. Consequently, a system's performance depends critically on how the parts in the system fit and work together and not merely on how well each performs independently. Performance

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is also dependent on how the system is related to its environment (the larger system of which it is a part) and to other systems in that environment. It is therefore desirable to evaluate the performance of a system by evaluating its functioning as a part of the larger system that contains it.

Figure 8 A system is a set of elements and the relations among them

System is not a discipline in itself but a meta-discipline whose subject matter can be applied within virtually any other discipline (Checkland, 1981). It can also be seen as a practical philosophy of system management and a methodology of change (Van Gigh, 1991).

An approach is a way of going about tackling a problem (Checkland, 1981). Ackoff (1973) explains it as when system mode of thought is applied to systems problems it is called the systems approach. According to Arbnor and Bjerke (1997) the systems approach is a way of depict, explain, and understand the “real” world. It consists of a system language and a shape of the world that the systems researcher intends to depict, explain, and understand. *Systems theory* is trans-disciplinary theories of systems in general and their related principles can be applied to all types of systems. *General systems theory* is elaborated by among others (Von Bertalanffy, 1972, Von Bertalanffy, 1950a, Kast and Rosenzweig, 1972), from an organisational or management perspective in for example (Kast and Rosenzweig, 1972, Johnson et al., 1964) and from a SCM perspective in e.g. (Caddy and Helou, 2007). According to Arbnor and Bjerke (1997), systems theory contains models and/or producer–product relationships valid for more than one real case.

Modern systems theory is a development of general systems theory and has several similarities to the “old” systems theory. Generally though, modern system theory is considered to be more concrete because researchers make explicit what types of real systems they refer to (Arbnor and Bjerke, 1997). Related to this, organisations studied as systems are now described more as social phenomena that have an ability to learn and have a culture. *System thinking* is the conceptual cornerstone that underlies the substance in Senge’s (Senge, 2006) famous organisation textbook. He refers to system thinking as a discipline for seeing wholes, a framework for seeing interrelationships rather than things. It offers a language for how to think when dealing with complexity, interdependence and problems that have no simple local cause. The focus is on the shift in thinking, from seeing parts to seeing wholes, the *process of understanding* how things influence one another within a whole. It implies thinking about the world outside ourselves and doing so by means of the concept system (Checkland, 1981). Systems analysis requires knowledge of the features that subsystems can perform, and

without this knowledge it is very difficult to determine what the overall system really coordinates and governs (Emery, 1972).

4.3 SYSTEMS APPROACH TO ORGANISATIONS

The systems approach with its associated concepts and mental models by which an organisation can be described and related to the outside world and with the principles of consistency, equilibrium and change, through which an organisation's adaptability and change can be identified, is an essential tool for researchers, organisations' leaders and workers in organisations. Ackoff (1971) defines an organisations as follows:

"An organization is a purposeful system that contains at least two purposeful elements which have a common purpose relative to which the system has a functional division of labour; its functionally distinct subset can respond to each other's behaviour through observation or communication; and at least one subset has a system-control function."

(Ackoff, 1971)

Organisations are man-made systems which are made for a purpose that is achieved by the delivery of outputs. The elements must then be related, they must be designed to work as a coherent entity. The input to one function is formed by output from others when functions act together to achieve overall company objectives (Gregson, 1976). This means that actions of one department can affect the performance of others in contributing towards overall company objectives. For an organisation a goal (a preferred outcome in a particular situation) can be obtained within a specified time and the objective (a preferred outcome in a particular situation) can be attained over a longer time period (Ackoff, 1971). Furthermore, an organisation's behaviour (reactions, responses or actions to something) and the outcome of behaviour are both variable and chosen (Ackoff, 1971). The interest lies in both antecedents and consequences of the organisation's behaviour. A systems approach within an organisation implies integration which enables sub-systems to relate to each other in the most effective way and ensure that internal contradictions in the corporate activity are minimised (Christopher, 1971). The adoption of a systems approach to an organisation implies the following point:

- The whole is primary, and the parts are secondary.
- Integration is the condition of the interrelatedness of the many parts within one.
- The parts so constitute an indissoluble whole that no parts can be affected without affecting all other parts.
- Parts play their role in light of the purpose of the whole that exists.
- The nature of a part and its function is derived from its position in the whole, and its behaviour is regulated by the whole-to-part relationship.
- The system is any system or complex or configuration of energy and behaves like a single piece no matter how complex.
- Everything should start with the whole as a premise and the parts and their relationships should evolve.

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To summarise, an organisation viewed as a system is purposeful and the behaviour and outcome of that organisation are variable and chosen along with the fact that the parts affect and are affected by all other parts, and it is controlled. Within the system, all functions or activities have to be understood in terms of how they affect, and are affected by, other elements and activities with which they interact. Hence the sum, or outcome of a series of activities, is greater than its individual parts. When studying actions in isolation, the understanding of the system as a whole or how such action affects or is affected by other activities disappear. This is in line with Christopher's (1971) statement on the system view of organisations:

"The systems view of corporate activity is essentially an integrative orientation; the company is viewed as a series of sub-systems, organized on functional or company-wide mission lines, which interface with each other to achieve stated objectives"

(Christopher, 1971)

4.4 THE SYSTEMS APPROACH IN LOGISTICS

The systems approach is evident within the logistics and the supply chain management discipline. The approach is treated both explicitly and implicitly in logistics articles and textbooks. Sanders (2007) claims that SCM has a systems view because all activities and functions that are needed to bring a product or service to market are considered. Arlbjørn and Halldorsson (2002) use the term *hard core* to explain what is unchangeable and to illustrate what the knowledge within logistics is all about. They formulate it as "directed towards the flow of materials, information and services; along the vertical and horizontal value chain (or supply chain) that seeks to; coordinate the flows and is based on system thinking (a holistic view) where the unit of analysis essential is the flow". Mentzer et al. (2001) see SCM as a management philosophy and state that SCM has a systems approach to viewing the supply chain as a whole to manage the total flow. Ellram and Cooper (1990) express this as "supply chain management is a systems approach to viewing the channel as a whole rather than a set of fragmented parts". Bechtel and Jayaram (1997) also emphasise that systems thinking is the most mentioned underpinning philosophy in the SCM literature. The systems approach is also the underlying premise in the conceptual framework of logistics management when Novack et al. (1992) present their guide to developing the logistics discipline.

These statements are all from the 1990s or later but the systems approach was present and described more clearly in less recent publications. One example is Bowersox (1978), who is especially clear: "The systems approach was and remains the cornerstone of the integrated logistical concept". In their review of the evolution of logistics thinking, Kent and Flint (1997) state that it was during the 1970s that the integrating and systems view was the most dominant theme as a logistics framework to guide researchers. Further, Gripsrud et al. (2006) stated that the dominant underlying theory of business logistics changed from the neo-classical economics to the systems theory in the 1970s. This development of the systems approach in the logistics and supply chain management literature is quite logical given the

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overall development of the systems view which took place during the 1960s and 1970s. One example is Heskett et al. (1973) in (Gomes and Mentzer, 1988), who make the following observations concerning logistics systems:

1. A logistics system possesses multiple interrelated parts.
2. The performance of one part affects and is affected by that of others; consequently, to analyse any subcomponent in isolation constitutes a serious methodological error.
3. The alteration of certain subcomponents generates more change in system behaviour than others.
4. Overall system performance is dependent upon “balance” achieved between the subcomponents.
5. The weakest member often dictates the upper bounds of a system’s performance.
6. Optimum system performance is often not dependent upon the optimal performance of each subcomponent, but requires balance and coordination between them.

In Christopher’s (1971) article, about the need for a systems approach in distribution planning with a cost-effectiveness orientation to the problem, he adds a number of characteristics to the basic components of a logistics system. These characteristics were identified by Geisler and Steger (1963):

1. A logistics system contains many interacting elements.
2. A logistics system contains elements affected by randomness, unpredictability, risk, etc.
3. A logistics system includes activities whose performance is affected by time lags. The lag is between the decision to act and the completion of the action.
4. A logistics system requires resources.
5. A logistics system requires policies, rules, and problem-solving capabilities for its operation.
6. A logistics system employs information and data.
7. A logistics system embodies component organisation.
8. A logistics system has objectives.
9. A logistics system has mutual impacts with other systems.

It can be concluded that several researchers claim that the systems approach is core to logistics and some have observed features of logistics systems. However, Abrahamsson and Aronsson (1999) use a systems approach when measuring logistics structure. They illustrate the systems approach within logistics as input, output, cost of transformation, and profit, see Figure 9. Still, the system cannot be seen as a “black box”, they emphasise the importance of understanding the existing structure of the system under study. This is to be able to explain why the cost of transformations is as it is when the purpose is to understand the cost of transformation for the system as a whole.

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Figure 9 The systems approach used in Abrahamsson and Aronsson (1999)

If the systems approach has been added to the logistics discipline or if the discipline has been developed along with this approach or if the discipline has been born and raised within that approach is not of interest. From the discussion above, it can just be concluded that in the discipline of logistics the systems approach is central.

To summarise, some researchers use systems language and concepts with a systems foundation and some state the underpinnings of a systems approach in logistics. All of these are a ways of viewing the world in a holistic perspective. The question, though, is what you see with that perspective when you look at a demand-driven delivery service system. The whole is in focus, but you cannot see everything. The object differs depending on the viewer. Ackoff (1971) describes this as: the system and its environment are *objective* things to a researcher but it is also *subjective* because the particular configuration of elements that form both is dictated by the interests of the researcher. The next section therefore provides some basic insights about how to model logistics systems.

4.5 MODELLING LOGISTICS SYSTEMS

What a systems model might contain is determined by the *use* for which the model is intended and by the *level of detail* desired. A model intended for reproducing (for descriptive purposes), can include a number of factors of reality but in a model to be used primarily for steering, several potential factors *may* be omitted (or even *must* be excluded) so the model is not too complicated to use (Arbnor and Bjerke, 1997). However, logistics is a system in itself, and the system approach is a crucial concept in logistics (Stock & Lambert, 2001). Nonetheless, it seems that a logistics system is a very complex but vaguely defined “concept” or sentiment, and that there appears to be no overall picture of what features such a system has or how it can be described. A first step is to indicate the positions of all elements and interactions in the system and consider all characteristics of the system, then a system state can be indicated, i.e. a system can be represented as a model (Arbnor and Bjerke, 1997). However, this is not enough to be able to answer the two research questions in this thesis.

When studying organisations and the management of organisations it is, according to the systems approach, necessary to consider all the complex patterns and interactions that shape

an organisation (Bruzelius and Skärvad, 2008). As a consequence, the way in which different parts of the organisation, such as divisions, units, groups, employees and equipment are interrelated and the way the organisation is dependent on its environment, must be identified, described and understood. In the same way, Abrahamsson and Karlöf's (2011) basic message is that the part should not be changed before it is known how the whole is affected and that the whole should not be changed without knowledge of how the parts operate.

Churchman (1979) outlines five basic considerations that must be kept in mind when thinking about the meaning of a system: the system's environment, the resources of the system, the components of the system, and the management of the system. Churchman (1979) aims more to help managers in systems thinking (to have a systems approach to organisations) and in the next step to be able to perform a systems analysis. The basis of his book is of course systems theory but it is not the explicit contribution. This means that his five basic considerations do not cover all descriptions aspects to make a system description. For example, there is no consideration of how to capture the interrelation between the systems components, i.e. the structure of the system, or what the system produces.

Van Gigch (1991) is clearer in his description of a system. He presents twelve system concepts that characterise a system: elements, conversion process, input and resources, outputs, environment, purpose and function, attributes, goals and objectives, components programs and missions, management agents and decision makers, structure, and state and flows. Even if he is more interested in computer simulations of systems, his concepts are more explicit than Churchman's (1979). The question still remains of what to include when describing a logistics system. Christopher (1971) uses inputs, process, output, feedback-control and restrictions to model a logistics system. He refers to the general parameters of any system and that they have these five basic components.

To summarise, models, principles, and laws exist that apply to generalised organisational systems, irrespective of their particular kind, the nature of their component elements, and the relationships or 'forces' between them. The aim of the description thus has to be decided before the "reality" is modelled along with the decision on what level the description should be at. The intention of this thesis is to present a method to evaluate a healthcare organisation by means of a logistics system's main features. Consequently, the description aspects that are going to be used to describe the case hospital's main features have to cover and perform a model of the cases that can provide a usable base for the aim of this thesis. The basis for further development of a logistics system's main features is in this thesis concluded from the systems theory of how an organisation acts and its main components. The main features of an organisation viewed as a system is at least that it is *purposeful, opened and bounden, consists of interrelated elements, has input and output, and is controlled and adaptive*. These main features are chosen as features of an organisation viewed as a system. It is first and foremost based on Ackoff's (1971) framework of a system's key concepts and terms. He especially focuses on organisation, but the roots can also be derived from how general systems work, i.e. system within systems in physics, control engineering and biology. Besides Ackhoff, a cornerstone of this framework is also Van Gigch (1991), but also additional systems theory is used. These

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features are the basis for the further elaboration by means of the development of a logistics system's main features and these features' resulting description aspects of such system. This is presented in the next chapter.

5 MAIN FEATURES AND DESCRIPTION ASPECTS OF LOGISTICS SYSTEMS

The system approach is in a philosophical manner widely problematized. In logistics research, the systems approach is fundamental but few researchers apply the systems approach concretely and distinctly to their research. Seldom do the grounds, theories and definitions report on what the systems approach is driven by. This thesis attempts to define a logistics system by discussing a logistics system's main features. This is done to be able to develop a descriptive model but also to evaluate the degree of characteristics of a logistics system in a healthcare context.

*The following subchapter elaborates the chosen main features of an organisation viewed as a system, i.e. that it is **purposeful, opened and bounden, consists of interrelated elements, has input and output, and is controlled and adaptive**. These features are valid for many systems, but do not help to highlight the uniqueness of logistics systems. Therefore, linked to the main features of an organisation, basic logistics literature focusing on areas central for "good" logistics management is added. The chapter ends with a summary of a logistics system's main features and how to describe a logistics system to be able to analyse it by means of the formulated main features, i.e. an analysis and a description model.*

5.1 PURPOSEFUL

A main feature of an organisation, according to systems theory, and used in this thesis as the basis for developing unique main features and description aspects for a logistics system, is that an organisation is *purposeful*.

An organisation divides labour in order to reach its goal, where the labour can be divided by function (activities), space and time (Ackoff, 1971). Traditionally, the flow within organisations is organised by functional units (e.g. purchasing, production, distribution) which are measured only at a functional level without flow coordination between the units (Abrahamsson and Karlöf, 2011). The flow is then regarded as transactions rather than a continuous flow, i.e. a transaction-oriented business. Rather, a flow orientation is the key element in terms of logistics systems. A logistics system must include the entire flow through the organisation.

Organisations are purposeful (Ackoff, 1971). They have meaning through having an aim. Furthermore, logistics exists within an organisation or organisations. Consequently, by this logic, a logistics system has to be purposeful. Furthermore, according to Arlbjørn and Halldorsson (2002) the flow is the core of logistics. Logistics is therefore about cost-efficient flows and a logistics system should be flow-oriented with an objective to be cost-effective when producing customer service. Christopher (2005) makes this very clear when he says that logistics management is a flow-oriented concept. One of the major goals of an organisation should also be to reduce the total cost of logistics activities rather than focus on each activity in isolation (Stock and Lambert, 2001). This thesis takes the stance that the overall objective of the logistics system is to reduce overall costs, shorten lead times, balance flows and deliver the required level of customer service. Consequently, there needs to be a balance between customer service and total cost to give the greatest benefit.

To achieve the logistics system's purpose the basis of the systems approach, having a holistic view which is also core in logistics, must be taken into account. The focus of a logistics system is therefore the integration of internal company functions where the performance of the system as a whole is always more important than the performance or productivity of each individual function (Abrahamsson and Karlöf, 2011).

From the above considerations it is possible to argue that one feature which makes a logistics system unique, linked to that organisation's being purposeful, is as follows:

Feature 1:

A logistics system's purpose is to meet customer requirements by cost-effective delivery service through flow orientation by prioritising total performance

This main feature of a logistics system has implications about what needs to be described to be able to analyse whether a system fulfils this feature. One obvious description aspect is thus to describe the *purpose* of the system. Since nothing is done in a logistics system without

reason, the following description aspect is to be considered. An important question to answer in relation to this is *what is the purpose of the system?*

Description aspect I: Purpose

5.2 OPENED AND BOUNDED

Another main feature of an organisation, according to systems theory, and used in this thesis as the basis for developing description aspects for logistics system is that an organisation is *opened and bounded*.

An opened system is open for exchange of material (or energy) with its environment (Emery, 1972). Consequently, an open system has an environment that consists of all variables that can affect its state (Ackoff, 1971). Furthermore, organisations are systems that are endowed with conversion processes by which elements in the system change state (Van Gigch, 1991), i.e. open systems. Business theory is usually interested in open systems because researchers must explain and put components in a context in order to understand them (Arbno and Bjerke, 1997). Furthermore, organisations are living systems and in that sense open systems and should therefore be analysed as that which leads to the need to define its environment (Emery, 1972). Hence, organisations have dynamic interplay with its environment, e.g. customer, competitors, labour organisations, suppliers, and government (Johnson et al., 1964). A more general definition of *environment* is created by Arbno and Bjerke (1997), "...the factors that are important to the system to consider but are beyond its control.... what lies outside the "boundary" of a system". Therefore, variables which affect irrelevant properties of the system are not part of its environment.

Following the above logic, a logistics system is also affected by its environment. Since it is not meaningful to include everything around the system, only the specific factors affecting the defined system should be included. The system's boundary defines the system and has to be handled critically. The boundary limits the object and hence which system is analysed followed by which system the solution addresses. Disturbances (e.g. changes in conditions of doing business such as technological development or deregulation), constraints (e.g. laws) and uncertainties (e.g. unpredictable demand) are all factors affecting the system and most often treated as fixed constraints. The system boundary can logically be extended to include certain of these factors, resulting in these being considered modifiable. For investigations of industrial systems, the system's boundaries lie around the flow and the economic systems within which it operates, because little effect is expected beyond it (Gomes and Mentzer, 1988).

System boundaries are imperative when studying open (living) systems – systems that interact with other systems. The boundaries determine which systems are to be left outside the decision-maker's jurisdiction (regarded as "givens") (Van Gigch, 1991). The boundary is completely indefinite in the observer's eye. It all depends on which question to answer or which analysis it is intended for. Hence, the delimitation cannot be true or false but it can be more or less useful in connection with the purpose of the study. The defined system can of

MAIN FEATURES AND DESCRIPTION ASPECTS OF LOGISTICS SYSTEMS

course be further divided into subsystems. Consequently, regardless of where the system boundaries are set, interactions with the environment cannot be ignored, lest the solutions adopted become meaningless (Van Gigch, 1991). Hence, the given constraints and the surroundings' effect on the system also have to be described. For a logistics system this may involve the context in which the system operates, laws, culture, market, uncertainties (more about uncertainties in section 5.6), etc

From the above considerations it is possible to argue that the definition of the system is a very important aspect to consider when making an analysis of a logistics system. Important questions to answer in relation to this are *what is included in the studied logistics system, where is the system boundary and what in the surrounding affects the system, i.e. what is excluded?* Hence, in a logistics system the following description aspect needs to be considered:

Description aspect II: Boundary and surrounding

5.3 INTERRELATED ELEMENTS

The next main feature of an organisation used in this thesis as the basis for developing unique main features of a logistics system and description aspects is that an organisation, according to systems theory, consists of *interrelated elements*.

As stated earlier, all systems consist of interrelated elements and the same applies to organisations. Each of a system's elements is directly or indirectly connected to every other element (Ackoff, 1971). "The notion of structure relates to the form of the relationships that bind the elements of the set together" (Van Gigch, 1991). Furthermore, a system's functions and the effectiveness with which they are carried out depend on the type and form of interrelationships between the system's elements (Van Gigch, 1991). Consequently, the structure of the elements depends on the relation between the elements and affects the total performance of the system. This it is in itself an important factor for explaining the magnitude of outcome. In addition, the structure of the elements can of course be simple or complex, depending on the number and type of interrelationships among the parts of the system (Van Gigch, 1991). This is illustrated by the following quote from Mintzberg (1983) in which he defines the structure of an organisation.

"The structure of an organization can be defined simply as the sum total of ways in which its labour is divided into distinct tasks and then its coordination is achieved among these tasks."

(Mintzberg, 1983)

Complex systems involve hierarchies that are ordered levels of elements (Van Gigch, 1991). Like other complex systems, a logistics system consists of a set of interrelated elements. An element means in Latin (*elementum*), basic ingredient, part, component, or unit (part of a whole), which in this thesis is translated into main tasks, groups of activities or activities that directly or indirectly support the flow in focus (the function of subsystems). It is important to highlight that element is not the same as organisational unit; they are functions that have different tasks (task logic). How an organisation has chosen to organise themselves is

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another logic. Like other systems, the elements can also be divided or grouped into subsystems, which are systems in themselves and thus parts of a larger system.

One of the main reasons for creating organisational units is the need for specialised knowledge and skills (Mintztzberg 1976). This means that the task of the interrelated elements of that system is close to the function of the unit. Moreover, a function oriented organisation is based on personnel and entities performing similar tasks that require similar skills and equipment which are grouped into one unit. As a consequence, units perform activities that belong to different processes. In Aronsson's (2000) opinion, this points to the fact that units are specialised. Specialised units perform specialised functions. However, the functional and processual division are interdependent and as a consequence both perspectives have to be taken into account (Aronsson, 2000).

The supply chain view of designing and hence structuring systems is that the processual perspective should govern the design of the elements (Aronsson, 2000). The interrelation prioritises the internal coordination between elements¹ along the flow. Since logistics management is a flow-oriented concept (Christopher, 2005). Furthermore, the aim of a flow-oriented structure is to reduce costs in terms of utilisation, economies of scale and scope, and the handling of uncertainties (Aronsson, 2000). The structure must thus be described, analysed and understood both in its entirety and in its parts in order to be able to permanently improve it. It might then be useful to examine the various elements characteristics. One way of doing it is to divide them into *core*, *control* and *supporting* elements (Bruzeliuss and Skärvad, 2008). Due to the fact that a logistics system is flow-oriented, the elements connected directly to the flow are *core elements*. It is these elements that transform input to output, i.e. the actual production of the system. The *control elements* plan, determine and control the operational work, provide guidelines and principles, and also decide how resources shall be allocated. Timetabling, executive duties, business planning and strategic work are all examples of work within control elements. The core elements and the control elements often need elements to support them, e.g. administration. The *supporting elements* receive assignments from the core elements or control elements and can never be the trigger for generating production in other units.

From the above discussion it is possible to argue that the second main feature of a logistics system, which makes such a system unique, linked to the organisation consisting of interrelated elements, is as follows:

Feature 2:

A logistics system has a flow-oriented structure

¹ The term element is in this thesis used to underline the fact that the theoretical basis is system theory, i.e. a system is a set of interrelated elements. This is however close to the concept of functions, as in task division and not organizational units, within organizations.

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To be able to analyse if a system fulfils this second main feature, the structure of the system has to be described. The definitions of logistics and supply chain management imply that various types of flows are subject to examination. The functional perspective is necessary to be able to describe how the order and delivery processes are structured and how the different activities are grouped together (Aronsson, 2000). The description of the structure monitors the division of labour and responsibilities. The level of abstraction of the system described decides what are to be considered elements and what are to be considered sub-functions and activities within an element. Rather than describing how a process is structured, the functional picture gives a description of how resources are organised and how responsibilities are divided between functions (Aronsson, 2000). The focus of structure within a logistics system is therefore on operative organisation rather than organisational organisation.

It is fundamental to indicate the positions of different elements and relations at a given time when describing the real world or part of it as a system (Arbnor and Bjerke, 1997). Abrahamsson and Aronsson (1999) also stress the importance of knowing how included elements within a logistics system are related to each other. The structure of the logistics system represents the functional perspective and provides a picture of how functions are related to each other. It can be said that functions carry out the same types of operation for different types of product whereas processes, flows or chains represent a series of different operations (undertaken in different units) for the same type of product. To capture a system's structure, some areas to describe are how functions are related to other functions and a description either by what activities the function consists of or by a description of the functions' responsibilities (Aronsson, 2000).

From the above considerations it can be argued that the structure of a logistics system is the interrelated elements where the elements and their primary tasks are connected directly or indirectly to one or several flows performed by resources and organised by units. They are related directly or indirectly to each other through the main flow, by information or by sharing resources. Moreover, within a logistics system, output from one element is often input to another in terms of materials, orders or directives. Important questions to answer in relation to this are *what are the elements of the system, what are their main tasks, activities and responsibilities, and how are the elements related to each other?* Hence, in a logistics system the following description aspect is to be considered:

Description aspect III: Structure

5.4 INPUT AND OUTPUT

The next main feature of an organisation used in this thesis as the basis to develop unique main features and description aspects of a logistics system is that an organisation, according to systems theory, has both *input* and *output*.

As mentioned earlier, an open system is open for exchanges of material (or energy) with its environment (Emery, 1972). Von Bertalanffy (1950a) calls a system opened when the system

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has input from its environment and thus output from the system to its environment. Furthermore, input to the system is changed by means of a transformation process into output, which constitutes the result (Van Gigh, 1991). According to the definition of logistics management (CSCMP, 2012), logistics aims to meet customer requirements and extends from the point of origin to the point of consumption. Consequently, the output can then be seen as customer service which is also the case in this thesis. Since the logistics system's aim is to meet customer requirements the point of origin should be the customer order and thus the input to the system. The customer order is then transformed into customer service in the logistics system. Customer requirements are also in general concerned with the total time from order to delivery (Stock and Lambert, 2001). A more efficient supply chain can be achieved by means of integration between order and delivery cycles by sharing information and decisions taken about pipeline capacity and the process perspective should be addressed before the functional perspective so that the flow focus can be upheld (Aronsson, 2000). The transformation in a logistics system is thus driven by customer order (input) and the delivery of it (customer service, i.e. output) in a flow-oriented process.

A process is seen as a standardised series of repetitive activities that transform input into a result. Since the process creates the result, the process should primarily be optimised, controlled and improved, and not the functions (Rentzhog, 1998). However, according to Abrahamsson and Aronsson (1999) it is the total system that should be in focus when measuring logistics performance. Consequently, processes should be in line with the total systems objective. The supply chain view of designing systems is that the processual perspective should govern the design of the functions (Aronsson, 2000). However, one definition of a process is:

“Any activity or group of activities that takes an input, adds value to it, and provides an output to an internal or external customer. Processes use an organisation’s resources to provide definitive results”

(Harrington, 1991)

This type of process definition focuses on *how* input transforms to output. Rentzhog's (1998) definition focuses more on the identification of activities to interconnect them in a flow structure and also emphasises the iterative nature of the process.

“A process is a chain of activities which in a recurring flow creates value for a customer”

(Rentzhog, 1998)

To these definitions with a focus on *how* and *repetition*, Egnell (1994) adds that a process must have a specific beginning and end.

“A process consists of a series of activities with a specific start and end, and with the help of an organization’s resources, recurring refine a measurable item from a supplier to a predetermined measurable results”

(Egnell, 1994)

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From a logistics perspective a process begins with a customer order, external or internal, and concludes with the demand having been met. (Oskarsson et al., 2006) include all these definitions in the requirements for a process, but they also add some valuable insights.

- A process is a chain of activities with a specific beginning and end.
- A process is both intended and repetitive.
- A process has distinct goals, defined steps that are involved, and expected outcomes.
- A process includes several activities, often both administrative and operative, and is cross-functional.

This means that the transformation of orders into customer services can be predictable, has a distinct beginning and end, is intended, is repetitive, and has defined steps and an expected outcome. Furthermore, from the above considerations it is possible to argue that an additional feature that makes a logistics system unique, linked to the organisation being opened and bounded, is as follows:

Feature 3:

A logistics system transforms orders into customer services in a flow-oriented process

A logistics system produces something through a flow-oriented transformation, i.e. the transformation represents a process perspective. Consequently, the description of the transformation should explain how the main flow changes through the system's activities. To achieve the organisational goals the transformation can be described at different levels, from main activities (e.g. in traditional logistics described by sourcing, production and delivery) to detailed activities (e.g. picking or order handling).

However, the transformation within the logistics system is an aspect to consider when describing such an order and delivery driven process. One way of describing it is by means of the customer order cycle. It starts with the placement of an order and ends when that order has been filled. The customer order cycle has an integrating role which connects the customer with the organisations as the supplier. The perspective is of activities and as a consequence the structure (functional perspective) behind these activities' taking place is invisible. The customer order cycle exists in all parts of the organisation, for both external and internal customers. Figure 10 shows the customer order cycle six components in which the customer places an order which is received by the provider who then fills the order and delivers it. The first part of the order process consists of administrative activities whereas the second is a fulfilment phase. A key to manage the customer order cycle is information technology to provide and support communication that links customer and supplier together (Stock and Lambert, 2001).

Figure 10 The typical order cycle components (Oskarsson et al., 2006)

From the above considerations it can be argued that the transformation within a logistics system starts with an order from an external or internal customer and ends when the order is filled. It is a cross-functional and flow-oriented process. The transformation is here described by the customer order cycle. Important questions to answer in relation to this are *which is the main flow's process, how are the transformations carried out, and how does the system's customer order cycle operate?* In a logistics system the following description aspect therefore has to be considered:

Description aspect IV: Transformation

Depending on the circumstances, what is considered to be the input and output may vary. The difference between input and resources can be slight and is also dependent on point of view and circumstance (Van Gigh, 1991). The purpose of this thesis requires both input and output to be defined. The input begins the transformation and the logistics' production is based on what is demanded by the customer. Consequently, input to a logistics system is in this thesis the demand. From the definition of logistics management (CSCMP, 2012) where logistics extends from point of origin to point of consumption which is done in order to meet customers' requirements, the output can be seen as customer service. To provide customers with the level and quality of service that they require is the entire purpose of logistics management and supply chain management, and to do so at less cost to the total supply chain (Christopher, 2005). This is also in line with Lambert et al. (1998) and Stock and Lambert (2001). Accordingly, the underlying principle of logistics systems recognises the importance of customer service (Langley et al., 2008).

However, a logistics system's transformation is based on what is demanded. Hence, the demand has to be described by its characteristics and mapped for the system to operate predictably. The demand can be seen as "fixed", handled as surroundings, or seen as

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effectible, e.g. by marketing, and handled as a part of the system. It is important to specify whether or not they come under the control of the system designer (Van Gigch, 1991).

The demand has to be managed by balancing the organisation's capability against the customer's requirements (Stock and Lambert, 2001). Demand which enters the system (not a part of the system) cannot be controlled. However, within the system production planning has control of the demand and is thus controllable and self-inflicted. Consequently, there is a benefit in separating external demand (a given factor) and internal demand (a part of the system). Demand can also be further divided into dependent and independent demand. Dependent demand is directly related to, or derives from, the demand for another function or activity within the logistics system and the other way around (Christopher, 2005). Independent demand is when it is not a function of demand for other function or activities. This distinction is crucial when planning for the transformation of demand to fulfilled order. The independent demand can be forecast using traditional methods but the dependent demand must be calculated because of the requirement for interaction with the next level in the logistics chain.

From the above discussion it is possible to argue that the next description aspect to consider to be able to evaluate a logistics system is the aspect of demand. An important question to answer in relation to this is *what type of demand (input) enters the logistics system?*

Description aspect V: Demand

Customer service represents the output of the logistics system (Stock and Lambert, 2001). For this reason, that the demand is transformed by the logistic system to customer service, the customer service also has to be described. The customer service is an important aspect since it is not possible to make defined decisions concerning logistics issues without determining the customer service objectives (Stock and Lambert, 2001). In a broad sense, "customer service is the measure of how well the logistics system is performing in providing time and place utility for a product or service" (Lambert et al., 1998). Langley et al. (2008) use this definition of customer service:

"Customer service is a process for providing competitive advantage and adding benefits to the supply chain in order to maximize the total value to the ultimate customer."

(Langley et al., 2008)

Customer service is not to be confused with the concept of customer satisfaction, which is an even broader concept that encompasses customer service (Lambert et al., 1998). Customer service is in the hands of the organisation that deliver the product or service. Customer satisfaction, on the other hand, is the customer's perspective and is not the focus in the description of a logistics system (in this thesis). However, no two customers will ever be exactly the same in terms of their service requirements but it will often be the case that customers fall into groups or 'segments' that are characterised by a broad similarity of service needs, so called 'service segments' (Christopher, 2005).

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From the above discussion it can be argued that the input to a logistics system can be raw material which is transformed into customer products or, in a somewhat broader perspective, customer demand that is transformed into customer service. The flow in focus depends on what input is chosen and the output also depends on the transformation within the system, which is also chosen. It is thus dependent on the observer's perspective. Consequently, the next description aspect to consider to be able to evaluate a logistics system is the aspect of customer service. Important questions to answer in relation to this is *what does the logistics system produce in terms of customer service (output) and which different types of customer segments are to be satisfied?*

Description aspect VI: Customer service

5.5 CONTROLLED

Another main feature of an organisation, according to systems theory, and used in this thesis as the base to develop unique main features of a logistics system and description aspects is that an organisation is *controlled*.

The behaviour of the system and the outcome of the behaviour are both variable and chosen, Ackoff (1971). Consequently, there is a choice to make, and the system must therefore be controlled so that it does not become a drifting ship on a stormy sea. This is done by one or more purposeful elements which are responsible for choosing from among different courses of action, i.e. the organisation is controlled (Ackoff, 1971). The transformation process changes the input into the output, which then forms the result (Van Gigh, 1991). As the logistics system is an opened system it also has input that transforms to output with the assistance of resources. The transformation requires resources, e.g. personnel, buildings, materials and equipment. One way to describe resources is to count them as costs (Van Gigh, 1991). Resources can be defined as objects that are used in the transformation, but not transformed or consumed by production (such as materials). It then follows the logic of that activity consumes resources that in turn drive costs, as in activity based costing. It then becomes a measure of cost of the transformation.

However, it is through effective business logistics management that a firm fully controls numerous customer service elements (Langley et al., 2008) and this must be controlled against predetermined standards (Christopher, 2005). Grant et al. (2006) also highlight the importance of standard performance of customer service. Customer service consists of many activities that in the end meet customers. Christopher (2005) and Stock and Lambert (2001) use three perspectives to capture the whole spectrum of customer service; pre-transaction, transaction, and post-transaction. The pre-transaction element concerns the organisation's ability to give the customer a clear picture of what service to expect. The transaction element refers to the actual delivery. Finally, the post-transaction relates to the organisation's ability to provide spare parts and handle complaints and product returns.

The above discussion indicates that a logistics system has the ability to choose behaviour and output. Consequently, a logistics system can control the transformation of demand to

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customer service and the cost of that transformation. Another main feature that makes a logistics system unique, linked to an organisation being controlled, is as follows:

Feature 4:

A logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources

To be able to evaluate a system's ability to control its transformation, the systems control function has to be described. Ackoff (1971) states that at least one element has a system control function. Control includes responsibility for continually adjusting the organisation's current and potential capacity to the current and potential demand from the environment (Emery, 1972). The control instruments continuously sense the environment outside and inside the organisation by which management tries to capture changes that may be disturbances and adjust activities in the system so that the discrepancies are eliminated and the system equilibrium is maintained. Prerequisites are thus that the control elements scan and capture disturbances in time and that adequate resources are in place to prevent the disturbance having a negative impact on the system. The system thus needs support to be able to be controlled and managed. A major influence on logistics and a contributing part to logistics management development is computer technology since logistics management needs to process large amounts of data due to the embedded holistic view. IT is now fundamental both as a control and communication tool to develop a company's logistics (Stock and Lambert, 2001). This indicates that a proper IT system is probably an important part in organisations' control on a daily basis, to link customer and supplier and in efforts to improve flow efficiency.

The above section indicates that the next description aspect to consider, being able to evaluate a logistics system, is control. This aspect also includes planning and management of the system. Important questions to answer in relation to this are *how are resources planned and managed to meet demand* and *how is the system managed?*

Description aspect VII: Control

To be able to choose a course of action, the control elements need information, i.e. feedback (Checkland, 1981). This can be compared with a regulator, i.e. the feedback is used to modify and in that way reduce the differences between actual and desired performance. By having control instruments continuously sense the environment outside and inside the organisation management tries to capture changes that may cause disturbance. This is primarily done by the principle of negative feedback (Checkland, 1981). That is the same principle as for general open systems (Katz and Kahn, 1966a). Prerequisites are thus that the control elements scan and capture the disturbances in time. The adjustment that must follow after the control elements have captured the disturbance in the system, to be able to reduce the disruptions is presented in the next part of this chapter. The control feature is intended for awareness and the adaptation more too handling and taking action based on the feedback.

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Logistics management requires monitoring and evaluating the performance of the supply chain regularly and frequently since the business environment is dynamic by nature (Lambert et al., 1998). Effective management and real cost savings can only be achieved by viewing logistics as an integrated system and minimising its total cost given the firm's customer service objectives (Stock and Lambert, 2001). Consequently, feedback on performance measurements is needed, which is also underlined by Bowersox et al. (1995) where performance measurement is identified as one of four key areas to achieve world-class performance in logistics. The control aspect can be operationalised as the best performance metrics for measuring logistics success (Stock and Lambert, 2001).

Most organisations have performance measurements or metrics in place to control, analyse and evaluate their efficiency and progress over different periods of time (Langley et al., 2008). Those measure or metrics can be used for setting baseline performance objectives or expected outcomes, e.g., orders filled and shipped per day. Quantitative descriptions are also a common way to describe a logistics system and to make its relationship between input and output understandable (Christopher, 1971). Furthermore, it is an advantage to measure on a structural level and document it to evaluate the total effectiveness of a logistics system as a whole (Abrahamsson and Aronsson, 1999). As an extension, the potential in quantum-leap improvements can then be fully explored.

Good performance measures and key performance indicators (KPIs) give the logistics system more advantages than control over total logistics costs and customer service. (KPIs are a few strategic metrics for managing a firm's logistics (Langley et al., 2008).) According to Gunasekaran and Kobu (2007) "it will facilitate a more open and transparent communication between people, leading to a co-operative, supported work and hence improved organisational performance". Parker (2000) points out some other reasons for organisations to measure performance, e.g. to identify success or where problems such as bottlenecks, waste, etc. exist and where improvements are necessary. Other reasons mentioned include: to help the organisation to understand its processes and to confirm what they know or reveal what they do not know and to ensure that decisions are based on facts and to check if planned improvements actually materialised. Furthermore, measurement is a tool to develop businesses for the better, for example through benchmarking against best practice, to know what to focus on or identify areas for improvement. Measurement allows the improvement projects to be based on facts and knowledge about the reality. The reason is that not everyone has the same view of reality and general opinions should be met with facts. Measuring or using performance measurements within an organisation are merely a tool for more effective management and not ends in themselves. Measurements do not tell why things happened or what to do about it; the results just indicate what happened. Performance measures are also embedded with politics, emotions and several other behavioural issues (Gunasekaran and Kobu, 2007). Measurement has strong control effects, which means that it can lead to manipulation and undesirable behaviour. What is measured gets done is therefore not always true. The desired impact of measuring may not always be achieved, leading to the question of what is the "right" measure to achieve proper control. Consequently, performance measures need to be connected to a strategic context, because of

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the way they influence what people do. Moreover, to achieve overall organisational or logistics objectives, lower-level measures must connect directly to the high-level performance measures of the organisation or the logistics (Langley et al., 2008). In order to make an organisation effective, the performance measurement outcome must be able to make the transition from measurements to management and as long as the logic behind the logistics system itself is not fully understood, designing a measurement system for a logistics system will remain a problem.

Since the character of logistics cuts across traditional company organisation functions with cost impacts on most of those functions the measurements have to capture the performance along the flow as well as the performance of the functions. Christopher (2005) illustrates that the logistics mission cuts across functional boundaries, see Figure 11.

Figure 11 Logistics missions cut across functional boundaries, consequently the same as for the performance measurements (Christopher, 2005)

Hence, within a logistics system measurements are chosen to give information about the state of the logistics system to capture the whole system's performance. Accordingly, additional main feature that make a logistics system unique, linked to an organisation being controlled, is as follows:

Feature 5:

A logistics system measures to capture the whole system's logistics performance, including total logistics costs, lead times and customer service

Since measuring performance is a multi-dimensional problem and there is not one measurement that can capture the whole complexity of the underlying logistics system (Mentzer, 1991) Aronsson and Andersson (2002) suggests a division based on the purpose of the KPIs. The division is based on whether the measurement's purpose is to measure process or functional performance, see Figure 12. Furthermore, they also combined that division with the engineering approach by focusing on physical measurements or the financial approach on financial KPIs. The division between physical and financial KPIs is based on the type of measurement system used to capture data. Neely et al.(1995) state that

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it is important to define where the data is gathered from. Process performance measures the output of physical and administrative processes, primarily the order and delivery process, i.e. the transformation within the logistics system. Representative measures are lead times, delivery service and cash to cash, whereas functional performance measures within a function, the input to a function or between functions. This means that these measures, unlike the process performance measures, often have a unit perspective. Typical measures are costs, productivity and utilisation, i.e. measures from of the structural perspective within the logistics system. Aronsson and Andersson (2002) argue that it is necessary to use measurements from all of these four groups to fully capture the underlying logistic system. This thesis therefore uses the division of KPI pursuant to Figure 12 to analyse whether the system under study fulfils the main feature, number 5, of a logistics system.

Physical KPI	Lead time, Customer service, Process flexibility	Utilization, Productivity, Turnover rate
	Difficult, there are some methods such as Activity Based Costing	Budgets, costs for used resources, ROI
Financial KPI	Process performance	Function performance

Figure 12 Process and function performance (Aronsson and Andersson, 2002)

By the above discussion it can be argued that the next description aspect to consider to be able to evaluate whether the system under study measures to capture the whole system’s logistics performance, is the description aspect of performance measurements. The measurements shall capture both the process’s performance, along the flow and across functional borders, and the functional perspective by means of both physical and financial KPIs. The division of measurements also points to the fact that effective and efficient logistics systems require both efficient and effective processes (transformation) as well as functions (structure). Important question to answer in relation to this are *what physical and financial KPIs are used to monitor process and functional logistics performance?*

Description aspect VIII: Performance measurements

5.6 ADAPTIVE

Another main feature of an organisation (based in the systems theory) used in this thesis to be able to develop unique main features of logistics system and description aspects is that an organisation is *adaptive*.

As an open system, an organisation is constantly exposed to uncertainty from its surroundings, but also from factors within the system. Uncertainties can for example be

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cyclical and seasonal variations in the demand for the organisation's products or services. Control thus includes responsible for continually adjusting the organisation's current and potential capacity to the current and potential demand from the environment (Emery, 1972). However, a logistics system can be seen as an adaptive system since it fulfils Ackoff's (1971) definition of an adaptive system, i.e. it has the ability to modify itself or its environment when either has changed to the system's disadvantage so as to regain at least some of its lost efficiency. The logistics system tries to manage disturbances with different forecasting tools, planning techniques and information sharing between different departments within the organisation but also by safety margins, e.g. stocking. An important adaption is to adjust the organisation's current and potential capacity to the current and potential demand from the environment. This is done by most organisations by forecasting customer demand to make a production plan for each function involved. One strategy is to produce before the "real" demand is known. This has to do with customers' unwillingness to wait for materials to be purchased and the product to be produced and finally distributed. The point in the logistics chain of activities where real demand meets the plan is called the demand penetration point. Upstream from this point everything is driven by forecasts and downstream the organisation can respond to customer demand (Christopher, 2005). This point is also known as the *decoupling point*. An example of this is shown in Figure 13 where the shift in strategy from lean to agile is the decoupling point. However, a decoupling point might occur at other points in the flow; it is basically just a point in the flow where there is a decoupling; a queue for example may cause such a point.

Figure 13 An example of a decoupling point; a shift from a lean to an agile strategy (Christopher, 2005)

Another strategy to meet demand is presented by Olhager and Johansson (2012), who address the timing and amount of capacity acquisitions relative to demand. The two extreme capacity strategies lead and lag demand (adapted from Hayes and Wheelwright (1984)) imply that capacity is acquired in advance of any demand increase or that capacity is never added if it cannot be fully utilised with new demand. In logistics the pull and a push approach is also a strategy for meeting customer demand. Pull relates to "pulling" products through the system and is sometimes called a "reactive" system or an agile strategy. The push strategy also uses inventory replenishment to handle anticipated future demand. A pull strategy applies more to independent demand and a push strategy to dependent demand (Langley et

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al., 2008). If there is a shift between these two strategies within the same flow, this point can be, and is, often called a decoupling point.

The discussion above indicates that a logistics system is an adaptive system. Consequently, to be able to meet demand a logistics system has to have a strategy to meet it, whether the choice is a conscious one or not. Moreover, to be able to use the chosen strategy the logistics system needs to have adequate resources in place to prevent the disturbance having a negative impact on the system. This involves adapting and adjusting the organisation's current and potential capacity to the current and potential demand from the customers. It also includes the organisation needing to plan its capacity. The next main feature that makes a logistics system unique, linked to an organisation being adaptive, is therefore as follows:

Feature 6:

A logistics system has a strategy to meet demand

When an organisation is exposed by messes (Ackoff, 1974), internal or external, the organisation tries to parry by changing its own elements, the relation between the elements and/or its relation to its environment. An organisation is, as presented earlier, controlled by one or more purposeful elements which are responsible for choosing from different courses of action (Ackoff, 1971). The challenge is to maintain equilibrium to keep the system efficient, i.e. the basic principle, maintaining the system's character (Katz and Kahn, 1966a). This means that the element can be modified but the output remains the same, like a body that maintains its temperature despite it getting colder around it. Measurements are thus needed as management decision support on the basis that management requires support for both process and functional orientation.

One of the most critical tasks for organisations for decision-making and control is the availability of information about logistics KPI. Accurate cost data and accounting are therefore required to manage and control logistics operations as well as monitor logistics performance. Lambert et al. (1998) state that performance analysis is almost impossible without accurate cost data. The reason is that most decisions will lead to some costs increasing and others decreasing. In the same way, reducing the costs of individual activities can lead to increased costs of other components and total costs as well (Cavinato, 1992). It may also be case that an individual part of the system should not be operating at its lowest cost to contribute to the system's overall efficiency (if efficiency is measured in costs) (Langley et al., 2008). A choice between several alternatives makes it is therefore essential to capture the total cost of change that each option causes. However, without a measure of the total system performance against which costs can be compared, cost data means nothing whatsoever. Another aspect is that structural changes can be quantitatively measured by logistics performance but will also result in several non-quantitative effects (Abrahamsson and Aronsson, 1999).

It can be concluded that performance measurements are elementary to managing and controlling logistics operations as well as monitoring logistics performance, calculating the consequences of structural changes, foreseeing what is possible to achieve and setting

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realistic goals. The logistics measurements should be used to regulate the logistics systems behaviour towards desired performance. Another main feature that makes a logistics system unique, linked to an organisation being adaptive, is therefore as follows

Feature 7:

A logistics system uses logistics measurements as feedback to regulate its behaviour to reduce differences between actual and desired performance.

5.7 THEORETICAL SUMMARY, DESCRIPTION AND ANALYSIS MODEL

The intention of this thesis is to present a method of evaluating a healthcare organisation by means of the main features of a logistics system. This is in order to provide a basis for management, control and controllability to such a system. The theoretical base in the development of the main features of a logistics system lies in systems theory linked to an organisation's main features. The fundamental basis is that a system is a network of related elements or activities that must be understood as a whole. The objective is to operate the whole system effectively, not just the individual parts.

The system approach is widely problematised in a philosophical manner, but few researchers applying the systems approach in a concrete and distinct way. This has however been done in this thesis. The selected main features of an organisation for the purposes of the study are that an organisation is *purposeful, opened and bounded*, consists of *interrelated elements*, has both *input and output*, and is *controlled and adaptive*. See Table 6 for a summary of these main features of an organisation and their content. These features are valid for many systems and by considering them from a logistics point of view both the main features of a logistics system and description aspects of such system can be designed.

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Table 6 Organisation system’s main features and their content

Organisation system’s main features	Content
Purposeful	An organisation has meaning through having an aim
Opened and bounded	An organisation is open for exchange with environment by transforming something from it It has an environment which affects its state The bounded system can be controlled.
Interrelated elements	An organisation consists of a set of interrelated elements (functions of subsystems)
Input and output	An organisation transforms something from input to output with the assistance of resources Its behaviour and the output of the behaviour are both variable and chosen
Controlled	An organisation is controlled by purposeful elements which are responsible for choosing from different courses of action. These elements are also responsible for continually adjusting capacity to demand from the environment
Adaptive	An organisation has the ability to modify itself or its environment when disadvantages appear, by using feedback to reach equilibrium again

The seven main features of a logistics system that have been developed in this chapter is presented in Table 7 below. These features are additional features to the features of an organization and are thus unique to a logistics system. Consequently a logistics system possesses thus also these main features. However, the overall objective of a logistics system and the first main feature is to fulfil its purpose; *to meet customer requirements by cost-effective delivery service through flow orientation by prioritising total performance.* The other main features can then be categorised based on how they support the main purpose of a logistics system. It can be argued that the other main features can be divided into two parts. The first concerns the system’s design to achieve the overall objective, i.e. how the system is meant to work to perform its duties. This is strongly connected to the flow-oriented structure of the system, which is a functional perspective of the design main feature 2. Likewise, the order and delivery driven transformation within the system is a process perspective, main feature 3. The second part concerns the management and control of the logistics system, i.e. how resources are applied and used in the system and how it is measured and regulated to perform its duties. This is strongly connected to the features of control of the transformation, measure of total performance, strategy to meet demand, and adaptation to desired performance (main features 4-7). The figure below shows the categorising of the main features, which is also the basis for the analysis of the case hospital in chapter 7.

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Table 7 A logistics system’s main features and their content

Logistics system’s main features	
Overall objective	
Feature 1	A logistics system’s purpose is to meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance
Design	
Feature 2	A logistics system has a flow-oriented structure
Feature 3	A logistics system transforms orders into customer services in a flow-oriented process
Management and control	
Feature 4	A logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources
Feature 5	A logistics system measures to capture the whole system’s logistics performance, including total logistics costs, lead times and customer service
Feature 6	A logistics system has a strategy to meet demand
Feature 7	A logistics system uses logistics measurements as feedback to regulate its behaviour to reduce differences between actual and desired performance

The main features of a logistics system are to be used for analysing how well the two cases, represented by two different healthcare organisations, fulfil these features. Ultimately the analysis provides a picture of how flow-oriented these organisations are, which in the end, hopefully, give insights for potential flow efficient improvements. The analysis model is presented in Figure 14 below.

MAIN FEATURES AND DESCRIPTION ASPECTS OF LOGISTICS SYSTEMS

Figure 14 Analysis model, the purpose of a logistics system and the two main parts to achieve its objectives

However, to be able to analyse the case hospital and its features as a logistics system, the case hospital has to be described, although to be able to describe a system, simplifications of reality need to be made. Consequently, not all information can be described; the object differs depending on the viewer. The eight description aspects, defined in this chapter, are considered to cover the picture of a logistics system to be able to analyse it by means of the analysis model. The description aspects are one way to ensure a logistics focus when describing the “real” world. The description aspects are derived, as well as the main features of the logistics system, from the main features of an organisation. The logic is: if a system has this special main feature what has then to be describe to be able to evaluate whether the studied system has the presented logistics systems main features. This provides a description model, which is presented in Table 8. The eight aspects to consider when describing a system have no distinct frame and sometimes overlap.

MAIN FEATURES AND DESCRIPTION ASPECTS OF LOGISTICS SYSTEMS

Table 8 Description model, a logistics system's description aspects, the outcome of the description and questions to answer when describing the system

Description aspects	Outcome of description	Questions to answer
Purpose	The description of the purpose provides a picture of what the system wants to achieve	What is the purpose of the system?
Boundary and Surrounding	The boundaries define the factors that are important for the system to consider but are beyond its control, i.e. given factors. The description of the opened system's context gives an opportunity to explain and understand an individual component.	What is included in the studied logistics system? Where is the system boundary? What in the surroundings affects the system, i.e. what is excluded?
Structure	The structure describes the functional organization and gives a picture of how resources are organized, how responsibilities are divided between functions and how functions are related to each other. Hence, the functions are specialized and are to support the flow.	What are the elements of the system? What are their main task, activities and responsibilities? How are the elements related to each other?
Transformation	The description of the chain of activities in the transformation process, which has a specific start and end, is repetitive and cross functional. It focus on the core flow to where resources are primarily planned and managed to be integrated in that particular flow.	Which is the main flow's process? How are the transformations carried out? How does the system's customer order cycle operate?
Demand	The demand describes what enters the system as orders and that the system convert's into customer service.	What type of demand (input) enters the logistics system?
Customer service	The customer service gives a picture of what the logistics system is performing in providing time and space utility for a product or service.	What does the logistics system produce in terms of customer service (output)? Which different types of customer segment are to be satisfied?
Control	The control description presents how the control elements control and plans system operations, as well as senses the system environment. It also describes how the system analyzes and evaluates the logistics system's efficiency and progress over different time periods.	How are resources planned and managed to meet demand? How are the system managed?
Performance	The performance aspect gives a picture of which measurements the system use.	What physical and financial KPIs are used to monitor process and functional logistics performance?

6 DESCRIPTION OF THE CASE HOSPITAL

*In the previous chapter the analysis model of a logistics system's main features and the description model of it was developed and presented. In this chapter, two cases will be described by means of the eight description aspects, i.e. **purpose, boundary and surrounding, structure, transformation, demand, customer service, control, and performance** (see page 68). This is done in order to illustrate examples of how to view healthcare organisations to be able to analyse them as logistics systems. The information used is collected from interviews, observations, business system or the case hospital's homepage.*

DESCRIPTION OF THE CASE HOSPITAL

6.1 INTRODUCTION

The case hospital is part of an organisation along with three other divisions located in four different cities in southern Sweden. The case hospital is their main facility, where they have overall responsibility for all activities. They have approximately 500 employees and a turnover of just over SEK 600 million (Hässleholmssjukhusorganisation, 2013). The hospital is divided into two clinics: a community healthcare clinic and an orthopaedic clinic. The hospital provides scheduled and emergency primary healthcare, internal medicine, medical rehabilitation, and planned orthopaedic operations. Some general facts about the hospital from year 2011 are presented in Table 9. The case organisation is known for being a good care provider, particularly in orthopaedics where they perform the most knee and hip arthroplasty operations in Sweden.

