Nutritional Intervention in Elderly People
Admitted to Resident Homes

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To my family
ABSTRACT

The aim was to investigate the effects of an intervention, based on education given to staff and implementation of an individualized nutritional programme given to the residents, to compare assessments on admission with a previous study, and to perform diagnostic test and inter-rater reliability of the Mini Nutritional Assessment (MNA). A further aim was to identify and describe factors with regard to appetite among the residents.

Upon admission, and after a four month intervention period, residents were classified as being either protein energy malnourished (PEM), or not, based on anthropometry and biochemical measurements. On both occasions, the Activity Index and the Mini Mental State Examination were used. In order to identify individuals in need of nutritional care, the MNA was performed. Information about medical data was obtained. A total of 127 residents were consecutively admitted to eight resident homes in a municipality in Sweden. Three resident homes constituted the experimental unit (n = 68) and five the control unit (n = 59). Fifteen residents were interviewed using a qualitative method, to investigate what affects their appetite.

On admission 32 % of the residents were classified as PEM, which was similar to in the previous study. A higher frequency of residents in the present study had severe medical diseases and cognitive impairment, compared with the previous study, indicating changed admission criteria in the present study.

Between the experimental and the control groups, no differences were seen in any specific anthropometric or biochemical variable. Within the groups, statistically significant differences were seen, as the number of PEM residents in the experimental group decreased, and motor activity and overall cognitive function improved. In the control group, motor activity deteriorated. This indicates that the intervention improved nutritional status and functional capacity in the residents.

Diagnostic sensitivity was 73 % regarding MNA versus PEM, and 89 % regarding MNA short form (MNA-SF) versus MNA, which indicates a rather high degree of sensitivity in both tests. Inter-rater reliability of MNA, carried out by simultaneous assessments by registered nurses and researcher showed a moderate agreement of 62 % (kappa 0.41).

The interview study showed that the willingness to eat was what affected the residents’ appetite. The willingness to eat contains internal factors, dependent on mood and personal values, as well as external factors, dependent on wholesomeness, food, eating environment and meal fellowship. When planning and realizing residents’ nutritional care, factors affecting the residents’ appetite have to be taken into consideration.

In conclusion, the results show that it is important to implement and develop strategies for individual nutritional care, in order to prevent and treat malnutrition in elderly people, which is in line with recommendations given by the European Society of Parenteral and Enteral Nutrition (ESPEN) and with the Swedish goal of nursing actions.

Keywords: Elderly people; resident homes; comparison; nutritional intervention; education; individualised care; inter-rater reliability; appetite, qualitative method
ORIGINAL PAPERS

This thesis is based on the following papers, which are referred to in the text by the Roman numerals given below:


II. Wikby K, Ek A-C & Christensson L. Implementation of a Nutritional Programme in Elderly People Admitted to Resident Homes. (Submitted for publication).

III. Wikby K, Ek A-C & Christensson L. The two-step Mini Nutritional Assessment Procedure in Community Resident Homes. (Submitted for publication).


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INTRODUCTION

An important and burning problem is that approximately one third of residents in municipal resident homes in Sweden suffer from malnutrition (Saletti et al 2000; Christensson et al 2002; Suominen et al 2005). In this context, malnutrition refers to a state of undernutrition, so called protein-energy malnutrition (PEM) (Keller 1993). It is not only a problem for the individual but also for the family, community, and the health care system (Visvanathan 2003).

The reserves of elderly people are often reduced with respect to physiological, psychological, and social factors. This may affect their life and makes them vulnerable. They are at increased risk of having decreased appetite, insufficient dietary intake and, through this, are also at risk of developing malnutrition (Morley 2001, 2002). Malnutrition is strongly associated with declined physical (Unosson et al 1991; Gazzotti et al 2000) and cognitive ability (Ödlund et al 2005), worsening of existing chronic diseases (Akner & Cederholm 2001; Seiler 2001) and may deeply affect quality of life (Vetta et al 1999; Crogan & Pasvogel 2003). It is associated with decreased immune reactions (Ek el al 1990; Hudgens et al 2004), presence of pressure sores (Ek et al 1991; Hudgens et al 2004) and increased mortality rates (Christensson et al 1999; Van Nes et al 2001). Elderly people in general have decreased ability to regulate food intake, which may contribute to difficulties in compensating for insufficient food intake and thus to weight loss (Roberts et al 1994; Roberts 2000; Das et al 2001). If the problem is not observed, they run the risk of their nutritional status deteriorating. Hence, it is important to use a reliable and valid tool to assess nutritional status (Omran & Morley 2000a; Guigoz et al 1999).

Since a reform in 1992, the municipalities in Sweden have the responsibility for service and care given to elderly people (The National Board of Health and Welfare 1996), and offer assistance in elderly people’s own homes, or in resident homes (Sjölenius 1997). The guiding principles of the reform focus on autonomy, privacy, safety and freedom of choice (The National Board of Health and Welfare 1996). In Sweden, approximately 17% of the people are 65 years of age or older. Five per cent are 80 or older (Statistics Sweden 2002), and among them 40% are in need of home service and nursing care. In December 2000, 127 000 residents in Sweden lived in resident homes, which was 10 000 less than in 1996 (The
National Board of Health and Welfare 2000). During that period, the number of elderly people in Sweden remained unchanged (Statistics Sweden 2002).

In order to prevent and treat malnutrition, a set of standards for practical use within the present health care resources are recommended by the European Society of Parenteral and Enteral Nutrition (ESPEN). A number of actions are suggested. Screening tools should be used to identify individuals at risk of malnutrition. Assessments of metabolic, nutritional and functional variables should be performed, in order to make a diagnosis, which should lead to appropriate care plans. The effectiveness of the care plans should be monitored, the results should be disseminated and the process of the care plans should be conducted in a systematic manner, in order to allow audit of the outcomes (Kondrup et al 2003).

In municipal resident homes actions directed toward malnutrition can be implemented by giving education to the staff as these actions may have positive effects on the residents’ nutritional status. However, few studies include an examination of these effects of nutritional education given to the staff and the results are not unambiguous (Christensson et al 2001; Faxén-Irving et al 2005). Consequently, there is a need for further studies on staff education within municipal resident homes, in order to examine the effects on the residents’ nutritional status.

According to Whitney et al (2002) and Morley (2002), eating is a complex process driven by hunger and appetite. Hunger is described as a strong desire or physiological need for food, while appetite refers to the enjoyment of eating and to food itself. Since decreased appetite is seen as a main factor of decreased food intake and malnutrition (Morley 2002), and no studies have been found where elderly people view their appetite, it is important to let elderly people describe what affects their appetite in order to gain a deepened understanding of the subject.
BACKGROUND

Ageing

During ageing, body composition undergoes changes, from increasing body weight in the first part of life, which stabilises in late middle age, and decreases in very old people (Dey et al 2001). Seventy five years of age seems to be a turning point, when weight starts to decrease (Perissinotto et al 2002), and the weight reduction seems to depend mainly upon loss of fat free mass (Huges et al 2002). According to a review by Bozzetti (2003), there is a gradual decrease in total body water from adulthood to old age, until it constitutes less than 50 % of body weight, i.e. below the normal range of from 50 to 65 %. There is also a successive decrease in the reserve capacity of bodily functions, such as of the capacity of the heart (Bozzetti 2003) and the immune system (Fulop et al 2005). The individual differences are big, and there are also variations between different functions (Bozzetti 2003). The reduced functions decrease the reserves in elderly people (Morley 2001), so that with greater age there is a higher incidence of chronic illnesses associated with increased metabolic processes, such as obstructive pulmonary disease, heart failure and rheumatic arthritis (Tracy 2003, Goldspink 2005).

With advanced age, a severe reduction in the flow of saliva is observed (Nagler & Hershkovich 2005), as well as a reduced number of natural teeth, and decreased stability and retention of protheses (Lamy et al 1999). Other problems seen in greater age are difficulties in swallowing (Wilkingson & de Picciotto 1999; Lamy et al 1999; Locker 2002) and decreases in the senses of taste (Bozzetti 1993) and smell (Wang et al 2005). Disabilities due to diseases, such as stroke, are also more common in elderly people than in those who are younger (Perry 2003).

Mental disorders, such as dementia disease and depression are found in approximately 30 % of elderly people and have also been seen to increase with ageing (Skoog 2004). During ageing, the cognitive reserve declines and may result in a reduced capability in functions such as orientation, memory, abstract thought and perception (Cullum et al 2000). This means that elderly people need more time to become acclimatised to new circumstances (Couture et al 2005). In later life, there is a continuum from normal cognitive ageing to overt dementia.
Changes due to dementia involve reduction in brain capacity, which may result in limitations in understanding and interpreting the surroundings (Whalley et al 2004). Depression is an emotional state characterised by inappropriate feelings, such as marked sadness, or a loss of interest or pleasure in daily activities (Friedlander et al 2003).

Loneliness is common in elderly people and seems to derive from societal life changes, such as the ability to maintain a social network and from negative life events (Skoog 2004; Savikko et al 2005). Conditions such as poor health status, poor functional status, poor vision, and loss of hearing, also increase the prevalence of loneliness (Bickerstaff et al 2003; Savikko et al 2005). Low level of income is associated with limitations, which can lead to isolation and loneliness, as can societal changes, such as the migration of younger people from the country to urban areas (Savikko et al 2005).

Because of changed conditions, such as disability or restricted money, elderly people may have to move from one location to another. This changes their life situation and they have to adjust to new surroundings. This can involve a painful process, which can produce lasting trauma (Johnson & Tripp-Reimer 2001). This may, in turn, result in a decline of physical vitality, depression, cognitive impairment, and malnutrition (Robertson & Montagini 2004).

**Circumstances influencing eating**

Eating is basic for all human beings, to bring the body nutrients, and to edify and regulate fundamental bodily functions (Morley 2002). A satisfying nutritional status is a necessary condition for maintaining health and avoiding illness (Whitney et al 2002). Nutritional status is, in this thesis, defined as the outcome of the balance between intake and consumption of nutrients.

Malnutrition is a condition which may adversely affect quality of life in elderly people (Vetta et al 1999; Crogan & Pasvogel 2003). According to Nordenfelt (1991), quality of life is very subjective and is, in most cases, based on conceptions such as harmony, satisfaction, wellbeing and happiness. These conceptions include physical and psychological ability, as well as social interaction, activity, material status and experienced health status. Sarvimäki &
Stenbock-Hult (2000) have defined quality of life in elderly people as a sense of wellbeing, meaning, and value or self-worth.

The reason why elderly people develop malnutrition is complex according to a review by Elsner (2002). It can be associated with increased vulnerability and susceptibility to strain, due to decreased physical, psychological and/or social functions (Morley 1996, 2002). This may affect eating behavioural, which includes difficulties in eating and in maintaining sufficient nutritional status (Elsner 2002). Eating difficulties have been defined by Westergren et al (2001, p 258) as "difficulties that, alone or in combination, negatively interfere with the preparation and intake of served food and/or beverages."

Poor oral health is associated with eating difficulties (Walls & Steele 2004) and with malnutrition (Chen et al 2005). Difficulties in chewing, because of poor dental status (Lamy et al 1999; Andersson et al 2002), as well as dry mouth, red mucus membranes, and oral sores, can greatly affect eating and nutritional status in elderly people (Andersson et al 2002). Elderly people who have suffered strokes have often increased difficulties in swallowing, because of paresis (Terré & Mearin 2006), and are at high risk of insufficient dietary intake and malnutrition (Kagansky et al 2005). Stroke may also include decreased impaired self-feeding ability related to e.g. impairment in the arms and visual deficits (Westergren et al 2001, 2002; Perry & McLaren 2003). Changes in the senses of taste and smell may affect dietary intake in elderly people (Schiffman & Graham 2000).

