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The Process of Anaesthetic induction with Children

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One day when I was preparing an old man for surgery, we heard a nurse anaesthetist talking with a child, preparing for a forthcoming procedure.

The old man said – I would have like to have that preparation, then I would have dared to come earlier.

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Abstract

Anaesthetic induction is one of the most stressful experiences a child can have during hospitalization. High anxiety is seen in 50–60% of the children and is associated with less compliance/cooperation during anaesthetic induction. It can also lead to behaviour problems after surgery.

Important factors that are associated with high anxiety are younger age, withdrawn shy temperament, previous negative experience in the hospital and certain kinds of adult behaviour. This thesis has been done to further illuminate the anaesthetic process and gain more knowledge about child behaviour, parent and staff communication, nurse anaesthetist decision-making communication and the reactions of children after anaesthesia and surgery.

Materials/Methods: One-hundred and two children between the ages of 3–6 that were scheduled for ENT surgery were video filmed. Screening instruments about child behaviour, fears and parental anxiety were used before the anaesthetic procedure. All children were video filmed during the process until they were at asleep. Parents were interviewed during the operation. Forty-nine children came 14 days after the surgery for a play session that also was video filmed. The video films were then analysed to identify critical situations and behaviours. Parents and nurse communication were categorized. Decision-making communications from the nurse anaesthetist were also identified and categorized.

Results: Four critical situations or reactions were identified, premedication, degree of sedation, compliance during needle insertion or mask on child's face and the child's reactions when going to sleep. Each of the situations influenced the next following situation, predicting a higher risk for developing a vicious circle. The first (taking the premedication) was predicted by earlier traumatic hospital experience, if the child placed him/herself nearby or in parent's lap, hesitant eye contact and highly active parents. The most common type of decision-making category was information, followed by negotiation. Unwillingness to take premedication was associated with more negotiation and less information. A child who takes premedication unwillingly had more often avoidant reactions toward anaesthetic equipment and anaesthetic play after surgery. An anaesthetic induction process is complex and transactional. Previous experience will together with the process of anaesthesia create a new learning history.

List of papers

This thesis is based on the following papers, which will be referred to in the text by their Roman numerals.

- I Marie Proczkowska-Björklund, Carl Göran Svedin.
Child related background factors affecting compliance to induction of anaesthesia
Pediatric Anesthesia 2004;14:225–234
- II Marie Proczkowska-Björklund, Ingrid Runeson, Per A Gustafsson, Carl Göran Svedin.
Communication and child behaviour associated with unwillingness to take premedication
Acta Paediatrica 2008;97:1238–1242
- III Marie Proczkowska-Björklund, Ingrid Runeson, Per A Gustafsson, Carl Göran Svedin.
Decision making about premedication to children
Child: care, health and development 2008 Nov;34:713–20
- IV Marie Proczkowska-Björklund, Per A Gustafsson, Carl Göran Svedin.
Children’s play after anaesthesia and surgery. Background factors and associations to behaviour during anaesthetic induction.
Submitted

Abbreviations

ENT	ear, nose and throat
PBCL	Preschool Behaviour Check List
FSSC-R	Fear Survey Schedule for Children
STAI	State-Trait Anxiety Inventory
RIAS	Roter Interactional Analysis System

Introduction

Anaesthesia as a traumatic experience for children

In 1942, Pearson published a paper on the effects that a traumatic anaesthetic experience can have on a child (1). Even if the dramatic consequences reported by Pearson are rarely seen, publication of this paper led to early recognition that perception of fear experienced by children during hospitalization and surgery may be quite different from those of adults and would depend on age and maturity of the child. Jessner et al. (2) identified four areas of anxiety in children who had experienced ear-nose-throat (ENT) surgery; 1. Fear of hospitalization, 2. Anticipation of narcosis (threat of death, punishment and execution, fear of murderous or sexual attack, loss of control), 3. The operation itself, and 4. Fear of needles. Many later studies have shown that the anaesthetic induction is one of the most stressful experiences a child can have during a hospital encounter (3-6), this also often includes the insertion of a needle.

Some children seem to endure the anaesthetic induction well, while others may feel fear and anxiety both before and during the anaesthetic induction process.