Table 9 General facts about the case hospital

Production	4,000 operations 36,000 outpatient visits to physicians 26,000 outpatient visits to other professionals 6,000 hospitalisation 8,000 emergency patients
Beds	~110
Number of employees	~570 Approximately 17% work part-time
Professionals	Nurses 26% Assistant nurses 25% Physicians 17% Medical secretaries 8% Management/administrators 9% Physiotherapists/therapists: 5% Other 8%

6.2 PURPOSES AT THE TWO CLINICS

The first aspect that describes a system is its purpose. The purpose of the logistics system is the overall objective that the system is intended to achieve. The description of the cases indicates how they prioritise logistics issues. An important question to answer in relation to this is what is the purpose of the system?

The two clinics' managers gave the following purpose formulation related to their logistics for the research project *Lean and Agile*.

Increase patient time and more flexible resource utilisation, especially of hospital beds (in the range of 90-130%) (Community healthcare clinic.).

And...

Increase the number of surgeries, "mission doubling" (surgery doubled by the capacity of existing resources) (Orthopaedic clinic).

The operational development manager, who is also the hospital's head of the research project, stated in their organisational principles another goal for the organisation.

DESCRIPTION OF THE CASE HOSPITAL

“We will organize ourselves so that our patients receive the best possible care based on available financial resources.” (Independently translated, Organisational principles)

And...

“We must organize ourselves so that continuous changes in our operating environment will become, as far as possible, assets that can benefit us” (Independently translated, Organisational principles)

Expressed goal from unit managers and planners, are for example; to keep the health care guarantee and to manage their mission from the County Council. It is also mentioned that all Lex-Maria deviations (a Swedish healthcare law) should be reported and that they also should be reporting more in the deviation management system.

6.3 BOUNDARY AND SURROUNDING

The next description aspect to consider when describing the two cases is boundaries and surroundings. Logistics systems, like all organisations, are open systems which mean that they affect and are affected by their surroundings (the superior system). The surroundings’ effects on the logistics system must thus be seen as given factors. As a consequence, the system has to be bounded and defined. The boundaries define the factors that are important for the system to consider but are beyond its control, i.e. given factors. The description of the open system’s context gives an opportunity to explain and understand an individual component. Hence, important questions to answer in relation to this are what is included in the studied logistics system, where is the system boundary and what in the surroundings affects the system, i.e. what is excluded?

The two clinics at the case hospital represent the two systems that are going to be described and analysed based on the logistics system’s main features. Accordingly the organisational structure represents the two systems. These clinics provide care under the same roof at the same hospital but have fairly little contact in terms of patients. There are, however, two exceptions to the organisational division. At the orthopaedic clinic, the Sports Injuries practice is excluded. That function is relatively small and has almost no relation to the other elements at the clinic. At the community clinic, the Pain and Memory wards are excluded. These functions are fairly small and have almost no relation to the other elements at the clinic. They can both be seen as independent activities, because it is always a choice whether the system should be able to influence or not.

The constraints on the systems or subsystem provide the boundaries within which it must operate, which in these cases are, for instance, that the hospital is part of the Swedish public sector. They are thus funded by their County Council, which gives the hospital an assignment defining how much care they have to produce each year. The two systems are of course also affected by laws, political decisions, population structure in the catchment area, and requests for care.

6.4 STRUCTURE

The next description aspect is how the cases are organisationally structured. The structure refers to how the involved elements² are organised, i.e. their tasks, responsibilities, goals, relationships, and interaction with other functions. Important questions to answer in relation to this are: what are the elements of the system, what are their main tasks, activities and responsibilities, and how are the elements related to each other?

6.4.1 Structure of the community healthcare clinic

The community healthcare clinic consists of twelve units; an emergency department and several care units and practices. These units are also divided into out- and inpatient care. Patients who visit the primary care for a session are examined and then return home, therefore outpatient care. Inpatient care refers to patients who have been admitted to a ward and placed in a bed. At a session, a distinction is also made between patients who visit physicians or other professionals, such as nurses, physiotherapists, occupational therapists or social workers.

The two main fields of activity at this clinic are local emergency care and primary care. The latter's main task is to provide high quality basic internal medicine (treatment of diseases in internal organs by specialists without surgery) for the local citizens. They work mostly with the major diseases, e.g. heart attacks, heart failure, stroke, diabetes, and asthma and allergies. Primary care also has an emergency service, intended for patients with internal medical problems. Local emergency care serves patients with easier urgent problems. These patients generally return home afterwards. Patients from emergency primary care either go home, are scheduled for a session or are admitted to a department. Local emergency care and emergency primary care share space but the patient pathways are separated.

To illustrate the structure of the clinic all interrelated elements are shown in Figure 15. These are either functional (organisational division) or parts of functions based on their responsibilities. The elements are related to each other via patients, information, missions or control. Chronic patients are common at the clinic and consequently complexity increases because of the undefinable beginning and end of the care process for these patients.

² The term element is in this thesis used to underline the fact that the theoretical basis is system theory, i.e. a system is a set of interrelated elements. This is however close to the concept of functions, as in task division and not organizational units, within organisations.

DESCRIPTION OF THE CASE HOSPITAL

Figure 15 The Community Healthcare Clinic as a system. A description of relationships between elements

Interrelated elements at the community healthcare clinic

The elements presented in Figure 15 are further described by their responsibilities. The elements responsible for planning and managing at the clinic are described in greater detail in section 6.8.1 and 6.8.3. Consequently, only the elements that have a direct connection to the patients are described below.

The emergency department, medical patients (ED)

ER is open between the hours of 8 am and 8 pm daily. There are care coordinators who coordinate patients from the ER to the wards if the patient must be treated at a ward and is not able to go home, or is sent to another care provider.

DESCRIPTION OF THE CASE HOSPITAL

The primary healthcare line

There is a local healthcare line, also an ED, which deals with minor acute surgical and orthopaedic conditions every weekday between 8 am and 5 pm. Most of these patients can go home after the visit. Patients who need major surgery or who have been admitted are referred to the Central Hospital in Kristianstad.

Outpatient department, children and young people

This is a specialised medical department for children and young people, including asthma and allergy issues, obesity, diabetes and bedwetting.

Outpatient department, medicine

This department is a general medical specialist department specialising in heart, brain and blood. Some activities, such as blood tests and ECGs, do not require appointments.

Outpatient department, geriatrics

This department is a department for elderly patients where the entire patient's sickness panorama is taken into consideration.

Ward 9

This ward primarily takes care of stroke patients but also neurological patients and patients in need of rehabilitation. The ward has 24 beds and the patients arrive from the hospital's ER or from other hospitals in the region.

Ward 38

This ward is an emergency ward and can admit patients who require specialist care around the clock. Patients with minor cardiac failure, COPD (chronic lung disease), or failing kidneys, are typical patient groups that are residential at this ward. The ward has 32 beds.

The Intensive Care Ward

This is medical ward with primarily cardiac patients but they also care for patients with intoxication and breathing difficulties. The ward has 14 beds, some of which have continuous monitoring of vital functions. It is located next to the ER.

Ward 38 C

This is a ward that can be opened if necessary.

Activities within an element

The elements consist of activities that have been suitably grouped for each responsibility. Consequently, many activities are performed within each element. This is exemplified by a ward at the community healthcare clinic, see Figure 16. These activities can of course be divided into smaller parts, which are then even more specific. This is thus the transformation within an element. Another refinement of the structure could be to describe different work teams. This is however not relevant for the analysis. The specified activity gives at least an idea of what is happening in the element and shows that it is possible to present a system at various levels of abstraction. All elements are described by their activities but not all are

DESCRIPTION OF THE CASE HOSPITAL

presented in this thesis. The activities described below are of cores of a general kind and from an individual patient perspective are not always true. The flow looks straight but there are many alternative paths through the ward depending on diagnosis, medical condition and so forth. Some of these steps may then be repeated, for example because other examinations are needed.

Figure 16 General activities in a ward

1. *Arrival* – The patient arrives at the ward and is given a bed.
2. *Registration* – The patient is registered at the ward.
3. *Care plan set up* – A care plan is set up that specifies the treatment or care procedures.
4. *Treatment or care* – The care plan is fulfilled.
5. *Evaluation* – The patient is evaluated during the doctor's rounds.
6. *Decision of aftercare* – When the patient's needs are lower than the ward's care level there is a decision on aftercare. Some patients are transferred to an external care provider, some go home with an appointment at the outpatient department and some just go home with a training schedule.
7. *Discharge* – The patient is discharged.
8. *Departure* – The patient leaves the ward.

6.4.2 Structure of the orthopaedic clinic

The orthopaedic clinic performs several types of orthopaedic procedures. The clinic specialises in plastic hip and knee joints, but also performs hand and foot day surgery. They also treat outpatients who come from home for an operation and then go home the same day without being admitted. The clinic also performs outpatient practice. The clinic has six fully equipped operating theatres and one for minor interventions. In total, five

DESCRIPTION OF THE CASE HOSPITAL

organisational units are connected to the care process at the orthopaedic clinic. The interrelated elements are shown in Figure 17. These elements are either function (organisational division) or parts of functions based on their responsibilities.

Figure 17 The orthopaedic clinic as a system. A description of relationships between elements.

The orthopaedic clinic's element

The elements presented in Figure 17 are further described by their responsibilities and tasks. The elements responsible for planning and managing the clinic are described in greater detail in section 6.8.2 and 6.8.3. Consequently, only the elements that have a direct connection to the patients are described below.

Pain outpatient department, first and revisit

This is a small department that treats pain conditions like chronic pain, neurogenic pain and pain caused by cancer. They also work consultatively with inpatients at the hospital which have intractable pain or pain after surgery.

General orthopaedic outpatient department, first visit

Patients visit the general orthopaedic practice for examination and evaluation before surgery or other treatments. The visit may also concern consulting or minor surgery. In cases where there is a decision for surgery, the patient can be fully prepared for the operation at this first visit. Otherwise, the patient returns for a pre-surgery visit. The visits are divided depending on how the patients visit; physicians or other staff. Other staff may be a nurse, an assistant nurse, a physiotherapist, an occupational therapist, a welfare officer or a gypsum technician.

DESCRIPTION OF THE CASE HOSPITAL

Pre-surgery in outpatient department

Examinations before surgery are conducted at the pre-surgery practice. The patients meet the orthopaedist, nurse, nurse anaesthetist, anaesthesiologist and assistant nurse with the aim to be prepared for the surgery. It may also be necessary to X-ray, perform ECG (electrocardiogram) or to make respiratory tests in order to minimise risks during the surgery. The patients are also given valuable information about the surgery.

General orthopaedic outpatient department (revisit)

Patients who return for further examination before surgery or other treatment are booked for a return visit.

Day surgery

Some operations are performed at the orthopaedic clinic. These are comparatively easy hand and foot operations. The patients come and leave the hospital on the same day.

Orthopaedic ward

Patients who will undergo planned orthopaedic surgery (for example replacement of the hip or part of the hip, knee, shoulder or elbow) are cared for at this ward before and after their operation. The ward has 38 beds but at weekends only 28. After surgery they return to the ward for care and also training as preparation to be able to return home. How long the patient remains depends upon the type of surgery performed.

Pre-operative ward

Some patients do not come from the orthopaedic ward, but come from home and are then prepared at the pre-operative ward before surgery.

Surgery department

The department specialises in hip and knee joint surgery. They have six operating theatres of which two are slightly smaller than the others. Activities at this department are further described below. After surgery, the patients either go to the postoperative ward or return home.

Post-operative ward

The patient wakes up in the postoperative ward immediately after surgery. How long the patient stays depends on what surgery the patient had, which type of anaesthesia the patient had, and how the patient feels after the surgery. When the patient is stable enough he or she is then moved back to the ward.

General orthopaedic outpatient department (follow-up visit)

After the patient has left the hospital, they are followed up by phone and after a specified time also one or two follow-up visits to check that the surgery went as expected.

Activities within a element

With the same motivation as for the community healthcare clinic, activities within an element are presented and exemplified by the surgery department, see Figure 18.

DESCRIPTION OF THE CASE HOSPITAL

Figure 18 Activities within the surgery department

1. *Locking* – The patient switches from bed to operating table.
2. *Preparations for anaesthesia* – Needles are inserted and the patient is informed about the anaesthesia that will act during the surgery.
3. *Preparations for surgery* – General or local anaesthesia is followed by cleaning of the area to undergo surgery.
4. *Setting surgical instruments* – the setting of the surgical instruments is prepared before the surgery in the operating theatre or in an adjacent room.
5. *Surgery* – The “knife time” begins when the scalpel enters the body and ends when the cutting is over.
6. *Bandaging and awakening* – Before the patient leaves the theatre the patient is bandaged and awoken.
7. *Locking* - The patient switch from operating table to bed.

6.5 TRANSFORMATION

Transformation is the next aspect to use when the two cases shall be described. In this thesis, transformation in a logistics system means to transform demand (internal or external) to customer service (internal or external) by means a chain of activities. The core flow then needs to be known to be able to describe the transformation from order to delivery along with the fulfilling activities. It is also of interest to know the implications of particular ways to organise these activities. Important questions to answer in relation to this are: which is the main flow's process, how are the transformations carried out, and how does the system's customer order cycle operate?

DESCRIPTION OF THE CASE HOSPITAL

6.5.1 Care processes at the community healthcare clinic

The community healthcare clinic has two general care processes: the emergency process and scheduled visits to the outpatient department.

Emergency

The hospital has two activities within the ED: local emergency care and emergency primary care. These share space but the patient pathways are separated. Local emergency care serves patients with minor urgent problems. These patients generally return home afterwards. The main task of primary emergency care is to conduct high basal internal medicine. Patients from the emergency departments are either admitted, transferred to an external care provider or return home (perhaps scheduled for a visit to one of the outpatient departments).

A general care process for patients entering the system via the ED is shown in Figure 19. The care process for an individual patient can be seen as a straight flow but for a large number of patients, as within an entire clinic, it is rather a network of alternative flow paths. Since it is general, there are exceptions, especially with regard to patients with a life-threatening condition.

Figure 19 Emergency department patient flow

1. Arrival – The patient arrives at the ED
2. Patient queue – The patient waits to be classified.
3. Classification of patients (triage) –All patients are classified on a scale depending on how serious their condition is. If the patient arrives by ambulance, the ambulance crew report to the ED staff who classify the patient. **Decision point**
4. Patient queue – The patient waits to be examined.
5. Examination – The patient is examined. **Decision point**
6. Patient queue – The patient waits for the result of the examination and perhaps also test results from the laboratory.
7. Supplementary examination - If necessary, a supplementary examination is made, e.g. X-ray.
8. Patient queue – The patient waits for the examination results.
9. Decision on further care or treatment – The patient is informed concerning treatment. **Decision point**
10. Patient queue – The patient waits for the treatment.
11. Treatment – The patient is treated

DESCRIPTION OF THE CASE HOSPITAL

12. Discharge – The patients leaves the ED or is transferred to an external care provider.

Decision point

13. Patient queue – The patient waits to be transferred to a ward or to an external care provider.

14. Transferred to a ward – The patient is transferred to a ward

15. Treatment or care in ward – See the figure for activities in a ward. **Decision point**

16. Discharge – The patient goes home or to an external care provider.

The flow looks straight when it is presented on this general level, but there are many alternative patient pathways. Other examinations may be needed, different types of diseases also make the path different, and sometimes certain steps have to be repeated and so on. Patients and referrals can also exit the system before all activities are completed. Some referrals are rejected and some patients do not need care at the level that the clinic offers or are sent to another type of specialist.

Scheduled visits at outpatient department

The general care process for individual patients scheduled to visit an outpatient department begins with a referral (an order) and ends with a discharge, as shown in Figure 20. Only orders between patients and the orthopaedic clinic are shown in the figure; there are also internal orders between activities.

The scheduled visits are preceded by a referral and the patients return home after the visit. (All visits are on weekdays.) The care process for scheduled outpatients is similar to the beginning of the care process at the orthopaedic clinic, which begins with scheduled visits before surgery or other treatments. The differences occur after the first visit since the treatments cannot be expressed with a common word (compare this to ‘surgery’). The discharge can also be more undefinable due to the patient groups at the community healthcare clinic, e.g. chronic illness or health problems that have to be treated over a number of visits. Each activity can be described further since they are subsystems within the system. The care process can also be described by diagnosis to see a more unique process for each patient group. However, here it is the general care process that is shown in the figure.

Figure 20 General care process at the community healthcare clinic’s outpatient department, scheduled visits

1. *Patient order* – Patients or external care providers (e.g. primary care) send a referral to the community healthcare clinic. This is the order which begins the care process within the system. From the patient’s perspective it began when he or she decided to request care.
2. *Referral queue* – The referrals are placed in a queue waiting to be handled.

DESCRIPTION OF THE CASE HOSPITAL

3. *Referral handling* – The referrals are stamped upon arrival, reviewed and sorted. Some are rejected. **Decision point**
4. *Referral queue* – The referrals line up to be accepted or rejected (decision on treatment or not).
5. *Treatment decision*- Decision to treat or not treat. **Decision point**
6. *Patient queue* – Waiting to be scheduled for an appointment.
7. *Appointment* – The accepted referrals generate appointments for patients.
8. *Order acknowledgement* – An appointment is sent to the patient or the patient is informed by phone when no treatment will be given.
9. *Patient queue* – Outpatient waiting list. The patients wait for the scheduled first visit to the outpatient department.
10. *First visit* – The patients visit the outpatient department and meet specialists.
11. *Decision on treatment* – The first visit generates a decision on further treatment or discharge. **Decision point**
12. *Patient queue* – Outpatient waiting list. Patients wait for their next appointment.
13. *Revisit 1* – The treatment continues and generates a decision on further treatment or discharge. **Decision point**
14. *Patient queue* – Outpatient waiting list. Patients wait for their next appointment.
15. *Revisit N* – For some patient groups there is no clear discharge (e.g. chronic patients) and some patients need to be treated N number of times. **Decision point**

The flow looks straight when it is presented on this general level, but there are many alternative patient pathways. Other examinations may be needed, different types of diseases also make the path different, and sometimes certain steps have to be repeated and so on. Patients and referrals can also exit the system before all activities have been completed. Some referrals are rejected, and some patients do not need care at the level that the clinic offers or they are sent to another type of specialist. Chronic patients are also common at this clinic and consequently complexity increases because of the undefinable beginning and end of the care process for these patients.

6.5.2 Care processes at the orthopaedic clinic

Just like at the community healthcare clinic, the care process for an individual patient can be seen as a straight flow but for a large number of patients, as within an entire clinic, it is rather a network of alternative flow paths. The general care process for individual patients begins with a referral. The whole care process is shown in Figure 21. Only orders between patients and the orthopaedic clinic are shown in the figure; there are also internal orders between the activities. Moreover, these activities are slightly different depending on whether it is a matter of inpatient or outpatient surgery.

DESCRIPTION OF THE CASE HOSPITAL

Figure 21 General care process at the orthopaedic clinic

1. *Patient order* – The patient or an external care provider (e.g. primary care) sends a referral to the orthopaedic clinic. This is the order which begins the care process in this system. From the patient's perspective it began when he or she decided to request care.
2. *Referral handling* – The referrals are reviewed and sorted. Some are rejected.
3. *Referral queue* – Waiting for decision to treat or not.
4. *Treatment decision*- The decision on kind of treatment (surgery or training) or no treatment at all. **Decision point**
5. *Order acknowledgement* – An operation appointment is sent to the patient or the patient is informed by phone when no treatment will be given. The patient receives the appointment by post and is asked to fill in a health declaration.
6. *Patient queue* – Outpatient waiting list. The patient is scheduled for a first visit to the outpatient department or for a treatment visit (e.g. to a physiotherapist).
7. *Visit* – The patient visits the outpatient department once or twice to be prepared for their operation. This applies to the procedure itself and the anaesthetic issue. Some patients visit for training (e.g. by a physiotherapist) instead of surgery preparation. This is for some patients the first and only visit and they are discharged afterwards.

Decision point

8. *Patient queue* - Inpatient waiting list. The patient's operation is planned and scheduled.
9. *Surgery* – The surgery is performed, including preparation and aftercare before the patient leaves the hospital.
10. *Patient queue* – Outpatient waiting list. The patient is scheduled for follow-up visits or rehabilitation visits to the outpatient department.
11. *Follow-up* – One or more follow-ups and/or rehabilitation visits to the outpatient department. **Decision point**
12. *Patient queue* - Outpatient waiting list. The patient's visit is planned and scheduled between each new visit.
13. *Discharge* – The care process ends after a follow-up telephone call. Some patients have complications and are scheduled for a complication visit before the process can be ended. **Decision point**

6.6 DEMAND

The next description aspect is the aspect of demand. The demand describes what's entering the system as orders that the system converts into customer service. An important question to answer in relation to this is what type of demand (input) enters the logistics system.

DESCRIPTION OF THE CASE HOSPITAL

The demand can be divided into two different types of demand. The hospital is given a mission by the County Council each year on how much care they should provide. In Sweden we also have a healthcare guarantee. This means that the care providers have to offer care within a specified time. The real demands are thus the demands from patients and are in this case represented by referrals, emergency department or direct admission. Within the systems and between subsystems there may be other types of demand, e.g. requests for laboratory services, patient evaluations, accepted referrals, contact from a patient or request for support and so on.

6.6.1 Demand at both clinic departments

Demand from referral is the same for both clinics and can be described as follows. The community healthcare clinic also has patients entering the system from the emergency department and by direct admission. These are further described below.

Referrals

There are two different kind of external demand entering the orthopaedic clinic in terms of external patient referrals. The referrals come either from external care providers or from patients themselves. At the community healthcare clinic the referrals are made by other care providers or by the clinic itself. This is because they have patients entering the clinic via the ED and then the physicians can make a referral to their own outpatient department. This, however, is not the real demand; it is internal demand and the external demand is from the patient in the ED in the first place. Patients' demands are not always "pure" patient demands; they may of course be expressed by physicians via referrals. The patients' limited knowledge of their own care situation and their medical expertise make the physicians' decision the "real" demand.

The referrals are sent to the two clinics from district health care centres. In some cases, patients make referrals themselves and send them in by mail. After the referrals have been arrival-stamped they are reviewed by a physician. The referrals have different priority depending on the healthcare guarantee and are also prioritised over revisits. The reason for this is that such visits are not included in the healthcare guarantee.

Emergency department

Patients entering the emergency department (ED) have either an internal medical problem or a minor urgent problem. In this case, patients waiting in the ED are the demand.

Direct admission

Direct admission concerns patients who are often in need of hospitalisation and are most often elderly people. They have a special card that entitles them to be readmitted without passing through the emergency department or during the night, when there the emergency department is not open. Approximately 1.3 patients a night enter the system through direct admission. In this case, the call that the patient makes for permission to be readmitted is the demand.

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6.7 CUSTOMER SERVICE

Customer service is the next description aspect. It gives a picture of how well the logistics system is performing in providing time and space utility for a product or service. Important questions to answer in relation to this are what does the logistics system produce in terms of customer service (output) and which different types of customer segments are to be satisfied.

The output, and thus the customer service, is patients taken care of with treatment or care. The patients leave the system when there is a decision to discharge. Output to another subsystem can thus be referrals, accepted referrals, emergency patients, evaluated patients, contact from a patient, fulfilled support requests, etc. However, the customer service for the community healthcare clinic's system can be divided into scheduled and emergency care depending on the need for care. The orthopaedic clinic only has scheduled care and thus only one patient group to deliver customer service to. Both patients, medical guidelines and the County Council, through laws and recommendations, set the criteria for the customer service for the patient groups. The customer services for the two systems are described below.

6.7.1 The community healthcare clinic

Scheduled care

A special group within scheduled care is chronic patients. Basically, they do not leave the system at all. They need treatment and care over and over again for the rest of their lives. Consequently, the customer service cannot be when the patients "leave" the system by being discharged. One example of these groups of patients is dialysis patients. However, information about how customer service is evaluated or guidelines for it has not been found during data collection.

Emergency care

The two emergency lines, local emergency care and primary emergency care, take care of between 5,000 and 3,000 patients a year. For those patient groups that are registered and followed by the national quality register, the case hospital follows these performance parameters. Examples of these groups of patients are stroke and heart patients.

6.7.2 The orthopaedic clinic

Scheduled care

A working group of almost 40 people (care employees) has compiled a guideline rapport on the care process of knee and hip replacement surgery in the case organisation. The following can be deduced from the results of two care processes. For patients undergoing knee or hip replacement, the clinical documentation for the reduction of pain and improved function and quality of life is well documented internationally (Hässleholmssjukhusorganisation, 2007). Cost-effectiveness is another measure of the result of knee and hip replacement operations presented in the *Care program for hip and knee replacement surgery* (Hässleholmssjukhusorganisation, 2007). This is calculated as the number of years the

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patient will benefit from the surgery and the cost of the operation is related to the decrease in cost from the reduced need for disability support and medication. Both operations are considered to be very cost-effective in comparison with other procedures. The working group behind the report (Hässleholmssjukhusorganisation, 2007) summarise this in the following statement: *this means that with relatively small means we can achieve a great improvement in the patient's health.*

6.8 CONTROL

The next description aspect used to describe the two cases is that of control. The control functions in a logistics system control and plan the system's operation, as well as sense the system's surroundings. Feedback and response are two of the control functions to manage the system to attain the stated objectives. This aspect also includes planning and managing the system. Important questions to answer in relation to this are how are resources planned and managed to meet demand and how is the system managed.

In both systems, there are different planning and management elements. These elements all have different functions and are described further below for each clinic.

6.8.1 Planning at the community healthcare clinic

At this clinic there are three different planning elements; the planning group, scheduling of physicians (other professionals are scheduled by the respective ward or unit manager) and scheduling of scheduled visits. These elements all have different functions and are further described below.

The planning team

The planning team consists of employees who manage staffing and thus has a staffing responsibility. The assignment from the County Council is converted into an annual plan by the hospital's management team who then delegate the planning to the planning team. The team meets monthly to review and discuss any deviation from the annual plan, plan the next two to three months' work, present and discuss the members' resource needs and evaluate available resources (personnel, labs, physicians, departments, beds for inpatients, etc.). The planning done by the group is mainly based on forecasts.

Scheduling of physicians

The scheduling of physicians concerns staffing wards, units, scheduled visits and telephone times. Scheduling begins with the physicians' requests for leave, conferences and education and is then done based on these requests, competencies, continuity, visit rooms, hours of training and personal knowledge. The departments' staffing is prioritised and based on standard demand. The telephone times are then staffed and scheduled visits have the lowest priority. To be able to schedule physicians, it is stated that personal knowledge of individuals is the most important skill.

Scheduling of other professionals

Other professionals than physicians are scheduled by the respective ward or unit manager.

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Scheduling of scheduled visits

The visit schedule is drawn up based on how many visit hours are available from the physicians' schedules. Patients are then booked into the free appointment times and thereafter the order acknowledgements are sent to the patients.

6.8.2 Planning at the orthopaedic clinic

The orthopaedic clinic only performs planned care.

The planning team

Just like at the community healthcare clinic, the overall planning is managed by the planning team. Their stated planning priority is first the annual plan, then patients, number of operations a day, operating theatres, and at finally the physicians.

Scheduling of physicians

Based on how much the clinic has to produce over a year a rough production plan is made. The physicians' requests for leave and so on are continuously reported and registered. Together with forecasts of scheduled visits and surgery demand, a rough schedule is drawn up. The physicians are then positioned depending on how many patients they have on the waiting list but also depending on medical skills. The schedule is then transferred into the booking system and scheduled times will be available to book visits, operations and telephone hours. The stated priority for scheduling physicians is to staff operations or visits that have a very large patient stock first, then wards, operations and visit times last.

Scheduling of operations and scheduled visits

Reviewed referrals are converted into surgical notifications or visit orders. By means of the surgical notification the physicians register patients via the operation planning system Orbit. The patients are then sorted into the waiting list by hand. Based on the physician's schedule and type of surgery that can be performed within the slot, patients are identified from the waiting list and placed in the schedule for an operation. Operating theatres and visiting rooms are then booked for each patient. The patients are now sent an order acknowledgement by mail with information about their operation and or visit.

6.8.3 Management

The board of the hospital

The two clinics are managed by the hospital board. Each clinic and unit also has its own manager.

Operational management

In addition to its planning assignment, the planning team also has a management function. They strive to develop their activities by discussing and giving directions concerning operational work to address needs with the resources available.

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The community healthcare clinic uses co-ordinators to organise patients from the ED to the wards. They have contact with all wards and information about their bed status along with the number of patients in the ER waiting for a bed.

Management principles of the clinic's managers, planners and ward managers

The stated management principles regarding the organisation of the operational processes to organise good processes and flows, of the clinic's managers, planners and ward managers are described below. On a higher level, several mention that they adjust their activities based on the annual assignment from the County Council. Further, decisions are to be decentralised after the production goals for the year have been determined. The principles for detailed production planning at the Orthopaedic Clinic deals take in to account that the main production is performed within surgery and these activities are therefore prioritised before scheduled visits. It is also mentioned that they seek to have waiting times in the range of 6-8 weeks for joint plastic surgeries. One of the surgery planners also points this out, to hold six weeks waiting time to surgery makes the patients feel calm. This also means that the waiting list is updated and true because patients do not have to stand in line to be sure to get a surgery time. The goal of six weeks to surgery also aims to create the opportunity to plan and fill out surgical times and to give the patients the opportunity to be physically and mentally prepared.

Within the community healthcare clinic it is mentioned that the management principles are focused on patient quality and utilising resources, especially in inpatient care (the number of care hours of admitted patients). This is where the highest costs are.

Some unstated management principles can be understood from the interviews, for example that joint operations are the most important ones when planning, because they are more profitable. It is also stated that operations have higher priority than scheduled visits and that the physicians are the most expensive staff but there are also too few of them so planning has to be done with this employee group prioritised.

Adaption of activities

There is a consensus at both clinics that they must be flexible. The orthopaedic clinic is constantly scanning the market to try to take extra missions from other county councils, which will not pass the healthcare time guarantee. They also check markets in neighbouring countries for opportunities to expand their activities, i.e. opportunities to welcome so-called medical tourism. This is also mentioned in respect of the goal of doubling the number of operations, i.e. it shall be done by analysing the clinic's needs and match these to the expansion.

"You have to be flexible in order to grab the available opportunities" and "Is there a need for 100 more joint operations, you have to think about it"

(Independently translated, Mats Molts)

The community healthcare clinic has the possibility to open an additional ward if necessary, depending on the number of patients who need to stay in hospital during their treatment

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and/or care. This will take four to five hours to arrange depending on the time it takes to find extra staff and the time it takes to supply the ward with medical equipment, medicine and food.

Both clinics agree that when daily work situations arise that they must adapt to it will work out well because the staff always makes a great effort to get it all together. The attitude of the staff is also mentioned as the most important factor to be flexible and have a flexible operational business.

6.9 PERFORMANCE

The final description aspect used in this thesis is that of the system's performance. The performance aspect gives a picture of which measurements the system uses. An important question to answer in relation to this is what physical and financial KPIs are used to monitor process and functional logistics performance.

Interviews and raw data from the case hospital's business system are used to describe how the systems monitor their logistics performance measurements. KPIs found in the business system are definitely measured but it is not clear whether these are in fact used. On the other hand, measurements mentioned in the interviews can be used for either follow-ups or decision-making. A classification has been made of these performance measurements and KPIs and is presented in Table 10. These measurements are mentioned by unit managers or administration staff. A total of 32 performance measurements and KPIs, not unique ones, were defined at the interviews and most were traditional functional KPIs.

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Table 10 Measurements at the case hospital

Classification	Examples from the interviews	Examples from the business system
Lead-time	Length of stay Lead-times	Lead-times
Production	Number of operations Number of visits	Number of visits, first and return, to physicians or other professionals Number of completed operations Other contacts
Productivity	Surgery time, percentage of total surgery time	Use of resources and occupancy
Demand	Number of patients waiting for a bed	Number of referrals Number of reviewed referrals Number of visits to emergency department
Occupancy	Overcrowded wards	Number of occupied beds
Costs	Economic outcomes compared to budget	Laboratory X-ray Employee Drug Medical
Waiting time	From request to surgery Number of waiting patients	Actual waiting time for new patients Number of waiting patients
Others	Quality Cancellations	Termination reasons Available beds Number of professionals (not physicians) per patient Reasons for rebooking/cancellation

At a higher level of the organisation it is mentioned that in daily operations the orthopaedic clinic traces the average length of stay and waiting time for new visits. These measurements are assumed to lead to action, if necessary, to reach a decent level and definitely stay within the healthcare guarantee.

At the community healthcare clinic they can follow the occupancy situation four times a day. They consider their monitoring system an easy system to monitor key performance indicators. “Press a few buttons and can you see what has been done” (Independently translated, Stefan Lamme). However, it is stated that the numbers are not presented automatically but that they can access them if they want to and can then also make calculations of whatever they want.

In addition, the financial accounting is monitored by the organisational functions, just as in the case of traditional accounting. Each functional unit naturally has a budget to follow. However, several people say that they want an easily understandable tool for economic monitoring customised for the ward staff.

7 ANALYSIS – THE CASE HOSPITAL AS A LOGISTICS SYSTEM

*In this chapter the following two questions will be discussed and answered: **Are the systems designed as logistics systems and are the systems controlled and managed as logistics systems?** This is done by means of an analysis of the case description in chapter 6, according to the analysis model presented in chapter 5. The main features of a logistics system are readily applied to the two case systems and evaluated. The chapter follows the logic in Figure 22 below. Accordingly, the design of the cases is analysed first, followed by an analysis of the management and control. At the end of the chapter a summary is presented together with an evaluation of how well the two cases fulfil the main features of a logistics system and the overall objective of such a system.*

Figure 22 The analysis model and the logic of this chapter

7.1 DESIGN

The purpose of this thesis is to develop a method of evaluating a healthcare organisation by means of the main features of a logistics system. The overall objective of a logistics system and the first main feature is *to meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance* (main feature 1). To be able to evaluate the two cases' fulfilment of this main feature the analysis is divided into two parts. The first concerns the system's design, i.e. how the system is meant to work to perform its duties, which is presented below. This consists of two main features; *a logistics system has a flow-oriented structure* (main feature 2) *and a logistics system transforms orders into customer service in a flow-oriented process* (main feature 3).

7.1.1 Flow-oriented structure

The first feature that supports the design of a logistics system is that *the system must have a flow-oriented structure* (main feature 2). This means that the elements in the system interact and are arranged to support the flow and total performance of the system. This is analysed by the responsibility of the element and the functional division of resources within the two healthcare systems.

During a care treatment process, the patient passes through a number of units. There are also a number of other units that support these units through planning, managing and coordination or with diagnostic help, as shown in the *structure description* in chapter 6.

Within the two systems, there are various types of units which all have different characteristics and main tasks. All these units are part of the transformation of patient's demand into the fulfilment of that demand. These units can be classified as functions and presented according to which main tasks they have. The classification then makes it possible to analyse how the system's elements are related to each other and in the end evaluate whether the two systems have a flow-oriented structure.

Functions and their main tasks

Emergency department

The emergency department at the hospital is divided into two areas of activity; local emergency care and primary care emergencies. Both deal with unscheduled flows in which all patients will be graded according to how urgent their condition is.

Wards

The wards take care of patients who have to stay at the hospital for one or more nights to recover. These patients are called inpatients and are both cured and cared for in the wards, where some also have equipment to monitor vital functions. The wards at the hospital specialise in different diagnosis groups but the occupancy rate is also a factor in deciding where the patient can be hospitalised.

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Outpatient departments

Patients visit outpatient departments to be examined by a specialist. In most cases, the patient has a referral from a general practitioner for an appointment time at one of the outpatient departments. The departments are organised by diagnosis and visits are divided into first visit and follow-up visits.

Surgery department

The surgery department performs operations, pre-op preparation and also monitors patients after their operations. The operating theatres are equipped with expensive equipment and the materials they use are also quite expensive.

Diagnostic departments

These departments provide diagnostic help for other units. At the hospital they have both an X-ray department and a laboratory, which support investigations of inpatients and outpatients.

Treatment departments

These departments consist of consultants, physiotherapists, occupational therapists, an almoner, and a nutritionist. They help patients recover after for example a stroke or an operation or better deal with their disease.

Medical secretaries

The secretaries take care of all incoming referrals, they write dictated medical records, archive records, monitor waiting times and carry out other administrative duties.

Determination units

These units plan, determine and allocate resources to the clinics' operations, e.g. outpatient visit planning, physicians' timetables, and have care coordinators who coordinate patients from the ER to the wards and planning teams.

Management

The hospital management board has the main responsibility for overall operations.

External care providers

Some patients, mainly patients from wards, are further cared for by another care provider such as the municipal housing department or public nursing homes

A system consists of two or more interrelated elements. As presented in the description in the previous section, the units have different characteristics. The care processes do not go from one unit to another; instead the units are divided into elements according to the activity sequence in the process. Some of the units have direct contact with patients, i.e. where the operational work with the core production is conducted. These units are called *Core elements*. Other elements exist to support the patient flow, i.e. the *Supporting elements* like X-ray and laboratory services but also medical secretary services that primarily support physicians.

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These elements receive assignments from the core elements and can never be the trigger for generating production in other units. Another element group is the elements that plan, determine and control the operational work within the core elements and also decide how certain resources are allocated. The managerial board of the hospital is also included in the *Management and control elements*. These elements have no direct contact with patients or handle information that can be linked to an individual patient. The element groups are presented in Table 11 related to the units and the units' main tasks. It should also be mentioned that documentation is a task that is performed in almost every unit but is not a main task.

Table 11 The units of the case hospital, their main tasks and associated elements

Functions	Main tasks	
<i>Emergency room</i>	To take care of small injuries, first aid, and acute admissions	Core elements
<i>Surgery department</i>	Surgical procedures	
<i>Wards</i>	Cure and care, monitoring and to help patients to recover	
<i>Outpatient departments</i>	To perform first and follow-up visits, minor treatments	Supporting elements
<i>Diagnostic departments</i>	To serve other units with diagnostic tests	
<i>Treatment departments</i>	To serve other units with therapies expertise.	
<i>Medical secretaries</i>	To assist other units with administrative duties but also for most perform administrative work for physicians	Management and Control elements
<i>Determination units</i>	Plan, determine and allocate resources to the clinic's activities	
<i>Management</i>	Manages the overall running of the hospital	

The community healthcare clinic is organised into functions: outpatient department, emergency department and wards. These perform activities in different parts of the care process, which means that some of the functions perform activities that are not arranged in sequence. Hence, the core elements are created by combining these activities in a logical order along the care process.

The orthopaedic clinic is organised into three functions; orthopaedic outpatient department, surgery and orthopaedic ward. These perform activities in different parts of the care process, which means that some of the functions perform activities that are not arranged in sequence. Hence, the core elements are created by combining these activities in a logical order along the care process. The elements within each of these two systems are shown in Figure 23 and Figure 24.

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Figure 23 The three element groups at the community healthcare clinic

Figure 24 The three element groups at the orthopaedic clinic

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As the two figures show, there are complex networks of relationships between the elements in the systems. The relationships consist of patient flows, missions or resource allocation directives. The management and control and the supporting elements are almost the same in both systems. The differences can thus be seen in the core elements where the patients are taken care of. In the orthopaedic clinic's system (Figure 24) it can be concluded that the units are divided into smaller parts to form elements with a specific main activity responsibility. The elements' main activities are similar to the activities that patients experience in connection with an operation. By way of contrast, at the community healthcare clinic (Figure 23) it is much harder to see the patient flow with related activities. The elements are almost the same as the units, except for new visits and revisits to the outpatient department. The unit's concern should in any case be the total flow of patients or other units requiring a service from the unit (Visser and Beech, 2005).

The medical specialties drive the functional orientation (or perhaps a better word is medical specialist orientation) consisting of a number of relatively independent activities but in a common patient flow network. It is thus important to view the systems as an entity to be able to apply logistics principles, methods, and mindsets and so on at the case hospital.

To be able to redesign the structure into a more flow-oriented structure, the flow has to be defined. The two case systems have several ways to define the flow of patients. They can group the flows by entrance into the system (e.g. from the ER, outpatients and inpatients), diagnosis, diagnosis groups, diagnostically related groups (DRG), pathways, care processes and/or others. Regardless of how the flows are defined, the number of groups that are treated in the system is considerable.

7.1.2 Order and delivery driven transformation

The other main feature that supports the design of a logistics system is that *the system shall have an order and delivery driven transformation* (main feature 3). This is a process perspective, from patient order to fulfilment of that order. The two systems, represented by the two clinics at the case hospital, transform patient demand into patient service, e.g. treated or patient taken care of. To fulfil a logistics system's main feature the case systems has to produce patient service based on patient demand and production must be process-oriented. This means that the transformation can be predictable, has a distinct beginning and end, is intended, is repetitive and has defined steps and an expected outcome. In addition, the underlying aim of the design of the transformation is to produce required care according to the overall objectives of a logistics system.

Order process

For both case systems the customer order cycle can be used to describe the transformation on an aggregated level. First, the patient "order cycle", i.e. the order process, see Figure 25. (1) A referral or a visit to the ER represents placement of the order by the patient. (2) The care provider receives it, either as a referral to one of the clinics or a patient at the triage in the ER. (3) The order is then handled by the care provider and (4) the patient is then given information about how the order will be handled, i.e. order acknowledgement.

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It is realised, already here in the first part of the patient's order cycle, that there is a difference between emergency and scheduled care. The order process for scheduled care is handled in of weeks and for the emergency department in hours, and in very urgent situations minutes or seconds.

Figure 25 The order process, the first part of the patient's order cycle

Fulfilment process

Within scheduled care at the case hospital, the patient and the care provider now meet for the first time and the fulfilment process begins, see Figure 26. For patients in the ER the first meeting has already taken place. (5) The treatment decision is made after the patient's examination in the diagnostic phase. (6) The patient then receives treatment or care, also with both patient and care provider present. (7) The last part of the fulfilment process is discharge. It is not always easy to determine when this process ends, e.g. for chronic patients or patients with multiple diseases.

Figure 26 The second part of the patient's order cycle, the fulfilment process

Patient order "cycle"

The order and fulfilment processes complete the patient order cycle. See the Figure 27 below. (See customer order cycle, chapter 5.4, for more details). It is this cycle that needs to be optimised and not the functions that perform the activities in the process of treating or taking care of all patient orders that enter the systems.

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Figure 27 The patient's order cycle

Based on the patient order cycle, the transformation from patient order to discharge cannot always be seen as a process. This is because the activities cannot always be predicted when the patient order is placed, i.e. the steps involved are not defined when the transformation begins. For some patient groups, decisions on the following steps have to be taken step by step. For example, laboratory results or some other important information about the state of the patient have to be evaluated before the next step can be decided. The activities of diagnostic phase (5) and treatment (6) are therefore repeated one or several times in both systems. There is thus a chain of decisions where there is a dependency on decisions from earlier in the chain. The process cannot be predicted when the patient order is placed, and as a result nor can the action that needs to be taken further down the chain or its outcome. The decisions are made in sequence, step by step, checking the patient's reaction or laboratory or radiological results and deciding on the next step from there. Consequently, there is no pre-defined lay-out that the patient will follow. This has of course relevance for how to manage and control these patient flows. It is then important to try and make the clinic's operations more predictable and strive to define the patient flows as processes. However, there are patient flows that are designated processes, such as the hip and knee operations at the orthopaedic clinic but also urgent stroke and heart patients at the community healthcare clinic. These are well-defined complaints with high certainty about the process and the outcome and which De Vries et al. (1999) call routine processes. It is possible to define a treatment path based on medical guidelines that defines the chain of activities in the process.

To summarise, instead of one predictable customer cycle, from order to fulfilment of that order, there are several small customer order cycles that structure the chain at the case hospital, see Figure 28 below. Consequently, it is not possible to outline the total patient order cycle. It is a case of one decision, then another decision, and then another decision, i.e. order and fulfilment cycles between each of the decisions, which in themselves can be seen as processes. The lack of control of the overall customer order cycle thus remains. It should be noted that uncertainty as regards outcome is often higher before the treatment is set (in the diagnostic phase) than is involved in the treatment phase. Consequently, variability is then higher upstream and not downstream as is common in manufacturing settings (De Vries et al., 1999). Accordingly, it requires a higher degree of flexibility and agility to be built into the system's design.

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Figure 28 Instead of one extensive patient order cycle there is several small ones within it

A clear difference from the industrial context where the customer order cycle is derived from is that services are co-produced. It is not possible to produce care or treatment without a patient. The transformation of patient demand is depending on a specific patient, which makes it driven by order and delivery. However, incorrect transformation may occur, i.e. activities not needed by the patient that do not give him or her any benefits. It may be that the patient has to wait meaninglessly, which Peltokorpi and Kujala (2006) call negative waiting time. Another risk is overcapacity, which will not lead to transformation of customer demand due to the service production logic. The main focus should be on the core flow, i.e. transform orders into treatment and care of patients.

When an order arrives in the system it is not clear what the exact output, customer service, is to be produced. It is obvious that the patient must be taken care of but not how or when or how long time it will take or what it will cost. Consequently, the outcome cannot be defined or predicted. The input, which is the demand from the patient, leads to a new kind of demand, some kind of decision on action. Consequently, there are two types of demand; one when the referral or the patient arrives at the ER (the problem) and the other when it is decided how the “problem” should be addressed. Health professional also always make a judgment as a basis for decisions on further treatment. This means that the demand as an order cannot always be met even if the patient wants it to be. The converse may also be true: the patient may not want the treatment that is offered.

The transformation is driven by demand but the demand is divided into small pieces. Constant checks are made in order to evaluate decision support and inform the patient and the other stakeholders about the “new” demand. Furthermore, the two clinics have special circumstances, with different types of demand, planned care and emergencies. Accordingly, there is variation both between specialties and within a specialty. The variation in routine and predictability is much lower in the orthopaedic clinic’s surgical path way than for the community healthcare clinic’s internal medicine. There is also variation within single patients’ flows (for example a diagnosis) at the level of a unit; homogeneity is low due to variation within patient groups, practices within units and practices within groups of specialists. The design of the patient flow from demand to outcome and the design principles when designing the order and delivery process for a healthcare system are most certainly affected by these conditions.

The analysis of the transformation at the two clinics shows that before the diagnostic phase ((5) in Figure 27) the process cannot be predicted. The process cannot be predicted when the patient order is placed and therefore neither can the action that must be taken further down the chain nor its outcome. The decisions are made in sequence, step by step, checking

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the patient's reaction or laboratory or radiological results and deciding on the next step from there. Consequently, there is no pre-determined layout that the patient will follow. The transformation has thus a distinct beginning and end when the patient order is placed. At an aggregated level, the transformation is intended and repetitive and the steps are defined. However, on a lower level it is hard to classify the healthcare systems by means of these characteristics. Instead of one predictable customer cycle, from order to fulfilment of that order, there are several small customer order cycles that structure the chain at the case hospital, see Figure 28. Consequently, it is not possible to outline the total patient order cycle. First there is one decision, followed by another and then another, i.e. order and fulfilment cycles between each of the decisions which in themselves can be regarded as processes. The transformation is driven by demand but the demand is divided into small pieces. Constant checks are made in order to evaluate decision support and inform the patient and the other stakeholders about the “new” demand. The lack of control of the overall customer order cycle therefore remains. It should be noted that uncertainty regarding outcome is often higher before the treatment is set (in the diagnostic phase) than is involved in the actual treatment phase. Consequently, variability is then higher upstream than downstream, as is common in manufacturing settings. Another difference against the industrial context is that services are co-produced.

To summarise, the two healthcare systems have some intentions to have an order and delivery driven transformation. The question is thus whether they can have a “fully” process-oriented transformation due to the fact that they are highly advanced service organisations.

7.1.3 Conclusions about the systems' design

There are parts that in a way remain about how a logistics system is designed. However, the systems are not wholly designed as logistics systems; they are rather functionally organised and medically oriented organisations.

Healthcare organisations are very knowledge and high-tech intensive with quite low patient volumes. Consequently, resources are shared between different functions. Healthcare organisations have long been classified by function and one of the major reasons for this is that the medical profession has a strong orientation towards different sub-disciplines, such as ear nose and throat clinic, dermatology clinic and cardiovascular clinic (Berlin and Kastberg, 2011). Naturally there is the risk of sub-optimisation as functions focus too much on their own part and not enough on overall patient flow, which should be observed by the management and control.

7.2 MANAGEMENT AND CONTROL

The next part in the analysis of the two cases is how the systems are managed and controlled. By reviewing the systems' characteristics and how well they fulfil the main features *measure of total performance*, *strategy to meet demand*, and *adaption to desired performance* (main features 4-7) the cases can be evaluated from a logistics system point of view.

7.2.1 Control of transformation - from patient demand to fulfilment

The first management and control part to evaluate in the two systems is the main feature *a logistics system can control the transformation of input (demand) to output (customer service) and thus the cost of resources*. This means that a logistics system has the ability to choose behaviour and output

Due to the facts that demand changes and are also determined retrospectively for both systems but especially for the community healthcare clinic by the outpatient department, the transformation cannot be fully controlled. Each patient order cycle can be controlled and defined as a process, but not the whole transformation. For the processes that are defined (knee and hip arthroplasties, stroke and the treatment of heart patients) there is a possibility to control the transformation. However, full control of the transformation presupposes complete and explicit specifications of the end-products' requirements and delivery requirements.

Due to the fact that services are considered to be different from products (see for example Zeithaml et al. (1985) and Grönroos (2007)) the customer order cycle will seem different within a healthcare setting. The reason for this has mostly to do with the inseparability characteristic of services. That the inseparability involves simultaneous production and consumption, which most services are characterised by (Zeithaml et al., 1985). Since the patient must be present during the production of many health services and the provider and the patient then are the same entity, this causes the fulfilment phase to involve both the patient and the provider. However, there are three perspectives integrated when patient orders are transformed to fulfilment of orders: the patient perspective, the care provider perspective, and fulfilment. Consequently, neither of the two systems can fully control the transformation because of the uncertainty that co-creation brings, see Figure 29. This co-creation cannot be an excuse for controlling the transformation from patient demand to fulfilment of request. However, full control of the transformation presupposes complete and explicit specifications of the end-products requirements and delivery requirements. The uncertainty is thus on a low level in the transformation, in the meeting with a patient. On a higher level, a more holistic view, these uncertainties should not appear. In fact, it should be an option to use the patient's own ability in the transformation. This is in line with Grönroos and Ravald's (2011) joint value creation with the customer, which is then possible.

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Figure 29 Patient perspective (1), Care provider perspective (2) and Fulfilment of care perspective (3)

Information technology to provide and support communication that links customer and supplier together is a very important part of logistics and computer technology has had a major impact on logistics and has contributed to the development of logistics management. Support to fulfil the demand is scarce in the two case care systems. Generally, in the healthcare sector, documentation is very comprehensive but information for decision support about transformation control is rarer. In both the two case systems, pen, paper and knowledge are used more in the control of the transformation than support from information technology. The operational planning staffs have extensive knowledge and understanding of both healthcare and the professionals, which makes it work. There are many dependencies when it comes to use of resources; both professionals and physical resources are shared between units as well as consecutively.

The management of the two systems has limited possibilities to control the transformation of demand into outcome as the order and delivery cycle is driven by medical specialists who do not manage the process of transformation. Ownership of patient flows is less defined than clearly defined medical responsibilities within each specialty. The interwoven resource dependency is another argument for aggregated transformation and resource control in the total system at hospital level. All resources are added to the system in order to transform

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demand (input) into customer service (output). Control is thus in both systems insufficient for the costs connected with the flow. The total logistics costs and costs along the flow are not monitored. For these reasons a need for professions with logistics expertise to complement the medical specialists is indicated.

Further indication that the community healthcare clinic's system does not have full control of the transformation is that they use coordinators. This shows that there is a need to coordinate and make decisions part-way into the flow to allocate critical resources.

7.2.2 Measure of the total logistics performance

The next main feature to use in this analysis of the two cases is that *A logistics system measures to capture the whole system's logistics performance, including total logistics costs, lead times and customer service*. This means that a logistics system chooses measurements to give information about the state of the whole system's performance.

The division of measurements, physical KPI or financial KPI and process or function, is made by the purpose of measuring. The division assumes that there is a need for both functional and process performance information to support managers in their decisions (Aronsson and Andersson, 2002). The classification used is thus divided into these four groups, see Figure 30 below. This is to illustrate not only what is measured and the measurements used but also to see what is missing in terms of ratios to obtain a complete picture of the complex underlying logistics system within the two systems. A total of 32 performance measurements and KPIs, but not unique ones, were defined at the interviews. Most were traditional functional KPIs, such as waiting time, demand, and occupancy.

It can be concluded that the two systems measure a great deal but there is significant uncertainty as to how much the information is used. There is a lack of definition of the measurements, knowledge and understanding regarding what the measurements include. This contributes to the difficulties to use the measurements to evaluate the systems' performance and steer towards specific goals. Moreover, there was no indication of the use of the customer service concept in the pre-transaction element, i.e. the organisation's ability to give the patient a clear picture of what service to expect, neither for the transaction element that refers to the actual delivery of the service nor the post-transaction, which relates to the system's ability to handle complains or re-admissions. It is also realised that there were no KPIs that could be group as financial process indicators. This was thus mentioned by the respondents as a needed instrument.

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Physical KPI	Lead time	Production, Productivity Demand, Occupancy Waiting time
Financial KPI		Costs
	Process performance	Function performance

Figure 30 Division of found measurements

Generally, all care providers in Sweden have strong requirements and standards for medical documentation. At the case hospital, the documentation around each single patient is also very extensive but there is a lack of information aggregated from operational level about patient processes that is made available for strategic decision-making. Neither of the two cases measures on the basis of improving patient flow efficiency.

7.2.3 Strategy to meet demand

The next main feature to evaluate the two systems by is that *a logistics system has a strategy to meet demand* (main feature 6). This means adapting and adjusting the organisation’s current and potential capacity to the current and potential demand from the customers. It also includes having adequate resources in place to prevent the demand having a negative impact on the system.