Because of diseases, many elderly people have prescription medications, which are associated with loss of appetite and weight loss (Morley 1996, 1997; Omran & Morley 2000a). The changed proportion of fat and water content in the ageing body may lead to changed effects in the distribution of medications, thus intensifying their effects. These effects may impede intellectual and physical abilities (Turnheim 2004) and, as a result, eating. Elderly people often have a decreased sensation of thirst and reduced fluid intake (Kenney & Chiu 2000). Dehydration is associated with impaired cognitive ability (Wilson & Morley 2003).

Failure to remember to eat, and how to eat, are common eating difficulties in elderly people with dementia disease (Morley 1997). Dementia disease has been seen as a risk factor for malnutrition in elderly people (Kagansky et al 2005). Decreased enjoyment of eating and of
food, as well as refusal to eat, are common problems in elderly people with depression, and are commonly associated with malnutrition (Morley 1996, 1997; Chen et al 2005).

Refusal to eat can indicate an indirect self-destructive behaviour, which has been defined as "an act of omission or commission that causes self-harm leading indirectly over time to the patient’s death" (Conwell et al 1996, p 153). It involves self-injurious eating and drinking patterns, abuse of medication, rejecting medical and nursing advice, and conflict interactions with other individuals (Conwell et al 1996). Indirect self-destructive behaviour has been seen in more than half of the residents studied in 25 nursing homes in Australia (Draper et al 2002).

Bereavement is a risk factor for poor nutritional status, since many elderly people are widowed. It imbues many areas of life functioning related to eating, and is for that reason likely to lead to a reduction in nutritional intake, weight loss and malnutrition (Browne et al 1997). Loneliness and social isolation have also been seen to be causes of weight loss in elderly people (Locher et al 2005), and low income has been seen to impact upon nutritional health in elderly people living in their own homes (Chen et al 2005).

Eating in elderly people involves interaction with others social and cultural manners, which are based on traditions and norms. When elderly people became disabled, their ability to behave according to the norms they have learned decreases, e.g. the management of food and objects on the table. They feel ashamed of themselves and simplify the procedures at the table or avoid situations they think are embarrassing. When elderly people are served food they do not like, such as unfamiliar dishes or different cooking, it highly reduces their wellbeing and their satisfaction at mealtimes (Sidenvall et al 1996). Eating in elderly people is affected by the meal environment. In a group of patients on a long-term care ward, food intake increased by 25 % when the dining-room was redecorated, reaching levels similar to what was common when the patients were young. When the dining-room was arranged back to its original state, the patients’ food intake decreased again (Elmståhl et al 1987).

When elderly people have to move from one location to another, such as a resident home, they have to adapt to new circumstances (Johnson & Tripp-Reimer 2001). This can lead to inactivity, insufficient food intake and weight loss (Robertson & Montagini 2004). The reason why elderly people have to move into a resident home is because of a non-functioning living
situation (Christensson et al 1999), and they have not always been involved in, and thus made the decision to move (Johnson & Tripp-Reimer 2000). All this, taken together, can be suggested to involve increased risk factors for eating problems. Saletti et al (2000) have shown that malnutrition is common among elderly people living in resident homes.

Assessment of nutritional status

Routine nutritional assessment of vulnerable elderly people is the first stage in implementing a nutritional programme (Todorovic 2001). In order to receive true assessments of nutritional status, it is important to pay attention to reliability and validity of the tool used (Polit & Beck 2003). The purpose of nutritional assessments is further to establish baseline values, which the effectiveness of nutritional intervention could be measured against (Omran & Morley 2000b). Many different methods have been used to assess nutritional status in elderly people, based on objective nutritional assessments, routine history and physical examination, evaluation of dietary intake, and assessment tools (Omran & Morley 2000a). At present, there is no gold standard for nutritional assessment (Berner 2003), which is probably due to the complexity of the phenomenon of nutritional problems in elderly people.

Objective nutritional assessments, such as anthropometric measurements in combination with biochemical variables, are often used in nutritional assessments (Larsson et al 1990; Unosson et al 1995; Christensson et al 1999). Commonly used anthropometric measures are body weight, Body Mass Index (BMI = weight in kg divided by height in m^2) (Garrow & Webster 1985; Flodin et al 2000; Weigly 1994), weight index in per cent (WI) (Warnold & Lundholm 1984; Bengtsson et al 1981), as well as arm measurements, such as triceps skinfold thickness (TSF), midarm circumference (MAC) and the calculation of midarm muscle circumference (AMC) (Symreng 1982).

Serum proteins, such as albumin and transthyretin (also known as prealbumin), are biochemical variables, which are often used in nutritional assessments, since the serum protein levels reflect the protein intake (Pirlich & Lochs 2001). Transthyretin shows a much higher degree of sensitivity to the nutrient intake than albumin does, which is related to its shorter biological half-life (2 days compared to 20 days) (Ingenbleek & Young 2002). When protein intake decreases, or during starvation, the synthesis of serum albumin and
transthyretin in the liver may decrease to values below normal. Low serum albumin and transthyretin values are also associated with liver and kidney diseases (Whitney et al 2002), as well as with chronic inflammation and infections (Ingenbleek & Young 2002).

In Sweden, many studies have used ‘objective nutritional assessments’, based on anthropometric and biochemical measures, to classify an individual as either PEM or non-PEM (Ek et al 1990; Unosson et al 1991; Christensson et al 1999). An individual is defined as being PEM if at least one anthropometric and one biochemical value are subnormal. The reference ranges for subnormal values emerge from a Swedish sample of elderly people (Bengtsson et al 1981; Symreng 1982; Warnold & Lundholm 1984).

In order to evaluate the risk of malnutrition in frail elderly people and to identify those who could benefit from early intervention, the Mini Nutritional Assessment (MNA) tool has been developed (Guigoz et al 1996). The aim of the development of MNA was to develop a valid and reliable screening tool, to facilitate nutrition intervention in clinical practice. It comprises 18 items, divided into anthropometric, general, dietary, and self assessments. The sum of the MNA score distinguishes between elderly people with malnutrition, at risk of malnutrition, and those who are well nourished. In many Swedish studies, the MNA tool has been used to evaluate nutritional status in elderly people in various municipal resident homes (Saletti et al 2000; Christensson et al 2002; Ödlund et al 2005). The European Society of Parenteral and Enteral Nutrition (ESPEN) has recommended the MNA tool to detect the presence of malnutrition and risk of malnutrition among elderly people in home-care programmes, nursing homes and hospitals (Kondrup et al 2003). The aim of the MNA is to identify those at risk of developing malnutrition at an early stage, where it can be easily corrected by nutritional intervention (Vellas et al 1999; Guigoz et al 1999). The tool is easy to administer and reduces the need for more invasive tests, such as blood sampling (Rubenstein et al 1999, 2001).

It is assumed that the MNA tool can be completed in less than 15 minutes. However, this has been seen as being too long thus limiting its usefulness in geriatric screening situations (Guigoz et al 2002). Consequently, the authors developed a short form of the MNA (MNA-SF), to be used in a two-step procedure. The first step includes MNA-SF, which is compiled by using six of the total 18 MNA items and takes approximately three minutes to perform. The score of MNA-SF indicates either well nourished or risk of malnutrition (Rubenstein et al
In the latter case the second step is carried out, using the remaining MNA items (Rubenstein et al 2001).

The MNA-SF has been found to be an appropriate screening tool in elderly patients within acute care (Ranhoff et al 2005), and in elderly people with pressure ulcers in nursing homes (Langkamp-Henken et al 2005), but not in middle aged patients undergoing surgery (Putwatana et al 2005). Several studies have been found where the two-step MNA procedure has been used, indicating it to be a useful tool to identify elderly patients with malnutrition or at risk of malnutrition (Cohendy et al 2001; Kuzuya et al 2005; Langkamp-Henken et al 2005).

**Municipal care**

When elderly people are in need of care, they are offered assistance in their own homes, or in special types of municipal resident homes, with service at different levels according to individual requirements (The National Board of Health and Welfare 1996). Accommodation in special types of resident homes includes service buildings, retirement homes, group living for people with dementia disease, and nursing homes (Sjölenius 1997). In service buildings, the residents mostly have mild dys-functions and receive home help service and home medical care as required. In retirement homes, the residents need relatively extensive support, such as assistance with eating. Group living is co-housing accommodation for approximately 8 to 10 residents with dementia disease. In nursing homes, the residents need extensive special care, since common diagnoses are stroke, malignancy, dementia and cardiovascular diseases. In order to decide the right level of resident home, the decision is made in accordance with the resident’s wishes and ability to manage his or her daily life, and is managed by a home help administer (The National Board of Health and Welfare 2000).

In the late 1990s, the care of elderly people gradually changed. Short-term stay was established, as well as palliative care given to residents in the final stage of life being introduced. The aim of short-term stay is to offer elderly people support, so that they can continue to live in their own homes as long as possible. In order to achieve this, temporary care is given to residents in need of further rehabilitation after hospital care, and to residents whose next of kin need to receive temporary support. When elderly people enter special types
of housings, they are mostly in great need of comprehensive care day and night, and the assistance offered in their own homes does not fulfill their needs any longer. Between 1996 and 2000, the number of accommodation places in special resident homes decreased by 10000 in Sweden (The National Board of Health and Welfare 2000).

In resident homes, registered nurses (RN) are responsible for giving safe and appropriate nursing care of good quality (SOSFS 1997:10). The RN’s working tasks include planning, realising or delegating, leading, documenting, and evaluating nursing care. They include responsibility for the residents’ nutrition, and especially for those residents who have difficulties in meeting their own nutritional needs. Medical needs are supplied by the resident’s general practitioner, employed by the County Council (The National Board of Health and Welfare 2000).

**Nutritional care**

As the reasons for decreased appetite, insufficient food intake and malnutrition in elderly people are multi factorial, elderly people with nutritional problems constitute a very heterogeneous group (Morley 2002). In every individual identified as at risk of malnutrition, an appropriate care plan should be carried out, which should be based on individual’s desires, needs and resources (Kondrup et al 2003, SOSFS 1993:17).

In studies designed to improve nutritional status in elderly people, the focus has often been on standardised actions, such as oral supplements in addition to regular meals. In a Cochrane database systematic review of randomised, controlled trials (RCT) by Milne et al (2005), the evidence from trials for improvement in nutritional status and clinical outcomes were examined. The review included 49 trials involving 4790 randomised elderly people, where extra protein and energy were provided, usually in the form of commercial ‘sip-feeds’. The results showed that oral supplementation in general produced a small but consistent weight gain in elderly people. In a majority of the trials, a reduced mortality rate was also observed in the supplemented group, as compared with the control group. However, there was no evidence of improvement in functional benefit or reduction in length of hospital stay in the supplemented group. This review points out that the results of standard actions towards nutritional problems in elderly people are not unambiguous (Milne et al 2005).
When following the recommendations given by ESPEN (Kondrup et al. 2003), staff education is suggested to be a basic pre-requisite for giving the residents appropriate nutritional care. In two Swedish studies (Faxén-Irving et al. 2005, Christensson et al. 2001), education was given to the staff in resident homes, in order to improve the nutritional status of the residents. The education involved identification of underlying causes of eating difficulties and malnutrition, to fulfil individual nutritional requirements, as well as instructions, such as what to serve. The intention was that the staff should apply what they had learned to nursing practice. One study (Faxén-Irving et al. 2005) was designed as a RCT study, where the intervention group included 37 residents and was based on various consistencies of food and drinks, as well as of enriched drinks. After five months, no objective changes were seen, either in the intervention or in the control group. Another study (Christensson et al. 2001) had single-case design and involved 11 malnourished residents, and was based on individually adjusted meals, using ordinary food. After three months, the residents’ nutritional status and functional capacity improved in general. The results of these studies, point out a need to further investigate whether education given to staff, and individual nutritional care based on ordinary food, have effects on residents’ nutritional status.