To better understand the vulnerability of children, research has focused on identifying factors associated with high preoperative- and induction- anxiety and on finding ways of diminishing this anxiety.

Developments in anaesthesiology have led to better technology and pharmacology making ambulatory surgery safer and more readily available, which seems to be of benefit for the children (3, 7).

Even so there are estimates that 40–60% of the children who are anaesthetized feel high or extremely high levels of preoperative anxiety (7–9). High anxiety preoperatively in the holding area is associated with an increase in anxiety during the process culminating during induction (3, 6, 10, 11). High anxiety preoperatively and during the process also seems to increase the risk for non-compliant behaviour during the anaesthetic induction (6, 7, 10, 12) and a situation may develop where restraint is used. Up to 25% of the children have been noted to require physical restraint to facilitate anaesthesia induction (5). Even if no one in the anaesthetic room wants to restrain the child, a high demand for efficiency together with very quick anaesthetic techniques with short observational distress may lead to the choice to proceed instead of stop and reschedule (author's remark).

High levels of preoperative anxiety may also lead to an increased risk for postoperative delirium and postoperative changes in behaviour (3, 5, 9, 13–16). In a Swedish study Karling et al. (15) found that as much as 34% of the children developed at least one type of postoperative problematic behaviour. Risk factors were: age less than 5, pain at home, nausea, child anxiety at the time of anaesthetic induction, postoperative distress, previous hospitalization, living in a single parent family, and having some previous problematic behaviour. Highly anxious children also seem to suffer from more pain and consume more analgesics (17).

To identify and to alleviate preoperative anxiety in children must be one of the main goals in the care of children scheduled for surgery. High anxiety preoperatively and peroperatively with increased risk of non-compliant (disruptive) behaviour during the induction may increase the risk for the use of restraints. This may from the child's point of view be very humiliating and give a feeling of lost integrity. This must be seen as a violation of the ethical rules for doctors: if possible cure, often relieve, always comfort. Identifying risk factors and risk situations may help us to individualize strategies both psychological and pharmacological strategies for each child that can minimizing the risk for anxiety.

Anaesthesia a negative experience or not

In trying to generalize research results some difficulty appears. Some researchers use global instruments, others structured observational behavioural instruments. Different words may be defined in different ways. Words often used are anxiety, distress, disruptive behaviour, compliance, and cooperation. There are also cultural differences in how children are met and anaesthetised in different countries.

Factors in the Child

Age

Younger children show more anxiety in the preoperative holding area (18), when separated from their parents (19), at induction (11, 18, 20) and are less cooperative during anaesthesia induction (12). The age range of the children in most studies is between 2 and 12 years. Children younger than 4 years of age are often seen as the most anxious and distressed. However, there are studies that found no association between increasing age and anxiety and others that found that children between the age of 4 and 10 show more anxiety than children younger than 4 years of age (3, 7, 9).

Evaluating young children's anxiety is always hazardous. Self-assessments are not always reliable since young children do not always understand and cannot differentiate between different aspects of feeling and cognition.

Another way of measuring reactions of fear and anxiety is using stress-hormone measurements. Comparisons of anxious with non-anxious preschool boys during anaesthesia induction showed that anxious preschool boys had higher levels of cortisol, adrenalin and noradrenalin. The same comparison between anxious and non-anxious schoolboys showed only higher levels of cortisol (21).

Temperament

Temperament can be defined as strong dispositions that direct human behaviour and are present early in life. Different authors have defined temperament in different ways.

A review by Ranger et al. (22) points out the differences in defining temperament as presented by different authors. Thomas and Chess defined temperament as the "how" of behaviours and identified nine dimensions of temperament: activity level, rhythmicity (regularity), approach or withdrawal, adaptability, intensity of reaction, quality of mood, attention span and persistence, distractibility and threshold of responsiveness. Using this framework, children with

higher levels of intensity and more withdrawal show higher levels of distress behaviour (20, 23, 24).

Buss and Plomin defined temperament as a constellation of inherited personality traits that appear early in life (22). They developed a questionnaire named EASI that characterizes these traits by taking into account the following four dimensions: Emotionality, Activity, Sociability and Impulsivity. The questionnaire is often used in studies of preoperative anxiety in children. Studies using this questionnaire have produced somewhat contradictory results. Lower ratings of activity and sociability have been associated with a higher level of preoperative anxiety in some studies (3, 18), but at least one study found that children with a low level of anxiety and children who show more compliant behaviour during induction have lower ratings of activity and impulsivity (25).