The strategy at the orthopaedic clinic is to first set up an annual plan to fit the county council’s mission. Closer to the real demand, the physicians’ schedules are set up and hence the point when staff are tied up. This is followed by tying patients from the surgical waiting list to a unique physician. (Other professions are scheduled within each unit). Operating theatres are then booked, which means that the space resource space is tied up (both patient and physician are linked to an operating theatre). Thereafter, and finally, the patient is given an order acknowledgement regarding his or her operation. Accordingly, the system’s strategy is to plan the resources (physicians, other professions and rooms/theatres) before the real demand is known. The resource base is then fixed. When the demand is higher than the plan they have forecast, the staff must either increase capacity by doing more or a queue builds up. Capacity in a service context is the counterpart of inventory in that it allows the organisation to increase its level of production to respond to customer demand. This has a similar effect to increasing safety stocks of goods: both have a buffering effect, allowing the supplier to be more responsive and flexible to meet increased customer demand (Ellram et al., 2004). This is thus also expensive if the customer demand is lower than planned.

The strategy to meet demand at the community healthcare clinic is similar to the strategy at the orthopaedic clinic, where resources are planned before the real demand is known. Activities within this system consist largely of outpatient visits. Visit activities serve to

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smooth the system, which is a chosen strategy to meet the demand. The fact that these activities have lower priority when planning and scheduling, which makes it act as a rubber band, makes it easier to plan and schedule the clinic's activities. However, this strategy is likely to bring fluctuations in arrivals of new patients and thus also visit demand as the number of referrals depends on the number of new patient visits. Likewise, it is likely that it also creates fluctuation in the number of patients waiting for revisits, dependent demand, when the activity is given lower priority. It is not until the queue is "too" long that the visits are scheduled and the queue diminishes. The dependent demand is not that easy to forecast; it has to be calculated because of the interaction both upstream and downstream.

Resources are used both within units and along the chains of patient flows, which means that the requirements and incentives in terms of the planning and control of these resources differ according to whether a unit or chain perspective is adopted (Visser and Beech, 2005). The chosen strategy in both systems indicates that a more unit perspective is used than viewing clinic's activities as a system.

Stocks are kept with the intention to protect companies against fluctuations in demand or to smooth out demand by production for stock. In the manufacturing industry stocks are thus linked to strategy, a variable that can be changed, whereas this is difficult to do in the healthcare sector since storage of healthcare services is not possible, e.g. patients cannot have an appendectomy before they have appendicitis just because there is capacity to do so. In times of low demand, unused capacity is lost forever. "Contrary to this, during periods of excess demand the excess business is usually lost." However, a patient queue can make it possible to handle small, short fluctuations. Consequently, the stock concept is a little complicated to express in terms of care. The concept of work in process is a variant of stock but without the connection to business strategy and is therefore perhaps more suitable for a healthcare context. The number of queuing patients also binds capital while the staff put effort into monitoring the queues for production planning purposes and to keep the waiting time guarantee.

To summarise, the two systems' strategy is to plan the resources (physicians, other professions and rooms/theatres) before the real demand is known. The resource base is then fixed. Both clinics meet fluctuations with effort and sacrifice rather than face it systematically, e.g. with a lead or lag strategy, see (Olhager and Johansson, 2012). There is no evidence for a pull strategy; instead patients are pushed through both the systems. Another conclusion that can be drawn is that both systems try to convert dependent demand into independent demand by applying decoupling points along the patient flow. Between each activity in the patient flow there is a queue of referrals or patients. Furthermore, the penetration point occurs when a unique patient is linked to unique resources, like a physician and a room. Consequently, the two systems both have strategies to meet demand but they are not in line with traditional logistics strategies. There is a lack of demand strategies that support the total logistics performance of the systems.

7.2.4 Adaption to desired performance

The last main feature of a logistics system is that of *it uses logistics measurements as feedback to adjust its behaviour to reduce differences between actual and desired performance*. The feature consists of two parts; first, the system has to use logistics measurements and second it has to have logistics objectives for the clinic's activities.

There are few intentions pointing to the use of logistics measurements within each system. The interviews gave a picture of that both clinics measure a great deal but there were no examples or evidence that the measurements are used. It is also unclear whether they actually measure the quality measures listed in the hip and knee surgery care process program. Nobody mentions it in the interviews. The report on care processes also mentions some customer service measurements; these are thus also more quality measures than measures of logistics. It is essential to measure the processes to achieve good customer service – the result and output of a system.

The objectives that are mentioned can be classified as production goals rather than logistics goals. An objective for the clinics is their organisational principles:

“We will organize ourselves so that our patients receive the best possible care based on the financial available resources.” (Independently translated, Organisational principles)

This indicates that the economy sets the framework and the service will be thereafter. This is contrary to the core of logistics; to perform customer service at a certain level at the lowest possible cost. This is probably a consequence of how Swedish healthcare is governed, as economic governance is not the same as patient flow focus.

Since the objectives are non-logistical and measurements to support an adaptation are scarce, it is difficult to talk about adaptation to desired performance. Hence, there are no stated objectives or support to adapt the clinic's activities to attain the undeclared logistics goals. However, if the view of adaptation is broadened a little the orthopaedic clinic's business plan to increase production may be a sign of adaptation to meet the budget objective. They thus take the opportunity to increase production by performing more operations than the assignment says. They take patients from those county councils who do not manage to keep the healthcare guarantee. They also sense what happen in neighbouring countries in order to scout for opportunities to expand the clinic's activities.

7.2.5 Conclusions about the system's management and control

The two clinics are not entirely managed and controlled according to logistics principles. The analysis of how they fulfil the main features of a logistics system's ability to manage and control demonstrates the lack of a flow-oriented focus. It can be concluded that overall control of the transformation from patient demand to fulfilment of that demand is less than optimal, which is likely a consequence of the embedded uncertainty in co-creation with the patients. Signs of scant control are also found in the analysis of which measurements are used in the two cases. Neither of the two cases measures or uses the measurements to improve patient flow efficiency. When it comes to the strategy of meeting patient demand, it

is indicated that the management of resources uses a unit perspective rather than a holistic view of the clinic as a system.

7.3 FULFILMENT OF LOGISTICS' PURPOSE AND PRIORITIES

The two healthcare cases have been analysed by means of several main features of a logistics system. The first part concerns the design of the system where it can be assumed that some parts remain about how a logistics system is designed but not the whole system. The design is rather a functionally organised and medically oriented business. The second part is that of management and control. The overall picture is that management and control are non-flow-focused; the overall notion of flow efficiency is missing.

A summation of the analysed features provides a picture of how well the case hospital lives up to the overall objective of a logistics system; *meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance*. It can be concluded that the two case systems do not prioritise logistics thinking or flow efficiency to any great extent. This is thus probably involuntary. Though, the orthopaedic clinic demonstrates a slightly higher degree of fulfilment because they have larger volumes of patient groups, more homogeneous patient mix and they have no emergency care. However, a representation of fulfilment, based on the analysis in this chapter, is made to provide a picture of the cases' logistics features, see Figure 31. It can be noted that the fulfilment of the first main feature, the overall objective of a logistics system, is a summation of the remaining features. Additional, the fulfilment rate of 100% represents a theoretical optimal and it is therefore neither attainable nor desirable. A further discussion about the fulfilment of these main features, the potential in comparing a healthcare clinic with a “perfectly working” logistics system and the generality of the model can be found in the next chapter.

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Figure 31 The evaluation model, fulfilment rate of the two healthcare cases' ability to live up to a logistics system's main features. (C = community healthcare clinic, O = orthopaedic clinic)

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This chapter concludes the findings and presents an overall discussion of these findings along with the connection to the purpose. By this means, the purpose of the thesis will be answered; to develop a method intended for evaluating a healthcare organisation by means of the main features of a logistics system. The thesis's contribution, managerial implications and further research are also presented. As was stated in the introduction, the intention of the thesis is not to propose definitive solutions to problems but promote a new mindset whereby they can more easily be solved (just as a reminder).

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8.1 CONCLUDING DISCUSSION

Based on the analysis it is realistic to suggest that a healthcare organisation can be evaluated by means of a logistics system's main features. This is done by means of frame of references by both systems approach and basic logistics literature. The features and description aspects of a logistics system were then used to describe and evaluate two different healthcare clinics' fulfilment of these features. The main features of a logistics system as used in that analysis are shown in Figure 32, the evaluation model. Increased logistics focus can be achieved by using the model and objectives towards increased flow efficiency by ambitions for each feature. The ideal objective is probably not a rate of 100% on all features, but the ideal result on the evaluation model is not studied in this thesis. The model is here used for evaluation of healthcare organisations but it also has potential for use in other contexts.

Figure 32 General model of fulfilment of a logistics system's main features, the evaluation model

8.1.1 A logistics system's main features viable in a healthcare context

It can be concluded that a healthcare organisation can be represented as a system. The case hospital's two systems have represented illustrations of how to describe a healthcare organisation with the aim of evaluating it by means of a logistics system's main features. The description is presented in chapter 6. However, the observer always chooses the perspective

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and the objective depends on the issue or what ought to be analysed in the system. Consequently, in order to make a more operational analysis, for example identify bottlenecks or enhance variations, it is likely that other, more tailored description aspects are needed. Nevertheless, the analysis presented in chapter 7 demonstrates the possibility to use the presented description aspects to evaluate healthcare organisations using logistics flow efficiency terms.

The first main feature, *to meet customer requirements by cost-effective delivery service through flow orientation by prioritising the total performance*, in this thesis represents the purpose of a logistics system. The other features create the capacity to achieve this. They are either features connected to the design of a logistics system or to how the system is managed and controlled.

The second main feature concerns the design of a logistics system, *an order and delivery driven transformation*, and can be considered applicable to a healthcare context based on the following discussion. The analysis shows that the transformation is driven by demand but the overall transformation design is divided into several small customer order cycles. The customer order cycle is derived from an industrial context and the differences occur in fulfilment, in the diagnostic phase, where co-creation begins. Despite these differences, the analysis shows that it is fruitful to apply the customer order cycle concept to locate flow efficiency potential. The analysis shows that it is not possible to outline the total patient order cycle but there are some aspects that probably make it hard to fulfil this main feature completely. This can be derived from the fact that the patient's requirements always need to be assessed; the patient may not want to undergo the treatment offered transparency may be limited transparency since the procedure may be interactive and exploratory. This means that the order and deliver cycle is sometimes well-defined, which shows similarities with the processes found in industry although they may also be exploratory when it is necessary to take one step at a time because of the patient's illness. Both well-defined and explorative order and delivery cycles can be found in both cases. This suggests that some flexibility must be built into the system design to transform patient demand efficiently.

The analysis of the third main feature, *a flow-oriented structure*, confirms the picture of an organisational design driven by medical specialties. This implies a possibility to change perspective to a more holistic view with the patient flow in focus. Furthermore, the perspective change has to come with awareness that there are many different types of patient flows that may be central to the design. Consequently, there must also be an awareness of the consequences of the choice for the overall system's performance.

A critical look at the fourth main feature, *control of the transformation of demand into customer service and thus the customer service and the cost of resources*, shows that a very useful analysis can be made when evaluating healthcare organisations. This is due to the fact that there are very few possibilities to control the transformation. This has partly to do with the fact that ownership of patient flows is less well-defined than clearly defined medical responsibilities within each specialty. It also has to do with the inability to distinguish between the uncertainty regarding unique patients on a low level of aggregation and at the higher level where there should be

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complete and explicit specifications of the end-product requirements and delivery requirements.

By studying the measurements used at the two clinics it is possible to evaluate the intention to measure flow efficiency. This represents the logistics system's main feature number five, *to measure total logistics costs and customer service to capture the whole system's logistics performance*. There is nothing in the empirical data that indicates intentions to measure the total systems' performance, especially not the total patient flow costs or the total logistics costs. It is apparent that the medical documentation needs to be complemented with available information on both functional and patient process performance. This is to make it possible to make proper strategic decisions to increase the possibility to meet patients' requirements through cost-effective delivery service, which is the aim of a logistics system. The generics in this feature should allow it to be 100% fulfilled by a healthcare organisation.

The sixth feature, *strategy to meet demand*, gives valuable information concerning what strategy a healthcare organisation chooses when meeting patient demand. This thesis shows that established strategies can be used to evaluate the potential in managing planning to meet demand. The analysis shows that the strategy at the case hospital is to create a fixed resource base before the real demand is known. The lack of demand strategies that support the total logistics performance ultimately leads to both clinics having to use a sacrificing work effort rather than working systematically to be able to meet the demand. This, however, is a conscious strategy but it is not in line with either traditional logistics demand strategy or a pull strategy since their demand strategy does not support the total logistics performance of the systems.

The last main feature, *to use logistics measurements as feedback to adjust the behaviour to reduce differences between actual and desired performance*, is also probably the hardest feature to fulfil. Fulfilment of this feature probably indicates the level of logistics "maturity". It requires both a clear purpose of the organisation and that the organisation use logistics measures in the improvement process for better flow efficiency. However, the study shows that this feature is nevertheless useful to evaluate a healthcare organisation's ability to adopt a more flow-oriented way of working since the analysis indicates that the clinic's economy sets the framework and service will be thereafter. This is contrary to the core of logistics; to performing customer service at a certain level at the lowest possible cost.

From the discussion above it can be concluded that a logistics system's main features are usable to analyse a healthcare organisation's potential to be more flow-efficient. Even if the evaluation concerns a special kind of service and the fundamentals of the features are from a different context the main features of a logistics system complete their aim. However, given that the theoretical basis is derived from systems theory, it should be mentioned that the system boundaries used are not fixed. A shift in the boundaries divides the systems into sub-systems or enlarges them, probably giving new opportunities and insights to improve logistics efficiency. The fundamentals of systems theory should thus be considered; viz that every sub-system is a part of a larger system and that they are not separable from the larger system as a whole, i.e. they are interactive. The healthcare organisations have been viewed as

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two separate systems. Other potential for flow efficiency might appear if they were merged to form a single system or in a wider sense also include upstream and downstream healthcare providers.

The main features that are now included are in a way more focused on operational excellence, i.e. focus on internal efficiency (doing things right). To evaluate dynamic efficiency and sense the surrounding market in order to be able to do the right things, additional main features are probably needed. It might require a feature, or several, that exploit the system's ability to maintain a sustainable strategy to meet long-term demand and changes in the surrounding market.

However, the six present features together provide a possibility to complement a healthcare organisation's ability to meet patient requirements through cost-effective delivery service through flow orientation by prioritising the total performance, i.e. to be flow efficient and demonstrate logistics operational excellence.

8.1.2 Great potential for healthcare organisations

As a direct consequence of the above discussion, and the indications in Figure 31, it is interesting to look further at the potential for the organisation to fulfil the main features of a logistics system better. It is concluded in section 7.1.3 that the case systems demonstrate some parts that in a way remain about how a logistics system is designed. Thus, the systems are not designed as logistics systems; they are rather functionally organised and medically oriented operations. The potential that lies in a possible redesign of the healthcare organisations is found in both the creation of efficient processes based on patient flow and supporting this with a suitable sharing of responsibilities by the functions. To strive for a design where the transformation is predictable, has a distinct beginning and end, is intended, is repetitive, and has defined steps and an expected outcome. Additionally, potential for improved management and control can be found in providing sufficient support for particular process owners. In order to be able to assess any progress when making improvements in either or both design and management and control, an adequate baseline is thus needed. The baseline should address both a process and a functional perspective, e.g. by costs, lead times, and ability to meet promises and for the last perspective resource utilisation, throughput time and productivity. These measures, however, are only suggestions and a proper study to define useful operative key performance indicators is therefore needed.

However, the greatest potential may lie in establishing views about healthcare organisations in patient flows and establishing flow-oriented objectives including total performance of patient service and costs.

8.1.3 The importance of objective

Aimlessness makes it hard to create improvements for better total performance. The mindset of flow thinking can in that case not be present. The case study shows that the objectives are rather formulated as narrowly defined productivity concepts than an effectiveness-oriented holistic view. To change such an approach, healthcare has to have

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greater focus and create target images for the results as a whole than on productivity in single care units or isolated patient groups. Moreover, large patient processes lack targets, with the consequence that useful metrics and standards are absent. The consequences are the same; improvements in business development are inhibited. The reason for this is that the overall purpose of logistics and flow efficiency is to accomplish a change. That is why a more distinct objective and vision is required in terms of more effective flows, i.e. improved patient service, decreased costs and shorter lead times for patients.

8.1.4 The economic governance has consequences

The Swedish healthcare system is decentralised, where the main part is managed and financed from public funds. Consequently, the obvious relationship in other industries between customer and producer are replaced by a third part where the behaviour of the producers and patients are affected but that a third party accounts for most of the funding. There is also much less price-performance interaction than in most production environments. The economic governance limits the creative incentives to develop healthcare as a flow-controlled system since the measurement only focuses on costs. One way to institute the new productivity approach is to view healthcare as a value-creating industry rather than just a community cost.

A key aspect in logistics is that management (control element) must consider the total of all logistics costs (e.g. costs connected to the flow of products or services) (Stock and Lambert, 2001, Lambert et al., 1998) because the impact of reducing specific costs within logistics functions may be less than optimal for the system as a whole, leading to higher total costs, when using a non-integrative approach to logistics cost analysis (Lambert et al., 1998, Grant et al., 2006). Likewise, the case hospital in this thesis is controlled by functional budgets, which probably leads to sub-optimisation of costs.

Hence, it takes strength and clear objectives to be able to have a means whereby costs and performance of the patient flows can be assessed. The healthcare organisation itself must thus provide its own flow-oriented objectives since this is not encouraged from a higher level, i.e. the county council. This is because the healthcare organisation is not measured or privileged by the objectives of logistics. Without incentives from governing institutions, this requires possibilities for a flow efficient perspective and opportunities to measure, manage and follow up changes to be created.

8.1.5 The measurements indicate the focus

Change management tends to focus on what can be measured and the measurements used often govern development. In logistics, delivery service is more justified than product quality although the analysis of the case hospital shows that clinical measurements and diagnosis measure or treatment outcome are more common in terms of measurements used. These organisations' specific quality measurements are not to be used as support in decision-making or follow-ups or to control the organisation at a management level. The focus in the healthcare sector then shifts to a strategic level with quality indexes for the end results, but scarcely to facilitate or support the work methods to get there. Additionally, these measurements provide a poor picture of the patient flows due to their end result orientation.

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Measurements of both processes and functions are important to manage and control a healthcare organisation and develop it towards greater patient flow orientation. Measuring, monitoring, and using physical KPIs for process and functional performance within the studied systems thus has great potential. Customer service (delivery precision, delivery reliability, service level and perfect order), lead time, throughput time and queuing time can be used to measure process performance. Functional performance can be monitored as demand, work in progress, average stock level, productivity, and utilisation.

8.2 CONTRIBUTIONS

This licentiate thesis stresses the importance of the “new” research field of logistics management and encourages transfer of knowledge of efficient flow management to a new sector. One of its fundamental intentions is to more clearly define the field of healthcare logistics research and provide both a conceptual foundation and empirical observations.

The research is a practical interpretation of general theories where the systems approach and general logistics literature are elaborated in a healthcare context. The system approach is in a philosophical manner widely problematised. Within logistics research the systems approach is fundamental but few researchers have applied the systems approach concretely and distinctly in their research. This thesis has presented the main features of a logistics system by considering a system’s main features along with the theoretical foundations of logistics. This part, along with the description aspects of a logistics system, also presented in this thesis, contributes theoretically to the field of logistics in new contexts. These theoretical models, answers to RQ 1 and RQ 2, represent a generality to other contexts than healthcare. They are very likely generic to other service industries, e.g. banking and insurance, but also to other contexts.

A first step towards analysing healthcare organisations’ potential to develop towards more flow efficiency is also proposed in this thesis. The research presents an analysis of two different healthcare organisations’ fulfilment of a logistics systems main features, see chapter 7. This has contributed to a methodology which makes it possible to transfer already developed knowledge to a new context, i.e. the healthcare sector. More about managerial implications is presented in the next section. The structurally conducted literature review of logistics research in a healthcare context also contributes to the body of literature on healthcare logistics.

8.3 MANAGERIAL IMPLICATIONS

The conclusions of the “shortcomings” illustrated by the fulfilment rate in Figure 31 are not that revolutionary. Several researchers have looked at the same implications. The major managerial contribution is thus the analysis based on the logistics system’s main features, which gives a more purposive understanding of what can be done to improve flow efficiency within a healthcare organisation to make healthcare organisations progress in their ability to be more flow-oriented. It will hopefully lead to increased learning and knowledge about flow efficiency to develop a more flow-oriented healthcare.

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8.4 FUTURE RESEARCH

This thesis states that the increased efficiency and effectiveness of a unique patient or production flow is one thing, but it is the means for the system's performance as a whole that matters. Likewise, the question is how will the entire system be influenced when optimising utilisation of resources such as physicians or operating theatres? The patient flow of a particular care group is rarely isolated but is rather included in a network with other patient flows and prioritising one patient group over other groups' health needs is not always accepted. Healthcare systems are often very complex. The complexity is partly due to the fact that healthcare organisations are very knowledge and high-tech intensive together with relatively low patient volumes. As a consequence, resources have to be shared between different functions. There is a constant risk of sub-optimisation of functions, resources or specific flows when the studied system's boundaries are too narrow. A key question is exactly how to design, manage and control a healthcare organisation to handle several of these unique patient flows in a structured and standardised manner. This is a straight extension of the findings in this thesis.

Another interesting research perspective is the question of how to measure costs along the patient flow. Budget pressure will probably not change and the two case organisations need support for decisions and to manage activities in all patient flows on a cost basis. The empirical findings show that there were no KPIs that could be grouped as financial process indicators. This was also mentioned by the respondents as a needed instrument. Consequently, methods need to be developed for cost control (use of resources) and customer service (value perceived by the customer) in the healthcare sector.

The section above shows that it is not that easy to monitor the total cost of a logistics system. It is therefore of interest to know what an appropriate flow-oriented costing system should provide. It should have the ability to focus on the output of the system, in essence the provision of customer service, and to identify the unique costs associated with that output (Christopher, 2005). It should also be capable of enabling separate cost and revenue analyses to be made by customer type and by market segment or distribution channel. This requires an 'output' orientation to costing. The cost connected to the flow depends on the business area, the order structure and the working methods of the company, etc (Manunen, 2000).

It is thus essential that the performance measurement outcome can make the transition from measurements to management in order to make an organisation efficient. The logic behind the logistics system itself should therefore be fully understood. Otherwise, designing the measurement systems will continue to be a problem. The empirical data collection in this thesis is a good start in that sense. There are good examples of methods used within logistics to capture costs along flows, see for example (Abrahamsson and Aronsson, 1999) who present a conceptual model for measuring logistics structures based on a total cost analysis in combination with a methodology similar to activity-based costing (ABC). Their model has been used in several distribution redesign projects, both as a simulation tool to define a new structure as well as a reference mark in the change process itself, i.e. a baseline. This model might be a good starting point to develop something similar for the healthcare sector. It is

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indicated that ABC is also relevant to healthcare organisations since almost all costs are fixed once resources have been committed (Kelemen et al., 2007). Another argument is that ABC is claimed to be beneficial in complex organisations where activities consume various levels of overhead (Naranjo-Gil et al., 2009). For a healthcare organisation there has to be a logical and quantifiable relationship between the utilisation of resources, the performance of activities, and services that the care provider provides, all connected to the patient flow. The total cost analysis, which derives from the logistics field for calculation of the total logistics cost tied to a particular decision in a given situation, seems to be, in combination with ABC, useful for the healthcare sector.

REFERENCES

- Abrahamsson, M. & Aronsson, H. (1999) Measuring Logistics Structure. *International Journal of Logistics: Research & Applications*, Vol. 2 No. 3, pp. 263.
- Abrahamsson, M. & Karlöf, S. (2011) *Det dynamiska företaget - Om följsambet och flödesorienterade affärsmodeller*, Malmö, Liber AB.
- Ackoff, R. L. (1971) Towards a system of systems concepts. *Management Science*, Vol. No., pp. 661-671.
- Ackoff, R. L. (1973) Science in the systems age: beyond IE, OR, and MS. *Operations Research*, Vol. 21 No. 3, pp. 661-671.
- Ackoff, R. L. (1974) The systems revolution. *Long Range Planning*, Vol. 7 No. 6, pp. 2-20.
- Arah, O. & Westert, G. (2005) Correlates of health and healthcare performance: applying the Canadian health indicators framework at the provincial-territorial level. *BMC Health Services Research*, Vol. 5 No. 1, pp. 76.
- Arbnor, I. & Bjerke, B. (1997) *Methodology for creating business knowledge*, Sage Publications, Inc.
- Arlbjørn, J. S., Freytag, P. V. & de Haas, H. (2011) Service supply chain management: A survey of lean application in the municipal sector. *International Journal of Physical Distribution & Logistics Management*, Vol. 41 No. 3, pp. 277-295.
- Arlbjørn, J. S. & Halldorsson, A. (2002) Logistics knowledge creation: reflections on content, context and processes. *International Journal of Physical Distribution & Logistics Management*, Vol. 32 No. 1, pp. 22-40.
- Aronsson, H. (2000). *Three perspectives on supply chain design*. Doctoral thesis, Linköpings Universitet.
- Aronsson, H., Abrahamsson, M. & Spens, K. (2011) Developing lean and agile health care supply chains. *Supply Chain Management: An International Journal*, Vol. 16 No. 3, pp. 176-183.
- Aronsson, H. & Andersson, D. (2002) Do Swedish Companies Measure Up...? *Logistics Research Network*. England.
- Arvidsson, L. (2007) *Vårdlogistik*, SKL.
- Baltacioglu, T., Ada, E., Kaplan, M. D., Yurt, O. & Kaplan, Y. C. (2007) A new framework for service supply chains. *The Service Industries Journal*, Vol. 27 No. 2, pp. 105-124.
- Bechtel, C. & Jayaram, J. (1997) Supply chain management: a strategic perspective. *International Journal of Logistics Management, The*, Vol. 8 No. 1, pp. 15-34.

- Berlin, J. & Kastberg, G. (2011) *Styrning av hälso- och sjukvård*, Malmö, Liber.
- Berry, L. L. & Bendapudi, N. (2007) Health care a fertile field for service research. *Journal of Service Research*, Vol. 10 No. 2, pp. 111-122.
- Bowersox, D. J. (1978) The logistics of the last quarter of the 20th century. *Journal of Business Logistics*, Vol. No.
- Bowersox, D. J., Calantone, R. J., Clinton, S. R., Closs, D. J., Cooper, M. B., Droge, C., Fawcett, S. E., Frankel, R., Frayer, D. J. & Morash, E. A. (1995) *World Class Logistics: The Challenge of Managing Continuous Change*, Council of Logistics Management, Oak Brook, IL.
- Brommels, M. (2008). *Vinnvård, beviljade projekt* [Online]. Vinnvård. Available: <http://www.vnnvard.se/forskning/beviljade-projekt/beviljade-projekt-2009/lean-and-agile/> [Accessed 16th september 2011].
- Bruzeliuss, L. H. & Skärvad, P. H. (2008) *Integrerad organisationslära*, Lund, Studentlitteratur.
- Caddy, I. N. & Helou, M. M. (2007) Supply chains and their management: Application of general systems theory. *Journal of Retailing and Consumer Services*, Vol. 14 No. 5, pp. 319-327.
- Carlsson, J. (2003) *Förändringsboks slut 2003, Utvärderingsrapport Hässleholms sjukhus*.
- Carlsson, J. & Sarv, L. (2001) *Utvärdering av HAK-projektet i Region Skåne*, Region Skåne, Utvärderingsrapport 2001.
- Cavinato, J. L. (1992) A total cost/value model for supply chain competitiveness. *Journal of Business Logistics*, Vol. 13 No. 2, pp. 285-301.
- Checkland, P. (1981) *Systems thinking, system practice*, Bath, John Wiley & Sons Ltd.
- Chow-Chua, C. & Goh, M. (2000) Quality improvement in the healthcare industry: some evidence from Singapore. *International Journal of Health Care Quality Assurance*, Vol. 13 No. 5, pp. 223-229.
- Christopher, M. (1971) The new science of logistics systems engineering. *International Journal of Physical Distribution*, Vol. 2 No. 1, pp. 5-13.
- Christopher, M. (2005) *Logistics and supply chain management: creating value-added networks*, Pearson education.
- Churchman, C. W. (1979) *The systems approach*, New York, Dell Publishing Co., Inc.
- CSCMP. (2011). *CSCMP Supply Chain Management Definitions* [Online]. Available: <http://cscmp.org/aboutcscmp/definitions.asp> [Accessed September 28th 2011].

- CSCMP. (2012). *CSCMP Supply Chain Management Definitions* [Online]. Available: <http://cscmp.org/aboutcscmp/definitions.asp> [Accessed October 16th 2012].
- De Vries, J. W. M. Bertrand & J. M. H. Vissers G (1999) Design requirements for health care production control systems. *Production Planning & Control*, Vol. 10 No. 6, pp. 559-569.
- de Vries, J. & Huijsman, R. (2011) Supply chain management in health services: an overview. *Supply Chain Management: An International Journal*, Vol. 16 No. 3, pp. 159-165.
- Dey, P. K., Hariharan, S. & Clegg, B. T. (2006) Measuring the operational performance of intensive care units using the analytic hierarchy process approach. *International Journal of Operations & Production Management*, Vol. 26 No. 8, pp. 849-865.
- Dey, P. K., Hariharan, S. & Despic, O. (2008) Managing healthcare performance in analytical framework. *Benchmarking: An International Journal*, Vol. 15 No. 4, pp. 444-468.
- Dulugacz, D. Y. (2006) *Measuring Health Care - Using Quality Data for Operational, Financial, and Clinical Improvement*, San Francisco, Jossey-Bass an imprint of Wiley.
- Egnell, P. (1994) Processledning—en arbetsmodell samt erfarenheter från svenska organisationer. *Licentiatuppsats. Avdelning för kvalitetsteknik & statistik, Luleå tekniska universitet*, Vol. No.
- Ellram, L. M. & Cooper, M. C. (1990) Supply chain management, partnership, and the shipper-third party relationship. *International Journal of Logistics Management, The*, Vol. 1 No. 2, pp. 1-10.
- Ellram, L. M., Tate, W. L. & Billington, C. (2004) Understanding and managing the services supply chain. *Journal of Supply Chain Management*, Vol. 40 No. 4, pp. 17-32.
- Ellram, L. M., Tate, W. L. & Billington, C. (2007) Services Supply Management: The next frontier for improved organizational performance. *California Management Review*, Vol. 49 No. 4, pp. 44-66.
- Emery, F. E. (Ed.) (1972) *Systemteori för ekonomer och samhällsvetare*, Falköping, Gummessons Boktryckeri.
- Emery, F. E. & Trist, E. L. (1965) The Causal Texture of Organizational Environments. *Human Relations*, Vol. 18 No. 1, pp. 21-32.
- Fredendall, L. D., Craig, J. B., Fowler, P. J. & Damali, U. (2009) Barriers to Swift, Even Flow in the Internal Supply Chain of Perioperative Surgical Services Department: A Case Study*. *Decision Sciences*, Vol. 40 No. 2, pp. 327-349.
- Gammelgaard, B. (2004) Schools in logistics research?: A methodological framework for analysis of the discipline. *International Journal of Physical Distribution & Logistics Management*, Vol. 34 No. 6, pp. 479-491.

- Gammelgarrrd, B. (2004) Schools in logistics research?: A methodological framework for analysis of the discipline. *International Journal of Physical Distribution & Logistics Management*, Vol. 34 No. 6, pp. 479-491.
- Geisler, M. A. & Steger, W. A. (1963) The Combination of Alternative Research Techniques in Logistics Systems Analysis. *Management Technology*, Vol. No., pp. 68-77.
- Glouberman, S. & Mintzberg, H. (2001) Managing the Care of Health and the Cure of Disease--Part I: Differentiation. *Health Care Management Review*, Vol. 26 No. 1, pp. 56-69.
- Gomes, R. & Mentzer, J. T. (1988) A systems approach to the investigation of just-in-time. *Journal of Business Logistics*, Vol. 9 No. 2.
- Grant, D. B., Lambert, D. M., Stock, J. R. & Ellram, L. M. (2006) *Fundamentals of Logistics Management*, New York, The McGraw-Hill Companies.
- Gregson, R. (1976) The Development of a Decision Making Framework for Logistics Management: I. The Systems Approach. *International Journal of Physical Distribution & Logistics Management*, Vol. 7 No. 3, pp. 150-158.
- Gripsrud, G., Jahre, M. & Persson, G. (2006) Supply chain management - back to the future? *International Journal of Physical Distribution & Logistics Management*, Vol. 36 No. 8, pp. 643-659.
- Grönroos, C. (2007) *Service management och marknadsföring-en CRM ansats*, Malmö, Liber
- Grönroos, C. & Ravald, A. (2011) Service as business logic: implications for value creation and marketing. *Journal of Service Management*, Vol. 22 No. 1, pp. 5-22.
- Gunasekaran, A. & Kobu, B. (2007) Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995-2004) for research and applications. *International Journal of Production Research*, Vol. 45 No. 12, pp. 2819-2840.
- Hallin, B. & Siverbo, S. (2003) *Styrning och organisering - inom hälso- och sjukvården* Lund, Studentlitteratur.
- Harrington, H. J. (1991) *Business process improvement: The breakthrough strategy for total quality, productivity, and competitiveness*, McGraw-Hill Professional.
- Hayes, R. H. & Wheelwright, S. C. (1984) *Restoring our competitive edge - competing through manufacturing*, New York John Wiley & Sons Inc.
- Hellström, A., Lifvergren, S. & Gustavsson, S. (2011) Transforming a healthcare organization so that it is capable of continual improvment - the integration of improvment knowledge. *18th EurOMA Conference 3-6 July 2011* Cambridge UK.
- Hässlholmssjukhusorganisation (2007) *Vårdprogram för höft- och knäledsplastik* Hässlholm.

Hässleholmssjukhusorganisation. (2013). *Fakta* [Online]. Available:

http://www.skane.se/sv/Webbplatser/Hassleholm/Hassleholm_internet/Patienter--narstaende11/Fakta/ [Accessed January 15th 2013].

- Janlöv, N., Emtinger, B. G., Magnusson, M. & Rehnberg, C. (2009) *Att analysera hälso- och sjukvårdens kvalitet och effektivitet. En metodstudie baserad på Öppna jämförelser*, Stockholm, Sveriges Kommuner och Landsting.
- Johnson, R. A., Kast, F. E. & Rosenzweig, J. E. (1964) Systems theory and management. *Management Science*, Vol. No., pp. 367-384.
- Kaplan, R. S. (1990) Measures for Manufacturing Excellence (Hardcover). *Harvard Business School Press Books*, Vol. No., pp. 1.
- Kast, F. E. & Rosenzweig, J. E. (1972) General systems theory: Applications for organization and management. *Academy of Management Journal*, Vol. No., pp. 447-465.
- Katz, D. & Kahn, R. L. (1966a) Allmänna egenskaper hos öppna system. IN Emery, F. E. (Ed.) *Systemteori för ekonomer och samhällsvetare*. Falköping, Gumnessons Boktryckeri.
- Katz, D. & Kahn, R. L. (1966b) The social psychology of organizations. IN Emery, F. E. (Ed.) *Systemteori, för ekonomer och samhällsvetare*. Stockholm, Bokförlaget Prisma.
- Kelemen, D. M., MacArthur, J. B. & Menzel, c. R. (2007) A Strategic Planning and Cost Management Model for Managed Care Companies. *Management Accounting Quarterly*, Vol. 8 No. 4, pp. 37-47.
- Kent, J. J. L. & Flint, D. J. (1997) Perspectives on the evolution of logistics thought. *Journal of Business Logistics*, Vol. 18 No. 2, pp. 15-29.
- LaLonde, B. & Zinszer, P. H. (1976) Customer Service: Meaning and Measurement. *Chicago: National Council of Physical Distribution Management*, Vol. No., pp. p. 156-159.
- Lambert, D. M., Stock, J. R. & Ellram, L. M. (1998) *Fundamentals of logistics management*.
- Langley, J. C., Coyle, J. J., Gibson, B. J., Novack, R. A. & Bardi, E. J. (2008) *Managing Supply Chains: a logistics approach*, Canada, Cengage Learning.
- Lillrank, P., Groop, J. & Venesmaa, J. (2011) Processes, episodes and events in health service supply chains. *Supply Chain Management: An International Journal*, Vol. 16 No. 3, pp. 194-201.
- Manunen, O. (2000) An Activity-Based Costing Model for Logistics Operations of Manufacturers and Wholesalers. *International Journal of Logistics: Research & Applications*, Vol. 3 No. 1, pp. 53-65.

- McAdam, R., Hazlett, S.-A. & Casey, C. (2005) Performance management in the UK public sector: Addressing multiple stakeholder complexity. *International Journal of Public Sector Management*, Vol. 18 No. 3, pp. 256-273.
- Meijboom, B., Schmidt-Bakx, S. & Westert, G. (2011) Supply chain management practices for improving patient-oriented care. *Supply Chain Management: An International Journal*, Vol. 16 No. 3, pp. 166-175.
- Mentzer, J. T. (1991) An efficiency/effectiveness approach to logistics performance analysis. *Journal of Business Logistics*, Vol. 12 No. 1, pp. 33-62.
- Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D. & Zacharia, Z. G. (2001) Defining supply chain management. *Journal of Business Logistics*, Vol. 22 No. 2, pp. 1-25.
- Mintzberg, H. (1983) *Structure in fives: Designing effective organizations*, New Jersey, Prentice-Hall, Inc.
- Naranjo-Gil, D., Maas, V. S. & Hartmann, F. G. H. (2009) How CFOs Determine Management Accounting Innovation: An Examination of Direct and Indirect Effects. *European Accounting Review*, Vol. 18 No. 4, pp. 667-695.
- Neely, A., Gregory, M. & Platts, K. (1995) Performance measurement system design. A literature review and research agenda. *International Journal of Operations & Production Management*, Vol. 15 No. 4, pp. 80-116.
- NHS. (2011). *About the NHS* [Online]. Available: <http://www.nhs.uk/NHSEngland/thenhs/about/Pages/overview.aspx> [Accessed May of 24th 2012].
- Novack, R. A., Rinehart, L. M. & Wells, M. V. (1992) Rethinking concept foundations in logistics management *Journal of Business Logistics*, Vol. 13 No. 2, pp. 233-267.
- NUTEK (2007) *Sjukvården — en tjänstebransch med effektiviseringspotential*, Stockholm, NUTEK.
- Olhager, J. & Johansson, P. (2012) Linking long-term capacity management for manufacturing and service operations. *Journal of Engineering and Technology Management*, Vol. 29 No. 1, pp. 22-33.
- Oskarsson, B., Aronsson, H. & Ekdahl, B. (2006) *Modern logistik-för ökad lönsamhet*, Liber.
- Parker, C. (2000) Performance measurement. *Work Study*, Vol. 49 No. 2, pp. 63-66.
- Parnaby, J. & Towill, D. (2009) Engineering cellular organisation and operation for effective healthcare delivery supply chains. *International Journal of Logistics Management*, Vol. 20 No. 1, pp. 5-29.

- Parnaby, J. & Towill, D. R. (2008) Seamless healthcare delivery systems. *International Journal of Health Care Quality Assurance*, Vol. 21 No. 3, pp. 249-273.
- Peltokorpi, A. & Kujala, J. (2006) Time-based analysis of total cost of patient episodes: A case study of hip replacement. *International Journal of Health Care Quality Assurance*, Vol. 19 No. 2, pp. 136-145.
- Pidd, M. (2004) Complementarity in systems modelling. IN Pidd, M. (Ed.) *Systems modelling - theory and practice*. West Sussex, John Wiley & Sons Ltd.
- Rahimnia, F. & Moghadasian, M. (2010) Supply chain leagility in professional services: how to apply decoupling point concept in healthcare delivery system. *Supply Chain Management: An International Journal*, Vol. 15 No. 1, pp. 80-91.
- Rentzhog, O. (1998) Processorientering. En grund för morgondagens organisationer. *Studentlitteratur, Lund*, Vol. No.
- Sampson, S. & Spring, M. Special Topic Forum on Service Supply Chains. *Journal of Supply Chain Management*, Vol. 47 No. 3, pp. 88-88.
- Sanders, N. R. (2007) The benefits of using e-business technology: the supplier perspective. *Journal of Business Logistics*, Vol. 28 No. 2, pp. 177-207.
- Senge, P. M. (2006) *The fifth discipline: The art and practice of the learning organization*, London, Random House Business Books
- Silvester, K., Lendon, R., Bevan, H., Steyn, R. & Walley, P. (2004) Reducing waiting times in the NHS: is lack of capacity the problem? *Clinician in Management*, Vol. 12 No. 3, pp. 105-109.
- SKL & Socialstyrelsen (2011) *Öppna jämförelser av hälso- och sjukvårdens kvalitet och effektivitet - Jämförelser mellan landsting*, Solan, Ordförrådet AB.
- Socialdepartementet (2010) *Den ljusnande framtid är vård - Delresultat från LEV-projektet* Stockholm, Regeringskansliet.
- Socialstyrelsen (2009) *Hälso- och sjukvårdsrapport 2009*, Västerås, Socialstyrelsen, Aros, E. V.
- Stock, J. R. (1997) Applying theories from other disciplines to logistics. *International Journal of Physical Distribution & Logistics Management*, Vol. 27 No. 9/10, pp. 515-539.
- Stock, J. R. & Lambert, D. M. (2001) *Strategic logistics management*, New York, McGraw-Hill Companies
- Svenskt-Näringsliv (2005) *Varför vänta på framtidens vård? En vision om morgondagens sjukvård*, Stockholm, Svenskt Näringsliv.
- Sveriges Kommuner och Landsting (2005) *Svensk sjukvård i internationell belysning - en jämförelse av vårdbehov, kostnader och resultat*, ISBN, no 91-7164-029-0.

- Sveriges_Riksdag. (1982). *Hälso- och sjukvårdslag (1982:763)* [Online]. Available: <http://www.riksdagen.se/webbnav/index.aspx?nid=3911&bet=1982:763> [Accessed January 23 th 2012].
- Towill, D. & Christopher, M. (2005) An evolutionary approach to the architecture of effective healthcare delivery systems. *Journal of Health Organization and Management*, Vol. 19 No. 2, pp. 130-147.
- Tranfield, D., Denyer, D. & Smart, P. (2003) Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *British Journal of Management*, Vol. 14 No. 3, pp. 207-222.
- Vafidis, D. (2007). *Approaches for knowledge and application creation in logistics*. Doctoral Dissertation The Turku School of Economics.
- Walley, P., Silvester, K. & Steyn, R. (2006) Managing variation in demand: lessons from the UK National Health Service. *Journal of healthcare management/American College of Healthcare Executives*, Vol. 51 No. 5, pp. 309.
- Van Gigch, J. P. (1991) *System design modeling and metamodeling*, Springer.
- Wiger, M. & Aronsson, H. (2011) Decision support by process-oriented cost accounting for the healthcare industry: PFC - patient flow costing. *18th EurOMA Conference 3-6 July 2011 Cambridge UK*.
- Wiger, M. & Aronsson, H. (2012) Healthcare logistics - a patient flow focus, What has been done? *NoFoMa Conference 2012, 24th NOFOMA Conference, 7-8 June*. Turku, Finland.
- Visser, J. & Beech, R. (2005) *Health operations management: patient flow logistics in health care*, Abingdon, Routledge.
- Von Bertalanffy, L. (1950a) An outline of general system theory. *British Journal for the Philosophy of Science*, Vol. 1 No. 2, pp. 134-165.
- Von Bertalanffy, L. (1950b) The theory of open systems in physics and biology. *Science*, Vol. III No. 2872, pp. 23-29.
- Von Bertalanffy, L. (1968) *General system theory: Foundations, development, applications*, George Braziller New York.
- Von Bertalanffy, L. (1972) The history and status of general systems theory. *The Academy of Management Journal*, Vol. 15 No. 4, pp. 407-426.
- Vårdförbundet. (2011). *3000 dör varje år av vårdskador* [Online]. Available: <https://www.vardforbundet.se/Agenda/Pressrum/Pressmeddelanden/3000-dor-varje-ar-av-vardskador/> [Accessed August 27 th, 2012].
- Yin, R. (2009) *Case study research: Design and methods*, Carlifonia, USA, Sage publications, INC.

Zeithaml, V. A., Parasuraman, A. & Berry, L. L. (1985) Problems and strategies in services marketing. *The Journal of Marketing*, Vol. 49 No. 2, pp. 33-46.

APPENDIX I

LITERATURE REVIEW – LOGISTICS RESEARCH IN A HEALTHCARE CONTEXT

Number of articles with a healthcare context (first search phase), structured by topic and journal; and Reviewed patient flow articles and categorization

Journal	Volume, issue, year		Number of articles on	
	From	To	Patient flow	Physical products flow
<i>International Journal of Logistics Management</i>	17,1,2006	22,3,2011	1	0
<i>International Journal of Logistics: Research & Applications</i>	9,1,2006	14,6,2011	0	0
<i>Journal of Business Logistics</i>	27,1,2006	32,4,2011	0	1
<i>Journal of Purchasing and Supply Management</i>	12,1,2006	17,4,2011	0	3
<i>Journal of Supply Chain Management</i>	42,1,2006	48,1,2012	0	0
<i>Supply Chain management: An International Journal</i>	11,1,2006	17,1,2012	5	4
<i>International Journal of Physical Distribution & Logistics Management</i>	36,1,2006	42,1,2012	0	3

Reviewed patient flow articles (a total number of 26 articles)

Patient flow articles (The bold ones is the patient flow related articles from the first search phase, followed by their references from search phase two)	Number of healthcare related references (Total number of references)
<i>Engineering cellular organization and operation for effective healthcare delivery supply chains</i> J. Parnaby and D.R Towill (2009)	27 (51)
<i>Performance improvement capability: keys to accelerating performance improvement in hospitals.</i> Adler, P. S., Riley, P., Kwon, S. W., Signer, J., Lee, B. & Satrasala, R. (2003)	
<i>An example of a good but partially successful OR engagement: Improving outpatient clinic operations.</i> Bennett, J. C. & Worthington, D. (1998)	
<i>Managing the Care of Health and the Cure of Disease--Part I: Differentiation.</i> Glouberman, S. & Mintzberg, H. (2001)	
<i>Viewing Kaiser Permanente via the logistician lens.</i> Towill, D. R. (2006)	
<i>Seamless healthcare delivery systems.</i> Parnaby, J. & Towill, D. R. (2008)	
<i>The introduction of patient process re-engineering in the Peterborough Hospitals NHS Trust.</i> Probert, D., Stevenson, B., Tang, N. K. H. & Scarborough, H. (1999)	
<i>Supply chain leagility in professional services: how to apply decoupling point concept in healthcare delivery system.</i> Rahimnia, F. & Moghadasian, M. (2010)	3 (49)
<i>Measuring lean initiatives in health care services: issues and findings.</i> Kollberg, B., Dahlgaard, J. J. & Brehmer, P. O. (2006)	
<i>An evolutionary approach to the architecture of effective healthcare delivery systems.</i> Towill, D. & Christopher, M. (2005)	
<i>Supply chain management in health services: an overview.</i> Jan de Vries, Robbert Huijsman (2011)	12 (32)
<i>Health care reform in Portugal: an evaluation of the NHS experience.</i> Oliveira, M. D. & Pinto, C. G. (2005)	
<i>A stakeholder-integrated approach to health care management.</i> Zinkhan, G. M. & Balazs, A. L. (2004)	
<i>Developing lean and agile health care supply chains.</i> Håkan Aronsson, Mats Abrahamsson and Karen Spens (2011)	17 (27)

Patient flow articles (continued from previous page)	Number of healthcare related references (Total number of references)
<p><i>Quality improvement in the healthcare industry: some evidence from Singapore.</i> Chow-Chua, C. & Goh, M. (2000)</p> <p><i>Why we are wasting time in the operating theatre?</i> Saha, P., Pinjani, A., Al-Shabibi, N., Madari, S., Ruston, J. & Magos, A. (2009)</p>	
<p><i>Explaining Anomalous High Performance in a Health Care Supply Chain</i> * Shah, R. & Goldstein, S. (2008)</p> <p><i>Supply chain management practices for improving patient-oriented care.</i> Meijboom, B., Schmidt-Bakx, S. & Westert, (2011)</p> <p><i>Medicine's service challenge: blending custom and standard care.</i> Bohmer, R. M. J. (2005)</p>	49(78)
<p><i>Barriers to Swift, Even Flow in the Internal Supply Chain of Perioperative Surgical Services Department: A Case Study</i> *.</p> <p>Fredendall, L. D., Craig, J. B., Fowler, P. J. & Damali, U. (2009)</p> <p><i>Bringing Robustness to Patient Flow Management Through Optimized Patient Transports in Hospitals</i> Hanne, T., Melo, T. & Nickel, S. (2009)</p>	
<p><i>Networks for integrated care provision: an economic approach based on opportunism and trust.</i> Meijboom, B., Haan, J. d. & Verheyen, P. (2004)</p> <p><i>ABC: The Pathway to Comparison of the Costs of Integrated Care.</i> Paulus, A., Van Raak, A. & Keijzer, F. (2002)</p>	10(44)
<p><i>Processes, episodes and events in health service supply chains.</i> Lillrank, P., Groop, J. & Venesmaa, J. (2011)</p> <p><i>Time-based management of patient processes.</i> Kujala, J., Lillrank, P., Kronström, V. & Peltokorpi, A. (2006)</p> <p><i>Time-based analysis of total cost of patient episodes: A case study of hip replacement,</i> Peltokorpi, A. & Kujala, J. (2006)</p>	

APPENDIX II:

LITERATURE REVIEW – SYSTEMS APPROACH

Reviewed researchers within the field of systems approach

Ackoff

Towards a system of systems concepts (1971)
Science in the system age: beyond IE, OR, and MS (1972)
The system revolution (1974)

Beer

The brain of the firm (1972)
Diagnosing the system for organizations (1985)

Bertalanffy

The history and status of general systems theory (1972)
An outline of general systems theory (1950)

Boulding

General systems theory – the skeleton of science (1956)

Checkland

Systems thinking, systems practice (1981)

Churchman

The systems approach (1968)
The systems approach and its enemies (1979)

Flood

Rethinking fifth discipline (1999)

Forrester

Industrial dynamics (1961)

Gharajedaghi

Systems thinking- managing chaos and complexity, a platform for designing business architecture (2011)

Jackson

The origins and nature of critical systems thinking (1991)
Towards a system of systems methodologies (1984)
Beyond a system of systems methodologies (1990)
Beyond problem structuring methods: reinventing the future of OR/MS (2006)
Fifty years of systems thinking for management (2009)

Quade

The methodology of systems analysis (1985)
Analytic strategies and their components (1988)

Senge

The fifth discipline the art & practice of the learning organization (1990)

Sterman

Business dynamics: systems thinking and modeling for complex world (2000)

Ulrich

Critical heuristics of social planning: A new approach to practical philosophy (1983)

Van Gigch

System design modeling and metamodeling (1991)

APPENDIX III

LITERATURE REVIEW – LOGISTICS SYSTEMS

Reviewed articles regarding systems approach in logistics research

Author	Systems approach in logistics
Sanders, N. R. (2007) The benefits of using e-business technology: the supplier perspective. <i>Journal of Business Logistics</i> , Vol. 28 No. 2, pp. 177-207.	Claims that SCM has a systems view because all activities and functions that are needed to bring a product or service to market are considered.
Gammelgaard, B. (2004) Schools in logistics research?: A methodological framework for analysis of the discipline. <i>International Journal of Physical Distribution & Logistics Management</i> , Vol. 34 No. 6, pp. 479-491.	Logistics research can be divided in to two schools based on the underlying methodological approach: the analytical school (positivism) and the systems school (systems theory).
Arlbjørn, J. S. & Halldorsson, A. (2002) Logistics knowledge creation: reflections on content, context and processes. <i>International Journal of Physical Distribution & Logistics Management</i> , Vol. 32 No. 1, pp. 22-40.	Uses the term <i>hard core</i> to explain what is unchangeable and to illustrate what the knowledge within logistics is all about. They formulate it as “directed towards the flow of materials, information and services; along the vertical and horizontal value chain (or supply chain) that seeks to; coordinate the flows and is based on system thinking (a holistic view) where; the unit of analysis essential is the flow”.
Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D. & Zacharia, Z. G. (2001) Defining supply chain management. <i>Journal of Business Logistics</i> , Vol. 22 No. 2, pp. 1-25.	See SCM as a management philosophy and state that SCM has a systems approach to view the supply chain as a whole to managing the total flow.
Ellram, L. M. & Cooper, M. C. (1990) Supply chain management, partnership, and the shipper-third party relationship. <i>International Journal of Logistics Management, The</i> , Vol. 1 No. 2, pp. 1-10.	“supply chain management is a systems approach to viewing the channel as a whole rather than a set of fragmented parts”.
Bechtel, C. & Jayaram, J. (1997) Supply chain management: a strategic perspective. <i>International Journal of Logistics Management, The</i> , Vol. 8 No. 1, pp. 15-34.	Underline that that systems thinking is the most mentioned underpinning philosophy in the SCM literature.
Novack, R. A., Rinehart, L. M. & Wells, M. V. (1992) Rethinking concept foundations in logistics management <i>Journal of Business Logistics</i> , Vol. 13 No. 2, pp. 233-267.	Present a guide to develop the logistics discipline and the systems approach is the underlying premise in the conceptual framework of logistics management.
Gregson, R. (1976) The Development of a Decision Making Framework for Logistics Management: I. The Systems Approach. <i>International Journal of Physical Distribution & Logistics Management</i> , Vol. 7 No. 3, pp. 150-158	Logistics within a company could be represented as a system because it portrays a total pattern of phenomena whose components are interrelated
Heskett et al (1973) in Gomes, R. & Mentzer, J. T. (1988) A systems approach to the investigation of just-in-time. <i>Journal of Business Logistics</i> , Vol. 9 No. 2.	Listing observations concerning logistics systems
Geisler, M. A. & Steger, W. A. (1963) The Combination of Alternative Research Techniques in Logistics Systems Analysis. <i>Management Technology</i> , Vol. No., pp. 68-77.	Listing a number of characteristics to the basic components of a logistics system.

APPENDIX IV

INTERVIEW GUIDE – SESSION 1

Frågor till sjukhusledningen inför intervju den 22 oktober, 2009

Intervjun med dig är en del i att beskriva en baseline av hur HSO och din enhet arbetar med förändring, och med de operativa processerna. Det är en del i ett gemensamt forsknings projekt mellan HSO, Linköpings Tekniska Högskola och Karolinska Institutet.

Frågor (förändring, 20 min)

- 1 Vilka bärande principer är viktiga för dig i förändringsarbete?
- 2 I vilka strukturer bedrivs förändringsarbetet?
- 3 Vilka rutiner eller standardiserade arbetssätt använder ni er av för att bedriva förändringsarbete?
- 4 Vilka verktyg och metoder använder ni?
- 5 Hur fördelas ansvar och roller i utvecklingsarbetet?