Present health care resources (such as ordinary food), are recommended when preventing and treating malnutrition (Kondrup et al. 2003). Serving ordinary food instead of commercial ‘sip-feeds’ should be a key component within nutritional care. The importance of ordinary food for elderly people in resident homes is shown in a study by Lengyel et al. (2004), where 205 elderly residents in long-term care expressed concern over food variety, quality, taste, and appearance, as well as with the menus. The residents in that study were less satisfied with areas related to their autonomy, such as food choice and snack availability. Another study by Evans et al. (2005), including 20 nursing home residents showed that food, which reflects the family background of the individual, is a source of comfort in nursing home residents. Food can play an important part in recovery from illness or adaptation to nursing homes. That study states that individualised nutritional care, based on food can promote nutritional status and quality of life in nursing home residents (Evans et al. 2005). When implementing of individualised nutritional care in resident homes, the RNs have to take an active part, like the researcher did in the study by Christensson et al. (2001). The RNs have to be responsible for identifying residents in need of nutritional attention and for carrying out individualised nutritional care.
Hunger and appetite

Since decreased appetite is seen as a main factor of decreased food intake and malnutrition in elderly people (Morley 2002), it is important to gain a deeper understanding about appetite.

Hunger and appetite initiate eating, and can be seen as parallel and interacting functions (Whitney et al 2002). Complicated feedback systems, transmitted by the nervous system, regulate hunger and satiety and the nutrient intake (MacIntosh et al 2000, Morley 2001). Eating is also initiated by appetite, which can be good or poor. It is based on a psychological phenomenon that makes it possible to experience good appetite without hunger, such as when someone offers an unexpected treat like a delicious dessert after a meal. In other situations, the opposite may occur, such as when an individual is faced with a stressful situation, thus hunger can exist but appetite is poor (Whitney et al 2002). Beliefs may also overcome hunger, such as when persons are starving themselves to death in order to make a political point (Morley 2002). A reduced food intake causing weight loss may then be due to physiological, psychological or social factors, or a combination of all of these (Morley 2001, 2002; Donini et al 2003).

Many research projects focus on eating strictly from a physiological point of view, and in that context, appetite is described as a physiological drive to eat and to regulate energy balance (le Roux & Bloom 2005; Mattes et al 2005; Erlanson-Albertsson 2005). In other studies, hunger and appetite are described as interacting functions, but with focus on the physiological drive to eat (Rogers 1999; Kristensen 2000; Morley 2002). No study has been found focusing mainly on appetite from a psychosocial point of view. This makes it of importance to carry out studies which elucidate the psychosocial influences on appetite, in order to gain a deeper understanding of how elderly people view their appetite and what affects their appetite.
AIMS OF THE THESIS

The general aim of this thesis was to investigate the effects of an intervention, based on education given to the staff and implementation of an individualized nutritional programme given to the residents.

The specific aims were:

- to examine nutritional status and socio-demographic and medical data, in people who were newly admitted to municipal resident homes. A further aim was to compare the results with a previous study performed in the same municipality (I).

- to test the hypothesis that education given to the staff will improve nutritional status, as measured by anthropometric and biochemical variables, as well as functional capacity in elderly people newly admitted to municipal homes, as compared with a control group (III).

- to test internal consistency and inter-rater reliability of Mini Nutritional Assessment (MNA) during implementation of MNA, and to test sensitivity, specificity and diagnostic predictivity of MNA-short form (MNA-SF) in relation to MNA (II).

- to identify and describe factors of importance with regard to appetite among elderly people (IV).
METHODS

This thesis consists of four studies of residents, newly admitted to resident homes in a municipality in the southern part of Sweden. Two approaches are used, based on paradigms with roots in two different scientific traditions i.e. quantitative and qualitative. The quantitative approach focuses on the universality in a group of residents and data is collected using deductive methods. One study is on nutritional status and functional capacity in newly admitted residents, and includes comparisons between two cohorts (I). In one another study, an individualized nutritional programme in newly admitted residents is tested (II). In the third study, the two-step MNA procedure is tested in municipal resident homes (III).

A qualitative approach focuses on the individual and unique phenomenon and the data is collected inductively in the residents’ natural context. One study is on how residents view their appetite and how they describe factors affecting their appetite from a qualitative perspective (IV).

A qualitative approach focuses on the individual and unique phenomenon and the data is collected inductively in the residents’ natural context. One study is on how residents view their appetite and how they describe factors affecting their appetite from a qualitative perspective (IV).

Internal validity refers to the extent the experimental treatment can be inferred to be responsible for the observed effect, and is obtained by control mechanism. Due to ethical and practical concerns regarding the residents, a true experimental design was not possible to carry out in study II, and a quasi-experimental design was used. Apart from random assignment, the design was the same as with an experimental design (Polit & Beck 2003).

This thesis is part of a research project with the aim of assessing and describing nutritional status, of identifying factors associated with nutritional issues and of investigating the effects of individualised nutritional care, in elderly people newly admitted to resident homes in Sweden. The project has been ongoing since 1996 in a municipality in the southern part of Sweden (Christensson et al 1999), with mainly rural work and industries.

When the research project started in 1996, approximately 27,500 people lived in the municipality. Four years later, the number was 26 600. Approximately half of the inhabitants in the municipality lived in the urban district. The municipality comprised a total of 14 resident homes, spread out over an area of 1500 km², where eight resident homes were involved in the project. In 1996, those eight resident homes comprised 334 beds, while the
number of beds in 2000 was 277. During the time period between the two cohort studies, palliative care given to residents in the final stage of life was established, as well as, short-term stays being introduced.

Participants

Residents, 65 years or older, newly admitted to eight resident homes in the municipality described above were consecutively included. Exclusion criteria were terminal stage, malignant diseases and kidney and liver diseases. From October 2000 to April 2002, 134 residents entered the resident homes involved. Of these residents, six did not wish to participate and one died unexpectedly before the examination was performed. One hundred and twenty-seven residents were included (I, II, III). Fifteen residents included in the interview study were recruited from this group (IV).

Study I. The participants were recruited from 208 residents included in a previous study carried out from October 1996 to October 1997 (cohort 1), and from the group of 127 residents included from October 2000 to April 2002 (cohort 2). Both cohorts were obtained from the same municipality, with the same resident homes and the same definitions of malnutrition. The same inclusion and exclusion criteria were used in both cohorts. The previous cohort study, however, had also included residents admitted to service buildings. When comparing the two cohorts in this thesis, these residents were excluded in order to make the cohorts comparable. In cohort 2, fewer residents were admitted to the resident homes during the 12 months, and consequently fewer were included as compared with cohort 1. To increase the number of residents, the study continued for another six months.

Study II. Three and five resident homes involved constituted the experimental and control units, respectively. The experimental and the control units included 135 and 142 accommodation places, respectively, and were similar regarding workload, type of nursing care, nursing competence and number of staff. Sixty-eight residents entered the experimental and 59 the control unit. Each of the residents was in the study for a four month period. During the study period, five residents died and one dropped out because of newly diagnosed malignant disease, in each group. In the experimental group, 62 residents (20 men, 42 women) completed the study. The corresponding number of residents in the control group was
53 (14 men, 39 women). In order to test the hypothesis adequately, a power calculation based on body weight was performed. The calculation was based on the results from an earlier study, where the same inclusion and exclusion criteria were used to assess nutritional status. The calculation showed that 20 residents would be sufficient in each group for showing statistically significant differences regarding body weight. Since the aim also was to investigate functional capacity, the number was increased to 50 in each group.

**Study III.** In three of the resident homes involved, called A, B and C, parallel identical nutritional assessments were performed by the researcher and registered nurses (RN), employed in those resident homes. Two RNs were employed in resident home A, one in B and one in C. The RNs’ burden of work, was judged to be equal, since the RNs in resident home A also had responsibility for accommodation places not included in this study. Resident homes A, B and C contained in the indicated order, 36, 49 and 50 accommodations. Fourteen residents were admitted to resident home A, and 22 and 32 to resident homes B and C, respectively.

**Study IV.** Sixteen residents were recruited from the group of 127 newly admitted residents. They were asked to take part in the study after they had finished the four month study period in study III. Fifteen accepted and one refused, due to lack of interest. The residents were also selected regarding gender, body shape, earlier work, marital status, dental status and ability to walk. The interviews were carried out from February 2002 to July 2002 and took part in the residents’ normal settings, at the resident homes.

**Basal characteristics**

During the two first weeks after admission, the residents or a next of kin, answered questions regarding the type of dwellings the residents moved from (I), and details of medical diagnosis and prescription medications were obtained from the residents’ medical records (I,II). Medical diseases were classified according to the International Classification of Diseases (ICD-9), and prescriptions according to the Anatomical Therapeutic Chemical Classification system (ATC).
All residents were assessed on three occasions: Upon admission (I - III), after two (II), and after four months (II). Upon admission, residents were assessed during their two first weeks and the assessment included the following procedure: It started with anthropometric measures (I, II), and with MNA (I, III). Functional capacity (II) and overall cognitive function (I, II) were assessed. Finally biochemical measurements were collected (I, II). Two months after admission, anthropometric and biochemical measurements were carried out (II). Four months after admission, the same assessment procedure as on admission was carried out (II). When the assessment procedure had been completed after four months, 15 residents were interviewed (IV).

**Objective nutritional assessments (I, II)**

In order to classify the residents as either PEM or non-PEM, body weight, height, mid-arm circumference (MAC), triceps skinfold thickness (TSF), arm muscle circumference (AMC), serum albumin and transthyretin, were used (Table 1).

### Table 1. Criteria used to determine protein- energy malnourishment (PEM). A resident was classified as being PEM if two or more of the nutritional variables were subnormal, including at least one anthropometric and one biochemical measurement.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthropometry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WI</td>
<td>&lt; 80 %</td>
<td>&lt; 80 %</td>
</tr>
<tr>
<td>TSF</td>
<td>≤ 6 mm</td>
<td>≤ 12 mm</td>
</tr>
<tr>
<td>AMC</td>
<td>≤ 79 years</td>
<td>≤ 23 cm</td>
</tr>
<tr>
<td></td>
<td>&gt; 79 years</td>
<td>≤ 21 cm</td>
</tr>
<tr>
<td>Albumin</td>
<td>&lt; 36 g/l</td>
<td>&lt; 36 g/l</td>
</tr>
<tr>
<td>Transthyretin</td>
<td>&lt; 0.23 g/l</td>
<td>&lt; 0.23 g/l</td>
</tr>
</tbody>
</table>

**Table 1:** WI = Weight Index; TSF = triceps skinfold thickness; AMC = arm muscle circumference
Height was estimated with the resident in a supine position on a flat bed. It was measured to the nearest cm, using a measuring instrument with a fixed foot plate and an adjustable head plate. Each resident’s body weight was measured to the nearest 0.1 kg by a mechanical balance chair. Weight index (WI), in percent, was calculated from actual weight on admission divided by the reference weight and multiplied by 100. The reference weight was calculated to be 0.80 x height (cm) - 62.0 (kg) for men and for women 0.65 x height (cm) - 40.4 (kg) (Bengtsson et al 1981, Warnold & Lundgren 1984). According to Pearson’s correlation analysis, the correlation coefficient between WI and BMI was 0.99, and a WI of 80 % was equivalent to a BMI of approximately 20.0.

Mid-arm circumference was measured to the nearest 0.1 cm with a measuring-tape and TSF, to the nearest mm, with a Harpenden skinfold calliper at the midpoint of the upper arm between the process of acromion and olecranon (Symreng 1982). The mean of three measurements was used and the non-dominant arm was measured, unless the arm was paralysed or otherwise injured. Arm muscle circumference was calculated: AMC (cm) = MAC (cm) - 0.1 [π x TSF (mm)]. Serum albumin and transthyretin were measured, and local reference values were used. A resident was classified as having PEM if two or more of the nutritional variables were subnormal, including at least one anthropometric and one biochemical measurement (Symreng 1982, Unosson et al 1995, Christensson et al 1999).