Quinones et al. who used EAS (EASI without the impulsivity trait) and added a trait of shyness found that shyness was predictive of disruptive behaviour during general anaesthesia induction for dental surgery (23).

When Midazolam is used as premedication, children with high scores on impulsivity seem to have a higher risk for paradoxical responses during induction and higher rates of postoperative delirium (26).

Previous experience of medical encounters

Previous anaesthetic experience and especially poor qualitative medical encounters have been shown to be associated with high preoperative anxiety (3), problematic behaviour when separated from parents (3, 19) and an increase in the risk for poor compliance during induction in school-age children (5, 12). Children who have negative memories of hospital encounters have an increased risk for high anxiety during induction (27).

Decision-making

The UN Convention on the rights of the Child (1989) article 12:1 (28) gives every child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, and also a responsibility for adults to listen to and give due weight to those views according to age and maturity of

the child. To concretely interpret the aspect of age and maturity as measures of child competence is a difficult task since competence is highly individual and is influenced not only by age and maturity but also by knowledge and earlier learning history, personal traits, gender, ability, ethnicity, temperament, fears, values, caution or willingness to take risks, level of optimism, hopes and level of independence (29). In health care situations the child more often is seen to be competent to assent (to agree), instead of being competent to consent (agree or disagree) (30). Consent implies that all relevant data needed to make a reasoned decision have been offered and understood (31). Much information must be given and much trust must be built to give the child the competence not only to assent but also to have the competence to refuse.

Shared decision-making has been in focus regarding adherence to treatment plan in adult care. In a review by Joosten et al. (32) no clear cut benefits could be seen regarding adherence to treatment and shared-decision making with respect to short term effects. However, there seems to be a positive effect on long-term adherence to treatment. Little is known about children and short-term procedures. More knowledge about how we invite children in different age groups and how this affects the child is needed.

Factors in the anaesthetic process

Preoperative preparation and information

There has been a lot of research on different kinds of intervention used to prepare children for anaesthetic induction. Preparation programs often include: age-appropriate information pamphlets, tour of the operating room and role-play with dolls and sometimes even training in learning coping skills. Preparations limited simply to providing information books does not seem to have any effect on anxiety (33). More extensive routine preparation programs that include information, guided tours and role play with dolls, seem to lead to a reduction in anxiety

but significantly only limited to the preoperative holding arena (34, 35). Using a highly extensive program including intervention video, pamphlets, preparing distraction and providing telephone coaching support and reinforcement during induction does lead to reduction of anxiety in both the holding area and during induction. The reduction of anxiety during induction was comparable with the reduction provided by premedication with Midazolam (36).

A cross sectional study by Kain et al. (37) showed that children over the age of 6 were least anxious if they were prepared 5–7 days before surgery and most anxious if they were prepared the day before surgery. Anxiety while in the holding area was associated with age, timing of preparation and baseline temperament. Anxiety at separation was associated with age, timing of preparation and earlier hospitalization.

Premedication

Midazolam is the premedication most commonly used before surgery with children in the United States (38) and is also widely used in Sweden (39) and has been shown to reduce preoperative anxiety and increase compliance during anaesthesia induction (14, 40–43). Midazolam seems to have the best effect with younger children (under the age of 4) (7, 40) and children who display high preoperative anxiety (7, 26, 40, 41).

Midazolam is not without disadvantages. Some studies have shown an increased postoperative delay, more arousal distress and higher score on pain and discomfort (44, 45). Some studies appear to show that Midazolam seems to protect against the development of postoperative behavioural changes (14, 15), but at least one study points out an increased risk for such changes (41).

Even if Midazolam has a good anxiolytic effect on the majority of patients, 14% of the children are non-responders (46). The non-responders were younger (under the age of 4) and scored higher on emotionality when compared with responders.

Other drawbacks are the bitter taste when given orally and irritation experienced when given intranasally. These may make the child more upset. In a study by Kogan et al (47) 77% of the children cried when given Midazolam intranasally.