Frågor (logistik, flöden, 20 min)

- 1 Vilka styrande principer används vid för hur de operativa processerna organiseras?
- 2 Hur sker planeringen av verksamheten?
- 3 Hur sker samordningen med andra enheter som är inblandade i patientens väg genom sjukhuset?
- 4 Vilka verktyg och metoder använder ni?
- 5 Hur fördelas ansvar och roller för planering och styrning av verksamheten?

Frågor (resultat, 20 min)

- 1 Vilka nyckeltal som ni följer upp är viktigast för dig?
- 2 Är flexibilitet viktigt för din organisation, och vilken typ av flexibilitet anser du att ni är i behov av?
- 3 Vilka behov av uppföljning och planering har du idag som du skulle vilja ha stöd för? (t ex ekonomi, resursplanering osv.)

APPENDIX V

INTERVIEW GUIDE – SESSION 2

Frågor inför intervju den 12 och 17 november 2009

Intervjun med dig är en del i att beskriva en baseline, nulägesbeskrivning, av hur HSO och din enhet arbetar med de operativa processerna. Det är en del i ett gemensamt forsknings projekt mellan HSO, Linköpings Tekniska Högskola och Karolinska Institutet.

Frågor (logistik, flöden)

- 1 Vilka styrande principer används vid för hur de operativa processerna organiseras?
- 2 Hur sker planeringen av verksamheten?
- 3 Hur sker samordningen med andra enheter som är inblandade i patientens väg genom sjukhuset?
- 4 Vilka verktyg och metoder använder ni?
- 5 Hur fördelas ansvar och roller för planering och styrning av verksamheten?

Frågor (resultat)

- 1 Vilka nyckeltal som ni följer upp är viktigast för dig?
- 2 Är flexibilitet viktigt för din organisation, och vilken typ av flexibilitet anser du att ni är i behov av?
- 3 Vilka behov av uppföljning och planering har du idag som du skulle vilja ha stöd för? (t ex ekonomi, resursplanering osv.)

Frågor (operativt, enheterna)

Detta är en övergripande struktur av frågor som kommer behandlas under intervjun. Vi kommer att anpassa frågorna efter respondent och då fokusera mer på vissa frågor genom underfrågor.

Respondenter

Datum	Respondent	Befattning	Längd
12 oktober 2009	Respondent 5	Chefsläkare ortoped, läkare	1h
12 oktober 2009	Respondent 6 och 7	Chef operationsavdelningen, ssk Chef anestesienheten, läkare	1,5h
12 oktober 2009	Respondent 8	Chefsläkare närsjukvården, läkare	1h
12 oktober 2009	Respondent 9 och 10	Enhetschef avd 9 Enhetschef Dialys	1,5h
17 oktober 2009	Respondent 11 och 12	Koordinator utvecklingsdelen (forskning) Koordinator ortoped	1,5h
17 oktober 2009	Respondent 13 och 14	Sekreterare närsjukvården Verksamhetschefens sekreterare ortoped	1,5h
17 oktober 2009	Respondent 15 och 16	Koordinator ort ssk Schemaläggare för läkarschemat ortoped	1,5h
17 oktober 2009	Respondent 17 och 18	Vårdkoordinator närsjukvården, ssk Vårdkoordinator närsjukvården, ssk	1,5h

Mer information om respondenterna

Respondent 5 – Började på sjukhuset 1992, har varit enhetschef och är nu överläkare.

Respondent 11 – Tar hand om allt runt logistiken med patienter som ingår i studier, ssk. Respondent

12 – ssk i botten, jobbar som mottagningsplanerare och operationsplanerare.

Respondent 13 – Sekreterare i botten, ansvarar nu för schemaläggning på NS och särskilda boenden + en primärvårds mottagning. Systemadministratör för avvikelser i systemet. Lokalansvarig vid lokalbyten osv och är med i miljögruppen kliniken. Kallar sig diversearbetare.

Respondent 14 – Medicinsksekreterare men nu chefssekreterare. Jobbar mot klinikchefen. Fixar telefoner.

Respondent 15 – Ansvarar för väntelistan, operationsprogrammen för läkarna är fyllda, att rätt dr är på plats och även patientfrågor och kontakt med dessa.

Respondent 16 - Jobbar på ortoped mottagningen i Kristianstad, enhetschef för läkarsekreterarna, schemaläggare för alla läkare (Hässleholm, Kristianstad, Ystad, Lund och Ängelholm)

Respondent 17 – Jobbar på akuten och är vårdplatskoordinator men har även andra uppgifter.

Respondent 18 – Jobbar på akuten, ssk, och är vårdplatskoordinator men har även andra uppgifter.

Största uppgiften är att ha hand om vårdplatserna, det övergripande ansvaret och ha kontroll över hur många vi har. Jobbar 1-2 pass/v som koordinator.

APPENDIX VI

INTERVIEW GUIDE – SESSION 3

Respondenter och Intervjuunderlag 10 och 11 mars 2010

Datum	Namn	Befattning	Längd
10 mars 2010	Respondent 19	Ortopeden, ssk	30 min
10 mars 2010	Respondent 20	Ortopedi mottagningen och närsjukvården minnesmottagning	45 min
10 mars 2010	Respondent 21	Ortopedavdelningen	30 min
10 mars 2010	Respondent 22	Närsjukvården, akutmottagningen	45 min
10 mars 2010	Respondent 6	Operationsavdelningen, ssk	20 min
11 mars 2010	Respondent 15	Operationsplanerare, ansvarig för väntelistan operationsschemat	45 min
11 mars 2010	Respondent 13	Närsjukvården, lägger läkarschemat	45 min
11 mars 2010	Respondent 14	Chefssekreterare ortoped	45 min
11 mars 2010	Respondent 23	Medicinnmottagning, IVÖ, ssk	45 min

Respondent 19

Onsdag kl 10.30 (Skalpellen) Ortopeden, postoperativa avdelningen

- Hur många anställda, heltid?
 - Yrkeskategorier? Ssk, usk och övriga, även administrativ personal.
- Fördelning av usk och ssk:s tid på olika aktiviteter? Uppskattning ur det ser ut hos er.
 - På närsjukvården har de gjort en undersökning där de delat upp de olika aktiviteterna enligt följande:
 - **Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - **Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - **Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.
 - Skiljer sig vården åt före och efter operation enligt ovanstående definition?
- Hur stor andel av patienterna passerar er för och efter operation?
 - Finns det patienter som varken passerar er eller avd 1 före och efter operation som sker på operationsavdelningen?

Respondent 20

Onsdag kl 11.15 (Skalpellen)

Ortopedi mottagningen och närsjukvården minnesmottagning

- Lite allmänt om hur flödet på mottagningarna ser ut.
- Hur många anställda, heltid?
 - Yrkeskategorier? Ssk, usk och övriga
- Fördelning av usk och ssk:s tid på olika aktiviteter? Uppskattning hur det ser ut hos er.
 - På närsjukvården har de gjort en undersökning där de delat upp de olika aktiviteterna enligt följande:
 - Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.
- Antalet besök?
 - Nybesök respektive återbesök för de olika mottagningarna?
 - Kan man även se om det är återbesök före eller efter operation?
- Hur många patienter operera på mottagningen?
- Finns det patienter som vårdas på avd 1 innan eller efter operation på mottagning?

Respondent 21

Onsdag kl 13 (Skalpellen)
Ortopedi, avdelning

- Hur många anställda, heltid?
 - Yrkeskategorier? Ssk, usk och övriga (även administrativ personal)
- Fördelning av usk och ssk:s tid på olika aktiviteter? Uppskattning hur det ser ut hos er.
 - På närsjukvården har de gjort en undersökning där de delat upp de olika aktiviteterna enligt följande:
 - Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.
- Medelvårdtid i dagar?
 - Före och efter operation?

Respondent 22

Onsdag kl 13.30(Skalpellen)
Närsjukvården, akutmottagningen

- Lite allmänt om flödet på akuten.
- Hur många anställda, heltid?
 - Yrkeskategorier? Ssk, usk och övriga (även administrativ personal)
 - Uppdelning mellan medicin och NS linjen?
- Fördelning av usk och ssk:s tid på olika aktiviteter? Uppskattning hur det ser ut hos er.
 - På närsjukvården har de gjort en undersökning där de delat upp de olika aktiviteterna enligt följande:
 - Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.

Respondent 6

Onsdag 14.15 (Skalpell)
Ortopedi, operationsavdelning

- Hur många anställda, heltid?
 - Yrkeskategorier? Ssk, usk och övriga (även administrativ personal)
- Fördelning av usk och ssk:s tid på olika aktiviteter? Uppskattning hur det ser ut hos er.
 - På närsjukvården har de gjort en undersökning där de delat upp de olika aktiviteterna enligt följande:
 - Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.

Respondent 15

Torsdag 10.15

Operationsplanerare, ansvarig för väntelistan operationsschemat. Även för att dr är på plats och för operationsfrågor och patientfrågor

- Antalet på operationsavdelningen som arbetar med administration eller andra uppgifter som inte har direkt patientkontakt?
 - Vilka uppgifter har dessa personer?
- Volym/produktion
 - Hur många opererades under 2009?
 - Hur stor andel av olika typer av operationer?
 - Kan man se hur många patienter som har ett besök innan operation eller flera?
 - Kan man se hur många patienter som besöker annan yrkeskategori än läkare innan och efter operation? Och hur många besök innan och efter?
 - Kan man se hur många telefonmöten som ske i samband med operationsprocessen med patient?
- På närsjukvården gjorde de en undersökning om hur usk och ssk fördelar sin tid. Har du någon uppfattning om hur läkarna på operationsavdelningen fördelar sin tid de dagar de jobbar hos er? På närsjukvården använde de följande uppdelning:
 - Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.

Respondent 13

Torsdag kl 11

Närsjukvården, läkarschemat

- Antal anställd administrativ personal på närsjukvården?
 - Hur många omräknat till heltid?
- Arbetsuppgifter hos administrativ personal?
 - Mest intresserad av de som jobbar med flödet av patienter, även indirekt så som schemaläggning och planering av patienter, journalskrivning, remisshantering mm
- Läkarna och deras fördelning av tiden på olika aktiviteter? (utgår ifrån hur de schemaläggs)
 - Frågor kring läkarschemat. Jag har med mig schemat som jag fick av dig, så utgår vi från det.
 - På närsjukvården gjorde de ju undersökningen av hur ssk och usk fördelar sin tid, där de delat upp de olika aktiviteterna enligt följande:
 - **Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - **Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - **Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.
 - Kan man göra någon form av uppskattning på hur läkarna fördelar sin tid enligt ovan?

Respondent 14

Torsdag kl 13.45

Chefssekreterare ortopedern

Berätta lite mer om de olika uppgifterna som läkarsekreterarna utför

Finns det fler administrativa som jobbar med flödet? Hur många och vad gör de?

Respondent 23

Torsdag kl 13.00
Medicinnottagning, IVÖ

- Lite kort allmän information om flödet på mottagningen.
- Hur många anställda, heltid?
 - Yrkeskategorier? Ssk, usk och övriga (även administrativ personal)
- Fördelning av usk och ssk:s tid på olika aktiviteter? Uppskattning hur det ser ut hos er. Jag har ej tagit del av resultatet på er undersökning men skulle behöva veta på ett ungefär hur ni fördelar tiden?
 - Direkt vård:** Alla aktiviteter där medarbetare och patient är närvarande samtidigt t ex tvättning, behandling, information osv.
 - Indirekt vård:** Avser en viss speciell patient, men patienten är inte närvarande när aktiviteten utförs t ex dokumentation, kommunikation med anhöriga per telefon osv.
 - Systemrelaterad aktivitet:** Gemensamt för alla patienter ex städning, förrådsarbete osv. Avser även pauser, väntetider osv.
- Medelvårdtid i dagar?
- Antalet besök?
 - Nybesök respektive återbesök på er mottagning?

APPENDIX II

CASE DESCRIPTION

DESCRIPTION OF CARE DELIVERY AT THE CASE CLINICS

- *A closely empirical low abstract analysis*

MALIN WIGER

2016

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THE CASE DEPARTMENT

The case clinics in this dissertation are parts of the Department of Obstetrics and Gynaecology at the University Hospital in Linköping. The origin of the empirical data found in this appendix can be found in Appendix III.

The department receives women in need of gynaecological outpatient and inpatient care, maternity care, obstetric care, postnatal care and fertility treatment. Pregnant and birthing women are also the largest group of patients at the department (Region Östergötland, 2016). The department is also responsible for cervical screening and contraceptive advice. At the department, highly specialised care is performed such as obstetrics, cancer surgery and complicated gynaecological conditions. The gynaecological surgeries can be conducted both in daytime and in inpatient surgical management. The department consists of five clinics and four of these are included as cases; Outpatient Obstetrics and Contraceptive Woman Care clinic, Inpatient Obstetrics clinic, Outpatient Gynaecology clinic and Inpatient Gynaecology clinic. The fifth is a rather small specialised operation focused on fertility treatment and is not included. This clinic conducts investigations and treatments of involuntarily childlessness and provides fertility preservation measures. The general content of the four clinics, two within obstetrics and two within gynaecology, is illustrated in the figure below, see Figure 1.

Figure 1: The department of Gynaecology and Obstetrics, the four clinics included in this appendix

1 STRATEGIC ISSUES - OBJECTIVES AND MISSIONS OF THE CASE CLINICS

The department's mission includes specialised care for citizens in the county and to some extent also nearby counties since they have regional responsibility for highly specialised care. There is also a business plan for the entire department and for each clinic. The four clinics' business plans are updated every year with their various specified objectives and the targets to achieve. Objectives and missions mentioned in the interviews are described below.

1.1 Clinic I – The Outpatient Obstetrics and Contraceptive Care clinic

The clinic's vision is *"to offer Sweden's provenly best preventive healtcare for women"*. They also express an objective to capture all the current women so that they will come and take their cervical screening.

1.2 Clinic II - The Inpatient Obstetrics clinic

The mission from the policy for the whole department is to offer and provide care related to pregnancy, childbirth with accompanying examinations and monitoring. It is also mentioned that the basic mission includes patient participation and that the baby and mother are healthy. The political objective that the clinic has concerning accessibility issues is to offer the partner a bed the first night. The clinic's own vision is *"to offer Sweden's provably best childbirth and postnatal care"*. It is mentioned that the keyword is to be provably the best; it is thus important to measure and monitor in order to show that they actually are confirmed to be the best.

1.3 Clinic III – The Outpatient Gynaecology clinic

The clinic has an agreement with the county council and through that also requirements for new visits' accessibility. Moreover, the clinic also has its own vision: *"Sweden's provably best women's clinic"*.

1.4 Clinic IV – The Inpatient Gynaecology clinic

One of the mentioned missions of the clinic is to conduct gynaecological inpatient care and provide the care that is requested and is justified. The clinic has to comply with the requirements from the county council about what they should carry out, which means that the mission is based on policy orientation. One example is sterilisation, which for a while was not conducted but is now offered and performed at the Inpatient clinic. It is mentioned that production dimensions are seldom stated as objectives, for example number of surgeries. The interest lies in the demand and whether it is possible to respond to it. Another mission and objective mentioned for the clinic is to coop with the healthcare guarantee, e.g. 80% should have surgery within 15 days or 2 months. However, the clinic has an objective of its own, which is slightly higher than that.

2 STRATEGIC ISSUES - PATIENT CASES AT THE CASE CLINICS

The presentation of different patient cases at the case clinics is done by using seven operating modes described by Lillrank et al. (2010): *Prevention*, *Emergency*, *One visit*, *Elective*, *Cure*, *Care*, and *Project*. The seven operating modes presented below include common general sub-processes to meet patient demand and transform it into output. They are based on five generic classifying variables: urgency, severity, clarity, continuity and risk. The benefit of presenting patient cases by these operating modes is that it highlights variations in patient cases based on demand from a managerial perspective and not only from medical and diagnostic needs. These modes are constructed as managerially homogeneous categories or care platforms responding to general types of demand and supply constraints (Lillrank et al., 2010). Each of the seven demand-supply combinations has its own operational logic. Demand refers to clinical need and the supply to value proposition. Since these operating modes are theoretical constructs describing an ideal type, they are not necessarily observed in a pure form. Consequently, some of the patient cases described below could be categorised by several operating modes. The main purpose is to describe each care clinic's business by their patient cases and not to exactly define their patient cases by operating modes.

Prevention

The *Prevention* mode refers to cases indicative of an elevated risk stemming from conditions such as hereditary disposition or a lifestyle with possible severe consequences. Because there is no harm or inconvenience yet it requires sacrifices from the patient, it involves motivational issues. The clinical need is: elevated risk and secondary prevention. The offering from the care provider is to reduce risk by life-style change support, medication and monitoring.

Emergency

The *Emergency* mode refers to clinical need as urgent and severe conditions requiring immediate treatment. The offering from the care provider is to save and stabilise.

One visit

The *One visit* mode is about medical conditions that can be treated as one set of procedures with resources currently available at one service provision point. The clinical need is minor ailment to be treated at earliest convenience. The offering from the care provider is routine procedure within one visit at earliest convenience. It is a here-and-now situation and the patient's medical history is not highly relevant.

Elective

The *Elective* mode refers to cases where precise diagnosis can be made and a treatment regime planned and scheduled but the sequence of steps cannot be treated in one visit. The clinical need is stepwise improvement based on precise diagnosis. The offering from the care provider is procedure with expected stepwise improvement in condition.

Cure

The *Cure* mode refers to cases where the diagnosis is not precise enough and the process can only be planned a few steps at a time. The medical problem can thus be assumed to have a preferable end state. The clinical need is unclear ailment with expected cure, but emergent process. The offering from the care provider is process adjusted to progress and restored function.

Care

The *Care* mode refers to when the ailment is chronic and will follow the patient throughout life. The clinical need is chronic condition and disease management. The offering from the care provider is to arrest decline and quality of life.

Project

The *Project* mode refers to cases that have no known precedents or patterns or that are extremely complex or costly and require extensive case by case integration, coordination and control. The clinical need is complex condition, difficult diagnosis, multi-morbidity, multi-functional interactions, very costly. The offering from the care provider is integration and coordination of several interventions to reach a solution.

2.1 Clinic I - Outpatient Obstetrics and Contraceptive Women's Care

The Outpatient Obstetrics and Contraceptive Women's Care clinic performs preventive care for women. It consists of maternity care, screening operations by cervical checks, contraception unit and phone consultations. The maternity care also includes parental support and foetal medicine. About 50 midwives work at the clinic and rotate on the different work tasks.

The cervical checks are, as mentioned, a screening operation which tests for cell changes that could lead to cervical cancer being detected. The patient is not in danger or inconvenienced; it is provided as *prevention*. Cases that only take *one visit* are also conducted at the clinic. Cases where a precise diagnosis can be made and treatment can be planned but not treated in one visit are also represented at the clinic. These patient cases are referred to as *elective*. For those patients where a diagnosis is not precise and the process can only be planned a few steps at a time, the case can be classified as *cure*. For a few patients the diagnosis and precedents are so unique and complex and are classified as *projects*. These patients are thus very few and not in focus in this analysis. Hence the parenthesis in the table below, where the different cases represented at the clinic are presented, see Table 1. More about the different cases in the next section.

Table 1: The represented patient cases at the outpatient obstetrics and contraceptive women's care clinic

	Prevention	Emergency	One visit	Elective	Cure	Care	Project
Outpatient obstetrics and contraceptive woman care	X		X	X	X		(X)

2.1.1 Prevention

All women between the ages of 23 and 65 are called every 3 or 5 years, plus those who have extra checks because of previous cell changes, to undergo a cervical check. Between 20,000 and 25,000 women are called each year and offered the test at the clinic in Linköping. In this activity it is not the patient who represents the demand or places the order, it is more of an offer. It is a chance to reduce or minimise the risk of discovering this type of cancer too late. If the patient wishes to take the tests she comes to the clinic to take the test and will thereafter get a test result sent home. If cell changes are identified the patient is called back for a return visit and if it is necessary, further investigations are made at the Outpatient gynaecology clinic. Common activities for these patient cases are shown in Figure 2 and Figure 3 below.

Figure 2: Common activities of *prevention cases* for cervical checks patient without any cell changes

Figure 3: Common activities of *prevention cases* for cervical checks patients who need further investigations

2.1.2 One visit

The Outpatient Obstetrics and Contraceptive Women's Care clinic has a particular group of patients, i.e. women in need of contraception, which can be classified as *one visit cases*. The Contraception practice helps women with contraception counselling and prescriptions. The patient contacts the clinic for an appointment, usually by phone and a visit to a midwife is booked. For women who just want to extend oral contraceptives, have visited the clinic before and are healthy, drop-in visits are also offered. Some prescriptions for some healthy patients can also be extended over the phone. Some patients wish to be sterilised, which takes a visit to the clinic and then leads to an appointment at the Outpatient gynaecology clinic. Common activities for these patient cases are shown in the figures below (Figure 4-Figure 7).

Figure 4: Common activities of *one visit cases* for contraception counselling and prescriptions

Figure 5: Common activities of *one visit cases* for contraception prescriptions via drop-in visits

Figure 6: Common activities of *one visit cases* for extended oral contraceptive prescriptions by phone

Figure 7: Common activities of *one visit cases* for extended oral contraceptive prescriptions by phone

The clinic also has telephone consulting during weekdays. Patients who call are those who are pregnant, need contraceptives or cervical check patients. This part of the clinic is now a separate business instead of being a part of the daily activities of midwives performing patient visits. The consultative part of the business can be counted as *one visit cases*, just that patients and caregivers do not meet physically in the same place. The booking or rebooking of visit times, which is also a part of the business, is rather a part of the process of a physical visit to the clinic. The midwives who advise patients by phone can now support each other, which should lead to a higher level of total knowledge available for the patient calling. More issues can then be managed on the phone instead of at a physical meeting at the clinic. This should also reduce any anxiety in the part of patients due to the telephone consulting's high availability. Common activities for the patient group calling for advice are show below, see Figure 8.

Figure 8: Common activities of *one visit cases* for the phone consulting business

2.1.3 Elective

Pregnancy is not considered a disease but is nevertheless a natural part of Swedish healthcare. These patients are in need of help and support during their pregnancy. The “diagnosis” is precise, they are pregnant, and action can be planed but not done in one visit.

Pregnant women visit the clinic for maternity checks, controls and to get support during their pregnancy but also to prepare for the upcoming childbirth and parenthood. The maternal care also includes foetus diagnosis. Most pregnancies follow the visit standards according to a basic programme. There is thus a special track for those patients who have an illness that needs extra support. More about these patient cases in the next section, *Cure cases*.

The first visit usually takes place sometime in pregnancy week 6-10. Thereafter follow a number of visits based on pregnancy week, e.g. week 25, week 29, etc. The basic programme includes 9 visits plus the additional ultrasound scans. The visits include both information, interchanges, tests and check-ups. After the childbirth (takes place at another clinic) there is a follow-up visit before case closure. The common activities for these patient cases are shown in the figure below, see Figure 9.

The clinic also offers parental support activities for parents, both during the pregnancy, during the birth, but also supporting pre-parenthood. These activities are independent and decoupled from the basic programme. Supporting activities are for example parent education, parenthood group, prophylaxis courses, breastfeeding support, groups for women expecting twins, young parents, non-Swedish speaking women and fear of childbirth support. These activities can either be categorised as *one visit* since they are one-off activities or a number of activities planned ahead as *elective cases*.

The supporting activities have different organisational forms where some are organised lectures, some are individual and personalised, and some are patient-run where the clinic only pools patients and arranges venues.

Elective cases at the clinic are characterised by many care steps. By separating the more basic needs that are common to the vast majority of pregnant women and the supplementary independent activities it is possible to standardise a process, the basic programme, which can still be perceived as individualised from the patient perspective. For those patients in need of a more flexible programme the clinic offers an individually designed programme.

Figure 9: Common activities of *elective cases* for pregnant women according to the basic programme

2.1.4 Cure

Even if the “diagnosis” is clear, i.e. pregnancy, the process can only be planed a few steps at a time for some patients at the clinic. Hence, this patient group can be classified as *cure cases*.

Pregnant women in need of additional medical support or individual expertise during pregnancy follow an individually designed programme that includes visits to clinicians instead of the basic programme. It may include women with diabetes, heart disease, HIV or autoimmune diseases. Diabetes patients are those who are most represented within this group, heart disease about 20 per year and pregnant women with HIV some a year. The common activities for the cure cases is shown in Figure 10 below.

Figure 10: Common activities of *cure cases* for pregnant women according to individually designed programmes

2.2 Clinic II – Inpatient obstetrics

The obstetrics clinic is one clinic organisationally but is divided into two units: the actual birth unit and the prenatal and aftercare unit. There are about 3,000 patients a year who give birth at Linköping University Hospital.

At the clinic patient cases that can be classified as emergency cases (according to (Lillrank et al., 2010) differentiation) is identified as they take care of birth-giving women. In addition, cases that only takes *one visit* are handled since they have an outpatient part of their business and also individual support for pregnant women. Cases where a precise diagnosis can be made and treatment can be planed but not treated in one visit are also represented at the clinic, e.g. *elective cases*. Patient cases which can be classified as *cure* are also identified. In addition, patient cases classified as *projects* are also in this case very few and not in focus in this analysis. The different patient cases represented at the clinic are presented in Table 2 below. More about the different cases in the next section.

Table 2: The represented cases at the inpatient obstetrics

	Prevention	Emergency	One visit	Elective	Cure	Care	Project
Inpatient obstetrics		X	X	X	X		(X)

2.2.1 Emergency

The first signal to the unit is when the patient makes a phone call to inform them about an upcoming birth. There is a midwife coordinator who makes contact with the patients. She both gives advice, coaches the women at home and gives the “green light” for the woman to come in to the unit. If the patient is then ready to continue the “real” preparatory work

before birth, the patient will be registered and assigned to a delivery room, i.e. admitted. Thereafter the delivery takes place. A delivery can take anywhere from 15 minutes to more than a day. After the child is born, the two patients rest and are moved to an aftercare bed (either to the maternity care or the special maternity care unit) followed by checks before leaving to go home. Before the patients leave they get an appointment for a follow-up visit and after that visit the case is closed. Within the scope of these activities so-called individual treatment processes are applied since both the pregnancy, delivery and after-care depend on the woman's and the child's health status. When the case is closed the child is registered at a child health clinic and the mother returns as a patient to the Outpatient Obstetrics clinic. The common activities for the emergency cases are shown in Figure 11 below.

Figure 11: Common activities of *emergency cases* for birth-giving women as inpatients

2.2.2 One visit

Via telephone contact with a midwife the patient is given permission to come to the birth unit for a check-up. They have approximately 3,000 outpatient visits per year, because most women come for examination and then go home again to wait for the contractions and the birth to begin for real. This business can be classified as *one visit* cases and the common activities for these cases are shown in Figure 12 below.

Figure 12: Common activities of *one visit cases* for birth-giving women as outpatient visits

Another type of one visit cases detected at the Inpatient Obstetrics unit are the follow-up visits of women who have given birth. The patient receives a note, with an appointment to the after care unit when she goes home from the hospital. They have about 2500 aftercare visits at the clinic. The common activities for these patient cases are shown in Figure 13 below.

Figure 13: Common activities of *one visit cases* for follow-up visits

2.2.3 Elective

Some women with complicated pregnancy need to be hospitalised at either the birth unit or the aftercare unit for monitoring or rest before the birth. The more highly specialised monitoring is provided at the birth unit. Figure 14 below shows the common activities for the elective cases at the clinic.

Figure 14: Common activities of *elective cases* for pregnant women

2.2.4 Cure

As mentioned above, there are women who need extra support before birth and the process some of them require cannot be scheduled with all steps at one time. Hence these types of cases may then be classified as *cure cases*. As common as they get, the common activities are presented in Figure 15 below.

Figure 15: Common activities of *cure cases* for pregnant women

Birth-giving women or children with extra need of aftercare are moved to an aftercare bed at the special maternity care unit. This unit has specialised resources to take care of those with extra needs and they also have staff during nights. Hence, the content and length of visit differ. The cases are closed after checks before leaving for home, see Figure 16.

Figure 16: Common activities of *cure cases* for birth-giving women

2.3 Clinic III – Outpatient gynaecology

The outpatient gynaecology clinic executes practice visits and outpatient surgery during weekdays and daytime for planned and emergency patients. All types of gynaecology are handled at the clinic. It may be patients with acute abdominal pain, profuse bleeding, or pregnant women if they have pain or bleeding in early pregnancy. The business also consists of cancer checks, abortions, incontinence, dysplasia (checks for cell changes), menopausal problems, hormone problems, prolapse, endometriosis (endometrium available outside the uterus, such as on ovary or bowel). Approximately 1,000 patients undergo surgery at the clinic each year. They have no emissions at the department's operating theatre, which limits what surgeries can be carried out. Patients are not anaesthetised but are sedated and given local anaesthetic.

Emergency patients are one type of patient case at the clinic that characterise *elective cases*. Some of the cases are classified as *one visit cases* and some patients have to visit the clinic several times, which makes *elective cases* represented. For some patients at the clinic the whole process cannot be planned in advance, which characterises a *cure cases*. The table below, Table 3, shows the different cases represented at the clinic. More about the different cases in the next section.

Table 3: The represented cases at the outpatient gynaecology

	Prevention	Emergency	One visit	Elective	Cure	Care	Project
Outpatient gynaecology		X	X	X	X		(X)

2.3.1 Emergency

Patients entering the system via the emergency department are announced by a call that tells them that they have a patient for the clinic. The patient is then sent up to the clinic to

meet a physician. All kinds of gynaecological problems are, as mentioned, handled at the clinic. The common activities for emergency cases are presented below, see Figure 17.

Figure 17: Common activities of *emergency cases*

2.3.2 One visit

One visit cases enter the clinic via referrals from a health centre or some gynaecology practice within the catchment area, or as an internal referral. The referral is then reviewed, which results in an appointment. The patient then receives an order acknowledgement by mail. A visit or surgery is then carried out before the case is closed. As some health centres in the region do not have access to a gynaecological chair "simpler" cases are also sent to the clinic. Referrals leading to a surgical order are scheduled by the surgery planner. The surgery is scheduled with respect to type of surgery and physicians' skills. An order acknowledgement is then sent to the patient's home, Figure 18.

Figure 18: Common activities of *one visit cases*

Additionally patients are also given appointments by phone. There are two types of case handled over the phone: appointment to physician/midwife/nurse/assistant nurse or a phone consulting call. An alternative for appointments, consulting, prescriptions, fit notes for sick leave, or copies of patient records is contact using the web-based service My Healthcare Contacts (MHC). Patients calling or contacting the clinic by MHC are given an appointment directly and an order acknowledgment it is also sent to their homes.

The phone consulting call starts and ends at the same care event just like for those patients who come for a visit or a surgery, see Figure 19. Hence the phone call is just an appointment-scheduling solution, see Figure 20. The clinic estimates that about 1/3 of all calls concern appointments and the rest are of a consulting nature.

Figure 19: Common activities of *one visit cases*

Figure 20: Common activities of *one visit cases* concerning phone or MHC consulting

2.3.3 Elective

At the clinic some patient cases can be classified as elective cases since the diagnosis is precise and it is more or less standardises stepwise improvement. Patients are to undergo

an abortion contact the clinic, are given an appointment, visit the clinic to get medication for the abortion and revisit it two days later to complete it, see Figure 21.

Figure 21: Activities of *elective cases* concerning abortion

Another patient case group that can be classified as elective cases is surgery patients. They are given an appointment by phone or MHC and an order acknowledgement is then sent to the patient. The clinic always sends an acknowledgement so that the patient receives information regarding the visit. Patients visit the clinic and if the visit results in a surgery decision the patient is given a surgical notification in her hand. The patient then goes to the surgery planner and is given an appointment for the surgery and information about the surgery. The visit, the appointment and the order acknowledgment all take place in the same day. The patient visits the clinic for the surgery and the case is then closed, see Figure 22.

Figure 22: Activities of *elective cases* concerning surgery

2.3.4 Cure

A visit can, as mentioned above, be a one visit or the visit can result in further investigation. For example, samples have to be taken and generate a revisit to receive test results or it results in a surgery appointment. The clinic provides tests for pathology and cytology. It may also be the case that an abortion patient needs to revisit for scraping.

The day after major surgery, the clinic calls the patient at home to check on how he/she is doing and if there seem to be any complications. For some patients this call results in a revisit. Those who have undergone minor surgery rarely have symptoms and are therefore not called but they have been given a phone number so they can be in touch if there is anything they may have. An illustration can be found in Figure 23.

Figure 23: Common activities of *cure cases*

2.4 Clinic IV - Inpatient gynaecology

The inpatient clinic for gynaecological patients conducts both planned and emergency surgeries. There is also a small group of patients who are not surgical patients but who are hospitalised at the clinic for other reasons. The number of surgeries carried out in a year is around 700 to 800, of which about 300 are cancer surgeries. The clinic is an inpatient clinic taking care of patients hospitalised for 24/7 service. However, the surgeries are carried out at the centralised joint hospital surgical clinic. They provide rooms, surgical personnel and materials, but not the surgeons regarding gynaecological inpatient surgery.

The clinic also has some abortion patients who first and foremost only visit them once and, as at the other reported clinics above, this clinic also has some patient cases who do not have a predictable and exact process. The table below, Table 4, shows the different cases represented at the clinic. More about the different cases in the next section.

Table 4: The represented cases at the inpatient gynaecology

	Prevention	Emergency	One visit	Elective	Cure	Care	Project
Inpatient gynaecology		X	X	X	X		(X)

2.4.1 Emergency

Emergency patients come to the clinic through the A&E and are examined at the clinic, which then often leads to surgery or medical treatment, see Figure 24. The reason for emergencies may for example be abdominal pain, bleeding in pregnancy or complications of pregnancy until week 20, miscarriage or ectopic pregnancy.

Figure 24: Common activities of *emergency cases* for inpatients

2.4.2 One visit

The clinic may have to take care of patients from the outpatient gynaecology clinic (which is adjacent to the inpatient clinic) after outpatient surgery if the patient has too much pain, too far to travel home, or has not been able to urinate after surgery. These patients will then be admitted to the clinic for hospitalisation for one or more nights, see Figure 25.

Figure 25: Common activities of *one visit cases* concerning hospitalisation due to need for rest

Regarding late abortions (from 12 weeks to 17 weeks plus 6 days), patients usually start their treatment at the outpatient clinic and ends up at the inpatient clinic (two days later). All patients will then return to the inpatient clinic after two days to complete the abortion, see Figure 26. If a patient has commenced an abortion, she must then be given a single room at the clinic.

Figure 26: Common activities of *one visit cases* concerning abortion patients from the outpatient clinic

2.4.3 Elective

The clinic has an extended catchment area because of agreements with nearby counties. Hence, referrals can come from four different healthcare providers: gynaecology oncologist at the hospital, care providers outside the county, the outpatient gynaecology clinic at the hospital and private healthcare providers in the county.

After referrals are received, they are reviewed inter alia by physicians. The referral reviewing is not about determining if the surgery is to take place or not. It is an assessment of the extent of the surgery and the patient's medical condition. How sick is the patient? What has been done before? Has the patient had surgery before? Or other diseases that must be taken into account? The surgeons need the information so that the surgery can be performed safely and order resources needed, e.g. special equipment or specialised surgeon. If the patient can go straight home after surgery or needs assistance from the municipality (e.g. home services or short-term stay) is also considered when reviewing referrals.

Some referrals are reviewed at a multidisciplinary conference in which oncologists and pathologists also participate. Samples and X-ray images can then be discussed. The radiologist can also take part if further review of radiographs is needed. When everything needed for a complete referral has been done, the patient case can be scheduled as an appointment for surgery. The patient then receives an order acknowledgment by post with information about the surgery, the surgery date and date for the registration visit. The registration visit takes place 1-2 weeks before the surgery or the day before the surgery. It results in a surgical notification that serves as an order to the central surgical clinic that prepares the operating theatre and also assists with all staff during the procedure (except surgeons).

Once a week the clinic has a coordination meeting with the surgery department which provides operating theatres and all staff except for the surgeons. The surgery day then follows. Some patients can go home the same day as the surgery while some need to stay 4-5 days after surgery depending on the type of surgery. The patient goes home or to their local hospital. There are no patients who come on planned revisits to the clinic. The figure below, see Figure 27, shows the common activities for the elective cases at the clinic.

Figure 27: Common activities of *elective cases* for inpatient surgery

It can be discussed whether this patient cases should be categorised as elective cases since the uncertainty of how precise the procedure is can be questioned. The review of the referral may result in a complete referral review with all the information needed to perform a safe surgery. However, the review may also lead to a need for more information about the medical condition or advice from other specialists. It seems that the surgeons can decide quite accurately how difficult the case is to judge to be able to plan the surgery. However, the percentage of referrals that can be a predicted path is unclear compared to where it is necessary to take decisions along the way for the referral to be complete.

Since the physicians first check the referrals for inaccuracy, and if some things are missing to be able to guarantee a safe surgery (such as X-rays, samples, etc.) the referral is sent back to the care provider that sent it. These can count as incomplete orders.

Moreover, there are cases where the procedure that will be used is precise but the diagnosis is not 100% certain. Patients with suspected cancer are given an appointment for surgery as if they have cancer since all patients who receive a cancer diagnosis after surgery are also counted in the care guarantee¹ and should then have surgery within 15 days. This applies to all types of referral. When cancer is not verified before surgery but when the test results from the pathologist are received after surgery and it turns out that it was cancer, those patients are then included in the statistics. It is stated that there are different strategies but some research suggests that it is not worth waiting for a diagnosis. The woman undergoes surgery first and the substance removed is always analysed and the patient is diagnosed retrospectively. The sample results can influence further activities at the next care provider. An illustration can be found in Figure 28.

Another type of elective cases is abortion patients. For patients who start their abortion during the weekend, when the outpatient clinic is closed, the patient begins the abortion in the inpatient department.

Figure 28: Common activities of *elective cases* concerning abortion patients in weekends

2.4.4 Cure

Regarding cure cases at the clinic it can be concluded that, as for the other cases, there are always exceptions. Sometimes late abortions may end with a necessary surgery but it is not very common, which then makes these types of patient cases cure cases. However, this is not known when the clinic receives the order. Hence, the process is handled as if the whole procedure is defined until some deviation is discovered, see Figure 29.

Figure 29: Common activities of *cure cases* concerning abortion patients with complications

The circumstances for patient cases concerning surgery are the same. Deviations from what first seems clear may occur or difficulties in reviewing referrals, or further medical investigation is needed after the registration visit. Patients may also come back for a revisit if something occurs during surgery or during post-surgery care or complications emerge when the patient has returned home. Illustration of it in Figure 30.

Figure 30: Common activities of *cure cases* for inpatient surgery

¹ The national government and the Federation of County Councils introduced the care guarantee in the early 1990s - an attempt to reduce waiting times for some operations. Since 2006, the care guarantees covered all diagnoses.

2.5 Patient order fulfilment – examples from the clinics

For emergency cases at the outpatient clinic, the order handling starts with a notification from the accident and emergency department (A&E) by phone. During the call the first medical report is declared which also starts the diagnostic activity. The patient then arrives at the clinic and the diagnosis can continue. During the same visit the treatment is started and also evaluated to predict if the patient is treated for the symptoms that brought the patient to the A&E. This corresponds to the follow-up activity and is followed by discharge from the clinic for the patient to go either home or to an inpatient clinic. The output can then be registered, see Figure 31.

Figure 31: Patient order fulfilment for emergency cases at the outpatient gynaecology clinic

The next example is taken from the outpatient Obstetrics clinic. The elective cases of pregnant women come to the clinic for checks according to the basic programme. It can be viewed as both the total episode of care and as consisting of several separate service events. Hence, a total patient order fulfilment from first contact to discharge after childbirth and each care occasion where a patient order fulfilment also exists for each and every one.

For the total patient order fulfilment, it can be supposed that an order handling is conducted through the first call from a pregnant woman. The diagnosis activity that will be followed is almost the whole process. As diagnosis is the basis for specific treatment, further investigation strategy, advice on lifestyle, predictions, forecasts, etc. It usually begins with anamnesis (medical history) and status (physical examination), which is also the case for these patient cases. This is likely since pregnancy affects women's bodies and health but is not really treated until the actual birth delivery. See Figure 32 below.

During one care occasion, i.e. service event, possible treatments can exist considering the results of diagnosis for that occasion. For example, it may be that the woman has health problems and treatment then consists of advice during the visit. A visit may also result in further treatment. For example, it may be that the woman has protein in her urine that may indicate preeclampsia, a urinary tract infection that must be treated, or that the woman needs to be monitored at the Inpatient Obstetrics clinic. See Figure 33 below for an illustration.

Figure 32: Total patient order fulfillment at the outpatient obstetrics clinic according to the basic programme

Figure 33: Patient order fulfillment for a service event - a part of total patient order fulfillment at the outpatient obstetrics clinic

For cure cases, i.e. the process is not fully predetermined due to the imprecise diagnosis as well as the procedure, which is then also reflected in the patient order fulfilment, the sub-processes act in a more iterative manner. Nevertheless, as for other cases the sub-process can still be measured and evaluated retrospectively. Furthermore, this can be a first step to go from cure cases to elective case by identifying content plus start and end points for each sub-process.

An example of the patient order fulfilment for a cure cases can be found at the Inpatient Obstetrics clinic for pregnant patients who need to rest or be monitored during their pregnancy. The reason for the stay and the content vary in this iterative process. An illustration of the patient order fulfilment related to cure cases at the mentioned clinic is presented below, see Figure 34.

Figure 34: Patient order fulfilment for cure cases at the inpatient obstetrics clinic

Another example of patient order fulfilment in relation to elective cases is taken from the Inpatient Gynaecological clinic. The referral arrives and is organised to be available for review by physicians. When physicians then start to review the referral the diagnosis process is started. The actual treatment then starts when the surgery begins. As in the previous example, see Figure 32, the diagnostic sub-process consists in relation to the other sub-process of a greater number of activities that the patient cases pass. It can, however, be discussed whether to make an appointment and acknowledge patient about order can be categorised as diagnostics. Nonetheless, these activities are steps to accomplish diagnosis since the patient becomes aware of an appointment for a registration visit. This is illustrated in the figure below, see Figure 35.

Figure 35: Patient order fulfilment for elective cases at the inpatient gynaecological clinic

The Inpatient Gynaecological clinic, as mentioned, performs surgery commissioned by other clinics. Referrals, an orders, come from the four healthcare providers described earlier. They are sometimes categorised as internal and external referrals. Consequently, the clinic can never trigger its own production. The total patient order fulfilment performance thus depends on more than just the inpatient clinic. The next chapter describes the inpatient clinic’s role in the overall patient order fulfilment.

3 STRATEGIC ISSUES - CARE DELIVERY STRUCTURE AT THE CASE CLINICS

This chapter describes the care delivery structure for each of the case clinics. In addition, two illustrations of dependencies to fulfil patient orders are also described and one of the case clinics' role in total patient order fulfilment. It ends with a description of different handovers between case clinics and other care units. The dependencies and handovers described in this chapter are derived from the interviews and there may therefore be more dependencies and different types of handovers than those presented here.

3.1 Structure characteristics at the clinics

The four clinics interpreted through the logistics lens by means of a closely empirical analysis in the previous chapter point out some characteristics. All four of the clinics have a number of different patient cases to handle, are more or less dependent on other care providers, and more or less partial care providers. The characteristics of the case clinics below follow Lambert and Cooper's (2000) dimension of understanding your supply chain network by describing the members, the different types of process, and the structural dimensions by horizontal, vertical and horizontal position.

3.1.1 Clinic I - Outpatient Obstetrics and Contraceptive woman care

The clinic concentrates on prevention for women. They are mostly a first in line care service as horizontal position and can handle a great many patient cases independently of other care providers. Further, they hand over patient cases to few care providers, which can be referred to as a narrow horizontal and vertical structure. They thus share recourses with other care providers as well as refer patients to specialists to complete patient cases. They have four different types of cases, see Table 1. Hence, prevention, one visit and elective cases characterise daily operations. This is the case clinic without emergency patients to take care of. Nevertheless, they have patient cases where time precision is greatly needed, as for contraceptive prescription and maternity care patients. The patient is not suffering or their condition is not life-threatening for the moment but the visits must take place at a certain pace. This clinic also has a number of entries for the patient, like phone appointments, phone support, drop-in visits, web-based services, and open time books for supporting services. For some patient groups they are dependent on other medical specialties, which means that these patient cases are cross-specialist and pass more than one care provider.

3.1.2 Clinic II - Inpatient obstetrics

The clinic has the most unplanned patient case business of the four case clinics. Most of their patients' visits are not booked in advanced but notified by a phone call from the birth-giving patient. The patient has also usually been a patient at case clinic I, which means that there is a medical record to take into account. From a patient perspective, the birth-giving is a part of the pregnancy and from a medical perspective prevention is of importance for the result at the clinic. They also hand over patients' cases (the new-born child) to a large number of childcare clinics. The mother case, however, goes back to clinic I. Hence, the clinic is embedded in the delivery network of care with quite a short horizontal structure and an expanding vertical structure. Consequently, they are a part of the total patient order

fulfilment and are seldom the first in line care provider. Hence, from an organisational perspective they can be classified as first in line as they take care of patient cases that are not sent from another care provider.

3.1.3 Clinic III - Outpatient gynaecology

The clinic has mostly planned appointments but also a constant preparedness for emergency patients. They are both a first in line care provider, receive cases from other care providers and hand over patient cases to following providers. Hence, their horizontal position differs. The vertical structure can be described as wide and horizontal where they are included in care chains with several care providers handling patient cases in steps. The surgeries are performed in their own theatre and with their own staff and surgeons. The clinic may be a little more first in line care provider than the system is designed for as some health centres in the region do not have access to a gynaecological chair. Consequently, "simpler" cases are also sent to the clinic.

3.1.1 Clinic IV - Inpatient Gynaecology

The clinic only receives patient cases from a previous care provider. For some patient cases they perform surgeries for other clinics, which makes them a partial care provider. They are therefore included in the care delivery network both vertically and horizontally. Regarding at the performance of the patient cases the clinic is dependent on other clinics' resources in almost every step. They also rent surgery time, including resources, at another organisational department.

3.2 Illustration I - Dependencies for patient order fulfilment at the Inpatient Obstetrics clinic

The way into the clinic may vary; most patients call before and come for outpatient check. This procedure can also be repeated. Some do not have time to call before the birth begins and some patients need to be admitted to rest or be monitored. Both the way in and the actual birth-giving and aftercare are individually tailored procedures for the patient and the new-born. A coordinator at the clinic (an experienced midwife) has telephone contact with most patients. She gives advice to the women at home with contractions and labour.

The coordinator examines the patient when she comes in and there may also be a physician involved. If the patient is ready to continue the preparatory work at the unit she will be admitted and assigned to a delivery room. The delivery unit is dependent on available beds at both the delivery clinic and some of the aftercare units. A bed includes room and necessary equipment to maintain patient safety. The patient record system provides the coordinator with information about bed availability at the units. However, all patients at both aftercare units are admitted for a reason, and there are therefore guidelines for how long they will have to stay for the intended checks. These guidelines give a possible prediction of length of stay, for example in the case of prolonged rupture of the membranes, when there is an increased risk of infection for the child but everything seems quite normal. They course of infection in a small child can be very rapid and he/she can become very ill quite quickly. All prolonged rupture patients therefore stay for 48 hours. This routine has changed in recent years, consequently, and now more patients stay longer. All dependencies described are shown in Figure 36.

The physicians have their organisational affiliation at the Department but not to the clinic. They are allocated to primary duty and duty on call. Anaesthetists belong not to the department organisation but come in to give spinal anaesthesia during birth-giving. If necessary, also surgeon and nephrology physicians can be called in. To be able to move the patient to the aftercare unit, there has to be a bed available at either of the two after care units. The medical status of the patient decides the care level and the time at day. The basic level of care unit has no staff at night and patients giving birth at night are therefore admitted to the special care level unit.

Paediatrician consultants at the after care units are thus not employees of the department either but come to investigate and prescribe at both units. If necessary, a counsellor, a physical therapist, a priest or other professional can be called in. Patients are given a note when they go home from the hospital with a time for a follow-up visit to a midwife and perhaps also to a paediatrician. The patient is not booked to see a specific individual, but the staff are scheduled to work with follow-up visits.

The baby is also a patient at the clinic but is handed over to Child Health after the aftercare process at the clinic while the mother returns to be a patient at the Inpatient Obstetrics clinic. The child is a patient for 4 weeks and the mother is a patient at the clinic for about 12 weeks after giving birth. The contact between the clinic and Child Health is on an information basis. The medical records are nowadays sent electronically, having earlier been sent by post to the specific Child Health clinic that the child would belong to and the mail was equal to the conclusion of the patient case and was related to the discharge from the clinic. This was a clear closing point of the cases from the clinic's perspective, i.e. that a copy of the fully completed medical record was sent off. However, it resulted in 5,000 letters a year.

Now there is a system of functional e-mailboxes where a secretary or a healthcare administrator sends a message to the selected Child Health clinic. Either the mother actively selects a Child Health clinic or it is the Child Health clinic that the mother belongs to according to area division. Once the Child Health clinic receives the notice about a new patient, i.e. the new-born child, they should wait a few days to check the electronic medical record so that all checks are completed and filled in. However, the full medical record is not complete until the mother has been to the last follow-up session. Nevertheless, it is the child that is handed over to the Child Health centre, which then contacts the mother with a proposed appointment for the first visit.

For the clinic, the mother is a patient for a number of weeks at the clinic. A check takes place at the Outpatient Obstetrics clinic after a few months, among other things to check healing after childbirth. If everything is OK the total patient case, as pregnant and birth-giving patient, is closed. The patient may later naturally be a patient in other cases, e.g. to obtain contraceptives, do cervical checks or in the case of a new pregnancy.

Figure 36: Dependencies at the inpatient obstetrics clinic to fulfil a patient order

As there is only one maternity clinic in the city, many women who will give birth at the Inpatient Obstetrics clinic are already patients at the Department of Gynaecology and Obstetrics by being enrolled at the Outpatient Obstetrics and contraceptive woman care clinic. In addition, some women with complicated pregnancies have also been admitted to either the birth unit or aftercare maternity unit for monitoring or relief and rest before birth. It can therefore be assumed that the clinic needs information about the patient's medical record. Availability problems at the outpatient clinic can also spill over to the inpatient clinic. Low accessibility by phone at the inpatient clinic causes perceived increased pressure on the phone advice service at the inpatient clinic.

The integration in the handover of patient cases from the clinic to Child Health can vary. The former way was by post, which also then included a full medical record with a clear end and where healthcare providers did not share information but submitted information, whereas in the current handover by functional e-mailboxes the clinic's medical records are shared with the Child Health clinic and accordingly the handover is multi-stage. Consequently, a more advanced procedure and other rules are required. However, the Child Health is allocated to health centres around in the county, which means that it is a challenge due to number and distance to have an appropriate communication.

The patient is thus usually a former patient of the department and therefore already has a documented history when she comes to give birth. Consequently, it can from a patient perspective be expected that the clinic will have a record about the patient's medical status and wishes about the birth-giving procedure. Since they belong to the same clinic, transparency should not be hindered by organisational boundaries. It is thus a management and technical issue. Furthermore, the medical record also has a role if the patient comes back to the Outpatient Obstetrics and Contraceptive Woman Care Clinic for new services. Just like in many other health services, the patient has a medical history. For this specific case the patients' history covers the same field as the new order, i.e. women's health.

As the Inpatient and the Outpatient Obstetrics clinics will take care of the same patient as a woman first being pregnant and then giving birth with after care, it is markedly important to have a good consensus between these clinics. Since both clinics carry out care with individual treatment and support for patients, consensus becomes more presence regarding practical hospitality. There are common issues linked to having the same individuals as patients and they also have some staff rotating. An example is breastfeeding, which is stated to be central, which requires a consensus among employees at both clinics.

For these issues, among others, an Executive Committee meets twice a semester and discusses common health care issues regarding for example breastfeeding preparation (issues for the outpatient clinic), breastfeeding support (issues for the inpatient clinic) and HR issues. Recruitment is another issue that concerns the relationship between inpatient and outpatient care. They compete for the same potential staff. Due to the working hours, outpatient care (daytime) can be more attractive, which makes it more difficult to recruit for the inpatient clinic.

To summarise, none of the defined activities are handled entirely with internal resources. Hence, resources are shared with other units and clinics, which indicates that there are interrelations. Furthermore, since the patient cases follow the patient's path through the clinic the patient is present through the whole patient order fulfilment.

3.3 Illustration II - Dependencies for patient order fulfilment at the Inpatient gynaecology clinic

The patient cases' entry to the clinic and hence the start of the patient process is via referrals from four kinds of care provider. However, referrals from the gynaecology oncologist clinic are notified in advance. When the gynaecology oncologist clinic receives the referral for a patient with confirmed cancer, the clinic is notified by a fax. This means that the surgery planner can then make a preliminary appointment and after completed review of the referral the patient can be finally scheduled. This method extends the planning horizon to be more certain that the 15-day limit of the health care guarantee is met.

Likewise, referrals from the outpatient gynaecology clinic, which is housed next to the inpatient clinic, communicates if they have patients who are in need of inpatient surgery. The planning of these patients may then also start before the referral is completed and reviewed. However, this transparency seems not to exist for other referral types, e.g. referrals from private health care providers in the county or care providers outside the county that have not passed the gynaecology oncologist clinic.

The referrals come either by post or digitally through the business system. The paper referrals are converted to digital format and vice versa. In addition to this, full data for considering referrals is needed. The reviewing of the referrals is dependent on some of the reviewing surgeons and X-rays and results from the pathologist have to be in place before a referral can be assessed. If the external referral for review is incomplete, it is required that the remittent fix it and submit the requested documentation. The same applies to internal referrals, where complementary X-rays or tests are requested from the referring physician. This means that the patient must be fully investigated and all evidence to make a review must be in place for decisions about episodes of care. These decisions concern type of surgery, resources needed, possible specialist during surgery, aftercare and so on. Referrals are prioritised by the physician by indicating in which time intervals the patient should undergo surgery within the care guarantee limit. For malignant or strongly suspected cancer, the guarantee is within 21 calendar days or 15 working days and benign surgery patients within two months. The shortest time to a surgery day a patient can be assessed for is thus three weeks. The time is counted from the day there is a complete referral so that all decisions can be made. All noted dependencies are illustrated in Figure 37.