In order to obtain information about possible infections, which have been seen to decrease serum albumin (Kalender et al 2002) and transthyretin levels (Ingenbleek & Young 2002), C-reactive protein (CRP) was measured. C-reactive values below 10 were defined as normal, according to local reference values, and were not specified.

**Mini Nutritional Assessment (MNA) (I- III)**

The anthropometric area of MNA consists of BMI, MAC, calf circumference, and weight loss during the last three months. Information about weight loss was collected from the residents, and from the residents’ record. The general area assessments (questions related to living, medical use, physical and mental status, and mobility) and the dietary area assessments (questions related to dietary intake and eating problems) were collected from the residents, and from the residents’ records. If necessary, a next of kin, or a member of the staff who knew
the resident well, answered the questions. The self assessment questions (one question on nutritional status and one on health) were collected from the residents. If the resident was not able to answer the questions, he/she received the score for ‘is uncertain of nutritional state’ and ‘does not know’ about his/her health.

To assist in judgement to complete the MNA form accurately and consistency, a user guide has been developed (MNA 2006). In the user guide, each question in the MNA is explained in turn and the scoring described. The six MNA items mobility, having suffered psychological stress or acute disease in the past three months, having neuropsychological problems, having pressure sores or skin ulcers, the amount of fluid consumed per day, and mode of feeding, were dichotomised into yes or no (I). In mobility, the resident was assessed as having inability to walk if the resident not could get out of bed/chair. Psychological stress could arise in connection with losing a spouse, or when one of the couple was in need of acute hospital care, leaving the partner in municipal care. Cardiac and cerebrovascular diseases, recovering from surgery and pneumonia, were examples of acute diseases. The following conditions led to the residents being assessed as having neuropsychological problems: Mild to severe dementia, state of depression or confusion. The resident was scored as having pressure sores or skin ulceration after verifying. The amount of fluid consumed per day was assessed as insufficient if it was less than six cups. In mode of feeding, the resident was assessed as in need of help during meals if the resident was not able to manage eating independently. Help during meals ranged from e.g. help with buttering a slice of bread, to complete assisted feeding, where the resident did not participate at all during meal. The maximum MNA score is 30 points and the sum classifies the residents in the following manner: Well-nourished ≥ 24 points (MNA 1); at risk of malnutrition, 23.5 to 17 points (MNA 2); malnourished, < 17 points (MNA 3) (Guigoz et al 1999, 2002).

Assessment of functional capacity (I, II)

In order to assess the residents’ functional capacity, the Activity Index (Hamrin & Wohlin 1982) was used. The Activity Index was developed to evaluate functional capacity in stroke patients and consists of 16 variables. The total activity index score ranges from 16, reflecting poor functional capacity, to 92 reflecting normal functional capacity. It is divided into the three parts mental capacity, motor activity and ADL (activity of daily living) function. Part
one, mental capacity includes four items and comprises degree of consciousness, orientation, communication, and psychological activity (4-32 points). The second part is motor activity, which includes six items and comprises motor activity in left and right arm and leg (6-24 points). Part three, ADL function includes six items comprising ambulation, personal hygiene, dressing, feeding, and emptying/function of bladder and bowel (6-36 points). The aim of the Activity Index is to score what the resident can do, which means his/her maximum performance. The tool has been validated in Sweden by Lindmark & Hamrin (1988), and in the United States by Chong (1995). It has been used in several Swedish studies (Lindmark 1988, Elmståhl et al 1996, Christensson et al 2001).

Assessment of overall cognitive function (I, II)

In order to screen for overall cognitive function, the Mini Mental State Examination (MMSE) was used. It is a brief screening tool developed by Folstein et al (1975), and attempts to quantify the individual’s orientation, short-term memory, attention, language, comprehension, writing and a visual task. Mini mental state examination has often been used, both internationally (deSilva & Gunatilake 2002, Tognoni et al 2005) and nationally (Aevarsson & Skoog 2000). The test takes approximately 5-10 min, but can take longer with those who are mildly impaired or who have auditory and/or communication difficulties.

The maximum and best score of the tool is 30 points. In the original paper (Folstein et al 1975), 20 points or less were the cut off score in order to be classified as having cognitive impairment. The authors have subsequently recommended different cut off scores, since cognitive ability varies in the population due to age and educational level (Crum et al 1993). Different cut off scores have also been used for classifying individuals as either cognitively intact, moderately impaired, or demented (Beck et al 2001). In studies I and II, 20 points or less were considered as representing cognitive impairment. Seven residents, out of 127, were not tested according to MMSE, because of aphasia in six residents and unwillingness to participate in one resident.
Nutritional programme (II, III)

The intervention comprised education and instructions regarding an individualised nutritional programme, and was carried out in resident homes A, B and C (II). Registered nurses (RNs) and nurse aids (NAs) attended an educational programme, especially developed for this study and which was divided into three steps. First, all staff received information about the study and the individualised nutritional programme. Every single staff member received the book "Food and dietary management in elderly people - Problems and opportunities" in Swedish (The Swedish National Food Administration 1998) (II, III).

Second, all RNs (n = 4) and NAs, with tasks of acting as dietary ombudsmen (NAO) (n = 3), were trained how to manage study circles. Both RNs and NAOs were taught how to identify individual needs and underlying causes of nutritional problems, how medications might affect appetite and eating, and how to structure nutritional documentation (II). The RNs were taught how to assess nutritional status by using the two-step MNA and to use the guide of the MNA form (Guigoz et al 1999, 2002) (III). They were also taught how to calculate energy requirements, based on estimated metabolic rate (BMR), using the equation given by the Nordic Nutrition Recommendation (1996) (II).

Third, education was given to the NAs. This was organized as study circles, with a RN or a NAO as leaders. Each study circle included 8-10 members of staff. On five afternoons during three months, each study circle had meetings directed by a study guide prepared by Christensson et al (2001). The study guide focused on issues regarding nutritional problems in elderly people, with the aim of stimulating the NAs to scrutinize how they could improve the nutritional care in their daily nutritional arrangements, as well as improving their knowledge. The NAs were taught how to use a ‘dietary plan’, which had previously been developed and used by Christensson et al (2001) and how to document in a food record. The meals in the ‘dietary plan’ covered every meal every day during a 10-week period, and were presented at three base levels: 5500, 7200 and 9000 kJ. Giving service at the right level was made possible by the meals being described in domestic terms, e.g. a small or normal slice of bread, a small or middle-sized potato, deciliter of soup or peas. The three base levels were based on the residents’ calculated energy requirements. No upper limit was set. The aim was to use the ‘dietary plan’ in residents with nutritional problems. A simplified food record, based on the
dietary plan’, was used in order to evaluate the residents’ daily intakes. In the control group, all residents received routine care (II).

The individualized nutritional programme was conducted on the basis of the residents’ habits, desires, resources and problems, as well as how the residents managed their meals before admission. Information was obtained from the residents, or their next of kin, as well as from the residents’ records, concerning diseases and medical treatments that might influence food intake. The staff scrutinized how they could improve the residents’ food intake, and investigated how they could avoid phenomena interfering with the residents eating, such as disturbing events in the eating environment. In some cases, an occupational therapist, or a physiotherapist, or the resident’s general practitioner or dentist was consulted. During the intervention period, successful and unsuccessful events during meals were recorded, including aids used and the techniques used for assisted feeding, as well as complications, such as nausea and diarrhoea. When the residents did not reach calculated daily energy intake, according to the food record, supplements were added, such as sandwiches, soups, snacks, and/or enriched drinks.

Education was given to the staff and, in cases where residents were identified as at risk of malnutrition, including that measured by the MNA consisting of two parts, implementation of individualized nutritional care was also implemented. Those residents who were not identified as at risk of malnutrition, or malnutrition by the MNA, received no individualised nutritional care, but it is noteworthy that they received benefit of the education given to the staff.

**Interview study (IV)**

In order to investigate how the residents viewed their appetite and what affects their appetite, an interview study was carried out, which had to be performed in a trustworthy way. It included paying attention to credibility by respecting the residents’ desires, conditions and what they really wanted to say. It also included assuring dependability by strict adherence to grounded theory methodology. Transferability was attained through making comparisons with the result of other research studies (Lincoln & Guba 1985).
Data were collected by interviews according to grounded theory, since the aim was to identify and describe factors of importance with regard to appetite among the residents. The primary purpose of the grounded theory approach is to generate comprehensive explanations of a phenomenon, such as appetite, that are grounded in reality. It is an inductive research method developed by two sociologists, Glaser and Strauss (1967), in the 1960s and has its roots in symbolic interactionism. This means that individuals believe and interact based on how they give meaning to and interpret specific symbols in their lives, such as food and eating or verbal and non-verbal expressions (Glaser & Strauss 1967). The authors have then developed the method in two different ways. The method according to Glaser is the traditional method, while the method according to Strauss has been developed to involve conceptual description (Stern 1994). In this interview study, the grounded theory according to Glaser has been used (Glaser 1978, 1998), since the aim of the study required paying attention to data and to allowing the data to tell its own story (Stern 1994).

The participants in study IV were chosen, one by one, when they were needed for their theoretical relevance for the area studied, so called theoretical sampling. Residents with 23 points or more according to MMSE were considered to have the cognitive ability to understand what it would mean to participate in the interview study. The sampling process continued until saturation was attained, which occurred when new data did not yield any new information. Consequently, the sample size could not be known until saturation was reached and the sample process was ended (Glaser 1978, 1998). Saturation was reached after 10 interviews, but 15 interviews were performed. The five last interviews were valuable because they confirmed the previous interviews.

The interviews were performed in the form of a conversation with two guiding questions: a) How do you view your appetite? b) What affects your appetite? The interviews varied in length from 10 to 45 minutes, because of what raised during the conversation. All interviews were tape-recorded and transcribed verbatim.

Statistics (I-III)

The results are described using frequencies or percentages, arithmetic means and standard deviations (I-III), and as medians and inter quartile ranges (II, III). Differences between
independent groups were determined by using student’s t-test (I-III), one way ANOVA (II),
chi-square test (I-III), Mann Whitney U-test (III), and Kruskal Wallis test (II). In order to
analyse differences within groups, paired t-test (III) and ANOVA for repeated measures (III),
Wilcoxon’s signet rank test (III), and McNemar’s test (III), were used. When determining
means between subgroups for repeated measures, MANOVA was employed (III).

Multiple logistic regression forward stepwise analysis (WALD) was used to estimate the
MNA items’ association with being classified as PEM, where all MNA items and their
weighted scores constituted independent variables (I). Internal consistency of the MNA items
was evaluated by using Cronbach’s alpha (III). The MNA classes were dichotomised into well
nourished (MNA 1) or at risk of malnutrition and malnourished (MNA 2 and 3) (I, III).
Sensitivity, specificity and diagnostic predictivity, regarding the dichotomised MNA
classification towards PEM/non-PEM (I), as well as MNA-SF towards the dichotomised
MNA classification, were estimated (III). Inter-rater reliability of the MNA tool was tested
regarding parallel assessments performed by the researcher and the RNs by using kappa
agreement test (strength of agreement: < 0.20, poor; 0.21-0.40, fair; 0.41-0.60, moderate;
0.61-0.80, good; 0.81-1.00, very good) (Altman 1991) (III).

Spearman’s rank correlation analysis was used in order to test the correlation coefficient
between the dichotomised MMSE and the item neuropsychological problems in MNA (I), and
the correlation between each of the MNA items toward the item total of MNA (item
calculated excluded) (III). Differences were considered statistical significant at a p-value
below 0.05 (I-III). The statistical programme SPSS ®, versions 11.5 (I, II) and 13.0 (III) were
used.