Midazolam can cause anterograde amnesia (48–50) that can make it more difficult for children to remember good medical experiences. It is not clear if

Midazolam protects against remembering more negative medical experience since Midazolam causes impairment of explicit memory but not of implicit memory (51, 52).

Premedication with Midazolam appears to have a greater beneficial effect on the child than does the simple presence of the parent. Using Midazolam also seems to make the parents feel more satisfied with the whole situation (43).

Type of induction

Aguilera et al. (53) found that intravenous induction (i.v. induction) caused greater anxiety than did mask induction, but in contrast with those results Bal et al. (54) found no difference in anxiety level when i.v. induction was used compared to mask induction.

Mask induction ordinarily can be performed more quickly than intravenous induction, but putting the mask firmly on the child's face may induce negative feelings that the child will not have time to translate into behaviour before falling asleep, making the evaluation of emotions and behaviour quite difficult or questionable. Children who have been induced by mask do report more negative memories (8) and show more behavioural problems postoperatively than do children induced intravenously (53).

Parental presence and staff behaviours

Parental presence

In Sweden, parental presence during induction is mandatory if the child is over 1 year of age (39). In sharp contrast to this, a nationwide survey from the United States 2002 found that 50% of the anaesthesiologists never used parental pres-

ence to alleviate child anxiety (38). Evidently the Swedish requirement was put in place in the belief that parental presence would alleviate preoperative anxiety and increase compliance during anaesthesia induction. Given the differences between practice in Sweden and the United States, and possibly other countries it is important to know what studies have been made to test the belief that parental presence provides benefits.

In a review Piira et al. (55) concluded that two thirds of the studies that were carried out as level II evidence studies (a properly designed randomized controlled trial) reported non-significant findings regarding reduction in child's distress as a result of parental presence. Yet all the studies in this review by Piira that were non-randomized claimed significant findings. He concluded that parental presence might not have a clear, direct influence on reducing child distress and behavioural outcomes during induction of anaesthesia.

There seems to be an association between parental anxiety and child anxiety (3, 4, 11, 18, 56). If it is the parent who influences the child, the child who influences the parent or some kind of transactional interaction has not yet been carefully studied.

Parents with low anxiety levels are more likely to have children who also have correspondingly low anxiety levels (25). The presence of calm parents may be of benefit for a potentially anxious child, while the presence of anxious parents does not help the calm child at all (11, 57).

Kain et al. (4, 25) showed that older children (>4 years), children with parents with low trait anxiety and children who had a low baseline level of activity as assessed by temperament had lower cortisol levels if their parents were present.

Even if parental presence per se does not lower the preoperative anxiety level of the child, parents often want to be with their child and they feel that they can be of help to both their child and the anaesthetist (4, 56, 58).

Parents often do worry about their own role during the procedure and they wonder if the child is going to be distressed by the anaesthesia procedure (59).

Adult behaviour

Child anxiety or distress can both be evoked and alleviated in all kinds of situations including situations as the anaesthetic induction. Adults (parents and staff) behaviour is important in regulating such feelings. Some adult behaviours such as reassuring, criticism, apology and empathy are associated with more child dis-

tress while other behaviours such as distraction, coping promoting, humour and non-procedural talk are associated with child coping (60–63). In randomized studies comparing children's distress if their parents were instructed to do more distress promoting behaviour or coping promoting behaviour children with parent's who was instructed to do more distress promoting behaviour (reassuring) showed more distress, while children with parents instructed to do more coping promoting behaviour (distraction) showed more coping behaviour (64–66). An interesting aspect was that parents instructed to do more reassuring expected to provide more help to their child before the procedure but felt more distressed after the procedure (66).

High-coping children (children who engage in more coping behaviours than average) had parents who more often acted to promote coping behaviour in their children. High-coping children also responded to their parents' promotion of coping with more coping behaviour than low coping children (67).

Frank et al. (68) used hierarchical regression analysis to predict child coping/distress behaviour during immunization. Twenty-five percent of the variance in child coping behaviour was accounted for by the parent's behaviour. The majority of this variance was accounted for by the positive effect of a parent's coping-promoting behaviour, with the rest accounted for by a negative effect induced by parental distress behaviour. Staff behaviour accounted for an additional 13% of the variance in child coping behaviour. Parental behaviour accounted for 53% of the variance in the measures of the child's distress behaviour, and this was primarily a function of the parental distress behaviour. An additional 4% was accounted for by the child's prior experience.