For those referrals where there is a need for additional expertise during the review, the multi-disciplinary conferences are held once a week. Referrals are notified if they should be part of the conference where an oncologist and a pathologist also participate in addition to the reviewing surgeon. The clinic's own radiologist can also take part if there is a need for further review of radiographs. Another option for additional expertise is the x-ray round where the oncologist and the radiologist participate with the reviewing surgeon. This also takes place once a week. Scheduling the surgeries, which leads to appointments, is based on physicians' schedule per day. There are always two physicians performing surgery together, and the same physicians do surgery throughout the day. There can either be two tumour surgeons, a tumour surgeon and a medical specialist or a tumour surgeon and a consultant. There are three fully qualified cancer surgeons and two in training. International guidelines recommend a number of surgeons related to number of patient cases to maintain good quality of the surgery, so that the surgeons simply receive enough training and gain experience. There are also a number of specialists who also do surgery but when it is not cancer. The non-tumour surgeons are gynaecologists or some are obstetricians. The gynaecologists also do surgery at the outpatient clinic and also carry out visits. Monday, Tuesday and Thursday the clinic can use one operating theatre and on Wednesday they have two. The surgery time can be extended to also include Friday or extra knife time on some of the regular days. This is in case of a need to shorten waiting times. Scheduling is therefore needed for all types of physicians and available operating theatres to make a surgery appointment. Nevertheless, no details about the number of beds at the ward is taken into account when planning. The planning results in an appointment, a surgery day, for the reviewed referral (patient). All planning is done using pen and paper in a traditional yearly calendar. The appointment is, however, also registered in the physicians' digital calendars. This has been introduced so that they should not have to actually go to the physical calendar to look up surgery schedules. It can be mentioned that the physicians belong to the common department but do not belong to the clinic where the patients are admitted. The surgery planner thus belongs to the clinic.

When the surgery planner considers it is time to send the order acknowledgement it is sent to the patient by letter and at the same time registered in the patient's digital record. The letter contains information about surgery day, registration visit day, how to find the clinics and necessary preparations.

Thereafter, the registration visit takes place. It is often carried out a week before surgery. The patient meets a nurse, the clinical physician for the day (probably not the physician who will later do the surgery) and an anaesthetist physician. The anaesthetic assessment is done at another clinic. See Figure 37 for illustration of patient order fulfilment and dependencies.

The registration visit results in a surgery notification. It specifies how the patient will be opened and, if necessary, any special equipment. Special equipment can for example be laser for surgery of cell changes at the cervix pin. The surgery notification functions as an order to the centralised joint hospital surgical clinic that prepares the operating theatre and also assists with all other staff than the surgeons.

The order to the centralised joint hospital surgical clinic is done by an internal business system, which is done once a week. The order includes information about the patient, social security number, date of surgery, diagnosis, anticipated type of surgery, how long it is expected to take, which surgeons, and if there is anything special about the patient, (e.g. high BMI or serious illness). The surgical notifications registered in the business system can then be transformed into a surgery schedule for the following week. This schedule is then faxed to the centralised joint hospital surgical clinic every Wednesday.

Every Thursday there is a coordination surgery meeting about the surgery schedule for the upcoming week. A short meeting is held the next morning involving the head of the central surgery, a nurse or assistant nurse, an anaesthetist physician, the surgery planner for the surgery clinic and the surgery planner for the inpatient clinic and usually also one of the surgeons who will do surgery the week in question. During this meeting the chronological order of the patients for each day is determined and if there is anything special to take into account, for example high-risk patients. Special occurrences during the past week of surgery may also be reported.

On the surgery day, all patients come to the clinic in the morning or the evening before if they have far to travel. This is in case there will be changes in the surgery schedule; the patients are hence available. When the patient is admitted this is also registered in the business system and used for counting days for the healthcare guarantee. The first patient is sent to the operating theatre and the others will be regularly called by the centralised joint hospital surgical clinic. Any samples taken during the surgery are sent to the pathologist for analysis. After surgery, the patient returns to her bed at the clinic and the surgeon checks the patient there. It can be repeated that the clinic hires surgery time per year at the centralised joint hospital surgical clinic

Results from sample taken during the surgery can influence the remainder of the care episode. Whether the patient can go straight home after some recovery days at the clinic or if she must be assisted through the municipality also influences the closing of the case. Some patients can go home the same day as the surgery while some need to stay 4-5 days. The dependencies for the Inpatient gynaecology clinic to conduct patient order fulfilment is shown in the figure below (during the marked activities the patient is present).

Figure 37: Dependencies at the inpatient gynaecological clinic to fulfil a patient order

To summarise, the clinic is never the first healthcare provider in line to meet patients. They provide surgery for other care providers and hence never have their “own” patients. They are always dependent on other providers in some way to get patient cases into their business. They also have a clear dependency with the centralised joint hospital surgical clinic since they rent surgery hours. The surgery planning structure is also in clear dependency with the physicians’ daily schedule as it is based on the individuals who are scheduled for surgery time by day. This is also mentioned by staff at the outpatient gynaecology clinic as their planning procedure for both surgery and visit appointments. Furthermore, the patient is present most in the later part of the patient order fulfilment.

3.4 The Inpatient gynaecology clinic’s role in total patient order fulfilment

In order to further exemplify episodes of care and service events, i.e. total patient order fulfilment and sub-order fulfilments, the Inpatient Gynaecology clinic’s role in the total order fulfilment serves as an example. From a patient perspective the first contact with healthcare is in this case exemplified by the health centre. The patient is then sent to special care at Kalmar hospital where a cancer diagnosis is stated. A referral is then sent to the Gynaecological oncology clinic at Linköping University Hospital, special healthcare for multi-counties. The medical part, e.g. radiation, of the treatment is conducted by the Gynaecological oncology clinic and the “physical” part is done by the Department of Gynaecology and obstetrics’ surgeons and performed at the centralised joint hospital surgical clinic. The health centre is in this example the patients’ entry to care; the special hospital is the first specialised provider, the Gynaecological oncology clinic is the second specialised provider, the Department of Gynaecology and Obstetrics is the third specialised provider, and the surgical clinic the fourth specialised provider. Consequently, for each healthcare provider there is a patient order fulfilment since the patient case is transferred from provider to provider and each handles the order, diagnoses in some way, treats or sends the patient for treatment, makes a follow-up and finally discharges the case by sending the cases further to the next provider. The total patient order fulfilment as well as service episodes for each healthcare provider as part providers is illustrated in Figure 38 below. The patient cases then return to the healthcare provider formerly in line and ends up at the Health clinic for follow-up and discharge of the case.

Figure 38: Patient order fulfilment conducted by several specialised care providers

Patient cases can be broken down even further than the figure above illustrates. The Inpatient Gynaecology clinic provides beds including staff and medical services on behalf of the Department of Gynaecology and Obstetrics. Further, the centralised joint hospital surgical clinic both provides operating theatres including staff and medical equipment and are in charge of the post-surgical unit, where patients are monitored and rest after surgery before being returned to the inpatient clinic. Both units also conduct patient order fulfilment as they get tasks to manage patient cases. This makes at least seven healthcare providers that meet the patient in order to conduct the total patient order fulfilment and transform demand into output. A further provider might for example be the municipality's home services.

3.5 Handovers

Within the four clinics variations in appointment system and handover variations by pre-establish protocols, orally and by the patient herself are identified. These are described in the sub-sections below.

3.5.1 Appointment systems

One kind of identified appointment system is *drop-in*, which is present for the prevention patient cases at the Outpatient Obstetrics and contraceptive woman care clinic. The clinic invites the patients to cervical checks and offers either a structured drop-in time or a drop-in time. The structured-drop-in time means that the patients are given a specific visit time but once at the clinic, there is an organised queuing system. This means that the patient might have to wait or can do the test earlier than time they were given. The test only takes minutes. The patient does not have to cancel the offered appointment time. She can just visit the clinic for a test at one of the offered drop-in times instead. The invitation is only needed so that the women themselves do not have to keep track of the check-up interval, which is between 3 and 5 years. The drop-in appointment system is also used for patients who need new contraception prescriptions or pregnant women who need to take samples for the registration visit. Consequently, the drop-in appointment system is used both as the

start of a single service event and as a part of a patient order fulfilment consisting of several service events or episodes.

Drop-in as an appointment system can also be found for emergency patient cases, which occur for both birth giving patients and gynaecological emergency patients. Phone advising and extension of contraceptive prescriptions by phone are other examples of drop-in appointments in the sense that the patient will determine the time of the care appointment, with a certain adaptation to possible opening hours.

Appointment by phone is another appointment system used at both the Outpatient Obstetrics and contraceptive woman care clinic and the Outpatient Gynaecology clinic. These appointments are made with a specific individual. Some kind of schedule at individual level and open reservation slots is therefore required. Open reservation slots can also be used when a healthcare provider needs to make an appointment for the patient at another care provider as when a midwife make appointment for an ultrasound examination for a pregnant woman. Open reservation slots can hence be on an individual basis but also on a functional basis. For instance, at the aftercare unit for birth-giving women when they are given a revisit appointment. The appointment is by function a revisit to a midwife but not to a specified individual.

A similar type of appointment to the phone appointment is the web-based service My Healthcare Contacts (MHC). However, appointment handling by this medium is decoupled from meeting in real time. It is not a direct contact and the patient case can thus be handled during an extended time window compared to appointments by phone calls.

Appointments for subsequent visits can also be integrated in the visit. This is done, for example, at the Outpatient Obstetrics and contraceptive woman care clinic, for pregnant women's next visit agreed during the visit. A variant of this is the appointment system used for revisits for birth-giving patients. They receive a note with appointment information for revisit before they leave the inpatient clinic.

3.5.2 Pre-established protocols

Pre-established protocols as referrals, surgical notifications and medical reports are identified at the case clinics. The pre-established protocols are not entrance to care providers; they are handover structures.

Referrals are used between different care providers as orders in which the receiving care provider itself will determine when and how the order should be handled. Referrals as handovers are identified at the two gynaecological clinics. Both perform surgeries. The two obstetrics clinics can hence use referrals to hand over a part or the whole of a patient case as in the example with pregnant women who need support for their fear of childbirth. This clinic stands more first in line that will receive patients from other care providers. In addition, the Inpatient Obstetrics clinic is more or less an emergency clinic where a referral to see a specialist is not required.

Another pre-established protocol is the surgical notifications used at both surgical clinics as specification of surgery order. Information about the patient, the surgery type and equipment needed is made clear.

Medical reports can also be classified as a pre-established protocol; the essence of the content is thus standardised but perhaps not the format. Medical reports are used in the handover from the aftercare unit at the Inpatient obstetric clinic to both the Child Health clinic and back to the Outpatient Obstetrics clinic. A message is, as mentioned before, sent to the pre-specified Child Health clinic that they have a new patient. The Child Health clinic then itself downloads the medical report and contacts the mother with a proposed appointment for a first visit. As the mother is instead handed back to the outpatient clinic they also get access to the medical report. The mother contacts the clinic after a few months for an appointment for the follow-up visit. Medical reports are also used as handovers within patient cases in the same way as at the clinic.

There is also error management that can be categorised as pre-established protocols. Error management includes identifying, documenting and reporting abnormal events and near misses. An abnormal event is anything that is not consistent with the normal routine and expected course of treatment, also including administrative procedures. This has been used from the Child Health clinic to the Inpatient Obstetrics clinic when they have been displeased with the handover of new-born children concerning “incomplete” medical reports.

3.5.3 Orally and the patient herself

Handover of patient cases is also handled orally as when the emergency department announces that they have a patient for the In- or outpatient gynaecological clinic. The oral system is also used when in-hospital clinics contact the surgery planner at the Inpatient gynaecology clinic prior to referral. A confirmed cancer patient can then be scheduled before the completion of the referral.

As mentioned above, the patient herself sometimes has the responsibility to contact the care provider for an appointment. This is identified in the handover of patient cases from the Inpatient Obstetrics to the Outpatient Obstetrics clinic as well as any revisits after surgeries at the In- or Outpatient gynaecological clinic. The patient herself also has the responsibility for continuing in the care process when using drop-in appointments. Samples or X-rays needing to be completed before the next visit is an example of this. This is also the case when patients call the “wrong” clinic. The patient seeks care, is re-directed to another care provider and then tries again.

4 PLANNING ISSUES - PLANNING AT THE CASE CLINICS

At all clinics patient cases are received and handled in different ways, partly depending on the businesses' characteristics. Depending on how demand is managed to match available capacity there are consequences as regards lead times.

4.1 Clinic I – Outpatient Obstetric Clinic

No data is collected on this subject at the Outpatient Obstetrics clinic.

4.2 Clinic II - Inpatient Obstetric clinic

The Inpatient Obstetric clinic has a number of different types of patient cases; both planned and non-planned. Since birth-giving patients are not planned for a certain appointment, the clinic itself does not control the daily production rate. Moreover, the order handling and diagnosis processes are usually included in the meeting or talking over the phone with the patient. The patient case lead times are therefore more dependent on performance during the hospitalisation than on how they handle patient orders and the diagnosis process.

The clinic has four different units to staff; birth-giving, aftercare, special aftercare and revisits. They are staffed by standard staffing by number and experience. For example, the birth-giving unit has coordinators who have long experience, are clinically skilled and are good at leading the daily operational work. There is also a supervisor, with experience but who is focused on supervising students or new employees instead. The third group of midwives is so-called new midwives, those who are working their first year. There are also other healthcare professionals such as assistant nurses working at the clinic. All three types of midwives are needed during each work shift around the clock. There is a standard of two coordinators, two supervisors and one new midwife per day shift and evening shift. During nights there are four staff instead of five. Additionally, they have had for a test period automatic scheduling by IT support based on forecasting. The staff, however, wanted to choose shift more freely, especially regarding weekends. They are still using the capacity planning based on demand that emerged during the test but the staff planning is done by “hand” again.

4.3 Clinic III – The Outpatient Gynaecology clinic

The Outpatient Gynaecology clinic also has a number of patient cases, but more planned cases than emergency patients. This clinic can thus plan their production rate and the patient lead times therefore also depend on patient order handling and the diagnosis process.

The visit appointments to physicians and for surgery are based on the physicians' schedule. The physician is scheduled centrally (not at the clinic) and the schedule is communicated to the clinic about 1.5 months in advance. The schedule covers approximately 3 to 4 months where the number of physicians and skills are available per day. The clinic then puts the available appointment times into the business stem and they become available for reservations. The schedule of the physicians therefore controls the number of appointment times at the clinic. The clinic has determined a basic need for 22 physician visits / week

(Monday – Friday, no on-call times included). For the other visits, to a nurse or midwife, planning is done a little later, approximately 3-4 weeks before the appointment times become available for scheduling patients. These appointments are said to rather be controlled by available rooms and staffing. The schedule for these professionals is drawn up by the clinic itself.

The strategy for shortage of physician appointments is that new visits have priority over re-visits. This is because the clinic is evaluated by availability for new visits and thus rewarded with more money. However, medically it may be more important to prioritise revisits.

4.4 Clinic IV – The Inpatient Gynaecology clinic

The Inpatient Gynaecology clinic mainly has planned surgeries notified by referrals. As for the other clinics, the physicians' schedule is planned centrally. They ask for a schedule, the scheduler adds the schedule, and the schedule is then valid for 3-4 months divided into morning and afternoon sessions. Thus, on what day an incoming referral is reviewed depends on the physicians' schedule (not all physicians make reviews). However, the surgery planner gets a notification from the Gynaecology Oncological clinic when they have a patient with malignant cancer and can then make a preliminary appointment. This is a strategy so that the healthcare guarantee can be met. It is an indication that the common cycle time is higher than the healthcare guarantee of 15 days since there is a risk that the surgery times are fully booked for the next three weeks when the review is completed. If they have to prioritise, cancer patients have priority.

Both the multidisciplinary conference and the X-ray round are held once a week. Consequently, it influences the cycle time. Surgery day also depends on the physicians' schedule. The physicians' experience and skills determine which surgeries are planned into their daily schedule. The surgery planner has a strategy to plan the most major surgeries for Mondays and the minor surgeons at the end of the week so that they do not have that many patients in bed over the weekend. Another reason is for the bed availability for new patients the following Monday. This is thus subordinate to the physicians' schedule; if a cancer surgeon is available on a Thursday, a major surgery is performed. The clinic has two operating theatres on Wednesdays. It is then standard with cancer surgery in one and "other" in the other (the surgeon is then a medical specialist). Bed capacity is otherwise not included in the surgery planning.

The staff at the clinic caring the patients before and after surgery and other treatments are scheduled by basic need for staffing. Previously they had scheduling according to staff preferences but now have fixed schedules. It took too much time to administer and the staff were never pleased with their schedules. Instead there are predefined schedule lines covering about 12 weeks. Since there are two operating theatres on Wednesdays, Thursday mornings are when several patients should be mobilised (to get out of bed the day after surgery). Therefore, some extra staff time is planned these days. However, the number of patients in beds varies during the week, and therefore also the total burden of care of the hospitalised patients.

If there is a need to reschedule patients' surgery day, e.g. cancer patients need the slots instead, the strategy is to move (in consultation with the physician) non-cancer patients with no greater suspicion of cancer and with no serious symptoms. Additionally, patients can be deleted during surgery day if some of the previous surgeries take too long. The strategy is then to find a new surgery day as soon as possible and that the woman is then made number one or two in surgery order. This is due to the need to as far as possible avoid being deleted again.

4.5 Planning characteristics at the case clinics

To handle patient order fulfilment there are dissimilar logics among the different clinics and types of patient cases. The two gynaecology clinics have a basic staffing depending on the day of the week. The number of physician appointments depends on the physicians' scheme, also a basic number of slots depending on weekday. The physicians' schema is, as mentioned, planned centrally, which also includes the scheduling of all types of on-call time, research time, teaching, and continued training. In contrast, the number of appointments when using drop-in as the appointment system or taking care of emergency patients is instead dependent on number of visits. Hence, it can be assumed that the number of visits is flexible and follows the demand more dynamically than the fixed number of appointments per week. Furthermore, the two gynecology clinics use queues and can therefore utilise resources "fully". Consequently, they should be able to have a steady workload. While the Inpatient Obstetrics for example due to their large number of emergency patients, sometimes has too little capacity and sometimes overcapacity due to the natural fluctuation in patient demand.

There is also a difference between planning logic for resources concerning appointment to visits or surgeries and other duties related to daily operations. For appointments the logic is based on individual schedules. This consequently regulates to the availability of resources and in that sense also capacity. It should be noted that more resources in terms of appointments or surgery slots do not necessarily increase capacity. Other resources than access to appropriate staff may be needed, e.g. operating theatre or visit rooms or beds. Furthermore, the other logic concerns the planning of other duties related to daily operations. There are a number of tasks to be performed, but the individual who will carry them out may be determined the same day or not individual-specified at all, tasks that balance their workload.

It is also indicated that there seem to be two different strategies to determine needed capacity; to determine it or experience it. At the birth-giving unit they have used a capacity determination based on demand and throughput times. In addition, at the Outpatient Gynaecology clinic they have noticed that they need at least 22 physician appointment slots each week, otherwise they become frustrated.

The tactical planning logic at both Clinic III, the Outpatient Gynaecology clinic and Clinic VI, the Inpatient Gynaecology clinic, seems to be that average capacity is sufficient to meet average demand. There will be the right level of capacity to provide care. The focus is on resources used for diagnosis and treatment of patients.

The production planning at case clinic IV is based on weekly cycle times and bed capacity is not an issue. The inpatient surgery planning does not take into account bed availability at the aftercare unit. The surgery planning structure is also in clear dependency with the physicians' daily schedule as it is based on the individuals who are scheduled for surgery time by day and other frequent weekly activities.

5 MEASURING ISSUES - MEASURING AT THE CASE CLINICS

The four clinics measure and use a number of medical measurements that can be categorised as results or output of patient order fulfilment. They have also defined some key performance indicators linked to quantitative objectives. How patient order fulfilment is measured and how they use the measurements at the clinics is described below. It should be noted that the description is based on information from the interviews and in some cases also business plans received during interviews. There may of course be measures and measurements in use that have not been mentioned. However, measures described in context can be assumed to be used more actively in a business than the measurements existing in business documents. The measurements mentioned during the interviews are described below

5.1 Clinic I – The Outpatient Obstetrics and Contraceptive Care clinic

Availability is indicated by three measurements, including target values: waiting time to visit a physician, waiting time to first visit for pregnant women and phone availability. In addition, also patients' satisfaction and the proportion of first-time pregnant women who participated in parenting education are measured with target values. Finances inter alia are tracked monthly per unit and development / improvement work is followed by focusing on certain processes (e.g. foetal medicine and referral process). In total 11 key performance indicators / target values are in focus in their business plan.

5.2 Clinic II – The Inpatient Obstetrics clinic

As the clinic's vision is to offer the provably best care they think it is important to measure medical results. A number of medical quality results are mentioned, i.e. caesarean sections, excessive bleeding and breast-feeding.

5.3 Clinic III – The Outpatient Gynaecology clinic

The clinic continuously follows the number of patients waiting for new visits since it is linked to money received. This is done by hand a few times a month. Through the business system lists of waiting times at individual level are extracted and scanned. The patients who have waited "too" long a time are checked by going into their medical records to perhaps find out if there is a problem. The clinic also follows telephone availability, waiting time for treatment from the medical review and percentage waiting more than 60 days. The percentage of satisfied patients is also observed by patient survey.

5.4 Clinic IV – The Inpatient Gynaecology clinic

A number of metrics were mentioned: returns as inpatients coming back to the clinic because of complications connected to the surgery or post-surgery care, demand, number of surgeries, and measures called for by the national register. However, the demand is not quantified more than it is believed that there is some fluctuation but the arrival of referrals is fairly steady over the year. Nevertheless, the demand is considered to be generally

governed by the profession itself depending on what they offer, what is written, and what can be done.

Waiting times are followed centrally and as mentioned earlier it is the time from when the referral is reviewed to the day the patient should have surgery and is admitted to the clinic via the business system. The clinic follows waiting times for checking that there is no patient "lagging", e.g. a referral is not treated. This is done by hand from list in the business system. However, it is mentioned that Oncology measure the time from when the referral arrives at the surgery since that time is not the same as the time covered by the healthcare guarantee. It is thus difficult to get that data.

The clinic receives both cancer lead times for treatment and surgery once a quarter. This follow-up is considered more as a check for good job performance. The daily checking to keep the healthcare guarantee is manual tracking by the surgery planner. As mentioned earlier, patients planned for surgery are scheduled in a paper calendar. Patients with referrals from the Oncology Gynaecology clinic are marked with a red pen for how many days they have been waiting (from reviewed referral to planned surgery day). Preliminarily planned patients are written in pencil, and called written in ink. The hand-written system in the calendar is necessary to have a daily check of the surgery plan and keep track of the patients who receive surgery within the healthcare guarantee.

The medical results are measured *inter alia* by the National Quality Registry of Gynaecological Surgery. All patients who have undergone surgery for any kind of gynaecological ailment receive a questionnaire before surgery and within a year after the surgery and two follow-ups. It is mentioned that the register offers the possibility to download a lot of data. However, currently no specific metrics were in focus for developing the business, but it is mentioned that specific indicators such as post-operative infections should soon be emphasised.

5.5 Lead and throughput times

Lead and throughput time variations are significant between different categories of patient cases; some take less than an hour while some can take over a year. This is from the clinics' perspective but from a patient perspective it can take from an hour up to a lifetime depending on what the health problem is. It has not been possible to, in a time-efficient way, collect data for lead and throughput times at the case clinics.

REFERENCES

- LAMBERT, D. M. & COOPER, M. C. 2000. Issues in Supply Chain Management. *Industrial Marketing Management*, 29, 65-83.
- LILLRANK, P., GROOP, P. J. & MALMSTRÖM, T. J. 2010. Demand and Supply-Based Operating Modes—A Framework for Analyzing Health Care Service Production. *Milbank Quarterly*, 88, 595-615.
- REGION ÖSTERGÖTLAND. 2016. *Kvinnokliniken i Linköping* [Online]. Available: <https://www.regionostergotland.se/Om-regionen/Verksamheter/Barn--och-Kvinnocentrum/Kvinnokliniken-i-Linkoping/> [Accessed May 13th 2016].

APPENDIX III

FALLBESKRIVNING

FALLBESKRIVNING

Kvinnokliniken

Universitetssjukhuset i Linköping

MALIN WIGER

2016

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1. INTRODUKTION

Denna fallbeskrivning är en sammanställning av åtta intervjuer med personer i ledande befattning eller centrala positioner på Kvinnokliniken (KK) vid Linköpings universitetssjukhus (US). Beskrivningen presentera verksamheterna utifrån hanteringen av patientärendena. Varje intervju varade ca 1 timma per respondent alla bandades. Intervjupersonerna fick under intervjun rita sin bild av patientflödena som hanteras i deras verksamhet. Bilderna användes genom intervjun som samtalsunderlag och som dokumentering av intervjun. Nedan följer en introduktion av KK följt av mer ingående beskrivningar av varje verksamhet.

1.1 KVINNOKLINIKEN

Kvinnokliniken tar emot kvinnor med behov av råd om sexuell hälsa, gynekologisk vård, mödrhälsovård, förlossnings och BB-vård och fertilitetsbehandling samt utför cellprovskontroller. På kliniken bedriv högspecialiseradsjukvård inom bland annat obstetrik, cancerkirurgi och komplicerad gynekologiska tillstånd. De gynekologiska operationerna sker i både dag- och slutenvårdskirurgisk regi.

Kvinnoklinikens patienter kommer huvudsakligen från Östergötland men inom den högspecialiserade vården kommer även kvinnor från Kalmar, Jönköpings, Södermanlands och Västmanlands län då US är ett regionsjukhus för dessa patientgrupper.

1.2 ORGANISATION

Kvinnokliniken tillhör Barn- och kvinnocentrum som är ett av fem centrum på Universitetssjukhuset i Linköping och som ansvarar för den specialiserade vården som är länsövergripande. Organisatoriskt ligger de fem centrumen direkt under regiondirektören.

Rent organisatoriskt delas kliniken in i fyra huvudspår: Obstetrik öppen- och slutenvård samt Gyn öppen- och slutenvård, se Figur 1 nedan. Inom kliniken finns även RMC som är en infertilitets verksamhet. Den är relativt liten i volym och avskild från övrig verksamhet och kommer ej att behandlas närmre.

Kvinnoklinikens fyra huvudspår

Figur 1: De fyra huvudspåren hos kvinnokliniken

1.2.1 Obstetrik

Obstetrikerna är uppdelade i öppenvård och slutenvård med tillhörande underverksamheter. Öppenvårdsobstetrik/preventiv kvinnohälsovård innefattas av Mödrahälsovården (MHV), Preventivmedelsmottagningen och Gynekologisk cellprovskontroll (GCK).

MHV tar emot patienter som väntar barn samt uppföljning efter barnafödandet. Till preventivmedelsmottagning kommer patienter för att få råd om eller recept på preventivmedel. GCK är en screeningverksamhet där patienter inom ett visst åldersspann kallas vart tredje år till cellprovskontroll.

Slutenvårdsobstetrikens verksamhet består av förlossning och BB. Det är kvinnan som är patient men Kvinnokliniken har ansvaret för barnet upp till 4 veckors ålder. Modern är vidare patient inom MHV till ca 12 veckor efter förlossningen.

1.2.2 Gyn

Gyn består av både öppenvård och slutenvård. Öppenvårdsverksamheten består av dels gynmottagning samt dagoperationer på gynmottagningen. Mottagningen tar även emot akuta patienter dygnet runt.

Inom slutenvårdsgynekologin opereras cancerpatienter och patienter med benigna åkommor. Här görs operationer som inte kan genomföras på mottagningens dagverksamhet. Dessa operationer genomförs på centraloperation som där tillhandahåller sal, anestesi, operationssköterska mm men opererande läkare kommer från Kvinnokliniken.

2. ÖPPENVÅRDSOBSTETRIKEN

Öppenvårdsobstetrikerna i Linköping bedrivs till största del på Kvinnohälsan inne i Linköpings city vilket gör att patienterna inte behöver besöka sjukhuset om de inte är sjuka då det handlar om preventiv kvinnohälsovård.

2.1 OM RESPONDENTEN

Respondenten är vårdenhetschef på Kvinnohälsan och har så varit sedan 7 år tillbaka. Barnmorska sen 1992 och har jobbat i olika landsting som barnmorska. Vårdenhetschefen bytte till privat sektor ett tag och jobba då som chef på Ikea i Älmhult med distribution i 3 år. Efter det bytte till Apoteket AB som chef i 5 år för ett dosapotek.

2.2 KVINNOHÄLSAN

Det jobbar 50 barnmorskor (BM) och 5 undersköterskor (Uska) på Kvinnohälsan (KH). Verksamheten består av mödrhälsovård (MHV), screeningverksamhet genom gynekologiska cellprovskontroller, preventivmedelsmottagning och telefonrådgivning. I MHV ingår även föräldrastöd och fostermedicin.

2.2.1 Uppdrag och mål

KHs uppdrag innefattar region Östergötland och till viss del även Kalmar och Jönköpings län. Vårdenhetschefen nämner angående mål bl.a. tillgänglighet, medicinska mål och ekonomiska. Dessa finns att läsa utförligt i den offentliga verksamhetsplanen som delgavs under intervjun. Visionen är *"att erbjuda Sveriges dokumenterat bästa preventiva kvinnohälsovård"*.

2.2.2 Organisation

Det finns en vårdenhetschef (VEC) som är BM, en biträdande vårdenhetschef som också är en BM och sju koordinators som då också är BM. VEC är chef för både KH centrala och KH väster (Motala och Mjölby). KH väster är 20 medarbetare samt ungdomshälsan och kommer inte närmare att studeras. Inom kort kommer det även att arbeta en vårdadministratör på Kvinnohälsan.

De 50 barnmorskorna som jobbar på kvinnohälsan har för det mesta roterande arbetsuppgifter. Som BM kan man antingen bara jobba på MHV, på roterande schema på MHV och BB, på roterande schema på MHV och förlossningen eller på roterande schema på fostermedicin (6 BM) (1 roterar inte alls, 1 roterar mot ungdomsmottagningen, 1 roterar mot abortmottagningen på US och de övriga 3 roterar mot MHV). Abortmottagningen tillhör KK-mottagningen så Kvinnohälsan delar personal med dem, samma med BB och förlossningen som inte heller tillhör Kvinnohälsan men de delar på personal.

Det finns ett antal styrgrupper som VEC sitter med i: Kvinnohälsan ledningsgrupp (KH LG), Kvinnohälsan Obstetriska enhetens ledningsgrupp (KH OB LG) och Kvinnokliniken ledningsgrupp (KK LG). Ett organisationsschema finns illustrerat längre fram, se Figur 5.

2.3 MÖDRAHÄLSOVÅRDEN

Kvinnor som väntar barn besöker MHV för att gå på kontroller och få stöd under sin graviditet samt att få möjlighet att förbereda sig på en kommande förlossning och föräldraskap. I mödrahälsovården ingår både kontroller, föräldrastöd och fostermedicin. De flesta gravida kommer på kontroller till KH enligt ett basprogram. För de patienter som har en sjukdomsbild och behöver extra stöd finns ett kompletterande specialspår, specialist MHV.

2.3.1 Basprogrammet

Nedan följer besöken som en gravid normalt genomgår under sin graviditet. Tidsbokning till nästa besök sker i samband med besöket, direkt via BM.

- Fösta samtal, sker oftast någon gång i v. 6-10.
- Ca v. 13, ultraljud, se fostermedicin längre ner i dokumentet
- V. 13-15 Inskrivningsbesök
- V. 18-20 ultraljud, se fostermedicin längre ner i dokumentet
- V. 20 besök – vissa går på ett besök då t.ex. de som har ett BMI >30, det kan även vara andra anledningar så som sjukdom.
- Besök i v. 25, v. 29 och i v. 32
- V. 35 Registrering av tillhörighet till BVC
- V. 37 för de som är förstagångsföderskor eller ska ha barn med ny partner
- V 38 besök är för de som är omföderskor med samma partner
- V 39 för de som är förstagångsföderskor eller ska ha barn med ny partner
- V. 41 ställningstagande om eventuell igångsättning.
- Förlossning när det blir...
- Efterkontroll
- Avslut

Bilden på nästa sida illustrerar aktiviteter tillhörande basprogrammet, se Figur 2.

Figur 2: Patient processen för gravida enligt basprogrammet

2.3.2 Specialist MHV

För de gravida som behöver ha extra stöd eller specialistkompetens under graviditeten finns ett individuellt anpassat spår istället för basprogrammet. Det kan gälla t.ex. gravida med diabetes, hjärtsjukdomar, HIV eller autoimmuna sjukdomar. Diabetespatienterna är de som är mest representerade inom denna grupp, hjärtsjuka gravida är ca 20 st per år och gravida med HIV någon per år. En BM jobbar 50 % med denna verksamhet.

2.3.3 Föräldrastöd

Föräldrastödsverksamheten inkluderar många delar som tillsammans ska ge stöd till blivande föräldrar både under graviditeten, inför förlossningen men även som förebyggande stöd inför föräldraskapet.

Föräldrastödet har förändrats från att alla går en föräldrautbildning som personalen, enligt Vårdenhetschefen, tyckte var pest att hålla in. Ett projekt drogs igång där både patienter och personal var inblandade och mynnade ut i Linköpingsmodellen som nu använd som föräldrautbildning. Det innebär att föräldraparen får olika typer av information beroende på behov. Tanken är att det ska täcka stor del av medborgarna som behöver stöd under sin graviditet. Detta har möjliggjort att det går att lägga extra resurser på de mer utsatta så som unga föräldrar och de med invandrarbakgrund. Nedan följer de verksamheter som KH erbjuder sina patienter under graviditeten.

Föräldrautbildning

Det erbjuds två storföreläsningar, "att bli förälder" och "att föda barn", där de blivande föräldrarna informeras i storgrupp.

Föräldraskapsgrupp

Föräldraskapsgrupper finns där en BM är gruppleddare men samtalet styrs av gruppens behov utifrån föräldraskapet och relation (alltså inga smärtlindringar eller förlossningssätt o.s.v). Denna verksamhet anmäler sig de blivande föräldrarna till och det är 6-8 par som bildar en grupp.

Profylaxkurser

Profylaxmetoden har varit lite omdebatterad men är uppskattade i Linköping. Profylaxkurser har körts i 3 år och grupperna är jämt fulla.

Amningsstöd

Individuellt amningsstöd om man tidigare haft problem med amning.

Tvillinggrupper

För de som väntar tvillingar.

Unga föräldrar

Dessa blivande föräldrar möter BM på Stadsmissionen som har grupper för just unga föräldrar. Stadsmissionen meddelar KH att de önskar stöd när det finns några unga som väntar barn. Till unga räknas kvinnor upp till och med 22 år.

Icke svensktalande

Kvinnohälsan erbjuder föräldrastöd på både arabiska och somaliska.

Aurora

Mottagning för förlossningsrädsla. Tre BM är kopplade till denna verksamhet som annars jobbar på förlossningen. De har en specialutbildning och brinner för dessa frågor.

2.3.4 Fostermedicinsundersökningar

Ultraljundsundersökningar av regionens gravida genomförs på KH. Barnmorska utför ultraljud för de som önskar i v. 13 då det görs ett KUB-test (Kombinerat Ultraljud och Biokemi). Någon gång i v. 18 - 20 genomförs organscreening också med hjälp av ultraljud. För de som behöver kontrolleras ytterligare kan även tillväxts, flöden och lägeskontroller genomföras. Den här verksamheten flyttades från US ner till KH i november 2014.

Läkare genomför ytterligare ultraljud om det upptäcks missbildningar, komplicerade graviditeter, samt utför amniocenteser (AMS), vilket är fostervattenprov, och chorionvilliopsier (CVS), vilket är moderkaksprov, om det är aktuellt.

2.4 PREVENTIVMEDELSMOTTAGNING

Preventivmedelsmottagningen hjälper kvinnor med preventivmedel och frågor kring preventivmedel. Det är en patientgrupp som inte är så mycket vårdtyngd för BM. Patienten kommer i kontakt med kvinnohälsan genom telefon i första hand, men det händer även att patienter dyker upp i receptionen för att boka tid (gäller de som har haft svårt att boka tid per telefon eller inte pratar svenska). När patienten bokar en tid bokas denne in till specifik barnmorska.

Ett första besök sker hos en barnmorska och vara i ca 30 min. Det är inte så vanligt med första besök eftersom de flesta har varit på en ungdomsmottagning innan. En hälsodeklARATION gås igenom anamnes (sjukhistoria), hereditet (ärflika sjukdomar) och metodval tas upp. Kontroller görs av blodtryck och vikt. Återbesök sker när patienten är i behov av nytt recept, byte av metod eller avslut av metod. Patienten ringer då för ny tid. Vissa recept kan förlängas per telefon. För patienter som har besökt kvinnohälsan tidigare och vill förlänga p-piller och man är frisk erbjuds drop-in besök. Detta startades i januari 2015. Nedan följer de generella aktiviteterna för ett preventivmedelsmottaningsbesök, se Figur 3.

Figur 3: Generella aktiviteter för patienten vid preventivmedelsmottagningen

2.5 TELEFONRÅDGIVNING

Sen i början av 2015 bedriver KH telefonrådgivning. Bakgrunden var att den privata mödravårdshälsan (Storken) stängde ner i slutet av år 2013. Kvinnohälsan fick besked om det i augusti och i december kom det då 300 gravida som flyttades över från Storken. 300 gravid motsvarar 3 heltidsbarnmorskor. Då det inte fanns fler barnmorskor att anställa

behövdes det nya sätt att arbeta på. Konsekvensen blev att telefonbemanningen drogs ner och dessa barnmorskor fick ta patienter istället vilket ledde till att telefontillgängligheten sjönk kraftigt. Tillgängligheten på telefon som ska ligga på 90 % låg då på 25 % - 60 %.

"Därför att de gravida går ju inte att skuta på, de måste liksom komma den här veckan. Är man i vecka 35 måste man komma i vecka 35."

Telefonrådgivningen inhyes i kontorslokal ovan 1177 på Platensgatan då det var rumsbrist och den verksamheten inte behöver ha tillgång till vatten och avlopp. Projektet att flytta telefonrådgivningen drevs från olika håll, bl.a. genom tillgänglighetsprojekt med verksamhetsutvecklaren på KK och en arbetsgrupp från KH. I mitten av januari 2015 hittades så lokaler till verksamheten. Från den 16/3 2015 har tillgängligheten på telefon varit 100 %, enligt verksamhetschefen.

2.6 GYNEKOLOGISK CELLPROVSKONTROLL

Denna patientgrupp får en kallelse var 3 år eller var 5 år samt de som går på extrakontroller för att de har tidigare haft cellförändringar. Alla kvinnor mellan 23 - 65 år blir kallade. Hösten 2014 utökades patientgruppen till att inkludera alla upp t.o.m. 65 år. Det innebär att det är mellan 20 000-25 000 patienter som kallas per år. Dessa patienter kommer på kallade tider och tider som är avsatta i verksamheten. Det är 3 BM som jobbar tisdag, onsdag och torsdag 07.30-09.30 samt 16.00 – 18.30. Dessa tider är även drop-in tider för dessa gynekologiska cellprovskontroller (GCK). Drop-in tiderna används av de som inte kan komma på sin kallade tid. Det är samma 3 BM som jobbar ihop på respektive pass. Det kommer mellan 30 - 90 stycken patienter per pass.

Patienten kommer till KH för att ta provet och får sedan provsvaret hemskickat. Vid cellförändringar kallas patienten igen för ett återbesök. Generella aktiviteter för denna patientgrupp visas i Figur 4 nedan.

Figur 4: Generella aktiviteter för patienter som besöker KH för GCK

För att öka täckningsgraden (antalet patienter som är kallade och kommer inom rätt tidsintervall, inom en 3,5 års period) på kontrollerna, som har varit ganska lågt, ca 75 %, infördes en ombokningstelefon. Det är en speciell telefon som är öppen måndag-fredag 13.00 - 14.00. Den bemannas av en Uska som kan boka om tider och informera om drop-in. Vissa patienter behöver ha en tid för att inte strunta i kontrollen. Kvinnohälsans mål är att fånga patienterna så att de kommer och gör sina kontroller. Det finns även en speciallösning för kvinnor som bor på boende (ex tidigare missbrukare) och är rädda för vården och då är det en BM som har öppet endast för dem under en kväll.

2.7 TIDSBOKNINGSMODELLER

Kvinnohälsans patienter bokar in sig för besök antingen via telefonbokning, drop-in, organiserad drop-in eller på plats via BM.

2.7.1 Telefontidsbokning

De seniora BM med bred kompetens och lång erfarenhet och tycker att det är roligt att sitta i telefonen är de som bemannar telefonerna. 08.00 – 16.30 och även över lunchen har telefonrådgivningen öppet. Patienter som ringer är de som är gravida, behöver preventivmedel eller är cellprovpatienter. Det är 3 barnmorskor per dag som sitter i telefonerna i kontorslandskap. Förut satt barnmorskorna på sitt rum under telefontiden och loggade in på sin telefon.

”Nu finns kompetensen i rummet.”

2.7.2 Drop-in

För patienter som har besökt kvinnohälsan tidigare och vill förlänga p-piller recept och man är frisk erbjuds drop-in besök. Detta startade de med i januari 2015.

”Det har fallit ut väldigt väl”

Tidigare behövde patienten ringa för att få en tid som kanske låg 3 månader fram i tiden. Ett besök bokas då in som ett 30 min långt besök men, enligt Vårdenhetschefen tar det inte 30 min att kolla vikt, ett blodtryck och skriva ut ett nytt recept, det tar ca 10 - 15 min.

Tre tillfällen i veckan körs drop-in och det kommer 5 - 10 patienter på 1,5 timma (ett pass). Det finns en trend att antalet patienter ökar (statistik från jan-mars). Tiderna för drop-in är 08.00 - 09.30 måndag och fredag 16.00 - 18.30 samt 08.00-09.30 fredagar, alltså både innan och efter arbetstid.

”det har slagit väldigt väl ut och det är en väldigt rolig arbetsuppgift tycker de som arbetar med det och patienterna är väldigt nöjda med det, så det är win-win.”

Just för denna patientgrupp passar drop-in väl eftersom patienterna oftast snabbt vill ha nytt recept och har inte möjlighet att vänta. Förr fick KH istället göra någon halvlösning genom att skriva ut recept för 3 månader och att patienten fick en tid längre fram. Detta funkar dock bara en gång.

Denna typ av drop-in är ju ”oorganiserad” och återfinns även för patienter som ska ta prover inför besök eller undersökning. BM skriver en remiss över vilka prover som ska tas och patienten väljer själv vilken tid och dag denne vill komma för provtagningen.

2.7.3 Organiserat Drop-in

En mer organiserad drop-in är när där de patienter som kallas till GCK får en tid i sin kallelse. Bokningen är inte kopplad till någon specifik BM utan patienterna sitter ner i väntrummet och blir omhändertagna i den turordningen de anlänt till KH. Kan patienten inte den angivna dagen finnas det möjlighet att genomföra GCK på de öppna drop-in tiderna som erbjuds.

2.7.4 Direktbokning till BM

Vissa tider bokas in under själva besöket hos BM, t.ex. gravida som går basprogrammet som bestämmer ny tid eller flera tider direkt med sin BM

2.8 PLANERING

Under intervjun hanns det inte gå in på planering då tiden inte räckte till och tyvärr har ingen fler intervjuer angående detta genomförts.

2.9 MÄTNINGAR

Fyra perspektiv ingår i verksamhetsplanen där mätningar tas upp: Kund (patient, student, remittent), Medarbetare, Process/förnyelse och utveckling, samt Ekonomi. För dessa perspektiv finns det Strategiska mål, Avgörande framgångsfaktorer, Nyckeltal/Mål och Handlingsplan/Måtnitningsintervall/Metod. Inom kategorin Nyckeltal/Mål finns det 8 st. medicinska mål, exempelvis andelen kvinnor som slutat röka mellan första samtal/inskrivning och gravvecka 32, andelen av preventivmedel som föreskrivs/används som är långtidsverkande och dateringsprecision vid graviditet. Det finns även mål om hygien och antalet forskningsprojekt. Tillgänglighet finns det tre olika nyckeltal/mål: tid för besök till läkare, tid för besök för första samtal och telefontillgänglighet. Även nöjdhet hos patienterna och andelen gravida förstföderskor som deltagit i föräldrastöd finns det mål och mått för. De finns några nyckeltal/mål till och totalsett är det 11 st. som det fokuseras på. Ekonomin följs bland annat månadsvis per enhet och utvecklingsarbeten/förbättringsarbeten följs där det fokuseras på vissa processer (exempelvis: fostermedicin och remisshantering).

2.10 FRAMGÅNGSFAKTORER FÖR EFFEKTIVA FLÖDEN

Under intervjun framkom ett antal framgångsfaktorer för effektiva patientflöden. Dessa presenteras nedan grupperade under gemensamma rubriker.

2.10.1 Förändrade arbetssätt

Som framgångsfaktorer för effektiva flöden av patienter tar verksamhetschefen bl.a. upp drop-in för preventivmedelsmottagningen som från början var en konsekvens av att det var fullt i tidböckerna. Bristen i ett andra skede var framförallt rummen vilket ledde till att telefonrådgivningen startade. När den drog igång och blev tillräckligt bemannad förbättrades arbetsmiljön enligt Vårdenhetschefen. Telefonrådgivningen har flyttat till andra lokaler och har bra tillgänglighet vilket gör att övriga barnmorskor inte behöver känna en stress att alltid gå in och hjälpa till i telefonen så fort de har en lucka. Tiden kan då istället användas till att läsa på rutiner, PM och förbereda sig för nästa patient.

"Innan har det varit så här att sitter man... har man en lucka så in i telefonen liksom sådär akut, alla måste hjälpa till i telefonen. Nu vet man att nu sköter dem telefonen och de sitter inte här. Och det blir ett lugnare tempo här."

En framgångsfaktor för att öka täckningsgraden på GCK är den separata ombokningstelefon för GCK patienter som startade i början av 2015. Även en större grupp

kallas, nu upp till 65 år. Vårdenhetschefen vill uppnå att flera kommer på kontroller och att det uppmärksammas mer ute bland medborgarna så som bröstcancer och prostatacancer. Vårdenhetschefen brinner för den här patientgruppen men tycker att de har för lite resurser. Det finns enligt Vårdenhetschefen mycket att göra för att fånga kvinnor t.ex. projektet med cellprovbussen men det finns kanske även andra arbetssätt för KH som kan bidra till att fler väljer gå på sina kontroller.

"Är det här liksom rätt, ska man jobba så här med de här tiderna som vi gör eller kan man hitta andra lösningar? Ska det ligga så här i den här verksamheten? Vad gör vi med de som inte kommer? I Västra Götaland ringer man upp patienterna som inte har kommit på mer än 6 år, pratar med dem och hör varför. Kan man hitta någon speciallösning på dem, varför vill inte du komma, är du rädd?"

KH har koordinatörer som är seniora BM som har bred kompetens. Denne jobbar mellan 07.30 - 16.30 och hade innan ansvaret att ställa in telefonerna, hur många som satt i telefonerna och fick också hoppa in och hjälpa till. Koordinatörens uppgift är att se till att de patienter som är inbokade under dagen får sitt besök även om några i personalen är sjuka. Koordinatören kan även hjälpa till att ta några drop-in patienter. Tempot har blivit lugnare för koordinatören, enligt Vårdenhetschefen, nu när en arbetsuppgift är borttagen och denne har nu bättre koll över den dagliga verksamheten. Koordinatörerna sitter också en dag i veckan i telefonen för att även vara delaktig i den verksamheten.

2.10.2 Organisation och ledningssystemet

På frågan om vad Vårdenhetschefen själv tror är framgångsfaktorer för en välfungerande verksamhet svarade Vårdenhetschefen att det delvis beror på att Vårdenhetschefen som VEC och den medicinskt ledningsansvarige (MLA) jobbar väldigt nära varandra.

"C och jag, som är, C är ju medicinskt ledningsansvarig, vi jobbar ju väldigt nära varandra."

Vårdenhetschefen nämner även fungerande ledningsgrupp som en framgångsfaktor.

"och vi har en ledningsgrupp som fungerar som vi inte haft tidigare. Det har vi sen 2 år tillbaka när de här blev anställda, de biträdande cheferna, så har vi ledningsgrupp här 1 gång i månaden. Där vi också fått in vårdutvecklare."

I ledningsgruppen för KH ingår MLA, VEC, biträdande VEC och vårdutvecklare som träffas 1 ggr i månaden. I den här gruppen jobbas det med måltalen som följs upp. Tillgänglighet är ett måltal som följs och som även kommuniceras ut till medarbetarna varje månad. De medicinska målen kommer ut 1 ggr per år då de följer kvalitetsregisterna. I övrigt försöker ledningsgruppen att skapa delaktighet inom personalgruppen och driver förbättringsarbeten, både korta och långa projekt bedrivs. KH har under det senaste året jobbat mycket med förbättringsprojekt som har sjuösatts under våren 2015.

"att försöka få med medarbetarna, det tror jag är en framgångsfaktor. För det dem oftast som sitter på grundkunskapen liksom. Men varför ser det ut så här? Vad är det för förändring vi kan göra?"

Att KH ligger som den gör och att de är organiserade som de är nämner även Vårdenhetschefen som en framgångsfaktor. All kompetens finns på ett och sammaställe, all kvinnohälsa är samlat. Det gör att även ekonomi och personalansvaret är samlat.

"jag och C [som har det medicinska ledningsansvaret] har personal och ekonomiansvaret och vi kan göra som förändringar i verksamheten på totalen som man inte kan göra på små för att det är olika chefer. Och det tror jag är en fördel att vi liksom kan se helheten."

Genom att allt är samlat sitter hela personalstyrkan samlat till skillnad från andra kvinnoverksamheter i landet som t.ex. sitter utspridda på vårdcentraler.

"Det är den största fördelen är att det finns så bred kompetens och en erfarenhet så att jag alltid har nån som att bolla med. Om jag stöter på problem hos patienten så går man bara ut. Och då går man oftast till koordinatör för den är en senior men är inte hon på plats så finns det någon annan som man kan fråga. Det tror jag liksom är styrkan i verksamheten att vi har den breda kompetensen."

Det finns även en ledningsgrupp där obstetrikern sitter med (KH OB LG) som träffas 2 ggr per termin för att enligt Vårdenhetschefen kunna se hela patientflödet. Denna grupp har jobbat ihop i ca 2 år.

Ledningssystemet är en annan framgångsfaktor som nämns av Vårdenhetschefen. Det är speciellt viktigt för nya personer och för de som inte jobbar kliniskt kontinuerligt. Det är ett väldigt bra stöd enligt Vårdenhetschefen.

"Ledningssystemet, den här certifieringen vi har, det var Kvinnohälsan först ut med 2009. Det är också en del i det här, att få struktur på. Var har vi alla våra dokument? Och framförallt när man är ny som person. När vi gör introduktionsprogrammet för dem så sätter vi av lästid, man ska plöja ledningssystemet och har man gjort det så får man en jätte bra bild av hur det det ut, var man hittar jag saker."

2.11 UTMANINGAR FÖR EFFEKTIVA FLÖDEN

Bristen på barnmorskor är ett av de största hindren för att få till effektiva patientflöden. Vårdenhetschefen beskriver hur ovanligt det är att externa BM söker tjänster hos dem.

"Det var en tjejsökande från Karlskrona. Och att få externt sökande barnmorskor som vill jobba heltid, det är väldigt ovanligt. Det har hänt 3 gånger under mina 7 år."

I samband med att den privata MHV stängde blev bristen på BM akut. Vårdenhetschefen berättar att det blev en liten lösning på bristen på barnmorskor när det kom ytterligare en externt sökande och att några från förlossningen kunde börja på Kvinnohälsan istället. Dock så fanns det då inga rum att utföra besöken i, då var de för trångbodda istället.

3. SLUTENVÅRDSOBSTETRIKEN

Slutenvårdsobstetriken verksamhet består av förlossning och BB och bedrivs på US i Linköping. Under hösten 2016 flyttar de till nya lokaler inom sjukhuset.

3.1 OM RESPONDENTEN

Respondenten är barnmorska som jobbar vårdenhetschef sedan 3 år på förlossningen och BB, den obstetriska enheten på US. Innan Vårdenhetschefen började som vårdenhetschef 2012 var Vårdenhetschefen biträdande vårdenhetschef. Har genom detta jobbat mycket med bemanningsfrågor, schemaläggning och praktiska frågor kring avdelningarna. Personalansvar för medarbetarna på avdelningarna, barnmorskor, sjuksköterskor, undersköterskor och barnsköterskor där flera har dubbelkompetens.

3.2 OBSTETRISKA ENHETEN

Den obstetriska enheten är en enhet men den är uppdelad i två inriktningar, själva förlossningen samt eftervård och även vård innan förlossningen. Det är ca 3000 patienter om året som föder barn på förlossningen i Linköping. Vilket innebär att det även då är 3000 öppenvårdsbesök eftersom de flesta kommer in för undersökning och går hem för att vänta in att värkarna ska komma igång och förlossningen närma sig. En förlossning kan ta allt mellan 15 minuter till över ett dygn. De har även 2500 återbesök på BB-mottagningen per år.

Antalet medarbetare är drygt 90 personer, fördelat på ca 70 st. BM (ett antal BM roterar till annan verksamhet också), och ca 25 st. Uskor. Inom gruppen finns det alltid några långtidsfrånvarande genom föräldraledighet eller långtidssjukskrivning. Under sommaren ökar givetvis personalgruppen och går upp till ca 125 personer.

3.2.1 Uppdrag och mål

Uppdraget som Kvinnokliniken (KK) har från politiken är att erbjuda och att tillhandahålla vård kopplat till graviditet, förlossning med tillhörande kontroller och uppföljning. Grunduppdraget innehåller patientens delaktighet och att det är ett friskt barn och en frisk mamma som blir utfallet. Det finns nedskrivet enligt Vårdenhetschefen.

Enhetens egen vision är ”att erbjuda Sveriges dokumenterat bästa förlossning och BB-vård”. Ett nyckelord är enligt Vårdenhetschefen att det ska vara dokumenterat bästa och därför är det viktigt att mäta och följa upp för att kunna visa att de faktiskt är dokumenterat bäst.