**Analysis of qualitative data (IV)**

The data analysis of the interviews in study IV was carried out on three levels. At the first
level, all data was fractured into different incidents, with the intention of finding as many
substantive codes as possible (e.g. happiness, integrity, tiredness, favourite dish, and
arguments). These codes described factors affecting the appetite positively or negatively. The
second level involved comparisons between the codes, in order to find similarities between
them and to create categories. Codes reflecting the same thing, but from different directions,
were compiled into the same category (e.g. independence and resignation in the category “personal values”). Six different categories were compiled by this procedure. At the third level, the intention was to find general patterns and features, which could link categories and codes together and explain what was going on in data (Glaser 1978, 1998). Through this method of analysis, the core category “the willingness to eat” emerged from the categories.

Levels two and three involved an increasing level of the abstract levels of the data analysis (Hutchinson 1986). During the data collection procedure, newly collected data were compared in an ongoing process with data obtained earlier, in order to refine theoretically relevant categories. Data were read several times in order to verify their fit, work and relevance (Glaser 1978, 1998). During the whole analysis process, theoretical ideas emerged about the codes, categories and their relationship. These ideas were written down as memos, and were included in the analysis. In that way, data analysis involved interplay between deductive memos and inductive data components (Hutchinson 1986). The analysis was performed mainly by the researcher, but all steps in the analysis process were discussed with the co-author of the study.

**Ethical considerations**

The ethical principles of this thesis are based on the principles of autonomy (the residents’ right to self-determination), beneficence (doing only those things that are of benefit to the residents), non-malfeasance (avoiding harm) and justice (equal care for all) (Swedish Research Council 2003). Autonomy was achieved by obtaining informed consent from the residents, after they had received verbal and written information about the aims of the studies. They were informed that participation was voluntary, that they could discontinue participation whenever they wanted without giving any explanation, and how data would be used. For those residents with cognitive dysfunctions, the next of kin were also informed, and their informed consent was obtained. The principle of beneficence was obtained through knowledge of how to improve nutritional and functional status in the frail and vulnerable residents by using the nutritional intervention programme, by obtaining knowledge about nutritional assessments, as well as receiving a deeper understanding what affects the residents’ appetite. Non-malfeasance was reached by respecting the residents’ wishes and by
minimising alteration of their life situation as much as possible, as well as not exposing them to unnecessary stress. Therefore, residents were at first hand admitted to resident homes in the neighbourhood. Justice was obtained by not excluding residents with cognitive dysfunctions, since it is important to receive knowledge about the residents as a whole. The thesis was approved by the Research Ethics Committee, Faculty of Health Sciences, Linköping University (Registration numbers 96-205, 00-243).

RESULTS

Characteristics of residents in cohort 2 upon admission

The sample comprised 127 residents admitted from October 2000 to April 2002, to resident homes. The age of the residents varied from 70 to 98 years, with a median age of 85 years. Eighty-seven residents (68 %) were women. The most common diseases among the residents were dementia, cerebrovascular disease and symptomatic heart failure. Each of these three diseases was present in 33, 33, and 32 %, respectively, of the residents. In men, symptomatic heart failure was statistically significant more common than it was in women (Table 2). Other diseases among the residents were diabetes mellitus (16 %) and ischaemic heart failure (13 %). Some residents had more than one of the diseases.

The median number of prescription medications was, for both men and women, six, with a variation in women from zero to 18, and in men from one to nine. The majority of those on medications, among both men and women, were taking them for the nervous system, the circulatory system, and the blood and blood-producing organs. Less than half of the residents were on medication affecting digestion. The residents were admitted from another resident home, their own homes and from short-term stay. Fifty-three per cent of the women and 47 % of the men were admitted from their own homes (Table 2). In the interview study, three residents were men and 12 were women. The median age of these residents was 89 years, with the youngest being 79, and the oldest 95.
Table 2. Characteristics of residents in cohort 2 (n = 127) at the time of entering resident homes. Disease and prescription are mainly more than one in each resident.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Women n = 87</th>
<th>Men n = 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Another resident home: %</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Own home: %</td>
<td>53</td>
<td>47</td>
</tr>
<tr>
<td>Short-term stay: %</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>Disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dementia: %</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>Cerebrovascular: %</td>
<td>29</td>
<td>42</td>
</tr>
<tr>
<td>Symptomatic heart failure: %</td>
<td>24</td>
<td>50 **</td>
</tr>
<tr>
<td>Diabetes mellitus: %</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Ischaemic heart failure: %</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Prescription medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nervous system: %</td>
<td>85</td>
<td>75</td>
</tr>
<tr>
<td>Circulatory system: %</td>
<td>64</td>
<td>67</td>
</tr>
<tr>
<td>Blood and blood-producing organs: %</td>
<td>62</td>
<td>72</td>
</tr>
<tr>
<td>Digestive organs and metabolism: %</td>
<td>42</td>
<td>30</td>
</tr>
</tbody>
</table>

** p < 0.01; Mann Whitney U-test

According to the objective assessment of nutritional status, 32 % of the residents were classified as being PEM (11 men, 30 women) (I, II). The highest frequency was seen among residents admitted from short-term stay, where 10 residents (38 %) were classified as PEM. In residents admitted from another resident home or from their own homes, the number was 12 (33 %) and 19 (29 %), respectively (I). In PEM-residents, the CRP median value was 0.0 (0.0 - 16.5), and it was 0.0 (0.0 - 19.2) in non-PEM residents (ns) (II).

According to MNA, 38 of the residents (30 %) were classified as well nourished (MNA 1), 64 (50 %) were as at risk of malnutrition (MNA 2) and 25 (20 %) were classified as being malnourished (MNA 3) (I, III). No difference was seen regarding residents admitted from another resident home, their own homes or short-term stay, according to chi-square test (p = 0.9) (I).

The overall cognitive function according to MMSE in the residents (n = 120) showed a median value of 16 (0-22). Two residents scored at most 30 points. Eighty-three residents scored 20 points or less, according to MMSE and were thus assessed to be cognitively
impaired (I, II). Residents admitted from their own homes had statistically significant better overall cognitive function, as well as mental capacity, ADL function, and total activity score, as compared with those who were admitted from another resident home and from short-term stay (Table 3). No differences were seen between men and women.

Table 3. Characteristics of overall cognitive function and functional capacity in residents in cohort 2, admitted from another resident home (n = 65), own home (n = 36) and short-term stay (n = 26) at the time of entering resident homes. Each value is given as the median (inter quartile range).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Admitted from Another Resident Home</th>
<th>Own home</th>
<th>Short-term Stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall cognitive function</td>
<td>MMS 13 (0-19)</td>
<td>20 (6-24) *</td>
<td>17 (5-22) *</td>
</tr>
<tr>
<td>Functional capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental capacity</td>
<td>27 (19-29)</td>
<td>29 (27-32) *</td>
<td>27 (23-32)</td>
</tr>
<tr>
<td>Motor activity</td>
<td>22 (18-24)</td>
<td>24 (20-24)</td>
<td>20 (19-24)</td>
</tr>
<tr>
<td>ADL function</td>
<td>24 (17-32)</td>
<td>28 (22-26) *</td>
<td>24 (18-28)</td>
</tr>
<tr>
<td>Total activity score</td>
<td>71 (55-82)</td>
<td>81 (70-88) *</td>
<td>74 (60-80)</td>
</tr>
</tbody>
</table>

* p < 0.05; Kruskal-Wallis test; 1 = three missing values, 2 = one missing value, 3 = three missing values

Comparison between cohorts 1 and 2 (I)

In cohort 1, 208 residents were included during a 12 month period, while in cohort 2, 127 residents were included during an 18 month period. During the interval between the two cohort studies, the number of accommodation places in the resident homes involved decreased by 57. In cohort 1, 38 % of newly admitted residents were classified as PEM, as compared with 32 % in cohort 2. The median ages in cohorts 1 and 2, were 84 and 85 years, respectively.

Forty-seven per cent of the residents in cohort 1 were admitted from their own homes. In cohort 2, 51 % of the residents entered resident homes from another resident home. None of
the residents in cohort 1 was admitted from short-term stay, and none of the residents in cohort 2 was admitted from hospital care (Table 4). The highest frequency of PEM in cohorts 1 and 2 was seen in residents admitted from hospital care (42 %) and from short-term stay (38 %), respectively.

In cohort 1, dementia disease, symptomatic heart failure, cerebrovascular disease, diabetes mellitus, and ischaemic heart failure were present in 22 %, 21 %, 20 %, 19 % and 19 % of the residents (n = 208), respectively, as compared to cohort 2, where the above mentioned diseases were present in 33% (p < 0.05), 32 % (p < 0.01), 33 % (p < 0.05), 16 % (ns) and 13 % (ns), respectively, of the residents (n = 127). Some of the residents in both cohorts had more than one disease.

According to MNA items, the presence of neuropsychological problems among newly admitted residents, increased statistically significant from cohort 1 to cohort 2. Other differences seen were that less residents in cohort 2 had been exposed to stress or acute disease in the previous three months, and more were able to walk, as compared with the residents in cohort 1 (Table 4).

Table 4. Comparison of type of dwelling/stay before admission and Mini Nutritional Assessment (MNA) items in residents in cohorts 1 (n = 208) and 2 (n = 127).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cohort 1</th>
<th>Cohort 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of dwelling/stay before admission (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Another resident home: %</td>
<td>28</td>
<td>51 ***</td>
</tr>
<tr>
<td>Own home: %</td>
<td>47</td>
<td>28 ***</td>
</tr>
<tr>
<td>Short-term stay: %</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>Hospital care: %</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>MNA-items (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinks less than 6 cups of fluid/day: %</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Need of help during meals: %</td>
<td>44</td>
<td>36</td>
</tr>
<tr>
<td>Neuropsychological problems: %</td>
<td>45</td>
<td>65 ***</td>
</tr>
<tr>
<td>Inability to walk %</td>
<td>35</td>
<td>23 *</td>
</tr>
<tr>
<td>Stress or acute disease %</td>
<td>41</td>
<td>23 **</td>
</tr>
<tr>
<td>Skin ulceration %</td>
<td>25</td>
<td>24</td>
</tr>
</tbody>
</table>

(1) = Chi-square test between cohorts 1 and 2; (2) = Mann Whitney U-test between cohorts 1 and 2; * p < 0.05, ** p < 0.01, *** p < 0.001
**Intervention (II)**

Upon admission, after two, and after four months, the anthropometric mean values within those residents (n = 62) in the experimental group, who completed the study period were: WI, 94.8 ± 15.5, 96.1 ± 15.4, and 97.2 ± 15.2 (p < 0.01); TSF, 12.4 ± 5.0, 13.0 ± 5.4, and 13.1 ± 5.3 (p < 0.01); and AMC, 23.2 ± 2.9, 23.3 ± 2.6, and 23.6 ± 2.8 (ns). The corresponding figures within the residents (n = 53) in the control group, who completed the study period were: WI, 92.0 ± 14.8, 93.0 ± 14.6, and 93.9 ± 14.7 (p < 0.05); TSF, 11.2 ± 5.4, 11.9 ± 5.3, and 12.1 ± 5.6 (ns); AMC, 22.6 ± 2.5, 22.7 ± 2.4, and 22.9 ± 2.3 (p < 0.05). Between group analysis showed no statistically significant differences between the experimental and the control groups, for any of the anthropometric variables.

The biochemical mean values on admission, after two, and after four months, within the experimental group (n = 62) were: Albumin/s, 37.1 ± 5.0, 37.6 ± 3.9, and 38.1 ± 3.9 (ns); transthyretin/s, 0.22 ± 0.07, 0.23 ± 0.07, and 0.23 ± 0.06 (ns). Within the control group (n = 53) the corresponding figures were: Albumin/s, 37.2 ± 4.0, 37.3 ± 3.9, and 37.4 ± 3.8 (ns); transthyretin/s, 0.23 ± 0.05, 0.23 ± 0.04, and 0.24 ± 0.06 (ns). Between group analysis showed no statistically significant differences between the experimental and the control groups, for any of the biochemical variables.