3.2.2 Organisation

Den Obstetriska enheten ingår i KK och ligger rent organisatoriskt under Verksamhetschefen och Ledningsgruppen för KK. Vårdenhetschefen har ett parledarskap för enheten med Medicinskt ledningsansvarige (MLA) som är överläkare. Vårdenhetschefen har personalansvar och gemensamt har de ansvar för budgetarbetet och ekonomifrågor även om det är Vårdenhetschefen som har jobbar med det mest. De rådgör

vid t.ex. större inköp. Vårdenhetschefen och MLA ingår i KKs ledningsgruppen (KK LG) och även den obstetriska ledningsgruppen (OE LG).

Vårdenhetschefen har två biträdande vårdenhetschefer som tillsammans med Vårdenhetschefen har personalansvar, där två biträdande vårdenhetscheferna har fokus på schemaläggning och daglig bemanning och korttidsfrånvaro. Vårdenhetschefen jobbar 100 % administrativt och de två biträdandes tjänster är konstruerade som 50/50 administrativ och operativt. Det verkliga utfallet är att de mest jobbar administrativt för att hinna med, enligt Vårdenhetschefen, och speciellt i samband med ombyggnationen.

Vårdenhetschefen är även en del av den relativt nya ledningsgruppen KHOB Kvinnohälsan och obstetrikern (KHOB) som har bildats då det finns ett flöde av patienter mellan MHV och förlossningen. KHOB startade under våren 2014. Nedan finns ett organisationsschema över både Obstetriska enheten och KK, se Figur 5.

Figur 5. Organisationsschema över Obstetriska enheten och Kvinnohälsan

3.3 PATIENTÄRENDETS VÄG GENOM AVDELNINGEN

Den Obstetriska enheten tillämpar så kallat individuellt vårdförlopp eftersom både graviditeten, förlossningen och eftervården beror på kvinnan och barnets hälsostatus. Patientärende förloppet som beskrivs nedan är det generella förloppet men kan alltså se olika ut beroende på patient. Det generella flödet innehåller aktiviteterna telefonkontakt, polikliniskt besök, förlossning, BB-vård samt eftervård.

Då det endast finns en MHV i Linköping är många kvinnor som ska föda på US redan patienter på KK genom att de är inskrivna på KH. Vissa kvinnor med komplicerad graviditet har även legat inne på antingen förlossningen eller BB för övervakning eller avlastning och vila innan förlossningen. Behöver patienten mer högspecialiserad övervakning finns den möjligheten på förlossningen.

3.3.1 Första kontakt med avdelningen - Telefonkontakt

Den första signalen som enheten får om att det är en kvinna som är på väg in till förlossningen är att patienten ringer till förlossningen. Koordinatoren på förlossningen har telefonkontakt med de flesta patienter som ska komma in och föda barn hos dem. Hon svara i telefon och ger råd/coachar kvinnorna som går hemma och ”puttrar” på med sitt värkarbete.

3.3.2 Polikliniskt besök

Via telefonkontakt med barnmorska får patienten komma till förlossningen för undersökning. Ca 3000 polikliniska besök per år blir det då de flesta kommer in för undersökning och sen åker hem igen för att vänta in att förlossningen ska komma igång på riktigt. Koordinatoren undersöker patienten som kommer in och här kan även doktorn vara inblandad. Är patienten redo för att fortsätta förarbetet innan förlossningen på enheten blir patienten inskriven och tilldelad ett förlossningsrum.

3.3.3 Förlossningen

Själva förlossningen har 10 rum där patienter kan föda barn. En förlossning varierar i längd. Omvårdnad, övervakning, handläggning, bemötande och närvaro är viktiga bitar i förlossningsförloppet. Efter födelsen ligger patienterna kvar upp till 2 timmar på förlossningen sen flyttas de till antingen Förlossnings-BB eller Special-BB.

I mötet med patienten på rummet under en förlossning är det mycket som kan hända och en viktig fråga, enligt Vårdenhetschefen är vad är det som de som barnmorskor gör eller inte gör som gör att en patient är nöjd eller inte nöjd med bemötandet efteråt.

”Man pratar ibland om barnmorskeriet som, vad är det som är barnmorskeri? Jo, det är närvaro, ingjuta trygghet, peppa, coacha. Ibland måste man kanske peppa och coacha på ett sätt som är väldigt bestämt. Det handlar hela tiden om att anpassa sig själv till patientens behov, så det är väldigt mycket av det som inte riktigt går att ta på. Vad är det som gör att du och jag jackar i bra, vad är det som gör att du kanske i ett läge känner att näe, den där Lotta vill inte jag se igen’, måste be om att få nån annan. Eller hon är så dum att jag blir peppad av det.”

Tidig hemgång är ett koncept om man som patient vill gå hem tidigt efter förlossningen. Då går patienten hem tidigast efter 6 timmar. Barnläkaren måste först då undersöka barnet och ett återbesök bokas in för efterkontroller.

Beroende på efter hur lång tid patienten går hem efter förlossningen finns det olika riktlinjer för vilka kontroller som ska göras innan hemgång. Går man hem innan totalt 72 h har gått kommer patienten tillbaka på ett återbesök. Patienten går då på sitt återbesök på BB-mottagningen.

Avdelningen har gjort en aktivitetskarta över aktiviteter kring själva förlossningen. Här är de olika yrkeskategorierna samt patientens roller definierade och aktiviteterna är i kronologisk ordning.

3.3.4 BB

Efter förlossningen flyttas patienterna till antingen Förlossnings-BB för de med normalt förlopp eller till Special-BB för de som haft ett mer komplicerat förlopp och då i behov av andra övervakningsmetoder efter förlossningen. På Special-BB finns det även personal på

natten vilket det inte finns på Förlossnings-BB. Det finns 6 respektive 18 platser på dessa två BB. Förlossnings-BB ligger i anslutning till förlossningen medan Special-BB ligger några våningar upp.

Medelvårdtid (MVT) för förlossningspatienter och BB patienter är 47 timmar. Då är alla typer av patienter inkluderade. De har en stor volym av patienter som går hem inom ett dygn. MVT räknas från det att patienten skrivs in till dess att denne skrivs ut, alltså både hela förlossningen och eftervården.

På Special-BB ligger det även gravida med komplikationer och de mammor och barn som behöver extra stöd eller vård. Det kan vara en ung mamma som är frisk men behöver mer stöd i övrigt. Det kan också vara en kvinna som inte pratar svenska som är fullt frisk men på Special-BB finns det möjlighet att i lugn och ro prata via tolk. Det kan också vara så att barnet behöver kontrolleras men mamman är frisk.

Barnläkarna konsultar på BB, de är ej anställda på KK, men kommer och undersöker och ordinerar på både Förlossnings-BB och Special-BB. Vid behov kan kurator, sjukgymnast, präst eller annan yrkeskategori kallas in.

3.3.5 BB-mottagningen

Patienterna får en lapp i handen när de går hem från BB med en tid för återbesök på BB-mottagningen. Bokade tider för besök hos barnmorska och eventuellt barnläkare. Patienten bokas ej till specifik individ utan personalen är schemalagda för att jobba på BB-mottagningen och tar emot besöken löpande. Här jobbar det barnmorskor och barnläkare konsulterar.

3.3.6 Ansvarsområde

Kvinna, barn och partner är i fokus enligt Vårdenhetschefen men det är kvinnan och barnet som är patienter men eftersom partnern också är med i familjeblivandet är denne också en viktig person som är med. Det är skillnader i patientklientel eftersom det finns alltid finns anhöriga men partnern är inte anhörig utan en blivande förälder.

3.3.7 Överlämnande till BVC

Både mamman och barnet är patienter hos enheten men barnet blir senare patient hos någon barnavårdscentral och mamman återgår till att vara patient hos KH. Kontakten mellan enheten och BVC är på informationsbasis där journalerna numera skickas elektroniskt.

3.3.8 Mödrahälsovården

Efter avslutat ärende hos BB återgår mamman till att vara patient hos MHV. Ett kontrollbesök sker efter några månader för att se så att läkningen efter förlossningen mm har gått bra. Mamman bokar själv in besöket. Om allt gått bra avslutas patientärendet. Patienten kan senare givetvis återkomma i andra ärenden hos KH, så som att få preventivmedel, göra cellprov eller ny graviditet. Givetvis även återkomma som patient till förlossningen och BB.

3.3.9 Schematisk bild över patientärendets väg genom avdelningen

Nedan visas en bild, se Figur 6, över patientärendeförloppet som ovan är beskrivet. Patienten är sen tidigare oftast patient hos KK redan och har en historik med sig när denne kommer till förlossningen. Vägen in till enheten kan se lite olika ut där de flesta ringer in innan och kommer in på en kontroll. Detta förlopp kan upprepas. En del hinner inte ringa innan förlossningen är igång och vissa behöver ligga inne för att vila eller övervakas. Således är det både polikliniskt (besök utan att ligga i en säng) och slutenvårdsverksamhet (patienten ligger i en säng) som återfinns på avdelningen. Både vägen in och själva förlossningen samt eftervården är individuellt anpassat till patienten och det nyfödda barnet. Barnet är också patient till enheten men övergår som sagt till att bli patient hos BVC efter vårdförloppet hos enheten medan mamma återgår till att vara patient hos MHV.

Figur 6: Schematisk bild över patientärende förloppet hos slutenvårdsobstetrikern

3.4 PLANERING

På avdelningen sker planering av både personal genom schemaläggning och även planering av den dagliga operativa verksamheten genom beläggningen på avdelningen.

3.4.1 Schemaläggning av personal

Schemaläggningen görs för de fyra funktionerna: Förlossningen, Förlossnings-BB, Special-BB och BB-mottagningen. Enligt Vårdenhetschefen är "schemaläggningen hur komplex som helst." Inom medarbetargruppen finns det koordinatörer som har lång erfarenhet, kliniskt skickliga och är bra på att arbetsleda. Det finns även handledare, som då också har jobbat ett bra tag men har istället fokus på att handleda studenter eller nyblivna medarbetare. Den tredje gruppen medarbetare är så kallade nya barnmorskor, de som jobbar sitt första år.

"Efter nått år så får du börja handleda andra studenter och det är liksom ett led i utvecklingsplanen också, att du blir, utvecklar din terminologi, och funderar och reflekterar varför gör man så här och då växer man ju själv också."

Alla tre typerna av medarbetare behövs under varje pass dygnet runt. Standarden som de jobbar enligt nu är 2 koordinatörer, 2 handledare och 1 ny per dagpass och på kvällen och natten önskar de att de kunde bemanna med 5 st. men har bara möjlighet att ha 4 st. per pass.

Barnmorskor, undersköterskor har Vårdenhetschefen som chef och läkare finns inom egen organisation men med KKs VEC som chef. Läkarna jobbar för hela KK och är fördelade på primärjour och bakjour. Narkosläkare kommer ”utifrån” och tillhör inte KK-organisationen men kommer in för att lägga EDA (ryggmärgsbedövning). Det samma gäller barnläkarna på BB och BB-mottagningen. Vid behov tillkallas även annan kompetens, ex kirurg eller njurmedicinare men det är enligt Vårdenhetschefen sällsynt. Inom kliniken finns det även kurator och sjukgymnast.

Det finns ett samarbete för bemanningen med MHV så är det sjukfrånvaro frågor de varandra om de har någon barnmorska som kan komma över för att fylla upp. Det blir, enligt Vårdenhetschefen, dock ganska mastigt att även känna ett ansvar för MHVs bemanning.

3.4.2 Samarbetet med Schemagi

Efter att Vårdenhetschefen jobbat ca ett halvår, alltså på hösten 2012, och då Vårdenhetschefen tidigare jobbat med bemanningen började Vårdenhetschefen undra var alla medarbetarna var. Ca 70 barnmorskor som finns på lönelistan men fick bara ut 45 - 46 st. heltider av det. Av en slump kom förlossningen och BB med i ett pilotprojekt genom Hälsoplan och Schemagi. Genom Hälsoplan gjordes en kapacitetsplanering och via Schemagi gjordes schemaläggning med input från kapacitetsplanering. Det som enligt Vårdenhetschefen var mest värdefullt var själva kapacitetsplaneringen som de fortfarande har användning av.

”Jag fick ut av det, både hårda och mjuka data kan man säga. Vi tittade ju på hur ser våra flöden ut, när har vi patienter, hur många toppar och dalar är det, man kunde faktiskt ganska tydligt se att... hon som hjälpte oss där konsulten Nina, hon tittade på när skrivs de in, när skrivs de ut, hur länge stannar de, hur länge är de på förlossningen, när föder de sitt barn, hur lång tid tog det innan de födde sitt barn, alltså alla de här grejerna som gick att titta på och så tog vi fram bilder på det. Och sen hade hon också workshops tillsammans med medarbetarna där man värderade i gruppen vad är en normal arbetsbelastning på ett arbetspass. Om man bara ska säga en sak som vi liksom verkligen fick fram där så var det att 85 % av alla arbetspassen som de såg ut då, hösten 2012, så var det en normal bemanning på 85 % av arbetspassen på dagtid och kvällstid. Och nattetid över 75. Och det som var utanför där, ytterfallet på 15 % respektive 25 % det var sådana händelser där man hade upplevt att det var tufft och för mycket att göra i förhållande till bemanningen. Och då fick vi det på prent på något sätt att det är 15 % av arbetspassen som är, på ett år då, som är för lågt bemannande och då får man ta fram en handlingsplan för hur gör man då. För det finns liksom inte en möjlighet här att ha en överkapacitet på alla arbetspass även om det skulle vara jätte enkelt. Men då skulle du inte heller ha någon flow i, alltså om du alltid är van att vara 10 st som jobbar fast vi egentligen oftast bara behöver vara 5 så får du inte heller... ne för du behöver kunna prioritera och inte stå med en patient liksom på ett helt pass. Om inte det är så att den patienten behöver det för då ska man göra det, det är en annan sak.”

Enligt Vårdenhetschefen ville de komma ifrån att lägga manuella scheman och de fick de hjälp med av Schemagi.

”Det tar en vansinnig tid att lägga manuella scheman.”

Under början av 2013 anställdes det fler barnmorskor till följd av kapacitetsöversikten och sommaren 2013 var enligt Vårdenhetschefen en mycket bra sommar. Men eftersom

personal av naturlig rotation på arbetsmarknaden har slutat och det har varit svårt att få tag på ny personal så är det ett annat personalläge nu våren 2015. Vårdenhetschefen håller med KKs VEC och bekräftar att det är billigare att bemanna upp än att behöva betala ut övertid.

Enligt Vårdenhetschefen är det svårt att få ett gehör för schemaläggningen från Schemagi, medarbetarna tycker inte att det är något de vill fortsätta med. Vårdenhetschefen tycker att de har fått hjälp med att fördela passen bättre rent kompetensmässigt. Fördelarna har varit att det har sparats tid för schemaläggning och att det finns rätt kompetensfördelning på passen. Dock finns det många som lägger mycket energi på att hata det automatiska schemat men givetvis också andra som tycker om det. Schemat läggs 10 veckor i stöten och det blir klart ca 3 - 4 veckor innan det börjar gälla, vilket många, enligt Vårdenhetschefen, tycker är för kort framförhållning. Detta gäller speciellt vilka helger man ska jobba. När de själva la schemat var medarbetarna med och byggde upp schemat genom att markera vilka helger man kunde jobba. Det ledde till att man hade en föräning om vilka helger man ska jobba. Med det automatiska schemat får medarbetarna allt i handen direkt utan föräning om vilka tider man ska jobba och det uppfattas mer som en order.

"Nu får du allting som ett statement och de grejar inte det, det är den sorgliga sanningen, så är det. Jag tycker att jag har haft jätte bra kontakt med dem och att vi har ändå liksom gjort justeringar och förändringar men vi kommer att behöva göra nått annat. Jag kan inte se, jag inte se liksom att att långsiktigt att det funkar. Så skulle man ju önska av den här organisationen som är så stor och har så många medarbetare att det fanns liksom ett bra schemaläggningsstöd och inte bara ett lönesystem."

3.4.3 Beläggning

Förlossningen är beroende av att det finns platser på BB för att kunna ta emot patienter. I journalsystemet finns det en beläggningslista där det går att se hur många patienter det finns på de olika avdelningarna. Det är koordinatören på förlossningen som avgör när det är fullt på förlossningen med tillhörande eftervård, en roll som finns under alla pass. Om koordinatörens roll säger Vårdenhetschefen följande:

"Vi tror att det är viktigt med en arbetsledare på golvet som gör de bedömningar som man behöver göra. När det gäller vem som ska ta nästa patient eller vem har bäst tid eller vem har mest kompetens för att ta hand om just det här. För ibland, så gör vi ju också, vi fördelar ju barnmorskeresurserna efter patientens behov. Så är det en helt normal patient som kommer in, eller en förväntad normalt förlopp, då kan ju en av de mer lite nya barnmorskorna ha henne för hon behöver ju få volymen och hon behöver träna och så. Är det en komplicerad patient så försöker vi å se att det blir en barnmorska med högre kompetens och längre erfarenhet."

Då alla patienter ligger inne på BB av en anledning finns det riktlinjer för hur länge de kommer att behöva stanna kvar för att hinna med de ämnade kontrollerna. Genom detta går det att till viss del förutse hur länge patienterna behöver stanna. Ett exempel är långvarig vattenavgång, det är klassiskt tillfälle då allt egentligen kan se ganska normalt ut men det finns en ökad infektionsrisk hos barnen i samband med detta. Ett litet barn som får en infektion kan få ett väldigt snabbt förlopp och bli väldigt dåligt. Därför låter man alla dessa patienter ligga kvar i 48 timmar. Det är en rutinförändring som kommit de senaste åren som gör att fler patienter måste ligga kvar längre.

"Är man inlagd på Special-BB för att man t.ex. ska kontrollera barnet med andningsfrekvens och temp, säger vi, då gör man det var sjätte timma om det är så att man har haft en långvarig vattenangång."

Gulsot är ett annat exempel där det finns riktlinjer för behandling och uppföljning. Gulheten hos barn uppstår efter nått eller några dygn och kan därför innebära att det upptäcks på ett återbesök och då läggs barnet och mamman in igen, en återinläggning sker då till Special-BB.

3.5 MÄTNINGAR

Det ända politiska målet som enheten har i tillgänglighetsfrågor är att erbjuda partnern övernattnings första natten. Det är det ända tillgänglighetsmålet på enheten påpekar Verksamhetschefen.

Då enhetens vision är att erbjuda den dokumenterat bästa vården är det enligt Vårdenhetschefen viktigt att mäta verksamhetens medicinska resultat.

"Och för att kunna visa det så mäter vi ju allting och då har vi ju en väldigt resultat inriktning på vårt arbete och vi följer alla parametrar skulle jag säga. Och jag tycker inte att vi mäter för mycket, jag tycker att vi mäter rätt saker och att vi hela tiden är drillade i det tänket liksom att veta hur många kejsarsnitt har vi, hur många stora blödningar har vi, vilken amningsfrekvens har vi, hur många har blivit undersökta av en barnläkare."

Enheten gör bland annat benchmarking med regionen (sydöstrasjukvårdsregionen), de träffas regelbundet och jämför medicinska kvalitetsresultat. Då sätts även målvärdet och det är den som har lägst värde inom de parametrar som följs. Vårdenhetschefen exemplifierar detta nedan:

"Så har vi 11 % kejsarsnitt frekvens och är lägst då är de det som är målvärdet. Nu är det inte så utan jag bara tog det som exempel. Målvärdet är att förlösa mer än 80 % av kvinnorna vaginalt utan ingrepp."

3.6 FRAMGÅNGSFAKTORER FÖR EFFEKTIVA FLÖDEN

Under intervjun framkom ett antal framgångsfaktorer för effektiva patientflöden. Dessa presenteras nedan under gemensamma rubriker.

3.6.1 Arbetsgrupper och delat chefskap och mätning

Framgångsfaktorer för Vårdenhetschefen är att ha en bra grupp runt sig. Det gäller både ledningsgruppen för obstetrikern där det ingår 5 st. (Vårdenhetschefen, medicinskt ledningsansvarig (MLA), 2 st. biträdande verksamhetschefer och en vårdutvecklare), möjligheten att utbyta erfarenheter med vårdenhetschefen på MHV, dialogen med ledningen för KK samt den stora gruppen medarbetarna, att det där finns människor som kommer med input och berättar hur det operativt fungerar i den dagliga driften och är till stora delar självgående.

"För det är det som har belastat rätt mycket de här åren alltså, att det från början inte var så utan väldigt mycket hamnade i knät på oss. Och det gör det ju när det är så här mycket att göra här ute som det är bitvis. När det liksom är alldeles för hög belastning egentligen, det tycker jag att det är."

Så klart att de inte binner läsa mailen, de binner inte läsa informationsbrev, de binner inte svara på medarbetarenkät.”

En annan framgångsfaktor är enligt Vårdenhetschefen att de mäter och där är även MLA en stor del i det arbetet.

”Framgångsfaktorerna för vårt arbete, det tror jag är att vi, att vi mäter, att vi har koll på vad vi gör, vad vi producerar, att vi vet, att vi har liksom standardiserat hur det ska se ut med bemanningen, att det finns en fortbildning, och en, hela tiden en coaching i liksom det dagliga arbetet. Jag tror att, just MLA då som du träffade en kort här, hennes sätt att vara en visionär ledare, hon är verkligen uppe på helikopterperspektiv och ser samband på ett högre sätt.”

Vid frågan om vilka samband MLA ser svarar Vårdenhetschefen att det är mest fokus på det medicinska men även det organisatoriska:

”hon har liksom en forskningsbas, dels, hon jobbar ju väldigt mycket med det, forskar också själv på 30 %, handleder. Så där har hon ju en hög medicinskkunskap och sen har hon också ett sätt att inte liksom grota ner in smådetaljer, för det vet hon att vi andra gör så bra.”

”Varför har vi nu flera av den här typen av patienter nu och varför blev utfallet så här. Men då går hon in i analysen och så tänker hon och så tittar hon och så. Och sen så meddelar hon också ut det. Så jag tror att hennes sätt att se på patienterna är också högst väsentligt för resultaten naturligtvis.”

”Det är komplext och det är ju en verksamhet som är väldigt positiv när den är positiv men som kan bli det värsta tänkbara när det händer nått illa. Och då har vi även där jobbat med de bitarna liksom, för att skapa en hållbar personalgrupp och det är ett långsiktigt arbete. Och alla orkar inte heller med. Man kan drabbas av någonting här ute eller får vara med om något som gör att man kanske inte kan tänka sig att fortsätta. Och det gäller ju alla kategorierna, även läkarna.”

3.6.2 Samsyn kring patienter

Då KH och OE tar hand om samma patient i och med att kvinnan först är gravid och sen ska föda barnet samt eftervård är det, enligt Vårdenhetschefen, viktigt att ha en bra gemensam samsyn mellan KH och OE. Dels finns det gemensamma frågor kopplat till att det är samma individer som först är patient på MHV och sen på förlossningen och BB, och dels så delar dessa enheter en del personal. KHOB (Kvinnohälsan och obstetrike) ledningsgrupp träffas ett par gånger per termin. Exempel på vad som tas upp i detta forum beskrivs i citatet nedan.

”Det kan vara vårdfrågors som börjar under graviditeten men som är viktiga vid flödet över till förlossningen och BB så kan det vara t.ex. ta amningsförberedelser då. Att man liksom under graviditeten erbjuder kvinnorna ett amningsstöd för att de liksom ska kunna, om de har haft en komplicerad amning förra gången. Då finns det ju barnmorskor där som jobbar med den frågan och sen när man är mer på BB eller förlossningen och BB och bands on med amning då är det liksom en sån fråga som man då behöver ha någon form av samsyn i, i personalgruppen. Och eftersom jag också har då ca 7, tror jag att det är just nu, barnmorskor som roterar, d.v.s. gör kanske 40 % inom mödravården och 40 % på förlossningen/BB, 40 - 50, då har man ju behov av att prata om saker som rör operation.”

Det är som sagt viktigt med en samsyn och enligt Vårdenhetschefen är det då också viktigt i frågor som rör patienter när det kommer till det praktiska bemötandet.

"Om vi tänker oss att vi ska erbjuda ett individuellt bemötande och stöd för patienten, alltså möta henne där hon är så behöver man ju ha, medarbetarna behöver ju ha samma tänk kring hur man rent konkret gör. Hur bemöter vi den här patienten, vad har vi för kunskaper, vad har hon för förmågor. Alltså, det är mycket av de bitarna som präglar hur vi, eller vilket stöd vi kan ge patienten i de olika situationerna. Och samsynen måste ju då också vara, tänker jag då, att vi tycker att det är viktigt med amning, punkt slut. Och att vi tycker att det är viktigt att erbjuda dagens patienter stöd i amningsfrågor t.ex. Och det är en grej av allt liksom, men det är ett bra exempel för det är inte så medicinskt liksom så där utan det är mer en... för där ligger så mycket i det då, blir det rätt, har du fått rätt råd från början och du får, alltså, du stärker kvinnan med att gör hennes egna val och att det sen är hon som gör det för det är ju hon som ska amma det ska ju inte vi göra så vi ska ju inte vara där och peta och pilla om vi säger så. Utan det är en grundsyn, ett förhållningssätt. Och sen att det då får vara, att det får finnas liksom en handlingsplan som är gemensam för hela vår vårdkedja när det gäller just amning. Det är ett ganska bra exempel. Sen har vi ju, vi har ju mycket, vi har annan förlossningsförberedelse också med föräldragrupper, storföreläsningar, det är ju också såna saker som är viktiga att vi har en grupp som jobbar med."

3.6.3 Vårdadministration

Förutom de nyckelpersoner som Vårdenhetschefen nämnde tidigare är viktiga för att få vardagen att gå ihop finns det en annan typ av stöd som är viktigt, det administrativa stödet. Vårdenhetschefen ser att barnmorskorna lägger väldigt mycket tid på administration, ren vårdadministration. Sådant som förut utfördes av en sekreterare. Själva dokumentationstekniken har också förändrats då de förr använde sig mer av stödord och sökord och hur man ska skriva.

"Alltså ren vårdadministration, skriva in och ut patienter, klicka. Det kommer sig av den här journalföringsändringen som man gjorde då i början på 2000-talet att alla skulle skriva sina anteckningar och så och det gäller ju alla kategorier. Men till det har det kommit liksom mer och mer och mer och mer så nu är det liksom ett fullständigt patentsystem där vi sitter och skriver in och ut patienter. Vi har historiskt sett inte haft den sekreterarbemanning som har, som man kanske hade förr när det satt en person och skrev in och ut patienter. Utan nu är det liksom, nu ligger det liksom på varje person här ute. Vilket måste medge att det blir fler fel."

Det som skrivs in i journalerna används av nästa vårdgivare. Det som skrivs in under dagen läses då eventuellt av den som kommer och tar över vid nästa pass. Det finns en patientjournal lag som säger att det ska dokumenteras det man gör och patienten ska ha rätt att få det i sin hand också.

"Ett ökat vårdadministrativt stöd skulle ju kunna frigöra mer tid till att vara chef och vara närvarande. Därför att all den här schemaläggningen t.ex., allt det här som [biträdande vårdenhetschefer] gör med att sitta och ta emot samtal om frånvaro och så, det skulle kunna göras av någon som inte är barnmorska eller chef. Ren inmatning i olika system, i olika schemaläggning t.ex. är ju sånt som inte heller behöver göras av en chef. Men det är klart att allt som har med pengar att göra och det som man liksom måste ta beslut om, det är mer där man måste vara med. Så vårdadministrativt stöd skulle jag kunna se faktiskt att vi fyllde med nästan en person till med bara sånt arbete. Jag har inga 40-timmars veckor, jag har inte 50-timmars veckor heller."

Vårdenhetschefen har skrivit en lista på arbetsuppgifter som hon tycker att någon som inte är chef gör. Det är t.ex. att hantera nyckelkort, behörigheter, skicka hem anställningsavtal, skriva ut anställningsavtal, sköta kuvert och porto.

"Nu har jag anställt 30 personer för sommarvikariat, och det är liksom både barnmorskor, sjuksköterskor och undersköterskor. Det är 30 kuvert som jag har suttit och skrivit med min egna penna."

3.7 UTMANINGAR FÖR EFFEKTIVA FLÖDEN

Under intervjun framkom också ett antal utmaningar för effektiva patientflöden. Dessa presenteras nedan under gemensamma rubriker.

3.7.1 Beläggning på Special-BB

De 6 platser som finns på BB räcker enligt Vårdenhetschefen oftast till eftersom det är "sådan snurr" på patienterna där. Det som däremot tjuvar till det är att det är många patienter som behöver Special-BB vård och där är det enligt Vårdenhetschefen nästan alltid fullt.

"Och det påverkar arbetssätt, det påverkar personalen, det påverkar bemötandet".

Vårdenhetschefen berättar att det är mer fokus på kontroller idag av barnen. Barnvården på BB har blivit mer komplicerad än var den var för 17-18 år sen när Vårdenhetschefen började. Då låg det som var komplicerade och komplext på barnklinik, idag har vi mycket mer kontrollfunktion på BB.

"Man screenar för mycket mer sjukdomar, tar fler blodprover, man gör fler uppföljningar, man har lite rutiner liksom för vissa tillstånd."

En av utmaningarna för ett bättre flöde är också samarbetet med barnläkarna enligt Vårdenhetschefen då de kommer in som konsulter till BB och BB-mottagningen. Detta är ett enligt Vårdenhetschefen identifierat flödesproblem som de själva inte rör på eftersom det är ett nationellt problem. Idag har man nämligen en högre överlevnad på prematura födda (våldigt mycket för tidigt födda barn) vilket gör att barnläkarnas belastning på barnavdelningen i och med blir enligt Vårdenhetschefen jätte stor. Det blir både en belastning på dem som yrkespersoner men det leder också till att det blir platsbrist. Även om BB har plats för mamman men kan inte Neo-IVA ta barnet måste både mamman och barnet flytta till något annat sjukhus i Sverige.

"Där har vi väl en, skulle jag säga, en av våra utmaningar med bra flöde och samarbete och det har inte blivit bättre på sista tiden."

3.7.2 Samarbetet med BVC

En annan samarbetsutmaning, så som Vårdenhetschefen uttrycker det, är samarbetet med barnavårdscentralerna (BVC). Förr skickade journalerna från BB till rätt BVC med posten när patienten var färdig och utskriven från BB. Det blev dock 5000 brev i Östergötland per år. Det blev då ett tydligt avslut från BBs sida i och med att en kopia på de färdig ifyllda journalerna skickades iväg. Nu finns det ett system med funktionsbrevlådor där en sekreterare eller vårdadministratör skickar ett meddelande till den BVC som mamman tillhör om att personen fött ett barn. BVC ska då vänta några dagar med att kolla i journalen så att BB hinner fylla i all information i journalen. Journalen blir klar när mamman har varit på sista kontrollen men det är barnet som ska lämnas över till BVC. BVC kontaktar sen mamman med föreslagen besökstid.

"Det ger ju inget att läsa journalen innan den är färdig och det är den ju inte förens de har varit på sista kontrollen hos oss. Så det här flödet är sisådär."

På frågan om varför Vårdenhetschefen inte gillar hur flödet fungerar mot BVC svarar hon:

"Det har tagit långtid innan den nya rutinen har satt sig. Det är som om man inte avslutar rent journalmässigt liksom bara i datorn utan det är ytterligare någon som ska in och agera i det där och så blir det liksom inte, vet inte... Det är otillfredsställande för dem förstås att inte veta riktigt. De skrev väldigt mycket avvikelserapporter initialt också från barnavårdscentralerna på det här, att de inte visste."

Känslan blev att personalen på BB/BB-mottagningen tyckte att de själva gjorde ett dåligt jobb. Att BVC förväntade sig all information i journalerna när de fick journalerna men att den informationen inte fanns tillgänglig eftersom alla kontroller ännu inte var genomförda. Så även om journalerna fylldes i när de skulle fyllas i upplevdes det som om de gjorde ett dåligt jobb. Men BVC hade en annan syn eller andra förväntningar på hur informationsöverföringen skulle ske och de vill också göra ett bra jobb.

"Och sen kände väl de tror jag, att när patienten ringde dit, säg att man går hem jätte tidigt och så ringer man, ah men nu kan jag ju, nu sover ungen, nu kan jag ringa här tänker Lisa. Och ringer de BVC och de inte vet någonting om henne då tyckte de att det var lite sådär, de kände sig inte kompetenta då tror jag och då blev de irriterade och då skrev dem."

På frågan om BB och BVC har något forum för att prata om överlämningsfrågor förutom genom avvikelserapporteringen svarar Vårdenhetschefen att de för nått år sen bad om att få träffa cheferna och verksamhetsutvecklare för BVC för att prata igenom överlämningsfrågan. BVC:erna har det lite knöligt eftersom de sitter utlokaliserade på alla vårdcentraler vilket gör att det blir en utmaning i sig eftersom de inte träffas alla speciellt ofta och det blir ju då enligt Vårdenhetschefen svårt att nå ut med information till dem.

3.7.3 Chefskapet

Närvarande chefer är en utmaning. Har man anställda på olika platser och som kanske även har andra chefer att lyssna på är det en utmaning att nå dem och kunna hålla en dialog med dessa medarbetare.

Vårdenhetschefen ser framemot att flytta in i nya lokaler med förlossningen, augusti 2016. De är först ut på KK att flytta. De har fått vara med i utformandet av den nya avdelningen och lokalernas layout. Vårdenhetschefen har varit med sen 2011 och tycker att de i de nya lokalerna har tänkt på flödet av patienter där man har tagit hänsyn till att det finns en poliklinisk verksamhet och att patienter behöver vård på olika nivåer innan, under och efter en förlossning. Då patientsammansättningen på de olika delarna ska ändras med att t.ex. de gravida inneliggande ska ligga in på förlossningen i st för på Special-BB behöver personalstyrkan eventuellt ändras där de ska se över vilka kompetenser som behövs vid de olika avdelningarna om patientmixen ändras.

Mycket bygger på att det finns en dialog med medarbetarna och att hitta mötesformer, något som enligt Vårdenhetschefen är svårt med 100 medarbetare och en verksamhet som rullar på 24 - 7. På ATP:er kan ju inte alla medverka eftersom det hela tiden pågår verksamhet och några måste då jobba.

"Att ha bra APT, de kommer ju inte på de allihop utan man kanske når 15-20 ena dagen och så får man dubblera mötena vilket tar mycket tid av mig, och så. Så det finns liksom, det finns svårigheter som jag fantastiskt inte vet hur man ska kunna förändra beller om man inte alltid sitter här dygnet liksom. Så är det."

"För jag kan inte göra någonting av det här ensam, så är det. Jag kan vara den jag är, jag kan försöka ha liksom min, mitt sätt att vara gentemot medarbetarna. Det är ju en sak och att jag försöker fylla på med kunskap och kompetens och att jag försöker vara duktig på att informera ut och de här bitarna. Det är bara att inse att man är fullständigt otillräcklig i en sån här stor organisation."

En annan utmaning är mer av organisatorisk karaktär och handlar om bemanningen där OE och KH delar på vissa barnmorskor. Vårdenhetschefen beskriver den svårigheten från både ett organisatoriskt perspektiv men också från ett individ perspektiv.

"Och liksom ha en, beroende på vem av oss som är chef för dem då för det blir lite mer komplicerat att ha en människa som är här på 40 % men sen är hon där på 40 %. Dels är det en utmaning för individen att hålla sig uppdaterad och läsa PM och information och så. Men det är ju också vilken chef träffar hon mest och vem ska ha utvecklingssamtal, lönesamtal såna saker? Vilka kurser ska vi erbjuda våra medarbetare, vad ska man få åka på, vad ska vi ha för policy, sådana frågor tar vi upp i den gruppen."

3.7.4 Påverkan av andra avdelningars prestation

Då OE och MHV har samma individer som patient kan även problem med tillgängligheten spilla över på de olika enheterna. Förlossningen märker t.ex. av problem på MHV genom att telefonbelastningen ökar hos dem. Ett nyligt exempel är när MHV hade problem med bemanningen och arbetsfördelningen av deras telefonrådgivning som ett tag var ner i endast 30 % tillgänglighet vilket gjorde att gravida som behövde få råd ringde till förlossningen i.st.

3.7.5 Rekrytering

Rekryteringen är en annan fråga som berör kopplingen mellan sluten och öppenvården. Tidigare fanns det en tradition av att man som ny barnmorska började på förlossningen och stannade där ganska länge innan man sökte sig vidare till öppenvården och mottagningsverksamhet. Nu är det enligt Vårdenhetschefen nått man vill göra ganska tidigt och kombinera med småbarnslivet för att det är bättre arbetstider inom öppenvården. Detta tycker Vårdenhetschefen är ett problem, att öppenvården är så pass attraktiv i och med arbetstiderna vilket gör att det blir mer svårrekryterat till slutenvården

4. ÖPPENVÅRDSGYNEKOLOGIN

Öppenvårdsgynekologins verksamhet består av gynekologmottagningen som bedriver mottagningsverksamhet och dagkirurgi under vardagar och dagtid för planerade och akuta besök.

4.1 OM RESPONDENTEN

Respondenten är vårdenhetschef på gynekologiska öppenvårdsavdelningen samt för motsvarande avdelningen i Motala. På avdelningen på US i Linköping bedrivs mottagning och dagkirurgi. Dagkirurgin är unik i landet. I Motala bedrivs samma typ av verksamhet men in mindre skala. Verksamhetschefen är i Linköping 3 dagar i veckan och i Motala 2 dagar i veckan. Verksamhetschefen har varit chef i 15 år och haft två olika uppdrag inom landstinget/regionen.

4.2 GYNEKOLOGMOTTAGNINGEN US

All typ av gynekologi hanteras på avdelningen. Det kan vara patienter med akuta smärtor i buken, blödning, då större. Även icke akuta patienter kan ha starka smärtor i buken och/eller blödningar, då av mindre karaktär. Gravida ingår också som patientgrupp om de har smärta eller blödning i tidig graviditet. Verksamheten består även av cancerkontroller, aborter, urogyn (inkontinens), dysplasi (kontroller av de som visat cellförändring vid cellprovet), klimakterieproblem, hormonproblem, framfall, endometrios (livmoderslemhinna som finns utanför livmodern, ex på äggstocken eller tarmen).

Dyplasi-patienter har enligt Verksamhetschefen blivit fler eftersom ett större urval av patienter görs, fler kallas då de har gått ner i åldrarna och att de nu även kan testa för HPV-viruset. Metoden har även utvecklats så att de numer hittas fler med lätta cellförändringar. Alla måste kollas även de flesta läker ut av sig själv.

På avdelningen jobbar sjuksköterskor, barnmorskor, narkossköterskor, operationssköterskor och undersköterskor. Avdelningen har 8 mottagningsrum var av ett alltid ett rum är jourrum för akuta patienter samt ett operationsrum och ett uppvakningsrum med fem platser. Det opereras fyra dagar i veckan på avdelningen och totalsett opereras det ca 1000 personer på ett år. De har inga gaser på avdelningens operationsrum vilket begränsar vad de kan utföra för operationer. Patienterna är inte sövda men de upplever det som om de vore det därför att de är cederade och lokalbedövning, alltså ej djupnarkos.

4.3 UPPDRAG OCH MÅL

Avdelningen har ett avtal med Region Östergötland där det finns krav på tillgänglighet för nybesök. Mål finns beskrivet i styrdokumentet som delgavs under intervjun.

4.4 PATIENTÄRENDETS VÄG GENOM AVDELNINGEN

Då det finns olika typer av patientärenden som avdelningen hanterar finns det också olika aktiviteter som ärendena passerar.

4.4.1 Första kontakt med avdelningen

Patientens första kontakt med avdelningen sker via telefon, remiss eller om patienten kommer till dem direkt från akutmottagningen.

Patienten ringer

Det finns två typer av ärenden som hanteras via telefonen, antingen är det ett rådgivande samtal eller så bokas patienten in på en tid till läkare. Genom pinstatistik har de räknat på att ca 1/3 av samtalen rör bokningar och resterande är rådgivning eller hänvisningar.

"Att sitta i telefon, det är en vetenskap... och alla kanske tycker att de ska komma men vi tycker inte det."

Mina vårdkontakter

Via 1177 kan patienter kontakta avdelningen genom Mina Vårdkontakter (MVK).

"Och det är samma som ringer, kan jag tycka. Det är samma typ av kontakt, antingen är det rådgivning eller så vill man boka tid eller om man vill avboka tid eller om man vill ha ett recept, man vill ha en sjukskrivning, man vill ha kopior på journaler, så."

Remiss

Remisser kan komma från vårdcentraler eller gyn-mottagning runt om i regionen, från utomlänspatienter, eller interna remisser. Remisserna kommer in via Cosmic (vårdinformationssystem) som bevakas och sedan skickas vidare till ansvarig läkare.

En intern remiss är om patienten redan är inlagd på sjukhuset på någon annan avdelning, även kallad konsult. Patienten kommer då till avdelningen om denne inte är svårt sjuk för då besöker läkaren patienten på den befintliga avdelningen (bed side). Är det en akut konsult ringer avdelningen som patienten är inlagd på Verksamhetschefens går konsulten via Cosmic.

Via akutmottagningen

Akuten ringer och talar om att de har en patient som ska till gyn. Patienten kommer sen upp till avdelningen för att träffa läkare.

4.4.2 Bedömning av remisser

Remisserna blir bedömda och ges en angiven tidsram som patienten ska komma inom. Ärendet prioriteras och leder till antingen ett inplanerat besök eller en operationsanmälan. Remisser som är ofullständiga skickas tillbaka till ex vårdcentralen för komplettering. Det kan handla om röntgenbilder eller utredning om inkontinens som saknas.

4.4.3 Bokning av tid

Patienterna som ringer in eller kontaktar avdelningen via MVK får en tid direkt till mottagningen och det skickas även hem en kallelse till dem.

Under telefonsamtalet görs en bedömning av vilken vårdnivå som behövs eftersom de har läkare med olika kompetens. Är det något väldigt komplicerat försöker de hitta en specialist och är det något enklare fall kan man ta en läkare under utbildning. Det görs även en bedömning av hur "akut" fallet är rent medicinskt. Hur snabbt behöver patienten komma? Och vissa symptom leder till att patienten behöver komma in snabbt och vissa kan vänta.

Remisser som leder till besök planeras in till passande vårdgivare och vårdnivå utifrån prioritering, vad remissen säger om när de bör komma och medicinskt behov. Alla patienter bokas in till specifik person, antingen en eller flera av yrkeskategorierna sjuksköterska, undersköterska, barnmorska eller läkare.

Remisser som leder till en operationsanmälan används av operationsplaneraren för att planera in operationen. Operationsplaneraren planerar in operationen efter vilken typ av operation och vilken läkare som kan utföra operationen och en kallelse skickas hem till patienten. Detta kan även ske integrerat under samma dag som patienten är på mottagningsbesök på avdelningen. Läkaren skriver då en operationsanmälan i samband med besöket och patienten får med sig den direkt och går till operationsplaneraren som ger patienten en operationstid och information samt att patienten fyller i sin hälsodeklaration. En kallelse skickas dock alltid hem till patienten för att undvika missförstånd.

"Det försöker vi alltid att göra, även om man har pratat med patienten så skickar vi alltid en kallelse till patienten för att det inte ska vara nått missförstånd. Och för att de ska veta vart de ska gå."

Om det inte går att ge patienten tid direkt förbereds patienten så mycket som det går genom provtagning, information osv samt avstämning om när patienten kan genomgå en operation och sen får patienten en tid via brev så snart det finns en passande tid.

4.4.4 Patienten besöker avdelningen

Ett besök kan vara ett engångsbesök eller det kan innebära att det under besöket tas prover som genererar att patienten ska få besked eller att patienten ska komma på återbesök eller att patienten ska opereras. De flesta prover tas på avdelningen men de är beroende av andra i vissa fall för att få dem analyserade. Bland annat skickas prover för patologi och cytologi.

4.4.5 Operation

Patienten ankommer på operationsdagen, förbereds, opereras och vilar ut efter operationen innan denne går hem samma dag. Eftersom det är en dagkirurgisk operationsverksamhet övernattar inga patienter. Om en patient mot förmodan inte kan gå hem samma dag blir denne inlagt på grannavdelningen för slutenvårdsgynekologi. Personalen inne på sal jobbar i team, alltså flera olika personalkategorier har ett nära samarbete för att nå målet.

Avdelningen har gjort en aktivitetskarta över aktiviteter kring operation under operationsdagen. Här är de olika yrkeskategorierna samt patientens roller definierade och aktiviteterna är i kronologisk ordning.

4.4.6 Återkoppling efter operation

Dagen efter större operationer blir patienten uppringd. För en del patienter planeras då ett återbesök in. De som genomgått en mindre operation har sällan besvär och rings därför

inte upp men de har fått ett telefonnummer så att de kan höra av sig om det är något de undrar över.

För de flesta operationer ingår det att patienten en viss tid efter operationen svarar på en enkät om patientnöjdhet. Enkätsvaren läggs in av sekreterare på avdelningen i gyn-op-registret. Genom enkäten fångas bl.a. sjukskrivningar, tid till åter i arbete och om de vill ha återbesök. Här kan avdelningen sen hämta data enligt Vårdenhetschefen.

4.4.7 Schematisk bild över patientärendets väg genom avdelningen

Nedan presenteras en schematisk bild över aktiviteter som genomförs för att fullfölja ett patientärende, från mottagning av ärendet till avslut hos avdelningen.

Figur 7: Schematisk bild över patientärendets väg genom öppenvårdsgynekologin

4.5 PLANERING

Planeringen består av både personalplanering och inplanering av patienter till mottagningen och operation.

4.5.1 Bemanningen av läkare

Läkarschemat läggs utanför avdelningen, centralt, och meddelas innan mottagning och operationstider ska planeras in. Schemat gäller för ca. 3 - 4 månader och blir tillgängligt ca 1,5 månader innan det börjar gälla.

4.5.2 Bemanningen av övrig personal

Schemaläggs på avdelningen utifrån grundbemanning om olika kompetenser.

4.5.3 Mottagning och operationstider

Mottagningen har både läkarmottagning och mottagning till övrig personal.

Läkartider

Läkartider till mottagning och operationstider hämtas från läkarschemat och då antalet läkare och kompetens som finns tillgängliga per dag. Detta görs ca 1,5 månad i förväg och görs först förhand på papper som sparas i en pärm och läggs sedan in i Cosmic. Tider blir

då bokningsbara för de som sitter i telefonen och bokar in patienter till specifika läkare. Läkarschemat styr enligt Verksamhetschefen antalet mottagningar på mottagningen. Antalet mottagningar är utifrån ett grundbehov 22 läkarmottagningar/veckan, ej jouren inräknad, måndag till fredag.

Tider till övrig vårdpersonal

För de övriga besöken sjuksköterske- och barnmorskemottagningarna görs planeringen lite mer efterhand. Ca 3-4 veckor innan läggs mottagningstiderna ut genom vad Verksamhetschefen kallar "Sudokut". Dessa tider läggs sedan ut i Cosmic och blir tillgängliga för att boka in patienter. Sjuksköterske- och barnmorskemottagnings tiderna styrs av lediga rum och bemanning.

Nästan alla som jobbar på avdelningen av sjuksköterskor och barnmorskor bemannar telefonen enligt schemaläggningen. Vid personalfrånvaro är det telefonbemanningen som de drar ner på, telefonen är deras gummiband eller Verksamhetschefen själv när hon sätter sig i telefonen.

4.5.4 Dagplanering

MLA och Verksamhetschefen lägger dagsplaneringen som ett förslag på hur arbetsuppgifterna under en dag kan fördelas och sen kan personalen själva byta om de vill. Schemat görs veckovis där bl.a. följande poster bemannas upp: fm, em och jour telefon, vem som är inne på operation, vem som har postop., operationsplanerare, medicinska aborter, abortmottagning, specialmottagningar för urogyn och promyelocyt, och även mer administrativa funktioner så som expedition fördelas. Det är detta schemat som Verksamhetschefen kallar Sudokot.

"Och det här är ett förslag från MLA och mig, att så här kan dagen se ut. Så får de ju byta mellan varandra om de vill men det är väldigt sällan de gör. Utan de tycker att det är skönt att gå och se vad ska jag göra."

Varje funktion har sen ett antal arbetsuppgifter som ingår och som man har ansvar för att de sköts under dagen. Tex har de som sitter i telefonen även ansvar för att sköta Mina Vårdkontakter (MVK).

Varje morgon fördelas läkarna ut på mottagningsrummen och rummen förbereds. Jourrummet är självskrivet till jouren. *"Det har vi alltid till jouren och där är det ju alltid patienter hela tiden"* enligt Verksamhetschefen. Jourrummet ligger alltid vid jourexpeditionen och väntrummet och avdelning 21 (slutenvårdsgynekologin) som har hand om jouren på kvällar och nätter. De andra rummen fördelas utifrån vilka patienter man ska ha, t.ex. ska man ha inkontinensmottagning ska det vara ett rum med toalett och det finns inte på alla rum.

4.6 MÄTNINGAR

Avdelningen följer kontinuerligt antalet väntande patienter för nybesök eftersom det är kopplat till kömiljarden. Detta görs genom att Verksamhetschefen ett par gånger i månaden i Cosmic, CI-rapport (Cosmic intelligence), gå in och dra ut listor över väntetider på individnivå. De patienter som väntat länge kollas upp genom att gå in i deras journal för att

se om det stämmer. Kan det vara så att någon lagt in fel eller har patienten redan varit på besök? Annars ser de till att patienten får en tid så snart som möjligt. De följer även telefontillgängligheten, tid till behandling från medicinskbedomning samt andelen väntande mer än 60 dagar. Andelen nöjda patienter följs även via patientenkäten.

Med hjälp av gyn.op.registret försöker de arbeta fram medicinska mål men det är enligt Verksamhetschefen svårt att hitta relevanta mått som också är mätbara.

”Och det där det jobbar vi jätte mycket med, för det är inte lätt att hitta medicinska mål.”

Ett av de medicinskamålen är att ”koniseringar mindre än 5 % benigna koner” vilket är ett mått på hur ofta de opererar i onödan. Alltså att man i efterhand konstaterar att det inte var den diagnosen som man trodde. Det kan vara svårt att bedöma allvarligheten i cellförändringar och ibland läker de ut av sig själv och därför är det enligt Verksamhetschefen ibland bra att ha lite ”is i magen”. De följer även antalet analyserade ”svåra fall”, alltså de patienter som har råkat ut för svåra komplikationer. Målet är att analysera alla ”svåra fall” för att lära sig av dessa.

4.7 FRAMGÅNGSFAKTORER FÖR EFFEKTIVA FLÖDEN

Utvecklingen har gått framåt och sådan ingrepp som för 10 år sedan ledde till att patienten blev inlagd i 3 - 4 dagar efter operation kan idag göras under dagen och patienten kan gå hem samma dag. Avdelningens dagkirurgiska operationssal har skapat möjlighet att operera lättare åkommor polikliniskt, alltså i öppenvårdsregi. Det vinnande konceptet med operationssalen för dagkirurgi är enligt Verksamhetschefen att hela förloppet är integrerat och att personalen och övrig verksamhet hänger ihop.

”Det är ju så att man kan ju göra betydligt mer polikliniskt idag än vad man kunde för typ tio år sedan. Det handlar om rätt information till patienten, alla säger lika och så. Och vi har haft massa studiebesök.”

”Här kan du hämta hem mycket pengar. Att inte köra dem till central.op och ha de inlagda. Det handlar inte bara om pengar, det handlar om att det är bra patientflöde också. Också skapa utrymme på centraloperation för de stora operationerna, canceroperationerna.”

En av framgångsfaktorerna med att skapa en väl fungerande dagkirurgiskverksamhet var att få med personalen enligt Verksamhetschefen. Personalen måste tycka att det är intressant och vara med på tåget när man genomför en större förändring som det var med dagkirurgin. Det gjordes riskanalys, de gick patientens väg, genomtänkt vad gäller lokal och personalens kompetens. Verksamheten har under tiden anpassats genom rätt mängd operationer, rätt personal genom att höja kompetens. Personalen har stor delaktighet och jobbar i team i operationssalen.

En annan framgångsfaktor för att verksamheten ska flyta på bra är det nära samarbetet mellan verksamhetschefen och MLA, det är en mycket viktig komponent att man har sin parhäst säger Verksamhetschefen. Man ska gilla varandra, prata samma språk och ha gemensamt mål. Det är många frågor som rör det medicinska vilket understryker vikten av ett par-ledarskap.

Andra framgångsfaktorer som Verksamhetschefen nämner är telefonsystemet, TeleQ, vilket de flesta vårdcentraler också använder sig av. Det är lätt att styra, öka upp och dra ner antalet telefoner. Verksamhetschefen tycker att de har bra stöd genom digitala journaler. Ledningssystemet har också gett mottagningen en skjuts i utvecklingen av verksamheten samt att US är andra sjukhuset i Sverige som har barnmorskeledd abortmottagning istället för läkarledd.

De läkare som ska bli distriktsläkare gör en del av sin specialistutbildning på avdelningen i ca 3 månader. Genom det tycker Verksamhetschefen att det blir ett utbyte med vårdcentralerna.

"Där är vårt största utbyte, vi gör ju en jätte satsning på att utbilda de här. Sen vill att de fortsätter när de kommer till sin vårdcentral."

4.8 UTMANINGAR FÖR EFFEKTIVA FLÖDEN

Det viktigaste är att läkarschemat fungerar, anser Verksamhetschefen. När det inte fungerar är det dåligt med läkartider, när tillgängligheten till speciellt specialister är dålig fungerar verksamheten dåligt.

"Jag skulle säga, har du inte ett bra läkarschema och en bra läkarbemanning så skiter sig allting."

Problemet är, som Verksamhetschefen anger, att det inte planeras in tillräckligt med läkartimmar för att få till 22 mottagningar i veckan.

"Nej, att vi får inte tillräckligt med mottagning och det är ett stort problem."

Verksamhetschefen tror att en av orsakerna till att det ser ut som det gör ligger i deras verksamhet; då läkarna har patientverksamhet, uppdrag mot HU, och forskning. Enligt Verksamhetschefen blir det då en *"fruktansvärd frustration"* bland personalen som sitter i telefonen och inte kan ge tider till patienterna. Det blir även en patientsäkerhetsfråga. De får då slita för att få in nybesöken och återbesöken får vänta. *"Allting raseras, det är förfärligt"* säger Verksamhetschefen. Nybesöken prioriteras för tillgängligheten ska vara god på denna grupp eftersom det ger pengar men rent medicinskt kan det vara viktigare att få in återbesök.

"Vi har perioder när, alltså de som ska sätta sig i telefonen bara drar, alltså gud jag vill inte, jag vill inte sitta i telefon, jag har inga tider att ge."

Det är också frustrerande och tärande att som chef stå inför problem som man inte själv äger, som man inte har makt över anser Verksamhetschefen och syftar på den återkommande bristen på läkartider.

"De andra, sjuksköterske- och barnmorskemottagningarna, de gör vi allt eftersom, allt eftersom jag lägger sudokut, det där. Så när jag lägger sudokut, lägger jag in mottagningar, för då ser jag hur många, är det något ledigt rum överhuvudtaget, jag måste ju ha... Alltså, det här styr först [Verksamhetschefen pekar på läkarschemat] och sen så lägger vi in abortmottagning, cyttmottagning, urogynmottagning, prolapsringsmottagning. Allt efter där vi har personal och när det finns ledigt."

Det är enligt Verksamhetschefen upp till schemaläggare och verksamhetschefer att se till att schemat är anpassat efter behovet och att Verksamhetschefen ser till att det finns personal med rätt kompetens för att bemanna verksamheten. En problematik är att det är svårt att veta behovet på läkartider per vecka tycker Verksamhetschefen.

"Ett grundbehov som vi försöker räkna på, som är väldigt svårt."

Avdelningen har krav på sig genom ett tak på max antalet väntande patienter. Klarar de inte detta får regionen mindre pengar men klarar de det så får de sin budget.

"Fick mail från centrumchef igår att, att det fanns två patienter som hade väntat över 180 dagar på gyn i Norrköping, och finns de det så får vi inga pengar."

Kravet om tillgänglighet förstärks enligt Verksamhetschefen av kömiljarderna.

"Vi har ju ett avtal som säger vad vi ska göra men det säger ju inte hur mycket patienter vi ska ha, utan det är ju liksom gynekologin och bla bla."

"Och var man redan duktig då fick man ju ännu hårdare, och så har det varit för oss, vi har varit duktiga och så ska vi vara ännu duktigare, ännu duktigare och det finns ju en viss... sen kan man inte bli duktigare. Så känner vi, vi kan inte bli duktigare."

Som nämnts tidigare är det Verksamhetschefen som ansvarar för att kontrollera så att ingen patient väntar "för länge" och det arbetet skulle underlättas om CI-rapporterna skulle kunna komma automatiskt till verksamhetschefen med jämna mellanrum istället för att verksamhetschefen ska behöva gå in och söka fram de, enligt verksamhetschefen själv.

På frågan om hur många patienter som ingår i de olika patientgrupperna och vilken grupp som är störst, om det är dysplasi som står för det största antalet patienter, svarar Verksamhetschefen så här:

"och då ska alla de kontrolleras, och det är en himla massa, det är jätte många"

Nästa fråga är om den största patientgruppen:

"det var en svår fråga, det var en jätte svår fråga, den största patientgruppen, ja de ja det är en jätte svår fråga, för det kan ju vara den här"

Verksamhetschefen pekar på den akuta gruppen.

"alltså den här smärta blödning kan vara större. Jag tror inte någon av oss vet det faktiskt. Det var en bra fråga."

En annan svårighet är när provsvaren dröjer, då ringer patienterna och frågar varför de inte fått svar på sina prover. Enligt Verksamhetschefen påverkar det både avdelningen genom högre belastning på telefonerna och patienterna genom att de känner en oro.

"Då skickas det till patologen. Där har vi väntetider. Det är liksom brist på patologer i hela Sverige."

Ytterligare en utmaning som nämns är att vissa vårdcentraler i regioner har inga gynstolar och kan därför inte genomföra enklare undersökningar utan allt går då till US ist.

5. SLUTENVÅRDSGYNEKOLOGIN – ETT MEDICINSKT PERSPEKTIV

5.1 OM RESPONDENTEN

Respondenten är specialistläkare i obstetrik och gynekologi samt i gynekologisk onkologi, och disputerade 1996 vid Linköpings Universitet. Respondenten är också professor och överläkare på kvinnokliniken med medicinskt ledningsansvar (MLA) för avdelning 21.

5.2 SLUTENVÅRDSGYNEKOLOGISKA AVDELNINGEN US - AVDELNING 21

Avdelning 21 är en slutenvårdsavdelning för gynekologiska patienter som ska opereras antingen planerat eller akut. Det finns även en liten grupp patienter som inte är operationspatienter men som är ineliggande på avdelningen av andra anledningar. Antalet operationer som genomförs på ett år ligger runt 700 - 800 och av dem är ca 300 canceroperationer.

5.3 UPPDRAG OCH MÅL

Uppdraget för avdelningen är att bedriva gynekologisk slutenvård och ge den vård som efterfrågas samt är motiverad. Avdelningen ska då uppfylla de krav som landstingen ställer på vad det är de ska göra vilket innebär att det är utifrån politiska riktlinjer. Ett exempel är att mellan år 2000 - 2010 skulle steriliseringar inte genomföras men nu har det uppdraget kommit tillbaka. Sterilisering sker numera i KK:s öppenvård.

Det finns en viss fluktuation av patienter som behöver opereras men inflödet av remisser är ganska jämn över året, tror Medicinskt ledningsansvarige. Efterfrågan generellt sätt styrs däremot oerhört mycket av professionen själv. Vad man erbjuder, vad man skriver om vad man kan göra påverkar efterfrågan av vård.

Det finns en verksamhetsplan för hela verksamheten och för varje enhet. Klinikens verksamhetsplan ska samstämma med centrumet som i sin tur ska samställas med landstinget verksamhetsplan. Avdelning 21:s verksamhetsplan uppdateras varje år och i den finns det olika mål som ska nås och måltal som ska uppnås. Det är sällan som produktionsmått anges som mål, som t.ex. antalet operationer, det är ointressant anser Medicinskt ledningsansvarige, utan frågan är vad efterfrågan är och om det går att bemöta den.

5.4 PATIENTÄRENDETS VÄG GENOM AVDELNINGEN

Vägen för ett patientärende för slutenvårdspatienter vid gyn kan illustreras genom att beskriva aktiviteter som är kopplade till detta flöde. Aktiviteterna beskrivs var och en för sig i kommande stycken.

5.4.1 Remisser ankommer, interna och externa

Remisserna är antingen externa eller interna. Interna är från mottagningen (som ligger på samma våning, lite längre bort i korridoren) där en doktor beslutat om inläggande operation. Externremisserna kommer från andra vårdgivare, oftast är det från andra gynekologer inom regionen. Det kan även vara från gyn onkologen på US som önskar att en cancerpatient ska opereras som de har fått remiss på.

5.4.2 Remiss bedömning

Ankomna remisser bedöms av någon av de två till tre doktorerna som bedömer remisser. När remisserna är bedömda går de vidare till operationsplaneraren på avdelning 21. Operationsplaneraren är en eller två sköterskor på avdelning 21 som lägger in patienterna i operationsplaneringen.

Alla remisser bedöms och det är endast remisser på patienter som redan är bestämt att de ska opereras. Bedömningen handlar alltså inte om att bestämma om operationen ska bli av eller ej. Under själva remissbedömningen sker en bedömning av omfattningen av operationen samt patientens medicinska tillstånd. Hur sjuk är patienten? Vad har gjorts tidigare? Är patienten tidigare opererad eller har andra sjukdomar? Doktorerna behöver ha information så att operationen kan genomföras på ett säkert sätt och eventuellt kan andra resurser behövas, så som någon specialist. Den här informationen får då operationsplanerarna så att de vet om det är andra specialister som ska vara med under operationen eller i förberedelserna till operationen. Hur vida patienten kan åka direkt hem efter operation eller om den måste få hjälp via kommunen (t.ex. om hemassistents behövs, eller korttidsboende) bedöms också vid remiss bedömningen. Remissbedömningen handlar således om att göra bedömning över hela vårdkedjan så att patienten också hamnar rätt efter operation enligt Medicinskt ledningsansvarige.

Vissa remisser bedöms via en multidisciplinärkonferens där onkologer och patologer också deltar. Prover och röntgenbilder kan då diskuteras. Den egna röntgenläkaren kan även kopplas in om det finns behov av ytterligare granskning av röntgenbilder. Röntgenrond sker 1 ggr/vecka. Gyn onkologen och röntgen träffas ytterligare 1 ggr/vecka. Om underlaget för att bedöma externa remisser är ofullständigt ställs det krav på remittenten att åtgärda det och skicka in begärt underlag. Remissgranskningen leder till beslut om vilka som ska genomföra operationen, när den behöver genomföras och hur patienten ska förberedas samt vård efter operationen.

5.4.3 Beslut om operation

För benigna patienter ska operation vara gjord inom två månader från det att beslut är fattat om att det ska bli en operation. Det betyder att patienten måste vara färdigutredd och allt underlag för att kunna göra en bedömning måste vara på plats för att ett beslut ska kunna tas. För maligna patienter eller misstänkta är det 21 kalenderdagar som gäller.

5.4.4 Besök innan operation

Patienten kommer oftast innan till avdelning 21 och träffar doktor. Detta besök kan sammanfalla med operationsdagen, det beror på vem som har remitterat patienten, är det en intern remiss så har patienten fått informationen innan. De externa patienterna kommer

till US och gås igenom, pratar med narkos, gynekolog och får mer information om operation om det behövs. En anestesiläkare träffar patienten för bedömning och information om narkos. Helst görs detta besök en vecka innan operation för att om ytterligare medicinsk utredning behövs finns tid att göra det innan operation.

5.4.5 Inskrivning

Dagen eller dagen innan patienten ska opereras anländer patienten och skrivs in på avdelning 21.

5.4.6 Operation

KK hyr operationstid på centraloperation som drivs av Anestesi och operationskliniken (An.Op). Patienten opereras och eventuella prover tas och skickas till Patologen för bedömning. Provsvaren kan vara avgörande för hur förloppet ser ut efter operation.

Det är 3 seniora kirurger och 2 kirurger under utbildning som opererar. Det finns en speciell tumörkirurgiskutbildning inom gynekologin. Det finns internationella riktlinjer för hur många kirurger man bör vara beroende på patientunderlaget för att upprätthålla god kvalitet på operationerna, så att kirurgerna helt enkelt får tillräckligt med träning. För att säkra en återväxt bland kirurger måste utbildning av nya kirurger börja i tid, så att de nya hinner med att både gå utbildningen och att lära av de mest seniora kirurgerna innan de går i pension.

"Det är ett livslångt lärande som vi håller på med, vi som läkare. Det tar aldrig slut."

5.4.7 Postoperativ vård

Efter operationen ligger patienten på postoperativa avdelningen för att stabiliseras efter operation. Det är anestesi och operationskliniken som driver även denna avdelning. Patienten ska medicinskt sett vara så kort tid som möjligt på postoperation och för det krävs det att rätt resurser läggs på att hjälpa patienten återhämta sig. Forskning krävs i nya metoder som hela tiden ger nått som är bättre, menar Medicinskt ledningsansvarige.

5.4.8 Eftervård på Avdelning 21

När patienten inte längre behöver postoperativ vård flyttas denne tillbaka till avdelning 21 där eftervård sker tills patienten är redo att återvända hem eller till annan vårdgivare.

5.4.9 Utskrivning

När allt är stabilt och patienten är redo att gå hem skrivs denne ut från avdelningen. Alternativt för de som kommer från andra kliniker till KK, om de inte kan utskrivas till hemmet, utskrivas och överflyttas till hemortskliniken.

5.4.10 Återbesök

För benignkirurgi planeras inga återbesök men givetvis görs undantag om det finns speciell anledning till ett återbesök. Patienten kan via ett frågeformulär kopplat till kvalitetsregistret ange att de önskar återbesök om det uppstått några komplikationer. Frågeformuläret skickas ut 4 - 8 veckor efter operation. Patienten kan även ringa till avdelningen om besvär uppstår efter operation för att få information eller boka återbesök. Patienterna kan alltså antingen få ett återbesök inplanerat i samband med operation, själva kontakta avdelningen via frågeformulär eller telefon för återbesök eller så behövs inget återbesök.

Patienter kan komma på retur om det händer nått under operation eller under det postoperativa vårdförloppet som gör att det uppstår komplikationer när patienten kommit hem, t.ex. tarmvred, infektion eller dylikt. Dessa patienter kommer då ofta akut.

5.4.11 Schematisk bild över patientärendets väg genom avdelningen

Nedan illustreras de aktiviteter som är kopplade till patientärendets väg från remiss ankommer till avdelningen till patienten är opererad och klar för hemgång, se Figur 8.

Figur 8: Schematisk bild över patientärendets väg från remiss till hemgång utifrån MLAs perspektiv

5.5 PLANERING

Läkare planers central för hela kliniken. Läkarna önskar schema och schemaläggaren lägger schema för 3 - 4 månader fram i tiden. Schemat är uppdelat på f.m. och e.m. pass.

5.6 MÄTNINGAR

Det framkom ett antal mätetal under intervjun som följs enligt Medicinskt ledningsansvarige. Returer, efterfrågan, antalet operationer och det som finns i nationella registret följs. Dock används just nu inte något specifikt mätetal för att utveckla verksamheten utan det blir en helhet. Men de ska gå in på mer specifika indikatorer som t.ex. postoperativa infektioner, enligt Medicinskt ledningsansvarige

5.7 FRAMGÅNGSFAKTORER FÖR EFFEKTIVA FLÖDEN

Avdelning 21 har ett stort förtroende i regionen från remittenterna som uttrycker en nöjdhet. I nationella patientenkäter ligger avdelningen väldigt bra till. Forskningen ligger också i framkant. Det är alltså en kombination av att patienterna är nöjda och förtroende från remittenterna i regionen som gör att de som jobbar på avdelning 21 vet att de gör ett bra jobb.

5.7.1 Forskning, kompetensutveckling och investering i individer

Forskning i nya metoder som ger kortare vård och därmed bättre för patienten. Att patienten rent medicinskt ska behöva vara så kort tid som möjligt under post operativ vård. Att utveckla nya metoder kan man bara göra när man har erfarenhet och känner sig trygg i sin yrkesroll, metoder för att t.ex. korta postoperativa vården för patienten eller göra öppenvårdsoperationer i.st. för slutenvårdsoperationer.

Att vara en mindre grupp som jobbar ihop är också en framgångsfaktor enligt Medicinskt ledningsansvarige. För att bli en duktig kirurg måste man göra ett antal operationer. Patientantalet styr hur många kirurger som kan "tränas" för att bli så skickliga som det krävs. Kirurgerna ska alltså operera så mycket som möjligt men också ha drägliga förhållanden så att de inte slits ut av det. Läkargruppens storlek beror alltså på vilket underlag av patienter det finns.

Remissgranskning kräver stor erfarenhet, man måste vara mycket systematisk för att inte göra samma misstag som eventuellt remittenterna har gjort. Man måste kunna se om det saknas något för att kunna göra en bra bedömning. Det måste vara en som kliniskt skicklig och insatt i verksamheten som gör detta, enligt Medicinskt ledningsansvarige.

Varje gång det inte blir ett lyckat fall granskas det och diskuteras så att det går att undvika att få situationer där vi gör saker som vi inte riktigt kan försvara säger Medicinskt ledningsansvarige. Detta gäller både operation och vården på avdelningen 21. Att sköterskorna har en öppen attityd och är trygga i det de gör är då också en framgångsfaktor enligt Medicinskt ledningsansvarige. Personalstyrkan på avdelningen 21 är relativt unga och det finns även en ganska hög omsättning av sköterskor då många vill vidareutbilda sig till barnmorskor. Det stimuleras de till eftersom det är grundläggande för en kvinnoklinik att det finns barnmorskor. Här måste vårdenhetschefen driva på, den som har ansvaret för personalen på avdelningen 21. Se till att få personalen att tänka så att de kan bidra till utvecklingen av verksamheten. Det är bättre att jobba med utvecklingen internt med de personer som känner verksamheten än att komma med något externt så som Lean och trycka på verksamheten tycker Medicinskt ledningsansvarige.

5.7.2 Delat ledarskap för verksamheten

Avdelningen har ett delat ledarskap där en är ansvarig för personalen på avdelningen och så den medicinskt ledningsansvarige som har det medicinska ansvaret.

"Vårdenhetschefen har ansvaret för vårdpersonalen och jag har det medicinska ledningsansvaret men vi har ett par ledarskap. Det är inte så att vi kör det separat utan vi måste ha ett bra samarbete för det. Och det tror jag också är en av framgångsfaktorerna att vi har ett bra samarbete och att vi har öppna kanaler till de som jobbar där."

5.7.3 Rätt från början

Ju sämre patienten är utredd när de kommer till operation rent medicinskt desto svårare blir det att genomföra en säker operation, enligt respondenten. Om det överhuvudtaget går att operera patienten då patienten kan vara mycket sjuk.

Enligt Medicinskt ledningsansvarige är påtryckningarna för tidsramarna att hålla sig inom, de 21 dagarna och 2 månaderna, sätta av ämbeten som inte förstår sig på verksamheten. Det kommer att göras flera misstag pga att man ska stressa och jäkta igenom patienter anser den medicinskt ledningsansvarige.

"Det handlar inte om att tiden mellan beslut om operation till operation ska vara så kort som möjlig, det handlar om att få det rätt. Att operationen utförs av personer med rätt kompetens. En patient med en malignitet vill givetvis ha det åtgärdat direkt men det är inget som påverkar det medicinska om man väntar t.ex. överlevnad. "

5.8 UTMANINGAR FÖR EFFEKTIVA FLÖDEN

Under intervjun framkommer även ett antal hinder för effektiva flöden. Dessa tas upp nedan under gemensamma rubriker.

5.8.1 Samutnyttjande av resurser

Det största problemet med att få en väl fungerande verksamhet är enligt Medicinskt ledningsansvarige det samutnyttjande av operationssalar och personal som sker vid operationerna.

"Vi hyr in oss för en operationssal. Det är vårt största bekymmer. Att vi icke själva äger det, vi äger inte personalen eller resursen där. Och det är det som är vår flaskhals kan man säga. Och det är det som gör vårt system ganska osmidigt."

Samutnyttjande av resurser leder till att den flexibilitet som önskas på en daglig basis inte finns.

"Flaskhalsen är att du inte har personal, du kan icke göra så att, om du ena dagen behöver vi operera 4 patienter exempelvis så är det en som tar lite extra tid så måste man fortsätta. Utan då är vi styrda av anestesi som äger själva..."

"Denna verksamhet är inte lämpad och driva på detta sätt, helt enkelt. Av den enkla anledningen att det kan hända... svängningar i det här och vår operationstid är ingen standard sak att göra. Det är liksom ingen industriprocess där man kan säga att det tar tex 5 min. Förvisso kan vi ju säga genomsnitts tider men det är genomsnitts tider och sen är det plus minus på dem."

"Vi är hela tiden bundna av att vi skall fråga om och få någonting, vi styr det inte själv. Vi kan icke själva planera det. Så när operationsplaneraren planerar någonting så är det utefter en mall alltså, så här mycket kan man ha, där är det ingen flexibilitet."

Det blir en frustration av att inte styra sin egen verksamhet.

"Jag styr inte hela verksamheten, det är det som är det största problemet för oss. Det den här lille stoppklossen som heter an.op centrum som är problemet."

"Vi tror att vi kan göra det mycket bättre om vi själva ägde, vi har sett exempel, och vi har tankar, ideer och energi till att genomföra det här men vi får inte gehör för det från regiondirektören vill inte göra någon organisationsändring. Sen är det så att det är en komplex fråga också, det måste man vara medveten om. En sak är att Kvinnokliniken har ett önskemål, kan ni göra en viss sak här. Men man kan säga så här, anestesi och intensivvårdskliniken täcker ju en liksom en jourverksamhet också, någonting bredare. Så alla måste ju liksom ju förstå också att det här kan enbart lösas om verkligen försöker att ändra väldigt mycket i strukturen. Så det är ingen lätt uppgift. Men det är inte heller någon som är beredd att pröva heller. Man upplever ibland en anmärkningsvärd, en känsla av maktfullmaktighet från vissa grupper. Och det kan man ju fundera lite på vad det betyder."

Avdelning 21 är även beroende av svar på prover för att kunna bedöma sina patienter. Detta är ett annat problem enligt Medicinskt ledningsansvarige då det är långa väntetider för att få svar på prover som tagits under operation och skickats till patologerna.

5.8.2 Bristande kompetens, kompetens- och verksamhetsutveckling

Verksamhetsutveckling inom operation hindras enligt Medicinskt ledningsansvarige då personalen som genomför operationerna tillhör olika delar av organisationen och har på så vis ingen gemensam verksamhet.

"Och sen ser vi inte den personalen mer än den tiden de är där och det är ju också ett betydande bekymmer därför att den utveckling som man önskar och som bör vara inom, kan man säga inom

operativa sidan, den är fullständigt förlegad. Det har icke hänt någonting på 25-30 år på det här avseende. Så ska man utveckla de här så måste man ha sin egen och vi har sett det med effektivitet på vår mottagningskirurgi där man ser till att undvika och ha andra som beslutar och bestämmer om det här. Då får man det effektivt och man får ordentligt flöde.”

Personalen som arbetar på centraloperation assisterar alla operationer som sker där. Det delade resursutnyttjande som sker vid operationer gör att personalen som assisterar kirurgen under operationen bara ser patienten under själva operationen.

”Och de ser ju bara liksom patienten under den här korta tiden. Vi ser ju dem längre tid, vi ser ju också vad som är till fördel och vad som är nackdel och det kan man säga förstår de inte riktigt det här. Jag tror att det är bättre att man har någon som är med i flera led som utför det.”

En viktig del i att trygga försörjningen av operationssjuksköterskor är enligt Medicinskt ledningsansvarige att göra operationssköterskors arbetsuppgifter mer intressanta, inte bara stå i sal utan att egentligen ha kontakt med patienterna. Det har kommit önskemål om det i flera år. En förutsättning för att kunna driva utvecklingen med operationssköterskors arbetsuppgifter behöver resurserna ägas.

”Det är fascinerande att det inte har hänt nått utvecklingsmässigt på 20-25 år. Man har bedrivit det här med operationssköterska på samma sätt man har inte förstått att utveckla den till en ny typ av operationssköterska som är med i vården från början.”

5.8.3 Delad målbild

Patienten tillhör avdelning 21 och det är de som har uppdraget att operera patienterna. Då KK hyr in sig för att genomföra de inläggande operationerna är de beroende av att centraloperation genomför sin del av uppgiften för att patienten ska bli opererad på avtalad tid.

”De har lite strutsmaner. De kommer sällan och säger att det kan vi göra då och då istället. I anslutning till det här.”

”Man gör ju en commitment med en patient när man har avtalat att man ska göra en operation på dig. Patienten har tagit ledigt från arbete och planerat en sjukskrivning och sen blir det plötsligt ingenting av det här. Och de som har resursen här de kan inte ens ta sig tid att komma och säga när ska vi kunna göra det här. Vi kan lägga till en resurs imorgon exempelvis, kan ni komma göra det då? Så det är stor brist på servicetänkande i den verksamheten. Jag tror att det är en omöjlighet att få in det här, utan vi ska äga det här själva.”

Att patienter inte kan opereras den dagen som utlovades händer enligt Medicinskt ledningsansvarige.

”Det är inte sällan strukit patienter av olika skäl men det är sällan för att det är operatören icke kan operera utan det är för att det saknas resurser på an.op. Hade vi dem själva här hade vi också en möjlighet att lösa de problem och få det gjort. Det har vi inte idag.”

Under sommaren skärs tillgången på operationssalar som KK kan nyttja via An.op ner.

”Cancern har inte semester”.

Onkologiska kliniken kan också gå ner på halvfart under sommaren.

"Det skaparen en väldig frustration, det skapar slitningar också av mer, kan man säga, etiska karaktär, jag tycker det är lite jobbigt att vi ska erbjuda saker inom en viss tidsperiod när vi inte får resurserna att göra detta. Man talar med dubbel tunga så att säga från politiker och ämbetsmäns håll i det här avseendet. Å ena sida ska vi uppfylla några krav om tillgänglighet och samtidigt får vi inte resurser att göra det. På sommar tid är det liksom djungelns lag gäller."

När an.op släpper till fler tider är det oftast att operationsdagen förlängs vilket leder till att kirurgen får arbete längre pass. Detta drabbar alltså på individnivå hos kirurgerna men inte an.ops personal eftersom de schemaläggs med en annan logik. An.ops personal går efter schema där de byts av för raster och hemgång, de har alltså reglerade arbetstider på ett annat sätt. Operationscentralens individer drabbas alltså inte på samma sätt.

5.8.4 Styrning av verksamheten utan kunskap om den

Ett annat problem, enligt Medicinskt ledningsansvarige, är att verksamheten har blivit mer politisk styrd och då även mer byråkratisk.

"Sönderstyrt av byråkraterna. Och det kanske också är orsakat av att vi haft lite för dåligt intresse av att faktiskt stå och kämpa för det och ta det från en medicinsk synvinkel. Man vill gärna gör det här till en produktion men det är en människa vi arbetar med. Det är inte en Toyotabil eller någonting sådant som är behäftat med ett antal steg."

Det finns en övertro till Lean. Ämbetsmännen vill överföra det här med Toyota Lean modellen, vilket Medicinskt ledningsansvarige tycker är ett fiasko då Toyota nu förtiden inte längre ligger i framkant vad gäller kvalitet.

6. SLUTENVÅRDSGYNEKOLOGIN – ETT AVDELNINGSPERSPEKTIV

6.1 OM RESPONDENTEN

Respondenten är vårdenhetschef på kvinnoklinikens slutenvårdsavdelning, avdelning 21 på US. Vårdenhetschefen började i november 2014. Vårdenhetschefen har dock jobbat på avdelningen sedan 2002, både som sjuksköterska i slutenvården, forskningssjuksköterska och operationsplanerare för avdelningen i 4 år.

6.2 SLUTENVÅRDSGYNEKOLOGISKA AVDELNINGEN US - AVDELNING 21

Det är ca 17 operationer i veckan som genomförs. Avdelningen har ett stort upptagningsområde då de har avtal med Kalmar och Jönköpings län samt Sörmland och Västmanlands län. Enligt Vårdenhetschefen är avdelningen en av de kvinnokliniker som opererar mest i landet.

Avdelningen hyr operationstid på centraloperation som drivs av An.op. Måndag, tisdag och torsdag har de en sal att tillgå. På onsdagar kan två operationssalar nyttjas och ibland har de extra sal att tillgå. Förr hade de en sal fem dagar i veckan men eftersom det på fredagar är en kortare operationsdag vilket gjorde att de började operera på två salar på onsdagar i stället för att då få in en operation till i veckan. An.op erbjuder operationstid mån-tor 08 - 17 och då en kortare operationsdag på fredagar.

Det finns 12 vårdplatser och två undersökningsrum på avdelningen som är bemannad dygnet runt. Kvinnokliniken mottagningen ligger i samma korridor så där kan de "låna" rum om det behövs. Det finns 4 st. tumörkirurger knutna till avdelningen som har verksamhetschefen som sin chef medan Vårdenhetschefen är chef över Ssk och Uskor som jobbar på avdelningen.

6.3 UPPDRAG OCH MÅL

Uppdraget och målet för avdelningen är enligt Vårdenhetschefen att hålla vårdgarantin.

"Målen är ju att alla ska, att, de ska ju vara opererade den, alltså cancerkirurgin, de ska ju vara opererade inom sina 15 dagar och benignakirurgin inom 2 månader."

På avdelningen har de också ett eget mål som är något högre än vårdgarantins.

"Vi har ju egentligen ett högre mål, nu ska vi se här om jag kan procentsatserna i huvudet, jag tror det är att 80% ska vara opererade inom 15 dagar och då blir det ett mål på 85%. Vi försöker ligga lite högre för att verkligen hålla det där."

6.4 PATIENTÄRENDETS VÄG GENOM AVDELNINGEN

Nedan beskrivs aktiviteterna som utförs för att hantera patientärenden från första kontakt till avslut.

6.4.1 Första kontakt med avdelningen - Remiss ankommer och bedöms

Remisserna kommer antingen från Kvinnoklinikens mottagning, en intern remiss, eller via Gynonkologen, en extern remiss. Remissen bedöms av tumörkirurg som bedömer hur fort patienten behöver opereras eller om det är några andra utredningar som behöver göras innan. Det måste finnas svar från röntgen och svar från patologer innan en remiss kan bli bedömd. Den kortaste tiden till operation en patient kan bli bedömd till är 3 veckor.

"Det snabbaste vi har är egentligen 3 veckor, 15 dagar på totalen om vi har en konstaterad patient med en cancer. Så har vi ju 15 dagar på oss å kalla henne och få henne opererad. Men då ska ju allt vara klart. Då ska alla PAD¹, alla röntgen vara klar, det finnas svar och man haft en dikon, en liten kirurgkonferens om man behöver det."

För den benigna kirurgin gäller regelmässigt att patienten ska vara opererad inom 2 månader. Tumörkirurgerna bedömer alltså inom 3 veckor eller 2 månader som en patient bör bli opererad inom men det finns givetvis undantag.

"Sen kan ju de tycka att är det någonting som är benignt som man tycker är en cysta som är så stor så man kanske vill ta bort den inom nån månad så skriver de 1 månad."

6.4.2 Remisser via gyn onkologen, externa

Remisser på patienter från regionen, externa remisser, med konstaterad cancer går alltid via Gynonkologen. Avdelning 21 har ett väldigt nära samarbete med Gynonkologen enligt Vårdenhetschefen. Remissen bedöms då vid Gynonkologen men tumörkirurger knutna till avd 21 är även involverade i bedömningen via gemensamma röntgenronder och medicinkirurgkonferenser. Dessa remisser får operationsplaneraren på avdelning 21 oftast vetskapen om "i god tid", redan innan de är klara, för att kunna planera in dem i rätt tid (inom 15 dagar). De får en hint om att det finns patient som mest troligt behöver opereras.

"Vi får en hint om att de här finns, ska med all sannolikhet opereras men allting är inte klart än. Redan då kan vi ge dem en preliminärtid hos oss för att vi ska kunna vara i rätt tid."

Hinten går till som så att operationsplaneraren får ett fax från vårdplaneraren på gynonkologen när de fått remiss på en patient med konstaterad cancer.

"Så fort de har fått en remiss, t.ex. från Jönköping, om att de har en patient med en konstaterad corpus cancer t.ex., som med all sannolikhet ska opereras men alla utredningar och man har inte fått alla PAD-svar än och man har kanske inte fått röntgen svar, då skickar de ändå ett fax till oss på den patienten så vi vet att hon finns. Och då kan vi ju planera in henne redan då preliminärt. Och då brukar man lägga dem framåt ungefär en månad, för vi vet att det tar ungefär en och en halv vecka till innan allting är klart, klart. Och då hamnar hon inom de här 15 dagarna."

¹ patologanatometisk diagnostik (PAD)

Fördelen med att få en hint om att det finns en patient som troligen kommer att opereras är enligt Vårdenhetschefen att de då kan planera in patienten inom de 3 veckorna, Verksamhetschefen är risken att det blir fullt, och då får de inte in patienten.

"Det är tack vare ett väldigt nära samarbete."

När onkologen meddelar att det är ok att kalla patienten, alltså när allt är klart (röntgen, prover, mm) skickas kallelsen samma dag.

6.4.3 Kallelse till patienten

Patienten får hem en kallelse med brev för inskrivningsbesök samt datum för operation. Kallelsen skickas som sagt till patienten när alla bedömningar är gjorda.

När patienter är kallade skrivs det in i Cosmic i en tidbok eftersom läkarna har önskat det. Det är framförallt för läkarnas skull enligt Vårdenhetschefen. Patienter som ska opereras planeras in i en papperskalender. Onkologpatienterna skriver de med röd penna hur många dagar de har väntat (från dagen de är klara att kalla till dagen de har sin operation). Preliminärbokade patienter skrivs med blyerts och kallade skrivs med bleck. Systemet med att skriva in förhand i boken behövs för att få en daglig kontroll över operationsplaneringen och hålla koll på att patienterna får operation inom vårdgarantin.

"Men vi har ändå vår egen koll där, för det är ändå sättet vi kan ha en enkel koll på det, vi kan ju inte gå in och titta på det för att se hur ser det ut egentligen. För då ser man, du får en bekräftelse på det direkt, det här stämmer liksom."

6.4.4 Inskrivningsbesök

Inskrivningsbesöket sker oftast 1 till 2 veckor innan operation men det kan också genomföras dagen innan operation vid behov. Själva besöket innefattar 3 delbesök, patienten träffar först Ssk för provtagning samt för pre- och post operativ information. Patienten träffar även läkare/gynekolog som också berättar om operation för dem samt träff med narkosläkare. Besöket hos Ssk och läkaren sker på avdelning 21 och besöket hos narkosläkaren sker på operationscentralen.

Efter inskrivningsbesöket är patienten klar att opereras under förutsättningarna att läkaren som träffat patienten är överens med remissbedömningen. Det kan hända att t.ex. funktionella cystor har hunnit försvinna och då är operation inte längre aktuellt (ej vanligt). Finns det misstanke om att det kanske inte är aktuellt med operation genomförs inskrivningsbesöket i så pass god tid att en annan patient kan planeras in på den operationstiden istället.

6.4.5 Operation

Patienten kommer till avdelning 21 på operationsdagen och ibland kommer de kvällen innan, beroende på hur långväga de är. Patienter opereras sen under dagen på operationscentralen.

6.4.6 Postoperativ vård

Efter operation får patienten återhämta sig på den postoperativa avdelningen för att sen återvända till avdelning 21 när alla vitala parametrar är stabila och är bra smärtlindrad.

6.4.7 Utskrivning från avdelning 21

Vissa patienter kan gå hem samma dag som de opererats och vissa behöver stanna 4-5 dagar efter operation beroende på vilken typ operation som de genomgått. Patienten åker då hem eller till sitt hemsjukhus.

Det är inga patienter som kommer på planerade återbesök till avdelning 21. Det kan hända endast om det är någon patient som ringer p.g.a att de har besvär med t.ex. något sår eller något annat. Detta gäller om patienten hör av sig inom två veckor och att det på telefon går att avgöra att det är operationsrelaterat.

6.4.8 Schematisk bild över patientärendets väg genom avdelningen

Vägen för ett patientärende för slutenvårdspatienter som ska opereras kan illustreras genom att beskriva aktiviteter som är kopplade till detta flöde. Nedan visas dessa aktiviteter illustrerade där de mörkare aktiviteterna utförs på avdelning 21, se Figur 9.

Figur 9: Schematisk bild över patientärendets väg genom avdelning 21 och operation från vårdenhetschefens perspektiv

6.5 ÖVRIGA PATIENTGRUPPER

Förutom patienter som ska eller har opererats vårdas även akuta patienter samt patienter som kommer från mottagning och behöver sova kvar på sjukhuset på avdelning 21. Nedan följer en närmare beskrivning av dessa patientgrupper.

6.5.1 Akuta patienter

Akuta patienter kommer till avdelningen via Akuten och undersöks på avdelning 21 som sen leder till en eventuell operation eller medicinskbehandling. Vid en eventuell operation gör läkaren en prioritering över hur snabbt de tycker att en patient behöver opereras. Det finns många anledningar till varför patienter söker sig till akuten och slussas sedan vidare till Gynakuten. Nedan anger Vårdenhetschefen några exempel.

"Det kan vara oklara buksmärtor, blödningar i graviditet fram till vecka 20 eller om det är graviditetskomplikationer fram t.o.m. vecka 20 ligger här, det kan ju vara allt från blödningar till ett missfall som också behöver opereras. Utomkvedshavandeskap, kommer ju in väldigt akut med akuta buksmärtor och ofta stora blödningar i buken och måste akutopereras och ska de akutopereras då är det på akutsal."

6.5.2 Inneliggare från mottagningen

Mottagningen (som ligger i anslutning till avdelningen) har poliklinisk verksamhet (opererar dagpatienter) men det händer att patienter behöver vara kvar en natt p.g.a. av t.ex. smärtlindring, har långt att åka eller inte har kunnat kissa efter operation. Dessa patienter blir då inlagda på avdelningen.

"Så vi måste ha lite extra utrymme för de patienterna och även för abortpatienter"

6.5.3 Abortpatienter

Abortpatienterna söker till mottagningen för att göra abort. De tidiga aborterna görs nu förtiden oftast i hemmet. De mellantidiga aborterna utförs i första hand på mottagningen. De sena aborter, från vecka 12 till vecka 17 plus 6 dagar, påbörjar sin behandling på mottagningen och avslutas på avdelningen (två dagar senare). Behandlingen påbörjas på mottagningen där de tar sin medicin men är det lördag eller söndag så är mottagningen stängd och då får patienten påbörja aborten på avdelningen. Patienterna kommer sen åter till avdelningen efter två dagar. Abortpatienterna behöver ett enkelrum på avdelningen. Ibland behövs det göras en operation i samband med aborten men det är inte så vanligt. Har en patient påbörjat en abort måste denne få en säng och ett enkelrum på avdelningen.

"De är inga som vi kan, om vi skulle få fullt av någon annan anledning kan, vi kan ju inte låta de vänta om det är så att de påbörjat behandling för aborten. De måste ju in."

6.6 PLANERING

Avdelningen bemannas genom en grundbemanning. Vårdenhetschefen har tagit över grundbemanningen från tidigare vårdenhetschef.

"Den måste ju vara uppfylld för att få det att fungera när det är höga patientflöden."

Tidigare, fram till i mars, hade de önskeschema men har nu gått över till fast schema. Det tog mycket tid att administrera ett önskeschema och det blev aldrig rättvist vilket ledde till gnissel och det är anledningen till att det ändrades. Nu får man önska sig en schemarad som omfattar ca 12 veckor framåt. På onsdagar opererar man som sagt på två salar och på torsdag morgon är det då många som ska mobiliseras (att man kommer upp ur sängen dagen efter operation) och därför försöker de att bemanna med några extra personal då, enligt Verksamhetschefen.

"Vi har ju två operationssalar på onsdagar, som idag har vi, vilket gör att vi tycker att det blir rätt fullt här."

Det är måndag, tisdag, torsdag eller fredag som man är ledig innan eller efter man jobbar helg vilket gör att det naturligt finns fler personal att tillgå under onsdagar.

"Vi har egentligen samma grundbemanning måndag till fredag men vi försöker bemanna upp med en resurs på onsdag och torsdag i den mån det går."

Antalet patienter på avdelningen varierar under veckan och så även den sammanlagda vårdtyngden på de inläggande patienterna.

"Sen vet man ju inte, du kan ha fullt på avdelningen men det är inte speciellt vårdtungt. Och det är det som man inte vet innan egentligen."

De som jobbar på avdelningen har grundutbildning och just nu är det många nyutexaminerade. Vårdenhetschefen skulle önska att hon kunde ta hänsyn till erfarenhetsnivån vid planeringen för att blanda nyexade och mer erfarna under passen. Men det är enligt Vårdenhetschefen sådan sjuksköterskebrist att det inte går. De som kommer som nya till avdelningen får ett introduktionsschema som är uppbyggd som en checklista. Den utvärderades i slutet av april 2015. För de nya är också ledningssystemet viktigt enligt

Vårdenhetschefen eftersom där finns alla PM, alla rutiner och instruktioner samt all patientinformation. Ledningssystem är få vana med sen sina tidigare arbetsplatser eller praktikplatser.

"De tycker att det är helt fantastiskt när de väl hittar dit och kan orientera sig i det. Och det ingår ju också i deras introduktion att man ska gå igenom ledningssystemet. Även ledningen har ju en eftermiddag där man berättar om hela ledningssystem och går igenom det."

"Och är man osäker går man in och tittar i ledningssystemet vad är det som står."

6.7 MÄTNINGAR

Vårdenhetschefen nämner under intervjun ett antal parametrar som avdelningen följer.

Uppföljning av väntetider sker centralt. Väntetiderna till operationen startar när remissen är bedömd och slutar när patienten blir inskriven på avdelningen via Cosmic. Siffrorna plockas ur Cosmic och underlaget läggs in av operationsplaneraren. Vissa saker följer avdelningen själv t.ex. drar ut siffror på väntetider för att kontrollera att det inte ligger någon patient och "släpar", en remiss som inte är behandlad. Anledningen till att det ibland finns patienter som släpar kan vara flera men Vårdenhetschefen nämner det kan bero på att patienten glömts bort att strykas.

"Hon kanske inte vill opereras längre, ja visst säger man och lagt på luren och så kommer något annat emellan och så ligger en remiss kvar och skvalpar, sånt händer."

Alla patienter som opereras med någon form av gynekologisk åkomma (om det inte är väldigt liten operation) registreras i Gynop-registret som är ett nationella kvalitetsregistret inom gynekologisk kirurgi. Patienterna får hem en enkät innan operation och det är även två uppföljningar efter operationen inom ett år. Ur detta register tror Vårdenhetschefen att det går att hämta mycket data.

"Och där kan man ta ut väldigt mycket statistik om man vill, men det är inte helt lätt vad jag har förstått."

Vårdenhetschefen har funderingar på att studera vårdrelaterade infektioner men den informationen är lite klurig att få tag på. I övrigt så använder Vårdenhetschefen inget ur registret Gyn.op.

"Men ska man ha ut det ur Gyn.op-registret så är det ju även patienters uppfattning om vad som har varit en infektion och då måste jag in i alla patienters journal för att se om det är någonting de har faktiskt har fått antibiotika emot eller inte. Har de inte det är det ingen vårdrelaterad infektion."

Enligt Vårdenhetschefen följer Onkologerna t.ex. tiden det tar från det att remissen kommer till att patienten är opererad eftersom den tiden inte är samma tid som vårdgarantin avser. De 15 dagarna som vårdgarantin avser räknas från när remissen är helt klar för bedömning vilket då inte är samma tidpunkt som när remissen ankommer. Vårdenhetschefen har också tittat lite på dessa tider men tyckte att det även här var svårt att få ut data.

"Det var också rätt svårt, jag satt med en sekreterare med det och då går det ju liksom att titta i Cosmic från remiss till in egentligen[brus] Per patient ja, varje patient fick vi gå in på. Mmm [brus] Det tog några timmar kan jag säga. Vilket gör att det känns, det skulle kunna vara mycket bättre tycker man i ett sånt system."

Cancerledtiderna får de en gång i kvartalet för både behandling och operation. Denna uppföljning blir mer en check att de på avdelningen gör ett bra jobb. Operationsplaneraren kollar dagligen om patienterna som kallas ligger inom vårdgarantin. Det är en daglig och manuell koll.

"Operationsplaneraren har ju egentligen koll varje dag att den patienten hon kallar, att det liksom, nu kom den klar att kalla ligger den här inom de 15 dagarna för den tiden vi har preliminär bokat. Oftast så gör de det men annars får man hålla på och plocka om. Det kanske gick lite fortare än vad vi trodde och då får man liksom, och får man kanske flytta på någon annan som inte är klar lite längre fram istället. Så det är ett väldigt plockande för den personen varje dag."

6.8 FRAMGÅNGSFAKTORER FÖR EFFEKTIVA FLÖDEN

Under intervju nämner Vårdenhetschefen, både uttalade och indirekta, framgångsfaktorer för att verksamheten och patientflödena ska fungera väl. En framgångsfaktor som nämns är möjligheten att operera på två salar på onsdagar istället för att operera på fredagar.

"På onsdagar kan vi nyttja hela dagarna från 08 till 17."

"Vilket gör att vi faktiskt får en, det ser ut som om vi får en patient till opererad per vecka. Man kan planera lite mer och även planera, det finns ju alltid två tumörkirurger i tjänst på en annan sal om det skulle strula till sig på den andra salen. Då finns det liksom kompetens att låna om man behöver av de andra gynekologerna."

Att operera på två salar på onsdagar innebär att det behöver finnas plats för några extra patienter på avdelningen inför onsdagen.

"Då är det så att på måndagar försöker man hålla ner så att vi kanske har patienter som, vi på pappret i alla fall vet, går hem samma dag eller dagen därpå. Så att det ska finnas ledigt för de här kanske sex eller åtta patienterna som kommer till onsdagen."

Det finns ett bra samarbete, enligt Vårdenhetschefen, med mottagningen som ligger i anslutning till avdelningen som gör att avdelningen kan hjälpa mottagningen.

"Men det är ju så att ibland är det fullt inne på mottagningen och vi har nått utrymme här så då hamnar de här istället."

Operationsplaneringen är en annan viktig del för att det ska bli ett bra flöde och att vårdgarantin ska kunna hållas. Vårdenhetschefen nämner att det bland annat är viktigt med ett bra samarbete med de läkare som bedömer remisser. Med anledning av detta har de sen en tid tillbaka börjat med att operationsplaneraren är med på remissbedömningsmöten för att få information om patienter och operation så fort den finns tillgänglig.

"Utan en fungerande operationsplanering så rasar ju hela flödet egentligen."

Det är mycket logistik, mycket planering, att man har ett nära och bra samarbete med de läkare som bedömer remisserna, tycker Vårdenhetschefen. Operationsplanerarna är med på MDK, de är med på röntgenronderna, torsdag och fredag för att få direktinformation.

"Ibland, vi kände, det är rätt nytt, för vi kände lite att vi fick, informationen kom till oss lite för sent ska jag inte säga men vi ville ha den tidigare. Så tidigt som möjligt både för våran skull och för patientens skull. För är det någon som inte ska opereras så är det till att planera in någon annan och är det någon som ska så vill vi ju kunna kalla den så fort det går."

Operationsplaneraren är nu med för att få information direkt. Det känns som om det har blivit effektivare enligt Verksamhetschefen. Operationsplaneraren lägger in patienter löpande för operation och behöver ständigt fixa och trixa för att få in alla patienterna som ska opereras. Vårdenhetschefen beskriver det som ett dagligt fixande med operationsschemat.

"Det är ett dagligt, ett dagligt skysterande och ett dagligt plockande."

Ytterligare framgångsfaktorer som Vårdenhetschefen nämner är att det finns tillgång på personal.

"Alltså framgångsfaktorer är att man har personal som gör att vi ändå kan ta hand om de här patienterna. Det är ju sjuksköterskor och undersköterskor som jag behöver."

6.9 UTMANINGAR FÖR EFFEKTIVA FLÖDEN

Under intervju kom det inte upp några direkta hinder för verksamheten men några av ovanstående framgångsfaktorer kan ju också tolkas som hinder.

7. SLUTENVÅRDSGYNEKOLOGIN – ETT OPERATIONSPLANERINGSPERSPEKTIV

7.1 OM RESPONDENTEN

Respondenten är sjuksköterska och jobbar som operationsplanerare på den gynekologiska slutenvårdsavdelningen. Operationsplaneraren har jobbat på avdelningen sedan 3 år och har under det senaste halvåret arbetat med operationsplaneringen. Operationsplanerarens uppgift är att boka både operation samt inskrivningsbesök och att ta emot patienten på avdelningen vid inskrivningsbesöket. Ibland jobbar operationsplaneraren även ute på vårdavdelningen.

7.2 MÅL OCH UPPDRAG

Kliniken och avdelningen följer väntetiderna för att uppnå vårdgarantin för alla patienter men behöver de prioritera så prioriteras cancerpatienterna enligt Operationsplaneraren.

”Målet vi strävar efter är, det är alltid att hålla vårdgarantin. Men det viktigaste för kliniken är ju att cancerpatienterna får sin operation inom 15 arbetsdagar.”

”Och det delas in i kvartal och det finns det statistiksiffror på. Och det ska vara 85 % av alla cancerpatienter ska opereras inom den här tiden.”

Enligt Operationsplaneraren följer hon personligen inte några andra måttetal än vårdgarantin. Operationsplaneraren tycker att det är kul när de kommer ut väl i mätningarna av vårdgarantin men det viktigaste för henne är ändå att patienterna får sina operationstider så snabbt som möjligt.

”Och sen är det ju kul, när det, som igår eller förrgår, så fick vi mail om de här senaste väntetiderna. Och då låg vi jätte jätte bra. Så det är ju kul för då får man ju lite svart på vitt att... nämen, så det var ju första kvartalet i år. Så det gick ju jätte bra. Så det är ju kul, så då ser jag ju ändå att det är värt att, att få det att funka.”

”Alltså det här var första gången verkligen jag kände att jag verkligen tog åt mig, eftersom nu, jag har verkligen gjort att det blev bra. Det känns ju kul att få det svart på vitt. Men jag tror inte att det påverkar, för eftersom det handlar ju om människor. Och det är inte det att jag känner, jag struntar ju liksom inte i det, jag vill ju att de ska bli opererade snabbt.”

Operationsplaneraren beskriver även att hon har egna mål för sig själv, bland annat att det ska vara så få remisser som ej är färdiga som möjligt. Det ska enligt Operationsplaneraren vara så lite oklart som möjligt, ordning och reda, för att vara beredd om det smället till med remissinflödet.

”Jag är tävlingsmänniska så jag älskar ju när, jag sätter ju upp egna mål. Ja men nu vill jag att ’klar och kalla’ den ska vara tom.”

7.3 PATIENTÄRENDETS VÄG GENOM AVDELNINGEN - INPLANERING AV PATIENTER

Inplaneringen av patienter till operationstider utgår ifrån remisserna som kommer till avdelningen. Dessa bedöms av läkare och Operationsplaneraren planerar in operationsdag för patient, kallar patient till inskrivningsbesök och operationsdag. En beskrivning av dessa aktiviteter återfinns nedan.

7.3.1 Remisser kommer in

När remisserna kommer in antecknas datum på dem som är i pappersform och de som kommer in via Cosmic skrivs ut. Alla remisser läggs sedan i en låda märkt med "obedömda remisser". Alla remisser ska även finnas i Cosmic, så sekreterare hjälper till med att scanna in pappersremisserna. De läkare som har kompetens att bedöma remisser bedömer sedan remisserna. Remisserna prioriteras och det anges vad som ska göras med patienten. En del patienter ska på röntgen och andra undersökningar innan operation vilket då anges.

"Så är det några få doktorer som har den kompetensen att bedöma remisser och de bedömer ju remisser nästan varje dag."

Remisserna prioriteras genom att det anges inom vilket tidsintervall patienten bör opereras. För cancerpatienter gäller operation inom 15 arbetsdagar från den dagen de är färdigutredda. När remisserna är färdigbedömda läggs de i en annan låda. De flesta remisser leder till en operation enligt Operationsplaneraren.

Remisserna kan komma från fyra olika vårdgivare: gynecologen som finns inom sjukhuset, utomlänspatienter, gynmottagningen som finns inom sjukhuset och privata vårdgivare inom länet.

Gynecologen

Gynecologen har det medicinska ansvaret för tumörbehandlingar men behövs patienten opereras utförs det av avdelning 21. Från gynecologen kommer remisser på patienter med bekräftad cancer eller stark misstanke om cancer, både från inom län och utomlän.

Dessa remisser kommer via faxen. På remissen anges det om doktorn väntar på något provsvar eller några andra undersökningar innan bedömningen av remissen är helt klar. De kompletta remisserna leder till inplanering av operationsdag och för de icke kompletta remisserna planeras operationsdag för patienten preliminärt. När remissen sen är komplett kommer det ett fax till från onkologen som meddelar att patienten är färdigbedömd. Doktorerna på onkologen bestämmer när dessa remisser är färdigbedömda. Operationsplaneraren räknar då antalet dagar från den dagen remissen blev okej till patienten är preliminärinplanerad för att se att det är inom de 15 arbetsdagarna.

"När jag får okej då räknar jag, ja men är hon inom 15 dagar, annars får jag flytta om. Det är ju ett pussel, det är alltid ett levande pussel."

Är det så att patienten inte ska opereras stryks denne från sin preliminära operationstid.

"Vi har ju bara operationer, vi har ju inte, vi vet ju inte hur de behandlas på onkologen. Det har ju vi ingen aning om."

"En del vet om att de har preliminär operationstid, men att... Och det är ju alltid, det bär är ju, de patienterna, det är ju onkologen som informerar så vi är liksom, eller jag är inte insatt i hur hur det sköts deras patientkontakt, utan jag bara kallar de till operation. Sen hur de behandlas och så det vet jag inte."

Utomlän

Utomlänspatienter kommer från upptagningsområdet Kalmar, Jönköping Västmanland och Sörmland då US är ett regionsjukhus och har avtal med andra landsting. Dessa patienter kommer till avdelningen för att det behövs specialistkunskap under operationen eller de patienter där man har väldigt stor misstanke om cancer men att det inte är bekräftat. För utomlänspatienter med bekräftad cancer kommer remissen från gynonkologen. Remisserna kan även gälla patienter där man misstänker att det är svårt att operera.

Enligt vårdgarantin ska dessa patienter med en stark misstanke om cancer opereras inom 1 månad. Är det inte så stark cancermisstanke och patienten inte har stora besvär ska operation ske inom 2 månader, enligt Operationsplaneraren.

Mottagningen

Det kan även komma remisser från både mottagningen på US och i Motala. Dessa remisser kan röra misstänkt cancer (ej bekräftat) och även sånt som inte är elakt men ska opereras: benigna åkommor, cystor, myomen, besvär med blödningar, borttagning av livmodern, mm.

Privata vårdgivare

Den fjärde gruppen remisser kommer från privata vårdgivare runt om i Östergötland där patienterna kan ha samma typ av åkommor som de remisser som kommer från mottagningen.

7.3.2 Bedömning av remisserna

Att bedöma remisser är en av arbetsuppgifterna för operatörerna/kirurgerna och det brukar de göra mellan operationer. Ofta är det ca en timme mellan operationerna och då kommer de upp till avdelningen för att bedöma remisser och prata med patienter och så. De kan även ha andra arbetsuppgifter så som mottagning men det är enligt Operationsplaneraren sällan. Ibland har de även arbetsuppgifter på gynonkologen samt är bakjour för förlossningen, BB och special-BB, avdelning 21 och akuten.

Remisserna granskas för att bedöma vilken typ av operation som behöver göras, risker med den, utrustning för att kunna genomföra operationen och så vidare. Läkarna gör även bedömning om underlaget för beslut om operation är komplett eller om det behövs fler undersökningar, så som röntgen, provtagning osv, för att kunna bedöma det. Vissa remisser avvisas helt, men det är inte många enligt Operationsplaneraren. Det kan gälla att det inte ska opereras eller att de ska till mottagningen för att träffa en läkare där istället.

Remisserna prioriteras genom att läkaren anger inom vilket tidsintervall patienten bör opereras som utgår ifrån vårdgarantins tider. Läkarna kan till exempel markera på remissen att operation bör ske inom en månad och görs det en pil åt vänster förstår

Operationsplaneraren att det är en patient med misstänkt cancer som då ska planeras in snabbare.