Upon admission, 32 % of the residents in the experimental (n = 62) and in the control group (n = 53) were classified as being PEM. During the four month study period, the presence of PEM decreased statistically significant in the experimental, but not in the control group (Table 5).

<table>
<thead>
<tr>
<th>On admission</th>
<th>After four months</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Experimental group</strong></td>
<td>20 (32)</td>
<td>7 (11)</td>
</tr>
<tr>
<td><strong>Control group</strong></td>
<td>17 (32)</td>
<td>11 (21)</td>
</tr>
</tbody>
</table>

**Table 5.** Residents in cohort 2 (n = 127) assessed as PEM on admission to municipal resident homes and after four months, in an experimental (n = 62) and a control group (n = 53).
Within the experimental group, the mean body weight (kg) on admission, after two, and after four months, was 61.4 ± 10.3, 62.1 ± 10.2, and 62.8 ± 9.7 (p < 0.001), respectively. The corresponding figures within the control group were 59.5 ± 11.4, 60.0 ± 11.5, and 60.7 ± 11.7 (p < 0.001), respectively.

Among those 62 residents in the experimental unit, who completed the four months study period, the RNs carried out the two-step MNA procedure in 42 residents. Reasons for the RNs not carrying out the two-step MNA procedure in all the residents were forgetfulness and absence due to illness, according to the RNs’ verbal explanations. Out of those 42 residents, who were assessed by the RNs, 17 were included in the individualized nutritional programme. In these residents, energy requirement was predicted, individualised actions toward eating problems were implemented and registration of food intake was carried out. Within the group of 17 residents, the anthropometric and the biochemical values on admission, after two, and after four months, were: WI, 84.8 ± 16.6, 86.7 ± 17.0, and 89.0 ± 16.6 (p < 0.01); TSF, 10.8 ± 4.7, 11.7 ± 5.2, and 11.5 ± 4.9 (ns); and AMC, 21.9 ± 2.5, 21.5 ± 1.6, and 21.7 ± 1.9 (ns); albumin/s, 35.7 ± 5.4, 36.5 ± 4.2, and 37.9 ± 4.5 (ns); transthyretin/s, 0.21 ± 0.07, 0.24 ± 0.07, and 0.23 ± 0.02 (ns). In these 17 residents, mean body weight (kg) on admission, after two, and after four months was 55.5 ± 9.0, 56.6 ± 9.5 and 57.8 ± 8.8 (ns), respectively.

From admission to four month later, the residents in the experimental group (n = 62) improved statistically significant regarding motor activity and MMSE, according to within group tests. During the same period, motor activity decreased in the control group (n = 53) (Table 6). Between the experimental and the control groups, statistically significant differences were seen on admission in mental capacity, ADL function, and total activity score. After four months, statistically significant differences were seen between the two groups in mental capacity, motor activity, ADL function, total activity score, and MMSE (Table 6).

In those 17 residents in the experimental unit, who were included in the individualized nutritional programme, the median values regarding activity capacity, on admission and after four months, respectively, were: mental capacity, 27 (21-28) and 24 (21-28); motor activity, 19 (14-24) and 22 (16-24); ADL, 26 (16-29) and 21 (14-30); total activity score 71 (51-82) and 71 (51-80); and MMSE 14 (0-18) and 11 (0-20). Within group tests showed no statistically significant differences in any of the variables.
Table 6. Total activity score (Activity Index, AI) and overall cognitive function (Mini Mental State Examination, MMSE), on admission and after four months, in residents in cohort 2 (n = 127), newly admitted to municipal resident homes, in an experimental and a control group. A higher score indicates a higher activity capacity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Admission</th>
<th>After four months</th>
<th>Wilcoxon rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Md (IQR)</td>
<td>Md (IQR)</td>
<td>p-value</td>
</tr>
<tr>
<td><strong>Experimental group (n = 62)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional capacity (AI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental capacity (4-32)</td>
<td>28 (24-30)</td>
<td>28 (25-30)</td>
<td>0.219</td>
</tr>
<tr>
<td>Motor activity (6-24)</td>
<td>23 (18-24)</td>
<td>24 (19-24)</td>
<td>0.006</td>
</tr>
<tr>
<td>ADL (6-36)</td>
<td>27 (22-34)</td>
<td>29 (22-36)</td>
<td>0.583</td>
</tr>
<tr>
<td>Total activity score (16-92)</td>
<td>79 (68-86)</td>
<td>79 (69-88)</td>
<td>0.052</td>
</tr>
<tr>
<td>Overall cognitive function MMSE (0-30)</td>
<td>17 (6-22)</td>
<td>19 (6-24)</td>
<td>0.021</td>
</tr>
<tr>
<td><strong>Control group (n = 53)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional capacity (AI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental capacity (4-32)</td>
<td>27 (18-28) *</td>
<td>27 (18-30) *</td>
<td>0.113</td>
</tr>
<tr>
<td>Motor activity (6-24)</td>
<td>22 (19-24)</td>
<td>20 (17-24) *</td>
<td>0.025</td>
</tr>
<tr>
<td>ADL (6-36)</td>
<td>23 (16-28) **</td>
<td>24 (16-32) *</td>
<td>0.264</td>
</tr>
<tr>
<td>Total activity score (16-92)</td>
<td>72 (55-79) *</td>
<td>70 (53-83) *</td>
<td>0.607</td>
</tr>
<tr>
<td>Overall cognitive function MMSE (0-30)</td>
<td>12 (0-21)</td>
<td>11 (0-21) *</td>
<td>0.990</td>
</tr>
</tbody>
</table>

* p < 0.05, ** p < 0.01; Mann Whitney U-test, between the experimental and the control groups on admission and after four months; ¹ = four missing values, ² = two missing values

Test of MNA (I, III)

In those 41 residents classified as PEM, 30 were simultaneously classified as MNA 2 or MNA 3, implying a sensitivity of 73 % (a/[a+c]). Eighty-six residents were classified as non-PEM, of whom 27 were classified as MNA 1. Specificity was 31 % (d/[b+d]) and diagnostic predictivity was 33 % (a/[a+b]) (I) (Table 7).
Table 7. The relation between PEM/non-PEM and MNA classification after dichotomisation (well nourished: MNA 1, at risk of malnutrition or malnourished: MNA 2 and 3), in the residents in cohort 2 (n = 127).

<table>
<thead>
<tr>
<th>MNA classification</th>
<th>PEM n</th>
<th>non-PEM n</th>
<th>Total n</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNA 2 and 3</td>
<td>30 (a)</td>
<td>59 (b)</td>
<td>89 (a+b)</td>
</tr>
<tr>
<td>MNA 1</td>
<td>11 (c)</td>
<td>27 (d)</td>
<td>38 (c+d)</td>
</tr>
<tr>
<td>Total</td>
<td>41 (a+c)</td>
<td>86 (b+d)</td>
<td>127 (a+b+c+d)</td>
</tr>
</tbody>
</table>

PEM = protein energy malnutrition; MNA = Mini Nutritional Assessment

The internal consistency of MNA in the residents was 0.68 according to Cronbach’s alpha (III). With regard to the two-step MNA procedure, 79 residents were simultaneously classified at risk of malnutrition by MNA-SF and at risk of malnutrition/malnourished by MNA. Thirty-one residents were classified as well nourished, in both assessment steps. This gives an agreement of 87 % between MNA-SF and MNA.

In 89 residents classified as at risk of malnutrition or malnourished by MNA, 79 were simultaneously classified as at risk of malnutrition by MNA-SF, implying a sensitivity of 89 %. Thirty-eight residents were classified as well nourished by MNA, of whom 31 were classified in the same way by MNA-SF, giving a specificity of 82 %. Diagnostic predictivity was 92 % (III).

After receiving education and training concerning how to use the two-step MNA procedure, the RNs in resident homes A, B and C carried out the assessment procedure on admission in 45 residents, out of 68. The agreement level between the RNs and the researcher MNA classification was 62 %, since 12 residents were simultaneously classified as well nourished, ten at risk of malnutrition, and six as malnourished, implying a kappa agreement level of 0.41. The RNs’ median MNA value in those 45 residents was, 24.0 (18.5 - 25.5), while the researcher’s corresponding figure in those residents was 22.5 (19.0 - 25.0). In those 23 residents, not assessed by the RNs, the researcher’s median value was 22.5 (19.5 - 26.0).
According to the researcher’s assessment, 33 residents were classified as at risk of malnutrition, while the RNs classified 13 residents in the same way. In resident home C, the RN classified four residents as at risk of malnutrition, as compared with 16 by the researcher. Out of 22 residents in resident home B, 13 were not assessed by the RN (Table 8).

Table 8. Classification by Mini Nutritional Assessment (MNA) in 68 residents in cohort 2, newly admitted to three municipal resident homes (A, B and C), performed by registered nurse (RN) and researcher (R). The registered nurse carried out MNA in 45 residents

<table>
<thead>
<tr>
<th>Resident home</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNA 1</td>
<td>0/0</td>
<td>2/10</td>
<td>22/15</td>
<td>24/25</td>
</tr>
<tr>
<td>MNA 2</td>
<td>3/8</td>
<td>6/9</td>
<td>4/16</td>
<td>13/33</td>
</tr>
<tr>
<td>MNA 3</td>
<td>6/6</td>
<td>1/3</td>
<td>1/1</td>
<td>8/10</td>
</tr>
<tr>
<td>Total</td>
<td>9/14</td>
<td>9/22</td>
<td>27/32</td>
<td>45/68</td>
</tr>
</tbody>
</table>

MNA 1 = well nourished; MNA 2 = risk of malnutrition; MNA 3 = malnourished

Interview study about appetite (IV)

The residents in this study described their appetite on a sliding scale, from good to poor, as well as how their appetite expressed itself through concrete descriptions of their eating patterns and how much they ate. They also viewed their appetite as their experiences of eating, such as enjoying eating or not liking food or eating. All the residents in this study described eating to be, to a great extent, an act of will, based on desire or uneasiness to eat. Sometimes they did not want to eat but forced themselves to do so and at other times they ate with restraint because they did not wish to eat too much. They strived to control their eating using their sense and conduct it with their will.

The willingness to eat is the theory as to what affects the appetite among the residents in this study. It contains internal as well as external factors. The internal factors are dependent on
mood and personal values. Mood was described as being dependent on inner feelings and associated with how the residents looked upon their life situation, where the character of every individual was of importance. They also described how emotion affects appetite, where joy and delight affected it positively, while anxiety and grief affected it negatively. Independence and integrity were personal values the residents believed had importance for their appetite. The ability to do things without assistance was important to them, as was pursuing their interests and maintaining their usual life style. They also said that it was important to be satisfied with living at the resident home and to have influence over their own lives.

The external factors are dependent on wholesomeness, food, eating environment and meal fellowship. Wholesomeness involves good health, which seems to benefit the appetite of the residents, in contrast to diseases and unpleasant symptoms. The residents described healthy diet and physical ability as being of great importance, as well as the desire to maintain their health. Their knowledge about what was healthy gave them the motivation to eat even when they had poor appetite. The residents described having an increased appetite when the food was well prepared and in line with their expectations, i.e. the right consistency and served fresh. They said their appetite increased when the food tasted good and it was a pleasure to eat. Eating environment, including external conditions and different sight-and sound-impressions, was a factor of importance for the appetite of the residents. They said they wanted to eat in dignified circumstances, to appreciate the food in the right way. They said that they liked eating in peace and quiet, which included eating without stress and in smaller groups. Meal fellowship included occasions when the residents met and socialised. All of them said with emphasis that it was of importance for them to eat together. Their appetites increased when they ate together and gladly with people they knew and most of all with relatives or close friends.