Alla patienter som får en cancerdiagnos efter operationen räknas alltså också in i vårdgarantin och ska då ha opererats inom 15 arbetsdagar. Detta gäller för alla typer av remisser, att när det inte är verifierad cancer innan operation men när provsvaret från patologen kommer tillbaka efter operation och det visar sig att det var cancer så räknas även dessa patienter in i statistiken. Dessa patienter prioriteras ändå eftersom det finns en stor misstanke om cancer och läkaren försöker att bedöma hur stor risken är för att det är cancer.

"Att de prioriteras är ju självklart för att de ska bästa vården. Och så handlar det ju om pengar också, kliniken får ju pengar om man håller vårdtiderna."

"Jag vet att man får betala vite om man inte håller, jag tror det, jag kan inte men jag tror att det är så. Och jag antar att man får pengar om man håller men jag, ne, för det är ju ingenting... Jag strävar ju bara efter att de ska få operation så snabbt som möjligt."

Är det bekräftat cancer har man antingen gjort en punktion, att man har stuckit i förändringen och tagit ut vätska och skickat till patologen för provsvar. Då kan man verifiera att det finns cancerceller. Eller så kan man skrapa vaginalt. Det finns även andra sätt att bekräfta cancer. Men har man inte lyckats med det eller om man ser att kvinnan har en stor förändring i magen men det syns bara på röntgenbilderna, då misstänker man att det är cancer men det är inte bekräftat. Operationsplaneraren anger att det ligger lite olika forskning bakom strategierna men att viss forskning då pekar på att det är inte värt att vänta på en diagnos utan kvinnan opereras först och sen skickas alltid det som plockades ut iväg för analys och patienten diagnostiseras i efterhand.

Multidisciplinärkonferens

För de patienter där man misstänker att det är en större cancer så tas det upp på den multidisciplinära konferensen (MDK) som hålls på torsdagar. Operationsplaneraren är med på konferensen för att få förstahandsinformation om läget för dessa patienter. Enligt Operationsplaneraren har MDK införts för att det har visat sig att man har opererat patienter i "onödan", exempelvis att har det varit mer cancer än man trodde och så mycket att det kanske inte ens var värt att operera.

"Och om det behövs ytterligare undersökningar. Och det är väldigt ofta. Och de har även fått, inte påbackning men att, ibland opererar de och så ser de att det, nämen det här är spridcancer vi kan inte gör någonting. Så nu är det nästan på, inte exakt alla patienter men där man misstänker att det är något större. De tas upp, de patienterna tas upp på antingen MDK, det är som en konferens som är varje torsdag."

Röntgendoktor, gynekologer och några av avdelningens doktorer deltar på MDK. Patienterna som ska tas upp anmäls i förväg och röntgenbilderna visas på stora skärmar. Röntgendoktorn beskriver vad som bilderna visar, till exempel om det är stor spridning eller ej och om det finns förändringar i andra organ i kroppen. För är det spritt kan det vara bättre att till exempel ge cellgifter istället för att operera bort cancern. På frågan om hur

vanligt det är att man tar upp patientärenden på MDK och om de mäter detta på något sätt svarar Operationsplaneraren:

"Nämen, det är väl en magkänsla jag har att jag tycker att fler går igenom där."

"Nej det har vi inte, men jag vet att det inträffade flera patienter för några månader sen då man inte kunde göra så mycket. Och sen vet inte jag om det har kommit något nytt, jag menar det har ju läkarna koll på, men det är väl ett mål, alltså jag vet inte om det är nationella eller så att alla patienter ska tas upp på MDK. För att, det handlar ju om att bedöma bästa möjliga vård."

Röntgenrond

På fredagar hålls även en röntgenrond där mer svårbedömda remisser också kan tas upp med röntgenläkare.

"Så många patienter, antingen tas de upp på MDK eller på, även på fredagar då det är så kallad bara röntgenrond. Jag vet inte riktigt exakt vad skillnaden men det är samma koncept. Bara för att man inte ska missa att operera någon i onödan."

För de patienter som ska tas upp på MDK eller röntgenrond gör doktorn en anteckning om det på remissen så att Operationsplaneraren kan preliminärboka in patienten ändå även om remissen inte är fullständigt bedömd och komplett.

7.3.3 Inplanering av operationsdag

När remisserna är bedömda, antingen preliminärt eller komplett, planerar Operationsplaneraren in patienterna till operationsdag. Planeringen utgår ifrån läkarschemat som läggs flera månader i förväg.

Själva planeringen görs i en fysisk almanacka där det är ifyllt vilka doktorer som opererar vilka dagar utifrån läkarschemat. Olika läkare har olika kompetens att utföra olika typer av operationer. Operationsplaneraren kollar vilka som opererar under dagen och planerar sen in passande operationer under dagen. Det ska totalsett vara ca 5 timmars operation (knivtid) per dag. Ofta är det två stora operationer och en liten operation som då fyller upp dessa 5 timmar. På frågan om det anges på remissen hur lång tid operationen tar eller om det är något hon lärt sig svarar Operationsplaneraren:

"Jag har lärt mig och jag vet ju operatörerna, vissa är snabbare och vissa är långsammare. Och om det är det är några oklarheter så frågar jag doktorerna."

Patienterna planeras till en dag och ordningen och tiden under dagen bestäms senare. Patienten är inte kopplad till någon viss läkare innan hon planeras in till operation. För patienter med misstänkt eller bekräftad cancer planeras de in till första bästa lediga dag. Om det inte är "något elakt" då går Operationsplaneraren efter passande operatörer.

"Första lediga dag när det är något misstänkt elakt. Dom de inte är något elakt tar jag på passande operatörer. Om det är de som opererar de lättare sakerna, jag sätter inte dem med till exempel en myom i en muskelknuta. Dem som är förd för livmodern för den har blödningar till exempel, den sätter jag inte på en som opererar canceroperationer för då riskerar hon att bli flyttat. För kommer det en cancerpatient så måste hon ju få den tiden. Så de med de här, som vi tycker, de "snälla" åkommorna, sätter jag ju på de operatörer som inte opererar cancer så ofta. I den mån det går för då"

blir de inte flyttade. Så, så tänker jag ju också. För det, ja, de blir ju ofta flyttade eftersom cancer ska gå före.”

Det är alltid två läkare som opererar på sal och det är samma läkare som opererar under hela dagen. Det kan vara två tumörkirurger, en tumörkirurg och en specialistläkare eller en tumörkirurg och en ST-läkare. Det finns tre färdiga cancerkirurger och två under utbildning som opererar åt avdelningen. Det finns även ett antal specialistläkare som också opererar men då det som inte är cancer. De som ej är tumörkirurger är gynekologer och några är obstetrik. Gynekologerna opererar ibland då också på mottagningen och har även mottagning.

De opererar måndag till torsdag och på onsdag är det dubbla salar. För närvarande har de just fått en sal på fredagar också så att de även kan operera då. Under hela våren har de också haft så att de får operera en timme (knivtid) till på måndagar för att kunna klämma in en patient till för att kunna korta väntetiderna. Så här beskriver Operationsplaneraren hur hon tänker när hon ska planera in patienter:

”Vi har ju en doktor, han opererar nästan varje dag, så det blir ju ofta mycket cancer och svåra kirurgier. Och det jag har tänkt på det är ju att fylla, fylla operationstiden. Och, ja så att det blir bra, det är ett pussel.”

”Som här, den här veckan, då har vi tumörkirurger, tumörkirurg, tumörkirurg, och här har vi inte tumörkirurg och tumörkirurger. Så då fyller jag upp. Det är operatörerna som bestämmer.”

På onsdagar är det canceroperationer på en sal och ”annat” på den andra där då specialistläkare opererar. Det är, enligt Operationsplaneraren, en fördel med två parallella salar för då kan operatörerna hjälpa varandra om det skulle behövas. Runt planeringen på just onsdagar tänker Operationsplaneraren:

”Så då sätter jag cancer på ena, och cystor å när man ska ta bort livmodern på andra, den andra salen.”

Det bästa enligt Operationsplaneraren är om de största operationerna är på måndagar och så blir det mindre och mindre så att alla patienter kan gå hem innan helgen och framförallt att det finns plats på måndagen för nya patienter. Men är det en tumörkirurg som är på operation på torsdag då måste ju denne opererar cancer på torsdagen, enligt Operationsplaneraren. Så möjligheten finns inte alltid att tänka så. Eftersom de har en sal att lägga operationer på så blir det så att cancer även behöver opereras under senare delen av veckan för att de ska kunna hålla vårdtiderna enligt Operationsplaneraren. Men alla canceroperationer är inte så stora, det finns även de som tar relativt kort tid.

Utomlänspatienter med inte så stor misstanke om cancer och med inte så stora besvär är de patienter som Operationsplaneraren i samråd med doktorn flyttar på om det är många patienter med cancer som ska opereras.

När patienterna är preliminär bokade skrivs de in med blyerts och när allt är klart för att kalla patienten fylls bokningen i med bläck.

”Ja den här är allt [Operationsplaneraren syftar på kalender], skulle den brinna upp då blir det jobbigt. Det finns ju alltid ett papper på patienten någonstans. Men så fort remisserna är bedömda

så skriver vi in dem med blyerts för då finns dem om ett papper skulle blåsa iväg, ne men då finns de ändå någonstans. Så ja den här är...”

Sen några månader tillbaka finns det även elektroniska tidböcker för operation där ska Operationsplaneraren helst lägga in information till läkarna om vilka patienter de ska operera för att doktorerna ska slippa komma och titta i kalendern. Här skrivs bland annat diagnos och vad som är planerat att göras in.

”Jag försöker i möjligaste mån att fylla i där men någon gång glömmar jag säkert. Så vill de verkligen veta då, då får de komma och kolla.”

På frågan om Operationsplaneraren måste ta hänsyn till antalet platser på vårdavdelningen när hon planerar operationerna svarar hon att:

”Ne, jag kan inte göra det, utan de får ordna det. Som idag har vi en som sitter i fikarummet och väntar på sin operation.”

7.3.4 Kallelse skickas

När patienten är inplanerad i almanackan läggs remissen i en tredje låda som anger patienter ”klara att kalla”. När patienterna sen behöver ha sin kallelse skickas en kallelse hem till dem samt att operationsdag och inskrivningsbesöksdag läggs in i patientens journal i Cosmic. Operationsplaneraren brukar sitta på eftermiddagarna och kalla patienterna. Kallelsen innehåller bland annat information om vilken dag patienten ska komma på inskrivningsbesök, vilken dag patienten ska opereras, hur patienten hittar till avdelningen och vad de ska ha med sig. Bokningen i kalendern fylls även i med bläck för att bekräfta att patienten är kallad. När de är kallade sätts remissen in i en pärm.

”När de är kallade har vi en pärm, ja, där det står ”kallade patienter” så sätter vi upp dem där. För ibland ringer de ju om i fall de ibland fått kallelsen och undrar, ja men när ska jag på inskrivning och när ska jag opereras. Och ibland vill de ju boka om, ofta inte cancerpatienterna, andra vill ju boka om sina tider och då har vi dem i en ”kallade-patienter-pärm”.

Är det kort om tid så ringer Operationsplaneraren och berättar för patienten när hon ska opereras. Med kort om tid är det t.ex. om bedömningen av remissen är okej på torsdag eller fredagen och så ska patienten opereras på tisdagen. Då hinner inte kallelsen komma eller så får patienten en chock eftersom kallelsen kanske kommer dagen innan. Patienterna ringer även och frågar om när de ska opereras eller om deras remiss har kommit fram.

”Så det är mycket telefonsamtal också. Många ringer ju och undrar när ska jag få opereras och så.”

På frågan om det är någon speciell patientgrupp som ringer så säger Operationsplaneraren:

”Ne, det kan jag inte påstå att det är. Det är ju, kanske övervägande utomlän som ringer för att dubbelkolla om remissen kommit fram. Det är många sådana samtal.”

Patienter kan även bli framflyttade om en annan patient blir sjuk eller av annan anledning inte ska opereras. Då ringer Operationsplaneraren in en annan patient som hon vet antingen har stora besvär eller att det är väldigt bråttom att operera.

7.3.5 Inskrivningsbesök

Ofta kommer patienten på ett inskrivningsbesök ca en vecka innan operation. Detta eftersom de flesta patienter enligt Operationsplaneraren är lite äldre och kanske även har lite andra sjukdomar som man måste ta hänsyn till. Då träffar patienten oftast Operationsplaneraren, avdelningsläkaren och narkosdoktorn (troligtvis inte läkaren som sen kommer att operera patienten).

Inskrivningen resulterar i en operationsanmälan. På operationsanmälan anger läkaren hur och var patienten ska öppnas och om det behövs någon speciell utrusning t.ex. vi cellförändringar på livmoderhalstappen då man i bland använder sig av laser. Operationsanmälan fungerar som en order till de på centraloperation som förbereder salen inför operation och även bistår med all annan personal än de som opererar.

Inskrivning sker under måndag till torsdag och det mest optimala enligt Operationsplaneraren är att patienterna skrivs in en vecka innan operation eftersom det alltid finns en risk att det upptäcks något som måste åtgärdas. Hinner inte patienten med ett inskrivningsbesök innan operation får hon komma dagen innan operation vid lunch för inskrivningsbesök och då sover kvar till operationsdagen.

När patienten kommer på morgonen för sitt inskrivningsbesök tas blodtryck, EKG, blodprov osv och avdelningsdoktorn skriver in patienten. Operationsplaneraren ser sen till att patienterna kommer iväg ner till narkosläkaren för narkosbedömning, som alltså då sker på en annan avdelning.

7.3.6 Koordinering med centraloperation

Alla operationer som avdelningen utför sker på centraloperation som är en sjukhusgemensam operationsavdelning. Centraloperation tillhandahåller operationssalar, operationspersonal och material men de som opererar kommer från avdelning 21 när det gäller gynekologisk slutenvårdskirurgi.

Varje onsdag läggs operationerna in elektroniskt i datasystemet LINDA med information om patienten, personnummer, datum för operation, diagnos, planerad typ av operation, hur lång tid det beräknas ta, vilka som opererar och eventuellt om det är något speciellt med patienten så som högt BMI eller om den är svårt sjuk.

"Nej, det här är ett datasystem som heter Linda som är från stenåldern men de tycker att det är jätte bra. Så vi använder det."

Sen skrivs listor, operationsprogrammet, ut för operationerna nästkommande vecka från programmet och så faxas de ner till centraloperation på onsdagar.

Varje torsdag kl. 09 träffas chefen för centraloperation, en undersköterska eller sjuksköterska och en narkosdoktor, operationsplaneraren och ofta (om jag har tur, enligt Operationsplaneraren) någon av avdelningens läkare som ska operera för ett kort möte. Under detta möte bestäms operationsordningen på patienterna för respektive dag under kommande vecka. Det tas även upp om det är något speciellt att ta hänsyn till, till exempel högriskpatienter. Det kan även tas upp om någonting speciellt har hänt under veckan som gått.

”Men det här är ett väldigt kort möte. Det är mest bara för att de ska få rangordningen. Jag kan tycka att mötet är ganska onödigt, för jag kan tycka att vi lika gärna skulle kunna skriva siffrorna och faxa ner dem. Men ibland behövs det för att stämma av. Så ibland tycker jag att det är slöseri med tid men ibland så ger det faktiskt någonting.”

Oftast så sätts canceroperationerna först och sen det benigna som sista operation under dagen. Detta eftersom är det någon som blir struken så ska det inte vara en cancerpatient.

7.3.7 Operation

På operationsdagen kommer patienten till avdelningen som får information om vilka patienter som kommer, vad de ska opereras för och vad som ska göras. Alla patienter som ska opereras under dagen kommer kl. 07. De som har långt att resa kommer kvällen innan för inläggning. Detta för att det ska kunna ske ändringar i operationsschemat och att patienten då finns på plats.

”Alla måste vara här klockan sju på morgonen och det tycker många inte är jätte kul. Men vi har så just eftersom ibland blir det ändringar i operationsprogrammet någon blir sjuk. Så alla, alla som opereras måste vara här klockan sju.”

”Ibland händer det oförutsägbara saker. Ibland kan de inte göra någonting och då går det ju mycket snabbare. Och ibland ser de ”oj här var det spritt” men går att göra nånting och då kanske operationen tar fyra timmar istället för två. Men allt går inte att förutsäga.”

Om patienten blir struken försöker Operationsplaneraren att hitta en ny tid så snart som möjligt och att den kvinnan då får vara patient nummer 1 eller 2 den dagen för att i största möjliga mån undvika att bli struken igen.

Ibland träffar doktorn som ska operera patienten på morgonen och säger hej. Första patienten brukar gå ner till operation vid kvart över sju eller halv åtta på morgonen. Och sen tar det ca en timme att förbereda patienten nere på operation inför själva operationen. När patienten sen är tvättad och sövd så söker operationspersonelen på läkaren som ska operera genom att ringa deras sökare. De övriga patienterna som ska opereras under dagen blir löpande kallade genom att de ringer från operation och kallar ner patient nummer 2 och så vidare. Efter operation återvänder patienten till avdelning och opererande läkaren stämmer av med patienten där.

Är det någon läkare som ska operera som är sjuk så prioriteras operationer före andra arbetsuppgifter och det har enligt Operationsplaneraren inte hänt att de inte har hittat någon ersättare. Operationsplaneraren har heller aldrig varit med om att en tumörkirurg varit sjuk under tiden hon jobbat som operationsplanerare.

7.3.8 Schematisk bild över patientärendets väg för inplanering av operation

Nedan presenteras en schematisk bild, se Figur 10, över aktiviteter som genomförs för att fullfölja planeringen av ett patientärende för att en operation inom slutenvårdsgynekologin ska kunna genomföras.

Figur 10: Schematisk bild över patientärendehantering vid planering av slutenvårdsoperationer

7.4 MÄTNINGAR

Som nämnts tidigare följer avdelningen väntetiderna till operation från det att remissen är komplett. På frågan om Operationsplaneraren följer antalet inkomna remisser på något sätt eller om det är en känsla som hon kommer ihåg svarar hon:

"Nämen det är nog att jag kommer ihåg. För jag vet att det var, det var väldigt behagligt i, i. Jamen för hösten var jätte mycket, det var hemska. För det bara, ne det tog aldrig slut, och jag fick skjuta fram och skjuta på de här som alltså inte misstänkt, alltså där det inte är cancer. Men nu har det varit lugnt men nu har det ökat igen så jag vet inte om det är inför sommaren."

På frågan om varför Operationsplaneraren tror att de fick "så bra" resultat på väntetidsuppföljningen som de fick svarar hon att hon tror att det dels har att göra med att remissinflödet var något lägre. Och på frågan om hon vet det eller bra tror det svara hon:

"Det vet jag inte, det är magkänslan."

En annan anledning som Operationsplaneraren nämner är att hon även fått lite hjälp med att skriva in patienter så att hon har haft mer tid till att pussla med schemat. Men största anledningen tror hon ändå var att det inte var lika många som sökte.

På frågan om vilka volymer som finns i de olika remisslådorna svarar Operationsplaneraren:

"Ja nu, ja det är olika, just nu, ja gud hur många ligger det nu, i klara att kalla kanske det är 20. Det är många, den är tjock. Och i bedömda remisser så ligger det jätte jätte många, det är säker 20 där också som ska få, antingen väntar de på undersökningar eller så ska de få tider, alltså operationstider. Och i onkolog, kanske det är 15 kvinnor, på onkologpatienter som väntar på olika saker."

"I våras var det lugnt, i kanske februari där, det var jätte lugnt. Då kom det in fyra remisser om dan eller nått. Och ibland kan det komma 10 - 15 så det är jätte olika. Nu känns det som om det har ökat för jag vet inte om folk söker inför sommaren. Jag vet inte det går upp och ner. Ibland är det lugnt och ibland är det jätte mycket."

7.5 FRAMGÅNGSFAKTORER FÖR EFFEKTIVA FLÖDEN

Det viktigaste med att få till en bra operationsplanering är enligt Operationsplaneraren att man har en inre vilja att det ska bli bra.

"Jag tror man måste vilja, också. Vilja få det, att hålla vårdtiderna. Så det tror jag. Och att man tycker att det är kul, annars så är det... Det är ett alltid pågående arbete, det ta ju aldrig slut. Och det måste man ju också acceptera."

En fördel som Operationsplaneraren nämner är att hon hade jobbat på avdelningen innan och känner doktorerna och vet vilka operationer de gör så att det underlättade när hon skulle börja som operationsplanerare. Operationsplaneraren tycker även att det är bra att doktorerna är nära i och med att de kommer upp från operation för att bedöma remisser och prata med patienterna efter operationerna.

"Jag har ett fantastiskt samarbete med dem. Och vi har ju hur bra doktorer här som helst. Det är inga konstigheter. Och jag frågar ju hellre en gång för mycket så att det blir bra för dem. Jag kan ju inte planera en 8 timmars operation, alltså. Så ne, vi pratar ju varje dag om det är några konstigheter och så."

En önskan som Operationsplaneraren har är att de alltid skulle vara två på operationsplaneringen så att de kan dela på arbetsuppgifterna med inskrivning och operationsplaneringen. En annan önskan är att de ska få tillbaka flextiden och att alltid få operera på fredagar för att kunna hålla vårdtiderna.

7.6 UTMANINGAR FÖR EFFEKTIVA FLÖDEN

Det är enligt Operationsplaneraren svårare att lägga operationsschema innan sommaren då det inte går att planera in patienter utan cancer eftersom det under sommaren måste finnas tider till canceroperationer och höstens läkarschema inte finns tillgängligt ännu. Så därför prioriteras cancerpatienterna.

Det jobbigaste enligt Operationsplaneraren är när hon måste ringa en patient och berätta att din operation har blivit framflyttad.

"Det tycker jag är det värsta. Att du måste flytta fram för att det är en annan som behöver den. Och då tycker, en del har förståelse, - 'ja ha, ja det är en cancer, självklart ska hon få'. Men många har ingen förståelse alls. För de tycker, de har ju också besvär och det respekterar jag också, de har säkert ont och blödningar alltihopa. Men de med cancer, det handlar ju mer eller mindre om liv och död än.. Så det tycker jag är svårt och jobbigt."

Det är även jobbigt när patienter blir strukna på grund av att operationen innan drog ut på tiden. Då är patienten redan på plats och har fastat och väntat hela dagen. Det är då läkaren som meddelar detta. En strykning kan även bero på att det har kommit in akuta fall som behöver resurserna istället.

"Det är svårt. Men det är som det är. I början tog jag det nog mer personligt men nu..."

På frågan om vad som var det svåraste med att komma in i jobbet med tanke på att Operationsplaneraren inte jobbat så länge som operationsplanerare, så svarar Operationsplaneraren att förstå helheten och datasystemet. Hon syftar på de nya delarna som man använder i Cosmic som hon tidigare inte jobbat i, bland annat att registrera remisser och hålla kolla på inkorgen. Det kommer dessutom uppdateringar av Cosmic och då blir det mycket nytt att lära enligt Operationsplaneraren. En annan svårighet för Operationsplaneraren vara att inte ta med jobbet hem.

"Nämen jag tog med saker hem. Jag tänkte för mycket på det. Jag tänkte på de som ringde. Så det var svårt att lära sig. För på vårdavdelningen då rapporterar man över och sen är man färdig och sen kan man gå hem. Men här, det är ett pågående jobb."

Problem med inskrivningsbesöken kan det enligt Operationsplaneraren bli om det är en läkare som inte är på avdelningen så ofta för den tar ofta längre tid på sig och då får Operationsplaneraren mindre tid till sina administrativa uppgifter, att planera in operationerna.

En dålig start på dagen är när det är okontrollerat mycket remisser att hantera. Det är roligare när det är hanterbart, enligt Operationsplaneraren.

"Det kan till exempel vara, en av våra doktorer, det är han som bedömer mest. Han är, ja, han gör jätte jätte mycket. Och varannan vecka är han ledig torsdag fredag. Så har ingen bedömt remisser, säg att han bedömer på måndag och så har inte han haft tid eller någon annan har tid tisdag onsdag och så väller det in remisser, då bedömer han alla på måndag när han kommer till jobbet. Och komma då till exempel på tisdag morgon och se den högen, då är det "åh nej". Även om jag i bakbuvudet vet om att det är så. Men det kan vara tufft att komma och det är mycket."

En ny situation som uppkommit enligt Operationsplaneraren är att det under den senaste tiden har ökat antalet operationer som egentligen skulle utföras på mottagningen men då patienten är överviktig måste en narkosläkare vara med och då måste det utföras på centraloperation.

APPENDIX IV

PAINTINGS FROM THE INTERVIEWS

OP-planering

Avd 21 (GYN SLUTEN VÅRD)

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PATOCOG

APPENDIX V

CASE STUDY PROTOCOL

Forskningsdesign – Malin Wiger

För att öka kunskapen om effektivare patientflöden

Min forskning handlar om att ett systematiskt logistiskt tänkande och förbättringsarbete kan bidra till att förbättra patientflöden för att nå ökad tillgänglighet, kvalitet och effektivitet inom vården. Detta genom att teoretiskt definiera vad effektiva patientflöden är och sen jämföra det med hur patientflöden är designade, styrda och kontrollerade idag. Jämförelsen har som mål att kunna visa på potentiella förbättringar som sen resulterar i principiella tillämpbara riktlinjer för hur effektivare patientflöden kan uppnås.

Bakgrund

I min licentiatavhandling (presenterad 2013) visar jag att logistiska koncept, modeller och principer utvecklade för tillverkande företag och handelsföretag kan användas för att förbättra patientflöden och minska kostnaderna inom vården. Utgångspunkten i min forskning är patientens väg genom vården, där fokus ligger på vårdprocessen för att uppnå ett integrerat flöde för patienten genom hela vårdkedjan. Flera patienters väg skapar patientflöden och de stora potentiella förbättringarna återfinns på en aggregerad nivå. Genom att studera vården genom "patientflödeslinsen" kan potentiella lösningar för effektivare vårdprocesser utforskas.

Logistik handlar om att organisera, planera och styra flöden i och mellan organisationer eller företag. Ett annat ord för detta är att flödesorientera sin verksamhet. Målet är att få flödena av produkter så effektiva som möjligt, dvs. att verksamheten lever upp till kundernas/mottagarnas krav och förväntningar, samtidigt som kostnaderna hålls nere. För vården innebär det att effektivt planera verksamheten, koordinera genomförandet av behandlingar och omvårdnad samt ha kontroll på alla övriga aktiviteter från det att patienten söker vård till avslutad vård. Detta för att kunna tillfredsställa patientens vårdbehov och önskemål så som tillgänglighet, patientsäkerhet, vårdkvalitet och effektivitet till en lägre kostnad än idag.

Patientflöden handlar således om flödet av patienter mellan personal, avdelningar och organisationer där patienten genomgår olika typer av vårdaktiviteter. Patientflöde inkluderar hur, var, när och av vem patienten får vård och alltså inte om vilken typ av vård som ska utföras (kliniska beslut). Konceptet att använda flödesorientering av patientflöden för förbättring av vården har fått ökat intresse inom sjukvården de senaste åren, speciellt i samband med arbetet att reducera väntetider vid akutmottagningar och till elektiv vård. Den nationella vårdagendan fokuserar också på arbetet med effektivare patientflöden genom Sveriges kommuner och landstings projekt *Bättre flöde i vården*.

Att förbättra vårdssystemet genom effektivisering av patientflöden är en gemensam agenda mellan avdelningar, enheter och organisationer. Den fulla potentialen av systemet kan bara realiseras om man tar ett end-to-end patientprocessperspektiv som angreppssätt. Avdelningar, enheter och organisationer är sammanlänkande genom att

patienter flödar mellan avdelningar samt att resurser så som personal och lokaler delas av flera avdelningar.

Det vanliga idag är att varje avdelning arbetar med patientflödesfrågor var och en för sig med förbättringar av arbetssätten vid avdelningen eller på specifika patientgrupper. Konsekvensen blir suboptimeringar och att helheten kommer i skymundan. Hela vårdsystemets prestation ska ju förbättras, inte bara delarna. Fokus bör ligga på vad effekterna för helheten blir. Till exempel: vad händer med de totala kostnaderna och kvaliteten på systemet i stort när läkartider eller operationsrum optimeras? Målet är ju att designa samt styra och kontrollera vårdorganisationer så att alla unika patientgrupper kan hanteras på ett tillfredställande sätt. Bilden nedan visar patienters väg genom vården och därigenom även att patienter passerar genom flera avdelningar genom vårdsystemet. Inom avdelningarna genomförs aktiviteter (t.ex. operationer, undersökningar och behandlingar) med hjälp av olika resurser (t.ex. personal, material och lokaler) som tillförs dessa avdelningar. Både förbättringar inom **design** samt inom **styrning och kontroll** av patientflöden sker övergripande medan förbättringar av arbetssätt sker inom respektive avdelning. Detta är anledningen till att jag i min forskning fokuserar på patientflöden.

Det finns en stark övertygelse om att kunskapen om hur effektiva flöden bedrivs kan ge insikter om hur effektiva patientflöden inom vården kan uppnås samt utöka kunskapen om hur patientflöden på en aggregerad nivå påverkar vården som verksamhet. Genom att dela upp en vårdverksamhets organisation av flöden i de två delar: **design** av patientflöden samt **styrning och kontroll** av dessa flöden, finns det möjlighet att jämföra organisationers flödeseffektivitet mot en teoretisk modell. Den teoretiska modellen beskriver hur effektiva flöden uppnås mellan och genom verksamheter.

- Med **design** menas: vilka principer ligger bakom hur verksamheter är operativt organiserade
- Med **styrning och kontroll** menas: vilka nyckeltal följs, vilken strategi ligger bakom för att möta efterfrågan, hur verksamheten regleras med avseende på uppsatta mål och nyckeltal, vilken styrbarhet finns av verksamheten för att möta efterfrågan

Detta vill jag göra

Till min doktorsavhandling vill jag identifiera och beskriva ett antal representativa patientflöden gärna med möjlighet att följa end-to-end care flöden (från det att patienten söker vård till dess att denne är färdigbehandlad). De flöden som ska studeras bör vara av olika karaktär t.ex. planerad verksamhet och akut samt halvakut verksamhet. Därefter kan jag jämföra flödena mot **den teoretiska modellen** (modellen beskriver hur effektiva flöden uppnås) som jag delvis arbetat fram i min licentiatavhandling. Dels blir det en jämförelse av hur patientflödena är **designade** att fungera samt hur **styrning och kontroll** av dessa flöden sker.

Min förhoppning är att, genom att jämföra de beskrivna patientflödena och tillhörande verksamheter mot den teoretiska modellen, kunna presentera guidande riktlinjer för hur patientflöden bör designas och styras för att uppnå effektiva patientflöden. Eftersom logistik handlar om att förändra för att förbättra flöden definierar jag effektiva patientflöden som minskad genomloppstid för end-to-end care, lägre kostnader och högre kvalitet för vårdprocessen. När en verksamhet är flödesorienterad bidrar varje aktivitet samt designen av den operativa verksamheten till att uppfylla patienternas och samhällets efterfrågan på vård till en så låg kostnad som möjligt. Därför är tiden det tar för patienten att ta sig igenom systemet tillsammans med kvaliteten på den genomförda vården en stark indikation för att mäta patientflödeseffektiviteten. Det finns studier som visar att tiden det tar för patienten genom vårdssystemet är kopplad till både kostnader och kvaliteten på vården.

Kopplingen till KK:s ledningssystem

Innehållet i ledningssystemet blir en viktig komponent i underlaget till analysen av patientflödeseffektiviteten. Eftersom KK har ett välutvecklat ledningssystem som är aktivt och levande där den operativa verksamheten styrs genom dessa dokument finns det god grund att använda ledningssystemet som del av datamaterialet i min forskning. Genom att studera vilka nyckeltal som följs, hur de analyseras, hur de används för att styra verksamheten, men även vilka principer som den operativa verksamheten styrs efter samt vilka mål verksamheten strävar efter kan jag analysera vilket stöd ledningssystemet ger för att utveckla effektiva patientflöden.

Datainsamling

Av de sex enheter som KK består av är jag intresserad av fem stycken, Kvinnohälsan, Förlossning och BB, Gyn - mottagningen, Gyn - avdelningen samt Sekretariat - vårdadministration. MRC är (om jag uppfattade det hela rätt) en mindre verksamhet jämfört med de övriga och även relativt avskild från övrig verksamhet. Eftersom mitt perspektiv är patientflöden och patienternas väg genom vården och om patienterna på MRC enheten inte går vidare till någon annan del av verksamheten i anslutning till sin behandling blir denna enhet mindre intressant ur forskning om patientflöden perspektivet.

Datainsamlingen skulle kunna ske i tre steg: *överblick av verksamheten, intervjuer och kompletterande datainsamling.*

1. Överblick av verksamheterna

Det första jag skulle behöva göra är att få en orientering av hur de olika enheterna bedriver sina verksamheter. Det handlar om att få en överblick om vad enheterna gör, patientgrupper och deras karaktäristik, hur verksamheten planeras och styrs samt hur patientflödena ser ut inklusive samordning med andra enheter eller avdelningar.

Jag har via mötet med Siw Andersson fått en liten överblick av verksamheterna genom presentationen av ledningssystemets innehåll. Genom att träffa ytterligare någon med central funktion som kan berätta lite mer om verksamheterna utifrån ovan specificerade områden skulle det ge mig en god start för fortsatt arbete. Jag skulle även gärna vilja besöka de olika enheterna för att se verksamheterna.

2. Intervjuer

Nästa seg är att mer i detalj beskriva enheternas verksamheter utifrån ett patientflödesperspektiv. Genom att intervjua centrala funktioner så som enhetschefer, avdelningschefer, planerare och administratörer kan jag få en mer detaljerad bild av verksamheterna. När jag tidigare har intervjuat angående dessa frågor har tidsåtgången varit ca 1 timma för en respondent och mellan en och två timmar om det rört sig om gruppintervjuer. Nedan är några exempel på frågor som jag skulle vilja få svar på genom att genomföra intervjuer.

Frågor angående logistik och patientflöden:

- Vilka styrande principer används för hur de operativa processerna organiseras?
- Hur sker planeringen av verksamheten?
- Hur sker samordningen med andra enheter som är inblandade i patientens väg genom sjukhuset?
- Vilka verktyg och metoder använder ni för att styra verksamheten?
- Hur fördelas ansvar och roller för planering och styrning av verksamheten?
- Hur hanteras efterfrågan från patienternas behov och uppdragsgivarnas krav?
- Vilka nyckeltal följs och hur används dessa sedan?
- Är flexibilitet viktigt för enheterna, och hur skapas den i så fall?
- Vilka aktiviteter sker på er enhet rörande patienter och flödet av patienter?
- Vilka andra enheter/avdelningar interagerar ni med? Se bilden nedan.

3. Kompletterande datainsamling

Ledningssystemet kan jag behöva titta på igen efter att jag genomfört intervjuerna. Jag tror att det ger mig en annan förståelse för ert ledningssystem när jag vet mer om hur er verksamhet fungerar. Det kan även hända att några respondenter hänvisar till ledningssystemet i sina svar under intervjuerna. Eventuellt kan jag även behöva ställa kompletterande frågor om det är något som jag missat eller inte förstått om enheternas verksamheter med tillhörande patientflöden.

Några ord om mig

Jag är civilingenjör inom maskinteknik utbildad vid Linköpings Tekniska Högskola. Mitt examensarbete var inriktat på vårdlogistik utfört på Linköpings Universitetssjukhus på dåvarande R-sektionen. Därefter påbörjade jag mina forskarstudier inom vårdlogistik och min licentiatavhandling presenteras under våren 2013. Min doktorsavhandling planeras att avslutas i slutet på 2015 och försvaras i början av 2016. Utöver forskarstudierna undervisar jag studenter på civilingenjörsprogram inom Logistik bland annat genom handledning av *examensarbeten* samt kursansvar på kursen *Logistik och kvalitet inom vården*.

Development of interview questions

The interview questions are exaggerated from the description model of a logistic system developed in licentiate thesis, see table below, and linked by number.

Table: The link between description aspects of a logistic system and interview questions

Description aspects	Outcome of description	Questions to answer	Connection to interview questions
Purpose	The description of the purpose provides a picture of what the system wants to achieve	What is the purpose of the system?	2.1 - 2.4 4.2
Boundary and Surrounding	The boundaries define the factors that are important for the system to consider but are beyond its control, i.e. given factors. The description of the opened system's context gives an opportunity to explain and understand an individual component.	What is included in the studied logistics system? Where is the system boundary? What in the surroundings affects the system, i.e. what is excluded?	1.7
Structure	The structure describes the functional organization and gives a picture of how resources are organized, how responsibilities are divided between functions and how functions are related to each other. Hence, the functions are specialized and are to support the flow.	What are the elements of the system? What are their main task, activities and responsibilities? How are the elements related to each other?	1.1 - 1.2, 1.4 - 1.6 4.8
Transformation	The description of the chain of activities in the transformation process, which has a specific start and end, is repetitive and cross functional. It focus on the core flow to where resources are primarily planned and managed to be integrated in that particular flow.	Which is the main flow's process? How are the transformations carried out? How does the system's customer order cycle operate?	1.3 3.1
Demand	The demand describes what enters the system as orders and that the system convert's into customer service.	What type of demand (input) enters the logistics system?	1.3
Customer service	The customer service gives a picture of what the logistics system is performing in providing time and space utility for a product or service.	What does the logistics system produce in terms of customer service (output)? Which different types of customer segment are to be satisfied?	5.2
Control	The control description presents how the control elements control and plans system operations, as well as senses the system environment. It also describes how the system analyzes and evaluates the logistics system's efficiency and progress over different time periods.	How are resources planned and managed to meet demand? How is the system managed?	3.2 4.1, 4.3 - 4 .7
Performance	The performance aspect gives a picture of which measurements the system use.	What physical and financial KPIs are used to monitor process and functional logistics performance?	5.1, 5.3 - 5.4

Logistiksstudie för att öka kunskapen om effektivare patientflöden

Målet med min forskning är att **öka kunskapen om hur effektivare patientflöden kan uppnås**. Det handlar om att ett systematiskt logistiskt tänkande och förbättringsarbete kan bidra till att förbättra patientflöden för att nå **ökad tillgänglighet, kvalitet och effektivitet inom vården**. Genom att studera hur patientflödena på Kvinnokliniken vid US är designade, styrda och kontrollerade hoppas jag kunna visa på **framgångsfaktorer och potentiella förbättringar** för effektiva patient flöden som sedan resulterar i **principiella tillämpbara riktlinjer** för hur effektivare patientflöden kan uppnås.

Utgångspunkten i min forskning är **patientens väg genom vården**, där fokus ligger på vårdprocessen för att uppnå ett integrerat flöde för patienten genom hela vårdkedjan. **Patientflöden** handlar således om flödet av patienter mellan personal, avdelningar och organisationer där patienten genomgår olika typer av aktiviteter. Patientflöde inkluderar hur, var, när och av vem patienten får vård, men innefattar inte kliniska beslut så som vilken typ av vård som ska utföras.

Jag har under intervju med Ninnie Borendal Wodlin och Siw Andersson fått en övergripande uppfattning om verksamheterna på KK. Jag önskar att fördjupa mig i hur dessa verksamheter fungerar utifrån era patienters efterfrågan på vård. Därtill vill jag studera hur verksamheterna är designade för att uppnå verksamheternas mål samt hur styrning och kontroll av dessa verksamheter sker.

På nästa sida finns **underlaget till intervjuerna med frågor som jag tänkt utgå ifrån**. Intervjuerna kommer dock ske i diskussionsform, där vi mer resonerar kring områdena som frågorna berör än betar av dem en i taget. I det bifogade dokumentet återfinns **Caserapporten** som beskriver det jag hitintills vet om KKs verksamheter utifrån patientflödet och de aktiviteter som patienterna genomgår. Med hjälp av materialet från intervjuerna kommer jag att bygga vidare på Caserapporten. Ni som respondenter får givetvis läsa igenom och kommentera den om ni vill. Jag ser framemot att intervjua er!

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Intervjufrågor

Intervjun med dig/er är en del i kartläggningen av Kvinnoklinikens verksamhet utifrån ett logistiskt perspektiv. Jag brukar börja med att be respondenterna rita upp verksamheten utifrån patientens väg genom den. Det är bra att samlas kring en bild som stöd under intervjun. I bilden ska vi försöka fånga hur ni är organiserade och genomför vård, allt från planering av patienter och bemanning till avslut. Frågorna nedan är tänkta som hjälp för att rita upp bilden av er verksamhet och patientflödena samt att beskriva hur ni bemöter efterfrågan på vård och kontrollerar samt styr verksamheten för att uppnå era mål.

1. Organisationen och verksamheten

- 1.1 Hur är ni organiserade?
- 1.2 Vilka funktionella delar består verksamheten av?
- 1.3 Vilka patientgrupper ingår i era verksamheter? Vilka behov söker patienterna för? Beskriv patientens väg genom er enhet från att ni får information om att patienten önskar vård till avslut. Alltså vilka aktiviteter genomförs kopplat till patientens väg genom er enhet? Har jag fått med allt i beskrivningarna i dokumentet ovan?
- 1.4 Vilka resurser använder ni er av för att genomföra er dagliga verksamhet (personalkategorier, lokaler, utrustning, mm)?
- 1.5 Hur sker samordningen med andra enheter som är inblandade i samma patientflöde som ni?
- 1.6 Vilka andra enheter är ni beroende av för att bedriva er verksamhet?
- 1.7 Hur påverkar yttre faktorer (faktorer som ni ej kan styra över) er operativa verksamhet?

2. Mål och uppdrag

- 2.1 Vilket mål har verksamheten, vad ska uppnås?
- 2.2 Vilket uppdrag har ni?
- 2.3 Vilka mål har era delverksamheter?
- 2.4 Hur påverkar målet/målen er verksamhet? Hur påverkar uppdraget er verksamhet?

3. Design av vårdkedjan

- 3.1 Vilken tanke finns det bakom hur de operativa verksamheterna är designade (varför aktiviteter genomförs, i vilken ordning, användning interna resp externa resurser)?
- 3.2 Vilken typ av flexibilitet är ni i behov av? Hur skapas denna flexibilitet inom enheterna?

4. Planering och styrning av verksamheten

- 4.1 Hur sker planeringen av verksamheten, både planeringen av patienter och bemanningsplanering samt övriga resurser? Lång sikt, kort sikt och dagligen. Hur fördelas ansvar och roller för planering och styrning av verksamheten?
- 4.2 Hur arbetar ni för att uppnå era mål och uppdrag? Vad görs på ledningsnivå och vad görs i den operativa verksamheten?

- 4.3 Vilka styrande principer används för hur de olika operativa processerna är organiserade? Vad prioriteras?
- 4.4 Hur hanteras efterfrågan från patienternas behov och uppdragsgivarens krav? Alltså vilka strategier har ni för att möta efterfrågan, både långsiktigt och på en mer daglig basis?
- 4.5 Vilka verktyg och metoder använder ni för att styra verksamheten?
- 4.6 Hur fördelas resurserna mellan verksamheterna?
- 4.7 Hur skapar ni förutsägbarhet i verksamheten?
- 4.8 Kopplat till patientflödet och den operativa verksamheten, vilka frågor ligger inte på ditt bord och vilka frågor gör det?

5. Mätning

- 5.1 Vilka resultat presterar ni kopplat till verksamhetens mål?
- 5.2 Vilka olika typer av patientgrupper tar ni hand om? Vilka krav på resultat finns kopplat till de olika grupperna? Vad lovar ni patienterna kopplat till deras vård (tex väntetider, medicinska resultat mm)
- 5.3 Vad mäter ni för att kunna fördela resurser för att nå en önskad kapacitet?
- 5.4 Vilka nyckeltal följer ni? Hur använder ni era nyckeltal för att förbättra er verksamhet? Hur arbetar ni med effektivitet (produktivitet, kostnadskontroll och kvalitet)? Mäter ni ledtider? Volymer? 5.5 Beläggning sängar? Omsättning sängar? Andelen akuta? LOS och LOC? Hur mäts isf detta?

6. Övrigt

- 6.1 Vad är viktigt att tänka på för att verksamheterna ska fungera bra?
- 6.2 Vilka är framgångsfaktorerna för verksamheterna?

APPENDIX VI

LITERATURE REVIEW

– LOGISTICS RESEARCH IN A HEALTHCARE CONTEXT

Number of articles with a healthcare context (first search phase), structured by topic and journal; and reviewed patient flow articles and categorization

Journal	Volume, issue, year		Reviewed articles	Number of articles within a healthcare context	
	From	To	Quantity	Patient flow focus	Physical products flow focus
<i>International Journal of Logistics Management</i>	11, 1, 2000	28, 4, 2017	442	1	1
<i>International Journal of Logistics: Research & Applications</i>	3, 1, 2000	20, 6, 2017	496	1	5
<i>Journal of Business Logistics</i>	21, 1, 2000	38, 4, 2017	459	1	4
<i>Journal of Purchasing & Supply Management (European Journal of Purchasing & Supply Management up to year 2002)</i>	6, 1, 2000	23, 4, 2017	206+369	0	8
<i>Journal of Supply Chain Management</i>	36, 1, 2000	53, 4, 2017	562	0	1
<i>Supply Chain management: An International Journal</i>	5, 1, 2000	22, 6, 2017	690	6	6
<i>International Journal of Physical Distribution & Logistics Management</i>	30, 1, 2000	47, 10, 2017	1481	0	1
			Σ 4705	Σ 8	Σ 26

Reviewed patient flow articles (a total number of 42 articles)

Number of healthcare related references (Total number of references)	Patient flow articles (The bold ones is the patient flow related articles from the first search phase, followed by their references from search phase two)
27(51)	<p>1. PARNABY, J. & TOWILL, D. 2009. Engineering cellular organisation and operation for effective healthcare delivery supply chains. <i>International Journal of Logistics Management</i>, 20, 5-29.</p> <p>ADLER, P. S., RILEY, P., KWON, S. W., SIGNER, J., LEE, B. & SATRASALA, R. 2003. Performance improvement capability: keys to accelerating performance improvement in hospitals. <i>California Management Review</i>, 45, 12-33.</p> <p>BENNETT, J. C. & WORTHINGTON, D. 1998. An example of a good but partially successful OR engagement: Improving outpatient clinic operations. <i>Interfaces</i>, 28, 56-69.</p> <p>GLOUBERMAN, S. & MINTZBERG, H. 2001. Managing the Care of Health and the Cure of Disease--Part I: Differentiation. <i>Health Care Management Review</i>, 26, 56-69.</p> <p>TOWILL, D. R. 2006. Viewing Kaiser Permanente via the logistician lens. <i>International Journal of Health Care Quality Assurance</i>, 19, 296-315.</p> <p>PARNABY, J. & TOWILL, D. R. 2008. Seamless healthcare delivery systems. <i>International Journal of Health Care Quality Assurance</i>, 21, 249-273.</p> <p>PROBERT, D., STEVENSON, B., TANG, N. K. H. & SCARBOROUGH, H. 1999. The introduction of patient process re-engineering in the Peterborough Hospitals NHS Trust. <i>Journal of Management in Medicine</i>, 13, 308-324.</p> <p>2. RAHIMNIA, F. & MOGHADASIAN, M. 2010. Supply chain leagility in professional services: how to apply decoupling point concept in healthcare delivery system. <i>Supply Chain Management: An International Journal</i>, 15, 80-91.</p> <p>KOLLBERG, B., DAHLGAARD, J. J. & BREHMER, P. O. 2006. Measuring lean initiatives in health care services: issues and findings. <i>International Journal of Productivity and Performance Management</i>, 56, 7-24.</p> <p>TOWILL, D. & CHRISTOPHER, M. 2005. An evolutionary approach to the architecture of effective healthcare delivery systems. <i>Journal of Health Organization and Management</i>, 19, 130-147.</p> <p>3. VRIES, J. D. & HUIJISMAN, R. 2011. Supply chain management in health services: an overview. <i>Supply Chain Management: An International Journal</i>, 16, 159-165.</p> <p>OLIVEIRA, M. D. & PINTO, C. G. 2005. Health care reform in Portugal: an evaluation of the NHS experience. <i>Health economics</i>, 14, 203-220.</p> <p>ZINKHAN, G. M. & BALAZS, A. L. 2004. A stakeholder-integrated approach to health care management. <i>Journal of Business Research</i>, 57, 984-989.</p>

Patient flow articles (continued from previous page)	Number of healthcare related references (Total number of references)
<p>4. ARONSSON, H., ABRAHAMSSON, M. & SPENS, K. 2011. <i>Developing lean and agile health care supply chains. Supply Chain Management: An International Journal</i>, 16, 176-183.</p> <p>CHOW-CHUA, C. & GOH, M. 2000. Quality improvement in the healthcare industry: some evidence from Singapore. <i>International Journal of Health Care Quality Assurance</i>, 13, 223-229.</p> <p>SAHA, P., PINJANI, A., AL-SHABIBI, N., MADARI, S., RUSTON, J. & MAGOS, A. 2009. Why we are wasting time in the operating theatre? <i>Int J Health Plann Manage</i>, 24, 225-32.</p> <p>SHAH, R. & GOLDSTEIN, S. 2008. Explaining Anomalous High Performance in a Health Care Supply Chain. <i>Decision Sciences</i>, 4, 759-789.)</p>	17 (27)
<p>5. MEIJBOOM, B., SCHMIDT-BAKX, S. & WESTERT, G. 2011. <i>Supply chain management practices for improving patient-oriented care. Supply Chain Management: An International Journal</i>, 16, 166-175.</p> <p>BOHMER, R. M. J. 2005. Medicine's Service Challenge: Blending Custom and Standard Care. <i>Health Care Management Review</i>, 30, 322-330.</p> <p>FREDENDALL, L. D., CRAIG, J. B., FOWLER, P. J. & DAMALI, U. 2009. Barriers to Swift, Even Flow in the Internal Supply Chain of Perioperative Surgical Services Department: A Case Study*. <i>Decision Sciences</i>, 40, 327-349.</p> <p>HANNE, T., MELO, T. & NICKEL, S. 2009. Bringing Robustness to Patient Flow Management Through Optimized Patient Transports in Hospitals. <i>Interfaces</i>, 39, 241-255.</p> <p>MEIJBOOM, B., HAAN, J. D. & VERHEYEN, P. 2004. Networks for integrated care provision: an economic approach based on opportunism and trust. <i>Health Policy</i>, 69, 33-43.</p> <p>PAULUS, A., VAN RAAK, A. & KEIJZER, F. 2002. Core Articles: ABC: The Pathway to Comparison of the Costs of Integrated Care. <i>Public Money and Management</i>, 22, 25-32.</p>	49 (78)
<p>6. LILLRANK, P., GROOP, J. & VENESMAA, J. 2011. <i>Processes, episodes and events in health service supply chains. Supply Chain Management: An International Journal</i>, 16, 194-201.</p> <p>KUJALA, J., LILLRANK, P., KRONSTRÖM, V. & PELTOKORPI, A. 2006. Time-based management of patient processes. <i>Journal of Health Organization and Management</i>, 20, 512-524.</p> <p>PELTOKORPI, A. & KUJALA, J. 2006. Time-based analysis of total cost of patient episodes: A case study of hip replacement. <i>International Journal of Health Care Quality Assurance</i>, 19, 136-145.</p>	10 (44)

7. **SAMPSON, S. E., SCHMIDT, G., GARDNER, J. W. & VAN ORDEN, J. 2015. *Process Coordination Within a Health Care Service Supply Network. Journal of Business Logistics*, 36, 355-373.** 6(74)

KAPLAN, R. S. & PORTER, M. E. 2011. How to Solve The Cost Crisis In Health Care. *Harvard Business Review*, 89, 46-64.

8. **OLSSON, O. & ARONSSON, H. 2015. *Managing a variable acute patient flow – categorising the strategies. Supply Chain Management: An International Journal*, 20, 113-127.** 17(46)

ARONSSON, H., ABRAHAMSSON, M. & SPENS, K. 2011. Developing lean and agile health care supply chains. *Supply Chain Management: An International Journal*, 16, 176-183.

CONSIDINE, J., KROPMAN, M., KELLY, E. & WINTER, C. 2008. Effect of emergency department fast track on emergency department length of stay: a case-control study. *Emergency Medicine Journal*, 25, 815-819.

BOHMER, R. M. J. 2005. Medicine's Service Challenge: Blending Custom and Standard Care. *Health Care Management Review*, 30, 322-330.

VRIES, J. D. & HUIJSMAN, R. 2011. Supply chain management in health services: an overview. *Supply Chain Management: An International Journal*, 16, 159-165.

IERACI, S., DIGIUSTO, E., SONNTAG, P., DANN, L. & FOX, D. 2008. Streaming by case complexity: evaluation of a model for emergency department fast track. *Emergency Medicine Australasia*, 20, 241-249.

JOOSTEN, T., BONGERS, I. & JANSSEN, R. 2009. Application of lean thinking to health care: issues and observations. *International Journal for Quality in Health Care*, 21, 341-347.

LILLRANK, P., GROOP, J. & VENESMAA, J. 2011. Processes, episodes and events in health service supply chains. *Supply Chain Management: An International Journal*, 16, 194-201.

RAHIMNIA, F. & MOGHADASIAN, M. 2010. Supply chain leagility in professional services: how to apply decoupling point concept in healthcare delivery system. *Supply Chain Management: An International Journal*, 15, 80-91.

SANCHEZ, M., SMALLY, A. J., GRANT, R. J. & JACOBS, L. M. 2006. Effects of a fast-track area on emergency department performance. *The Journal of Emergency Medicine*, 31, 117-120.

SHAH, R., GOLDSTEIN, S. M., UNGER, B. T. & HENRY, T. D. 2008. Explaining Anomalous High Performance in a Health Care Supply Chain*. *Decision Sciences*, 39, 759-789.

TOWILL, D. & CHRISTOPHER, M. 2005. An evolutionary approach to the architecture of effective healthcare delivery systems. *Journal of Health Organization and Management*, 19, 130-147.

VEGA, V. & MCGUIRE, S. J. J. 2007. Speeding Up the Emergency Department: The RADIT Emergency Program at St. Joseph Hospital of Orange. *Hospital Topics*, 85, 17-24.

WALLEY, P., SILVESTER, K. & STEYN, R. 2006. Managing variation in demand: lessons from the UK National Health Service. *Journal of healthcare management/American College of Healthcare Executives*, 51, 309.