**DISCUSSION**

Newly admitted residents in this thesis formed a fragile group, many of them with a deteriorated nutritional status and functional capacity, which makes them to a relevant group for nutritional intervention. During the four years between cohorts 1 and 2, the number of
newly admitted residents classified as PEM did not decrease, despite the awareness of the problem.

After implementation of the nutritional programme, no statistically significant differences were seen between the experimental and the control groups for any specific nutritional variable. However, in the experimental group, the number of residents classified as PEM decreased statistically significant, but not in the control group. In the experimental group, statistically significant improvements were seen in motor activity and MMSE function during the intervention period, while in the control group, motor activity deteriorated statistically significantly. Despite education given to the RNs, they did not fulfill the instructions and assessed nutritional status in all residents, and consequently not all residents in need of nutritional attention received individual nutritional care.

When the nutritional programme was implemented, the course of actions suggested by ESPEN, was followed (Kondrup et al 2003) as were the Swedish guidelines for nursing care (SOSFS 1993:17). Due to the fact that nutritional problems in the residents are multi factorial, individual nutritional care is an appropriate strategy to fulfill their nutritional needs. This is confirmed by what emerged during the interview study, that the willingness to eat, which comprises mood, personal values, wholesomeness, food, eating environment and meal fellowship, is what affects appetite and eating in the residents.

**Basal characteristics in cohort 2**

Newly admitted residents were in this thesis very old, and the majority of them were women. Women in Sweden have a higher average length of life than men do (Statistics Sweden 2002), which could be the reason of a higher proportion of elderly women in need of help. The most common diseases and prescription medications were equal, except for symptomatic heart failure, which was twice as common in men as compared with women. Akner & Cederholm (2001) have shown that malnutrition in residents is often seen in connection with a variety of chronic diseases and in residents with several prescriptions. But even previously 'healthy' elderly people, e.g. those affected by hip fractures, have been observed to be malnourished (Bachrach-Lindström & Unosson 2000). In a study by Saletti et al (2005), approximately half
of home-living elderly people with support from the municipality were at risk of malnutrition or were malnourished.

Half of the residents in this study were admitted from another residential home and 28% from short-term stay. The reason why the residents moved from one resident home to another suggests a non-functioning living situation, such as changed conditions of the resident, or that the residents or their next of kin were dissatisfied with the residents’ previous living arrangements. This indicates that when some of the residents had to move into a resident home, their living arrangements were settled by the vacant place situation, and this was not always in accordance with the residents’ conditions and wishes.

Moving from one location to another has been described as a painful process for residents (Johnson-Tripp-Reimer 2001), resulting in decreased activity, insufficient food intake, and weight loss (Robertsson & Montagini 2004). The residents who had previously moved from one resident home to another had statistically significantly worse MMSE scores, mental capacity, ADL function, as well as total activity score, as compared with those who entered resident homes from their own homes. It was in the residents admitted from short-term stay and from another resident home that the highest (38%), and the second highest (33%), frequencies of PEM were seen. It is notable that one-third of residents admitted from another resident home were classified as being PEM, and there may be several explanations for this. Maybe the residents were already PEM when they moved into the previous resident home, and their nutritional status had not improved because of too short a time having elapsed. Another explanation might be that the residents had to move because they were in need of more advanced care due to deteriorated health status, accompanied by deteriorated nutritional status. It might also have been because the residents’ nutritional needs had not been observed and fulfilled by the staff in the previous resident home.

**Comparison between cohorts 1 and 2**

In cohorts 1 and 2, approximately one-third of the residents were classified as PEM, showing a similar prevalence as in other nursing homes studies during the last years (Lauque et al 2000, Beck & Ovesen 2002, Kofod & Birkemose 2004). During the inclusion year in cohort 1 (I), 82 more residents were admitted to resident homes as compared with cohort 2, even
though the cohort 2 study continued for another six months. Half of the residents in cohort 1, entered resident homes from their own home, and 25 % from hospital care, while in cohort 2, half of the residents were admitted from another resident home, and 20 % from short-term stay. The highest frequency of PEM in cohorts 1 and 2, were seen in residents admitted from hospital care and from short-term stay, respectively. This probably reflects the changes in the organization of elderly care in the municipality during the time between cohorts 1 and 2. The expansion of the home care service, fewer accommodation places, and the introduction of short-term stay are changes performed during the period. In short-term stay, the residents received further rehabilitation after hospital care, and consequently no residents in cohort 2 were admitted directly from hospital care.

The changes in the organization, seems also to have lead to changed patterns of admission criteria to resident homes. More residents in cohort 2 suffered from severe medical diseases and neuropsychological problems. At the same time fewer residents had suffered psychological stress or acute disease in the previous three months, and more were able to walk, as compared to cohort 1. It indicates that residents supported by home care service are able to manage physically, while when neuropsychological problems occur, they require institutional care. A shifting balance of long-term care is seen in Sweden according to Sundström et al (2002) to support elderly people within their own homes with help from family members, rather then in institutional settings. This trend is seen over the whole western world (McCormack 1997). If this trend continues in Sweden, there is a risk of insufficient number of accommodation places in the future. More people in Sweden are ageing (Aijanseppa et al 2005), simultaneously as health problems in old age have increased (Parker et al 2004). Many elderly people are also living alone (Carpenter et al 2004) with no support from family members (Sundström et al 2002). All together indicates an increased need of nursing care among elderly people in the future.

Intervention

In the experimental unit, actions toward malnutrition were implemented by given education to the staff, so they could identify residents in need of nutritional attention, make diagnosis, and give appropriate individually nutritional care based on ordinary food. To use ordinary food, with individually planned nutritional care, in order to improve nutritional status and functional

Even if there was no statistical significant difference seen in anthropometric and biochemical variables between the experimental and the control groups, there is a tendency seen that the intervention had effects. This is confirmed by a statistically significantly decreased number of residents classified as PEM in the experimental group, and statistically significant improved motor activity and overall cognitive function according to MMSE. In the control group, no improvements were seen, but motor activity deteriorated statistically significant, as well as the MMSE median score declined from 12 to 11 during the study period. Increased mobility in the residents in the experimental group, may explain why increased energy intake had moderately effect on the residents’ weight gain, which also has been seen in a study by Elmståhl et al (1987). According to the power calculation, based on body weight, 50 residents in each group were estimated to be sufficient for receiving statistical differences between the groups. Despite this, no statistically significant differences were seen when the two groups were compared, which may be explained by difficulties during the study period, insufficient number of residents in the study, or that the intervention period maybe was too short.

In those 23 residents, who were not assessed by the RNs, and in those 45 who were assessed, the researcher’s MNA assessment was the same (median value 22.5), which indicate that they did not differ with regard to the MNA assessments. Due to that, it is reasonable to suggest that if the RNs should have carried out the two-step MNA procedure in the remaining 23 residents, the assessments should have been similar as in those 45 residents, who were assessed by the RNs. Consequently more residents should have been included in the individually nutritional program, which might have affected the outcome of the intervention.

Despite the education given to the RNs about nutritional care and how to use the MNA, the RNs performed the two-step MNA assessment procedure in two-third of the residents. In resident home B, the RN carried out MNA in only nine residents out of 22 (41 %). The reason why the RNs not assessed all the residents was because of forgetfulness and absence due to illness, according to oral explanations by the RNs. It has been observed in another study that
the staff’s motivation and changes in the staff affected the study outcome (Wikby et al. 2003).
The reason why the RNs forget to follow the instructions given may be related to their
to attitudes toward nutritional problems in elderly people. Malnutrition has been observed as a
neglected problem in elderly people (Elmståhl et al. 1997) and to have low priority among
nurses and physicians (Rasmussen et al. 1999). Also time-consuming actions and lack of time
have been seen to be barriers to nutritional care (Crogan et al. 2001). To influence staff
attitudes towards nutritional nursing care is difficult, which Christensson et al. (2003) have
shown in a study of staff participating in an educational program.

Twelve residents in resident home C, were classified as at risk of malnutrition by the
researcher, but as well nourished by the RN. As the RN classified theses residents as well
nourished, they consequently did not receive individualized nutritional care. The differences
between the researcher and the RNs MNA classification in resident home C was maybe
because of the RN’s less experience to perform the two-step MNA procedure, as compared
with the researcher. In a hospital study, differences were seen in nutritional assessments
between an experienced and a less experienced observer (Ek et al. 1996). That study points out
that it is necessary to be well trained in order to manage assessment of nutritional status.

Other circumstances may also have affected the outcome of the intervention, such as
assimilating knowledge about the intervention in the control group, as it was not possible to
keep the resident homes isolated. Also the novelty effects and the knowledge of participating
in a study may have affected the behaviour of the staff, as well as, different nursing care in the
various resident homes could exert an important influence on the homogeneity of the result. It
may also depends on other circumstances affected the outcome of the intervention, such as the
complexity in elderly people.

Assessments

Since physical, psychological or social problems in elderly people usually tend to make them
vulnerable, this increases the risk of loss of appetite, insufficient dietary intake and by that
risk for developing malnutrition (Morley 2001, 2002). Malnutrition in turn has negative
influences on the total life situation by decreased functional status and psychosocial wellbeing
(Crogan & Pasvogel 2003). Nutritional status in elderly people may thus be seen as a marker,
pointing out the overall condition of the individual, and as important to assess by using standard geriatric assessment. In resident homes, a comprehensive geriatric assessment (Devons 2002) should be used on admission, and repeatedly when there are signs indicating problems.

In order to make comparison with the cohort 1 study (Christensson et al 1999), performed four years earlier in the same municipality, objective nutritional assessment classifying residents as either PEM or non-PEM, was used. C-reactive protein was measured to give information about possible infections and inflammations (Ingenbleek & Young 2002; Kalender et al 2002). Similar CRP values in PEM and non-PEM residents, indicates that the residents not were classified as being PEM because of ongoing infections or inflammations, but because of energy intake below that required.

To use anthropometric and biochemical variables as standard geriatric assessment in resident homes involves difficulties, as anthropometric measures, such as TSF and AMC, demand to use a Harpender skinfold calliper which is not a commonly used tool. Biochemical variables, such as serum albumin and transthyretin, demands blood-sampling and laboratory analysis, which are not always possible to carry out in resident homes.

Mini Nutritional Assessment was used because it is regarded as a valid tool specially developed for detection of elderly people at risk of malnutrition (Guigoz et al 1996), but also as it is a rapid tool without requiring specialised instruments or a specialised nutrition team (Guigoz et al 2002). Selected items in MNA have earlier been used in the previous cohort 1 study (Christensson et al 1999). In order to make comparisons with that study it was appropriate to use the MNA.

When testing the agreement between the dichotomised MNA classes in relation to PEM/non-PEM (I), 30 PEM residents, out of 41, were simultaneously classified as at risk of malnutrition/malnourished according to MNA, which was regarded as a satisfying degree of agreement. The fact that not all residents classified as being PEM, also were classified as at risk of malnutrition or malnourished by MNA, is in line with a study by Chumlea et al (1999), where limitations in sensitivity of MNA versus measured body composition was shown. On the other hand, not all residents categorised by MNA as at risk of malnutrition were classified as PEM.
When diagnostic test was performed using MNA-SF versus the dichotomised two-step MNA procedure, 110 residents out of 127 were classified in the same way in both assessments, implying a high agreement level. The sensitivity was 89 %, which indicates that MNA-SF itself might be an alternative to the two-step MNA procedure, since it has the practical advantages of being quick and easy to use. The purpose of a screening tool, such as MNA-SF, is to identify malnourished individuals or those at risk of becoming malnourished (Dougherty et al 1995, Kondrup et al 2003), so that more extensive nutrition assessment can be performed and intervention implemented (Berner 2003).

Activity Index was chosen to assess functional capacity in the residents despite it was developed for stroke patients. Functional capacity vary in elderly people due to a high frequency of diseases and impairments and as the activity index has ability to assess great variations in mental capacity, motor activity and ADL function, it seemed to be appropriate to use (Hamrin & Wohlin 1982). The tools relevance for clinical use (Chong 1995) was good since it was easy and quick to use in all residents. Unfortunately is it not a wide spread geriatric assessment, and has as so far most been used in Swedish studies (Lindmark 1988, Elmståhl et al 1996, Christensson et al 2001).

Mini mental state examination was used to screen for overall cognitive function of the residents, since it is a well validated and used tool and is able to separate individuals with cognitive impairment from those without. According to Kurlowicz & Wallace (1999) the tool is able to make comparisons between different studies and when it is used repeatedly, the tool is able to assess changes in cognitive function. Different cut off score is recommended for MMSE, since there is an inverse relationship between MMSE score, age and educational level (Crum et al 1993). As the residents were old and admitted from an area with mainly rural work and industries, a cut off score of 20 or less considered as representing cognitive impairment (Folstein et al 1975) in study I and II, which is in line with the recommendation given by Crum et al (1993). In the interview study (IV), the cut off score was increased to 23, to make sure that the residents had ability to understand what participation would mean for them. According to Kurlowicz & Wallace (1999), the MMSE relies heavily to physical ability. Therefore residents with physical impairments may perform poorly even when they are cognitively intact (Kurlowicz & Wallace 1999). In this thesis six residents were not tested according to MMSE, due to aphasia. Three residents who participated in the interview study
with score 23, were not able to carry out MMSE because of physical disabilities, like impaired sight and hand tremor.

**Interview study about appetite**

In the interviews the residents viewed their appetite by given concrete descriptions of what they liked and disliked regarding different circumstances, e.g. food and eating patterns, rather than described their appetite in more abstract terms, i.e. in that way appetite has been described in the literature (Whitney et al 2002). Each of the categories, mood, personal values, food, wholesomeness, eating environment and meal fellowship, were described by the residents as affecting the appetite either positively or negatively, like on a sliding scale.

The willingness to eat is the theory as to what affects the appetite among the residents in this study. It imbues the interviews, links the codes and categories together, and explains what is going on in data. The willingness to eat is in line with a theory of human motivation, which belongs to a certain conception of the human being as a subject in goal-directed actions (Pörn 1977). According to Pörn (1981,1984), motivation might be seeing as the willingness to decrease the discrepancy between what the subject wants to be and what he/she really is. The subject acts due to the relation between his/her abilities (repertoire) and environment, where the environment involves internal (psychological) and external (socio-cultural) factors (Gustafsson & Pörn 1994). Mood and personal values can in the perspective of Gustafsson & Pörn (1994) being seeing as internal factors, and wholesomeness, food, eating environment and meal fellowship as external factors. Out of the residents’ presuppositions, based on abilities and environment, he/she can be motivated either to act or not act towards a specific goal, such as eating a meal.

A connection may be seen between the willingness to eat and the residents’ quality of life. Mood and personal values are in agreement with what Sarvimäki & Stenbock-Hult (2000) call intra-individual conditions. Wholesomeness, food, eating environment and meal fellowship are in line with what they call external conditions. All the conditions influence each other and constitute conditions for quality of life (Sarvimäki & Stenbock-Hult 2000). Mood, personal values, food, wholesomeness, eating environment and meal fellowship may thus be seeing as affecting appetite and quality of life to a varying extent. When the residents in this study had
ability to maintain their internal and external conditions, it affected positively their appetite and quality of life. The opposite was also seen, such as when the residents had difficulties to maintain their internal or external conditions, it negatively affected their appetite and quality of life. Eating problems in residents may therefore not be seeing as isolated problems, but integrated parts of the residents and are not possible to separate from the rest of the residents’ life, as these things constitute a whole. This has also been seen in other studies (Gastman 1998; Vetta et al 1999; Crogan & Pasvogel 2003).

In this study consideration was taken to the residents’ conditions, and what they really wanted to say. As they were old and frail and thus became easily tired and confused in stressful situations, it was important to not force them in any way. If they were stressed to answer unexpected questions, they easily became confused and did not know what to answer. It was therefore important to not interrupt their train of thought and let the interviews proceed on their own terms. The residents were also informed that the participation was voluntary and they could discontinue participation whenever they wanted. Due to that, one resident discontinued participation after 10 minutes.

The residents in this study had cognitive ability to reflect upon their situation and express their thoughts and experiences. Not all residents have that ability. Even if every individual is unique, all people as a whole are alike. In that way the residents in this study may be seeing as spokespersons for residents in similar situations who do not have the ability to reflect upon their life situation and express their thoughts and experiences. By that the result of this study can be transferred to elderly people in similar situations.

**Clinical implications**

To identify residents in need of nutritional intervention should be a key component within nursing care, where MNA is a useful screening tool for early detection of those at risk. Due to a high agreement regarding the sensitivity of MNA-SF as compared with MNA, MNA-SF itself can be a sufficient screening tool in resident homes, since it has practical advantages. To overcome the problem among the RNs to not carry out nutritional assessments in all residents, due to forgetfulness and absence due to illness, more resources are needed. Suggested actions...
are to give the RNs more education about nutritional issues and about the two-step MNA procedure, but also to give the RNs continuous supervision to motivate and support them to include all residents in need of nutritional attention. Maybe also directions within the organization of elderly care are needed, with instructions to the staff to priority nutritional assessments and issues, as well as adequate number of staff.

In residents identified as at risk of malnutrition or malnourished, individualised actions have to be carried out. This is in line with European recommendations and with the Swedish goal of nursing actions. The individualised actions ought to be based on ordinary food, and nutritional supplementation would be considered only if it is not possible to meet the residents’ nutritional requirements with food, or when additional food has been ineffective.

It is of importance that the RNs at the retirement home identifies underlying causes of insufficient nutrient intake among the residents, as well as find out the residents problems, desires and resources. This demands that the RNs have sufficient knowledge about every one of the residents, with regard to their mental, social and physical needs and conditions. When nursing actions are planned and realised towards eating, the willingness to eat has to be considered. Every individuals’ desire, which includes factors, such as mood, personal values, wholesomeness, food, eating environment and meal fellowship, have to be taken into account, not only every single factor, but also with regard to how the factors affect each other. Planning, implementation and evaluation of nursing actions ought to be realised as teamwork and have to involve the residents, their relatives, the RN and other staff. The residents and their relatives should be seen as important resources in this process.

Even if the intention is to identify all residents in need of nutritional attention, it is probably not realistic to have a nil vision regarding malnutrition, as the population includes elderly people in the last stage of life. Before life ends in elderly people, illnesses are common problems, which mainly can affect appetite and eating. But, even if some residents are in the very end of their lives, and have difficulties to eat and to improve their nutritional status, they should still receive individualised nutritional care. In that situation, individualised nutritional care based on factors affecting the appetite is of great importance, as those factors contain qualitative dimensions which also affect the quality of life.
CONCLUSIONS

Elderly people newly admitted to resident homes are a fragile group, many of them with a deteriorated nutritional status and functional capacity.

The nutritional intervention seemed to have effect, interpreted from decrease in malnutrition frequency and improvement in functional capacities.

Despite education given to the staff, regarding nutritional care, it was not evident for the RNs to implement nutritional assessments and measures.

Due to high agreement between MNA-SF and MNA total the MNA-SF itself can be a sufficient screening tool for practice.

The willingness to eat, based on internal and external factors, is supposed to affects the appetite in elderly people.
Ett angeläget och aktuellt problem inom äldre vård är att många äldre riskerar att bli undernärda. Med stigande ålder riskerar människan att drabbas av förluster av olika slag, som gör henne mer sårbar. En del av deras problem består av minskad aptit, otillräckligt näringsintag och som i förlängningen kan resultera i undernäring. Undernäring försämrar ytterligare den äldrande människans liv genom sänkt livskvalitet, försämrad fysisk och mental förmåga, samt ökad risk att dö i förtid.

Det övergripande syftet med studierna var att studera om en intervention, baserad på utbildning av personal och införandet av ett individuellt anpassat nutriktionsprogram, kunde förbättra nyinflyttade vårdtagares näringsstillstånd och minska risken för utveckling av undernäring. Vidare var syftet att studera effekterna av förändringar i den kommunala äldreomsorgen över en fyraårsperiod, att utföra diagnostiska test och inter-bedömbara affidabilitet av Mini Nutritional Assessment (MNA) och att identifiera och beskriva faktorer av betydelse för vårdtagarnas aptit.

Vid inflyttningen och efter en fyra månaders interventionsperiod, blev vårdtagarnas näringsstillstånd (protein- energi malnutrition, PEM) bedömt med hjälp av kroppsmått och serumproteiner. Vid båda tillfällena bedömdes också fysisk förmåga med Aktivitetsidex (psykiskt status, motorik och ADL) och kognitiv förmåga med Mini Mental Test. För att identifiera vårdtagare i behov av individuellt anpassade nutriktionsåtgärder använde tränade sjuksköterskor MNA och beslutade om behov av åtgärder eller inte. Vid inflyttningen samlades information in om vårdtagarnas sjukdomar och mediciner. Totalt 127 vårdtagare inkluderades konsekutivt till åtta äldreboenden i en kommun i södra Sverige. Tre av äldreboendena utgjorde experimentenhet (n = 68) och fem kontrollenhet (n = 59). Femton vårdtagare intervjuades med en kvalitativ metod om vad som påverkar deras aptit.

Resultatet visar att vid inflyttningen bedömdes 32 % av vårdtagarna som undernärda, vilket var jämförbart med resultatet i en studie genomförd fyra år tidigare. En högre andel av vårdtagarna i den nuvarande studien hade allvarliga sjukdomar och nedsatt psykiskt status, vilket indikerar att inflyttningskriterierna har förändrats under de fyra år som har förflytut mellan studierna.
Vid jämförelser mellan experiment- och kontrollgruppen fanns inga statistiskt signifikanta skillnader beträffande kroppsmått eller serumproteiner. Däremot fanns statistiskt signifikanta skillnader inom gruppen, där antalet vårdtagare bedömda som PEM minskade i experimentgruppen och deras motoriska förmåga och psykiska status förbättrades. I kontrollgruppen försämrades vårtnagarnas motoriska förmåga. Detta tyder på att trots brist på skillnader mellan experiment- och kontrollgrupp så hade interventionen förbättrat näringsstillståndet, motorisk förmåga och psykiskt status hos vårtnagarna i experimentgruppen. En orsak till att det inte fanns skillnader mellan experiment och kontrollgrupp kan vara att sjuksköterskorna inte bedömde alla vårtnagare på experimentenheten och därmed missade vårtnagare som behövde individuella åtgärder.

Diagnostisk sensitivitet var 73 % hos MNA gentemot PEM, och 89 % hos kortversionen av MNA (MNA-SF) gentemot totala MNA, vilket visar på en relativt hög diagnostisk sensitivitet i båda fallen. Inter-bedömarreliabiliteten mellan samtidiga MNA bedömningar utförda av sjuksköterskor och forskare visade en moderat överensstämmelse på 62 % (kappa 0.41).

I intervjustudien framkom att viljan att äta är vad som påverkar vårtnagarnas aptit. Viljan att äta inrymmer interna faktorer, som sinnesstämning och personliga värden, och yttre faktorer, som nyttigheter, mat, ätmiljö och måltidsgemenskap. När omvårdnadshandlingar planeras och genomförs bör faktorer som påverkar vårtnagarnas aptit beaktas.

Sammanfattningsvis framkom att det är viktigt att införa och utveckla strategier för att genomföra individuellt anpassad omvårdnad i syfte att förebygga och behandla undernäring hos äldre. Detta är i linje med rekommendationer givna av European Society of Parenteral and Enteral Nutrition (ESPEN) och med Socialstyrelsens allmänna råd om omvårdnad inom hälso- och sjukvården (SOSFS 193:17).
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