Theoretical considerations

Children's anxiety before and during anaesthetic induction is associated with intrinsic child factors such as age (developmental level), temperament and the child's history. This means that each child will react in a manner different from the pattern shown by other children, and will display a set of highly personalized feelings to a situation such as the anaesthetic induction.

According to learning theory behaviours in daily life are governed by four different learning modalities. 1) Information, 2) Modelling: if the person has seen the behaviour done by other persons, 3) Pavlovian conditioning: feelings that is evoked in certain situations is bound to that situation or similar situations, 4) Operant conditioning: the outcome of a situation determines if we want to engage in this behaviour to a greater or lesser degree in the future (69). These principles help us to understand reactions and behaviour in situations and are the principles that govern our learning history.

A child with a previous negative medical encounter may experience negative emotions that will determine the child's behaviours in the future. These will be modulated by the child's cognitive function (age), understanding of the situation, the child's belief in the outcome and the reactions and behaviour of the parent and staff.

Using a transactional model can help us to better understand our own role in this situation. In a transactional model the behaviour of a child is followed by responses by the surroundings, in this case other people. In the anaesthetic situation a child's behaviour causes the parent and staff to react and respond in certain ways. These responses influence the child's behaviour in turn during the next step (70). These responses are of course individual and depend on that person's history and perception of the situation. By better understanding critical situations and effects of our own behaviours, we as adults (parents and staff) can modify the child's reactions and in this way diminish the negative effect.

One of the major responses a surrounding can give a person is in the way it communicates. In this situation the communication between child and adult is essential for modulating the child's reactions.

The most commonly studied situations with focus in communication in health care are evaluating primary care visits. Using the Roter Interaction Analysis System (RIAS) the focus is primarily on identifying communication elements as Information giving, Question asking, Partnership building, and Social-Emotional

behaviour, but also quantifying communication (who speaks the most) (71). This is what Linell (72, 73) calls the aspect of dominance (looking at who speaks most words or most time or who puts most topics or subtopics on “the floor”).

The anaesthetic process is a highly specific meeting with a clear-cut goal, which makes some aspects of the process different from what is experienced during for example primary care visits. Partnership building and socio-emotional behaviours during the anaesthetic process may be different since the goals in the two situations are quite different. Focusing on quantitative dominance is a first step that may help us to better understand the responses and behaviours of the parent and the staff to child’s behaviour during the anaesthetic process and how it effect the child.

It is important to study this and other health care situations from several different angles and for this reason, even descriptive studies are important. One important goal in this thesis has been to look carefully at the different parts of the process and to then categorize behaviour and communication as simply as possible. Detailed knowledge obtained in this way can then be readily translated into the procedures that are used every day by the anaesthetist or nurse anaesthetist.

Aims of the thesis

The general aim of this thesis was to study the anaesthetic process with children including the study of both the factors within the child (child behaviour) and also to closely examine the interaction between the child, parent and the nurse anaesthetist.

Aim paper I

To identify factors that could easily be assessed by the anaesthetic nurse or anaesthetist preoperatively and that could thus help to predict the level of cooperation that might be expected of the child during the anaesthetic induction.

Aim paper II

To see how dominance in adult communication during premedication affects the child's compliance in taking premedication.

To see if different forms of child factors or child behaviour generate different forms of communication patterns or compliance.

Aim paper III

To identify and describe nurse decision-making communication with young children in an anaesthetics setting regarding premedication.

To study if child factors like age, gender, non-verbal communication and verbal communication with anaesthetic nurse are associated with different communication style (regarding decision-making) from the anaesthetic nurse.

To study if nurse decision-making communication is associated with higher risk for the child to verbally hesitate and/or behave in a non-compliant way during the premedication.

Aim paper IV

To study how children react after anaesthesia and surgery when they are introduced to anaesthetic play equipment.

To study if an avoidant reaction was associated with certain kinds of child behaviour during premedication, anaesthetic induction or child background factors.

Materials

Paper I–III

A total of 104 consecutive patients for whom ear, nose and throat (ENT) surgery had been planned were contacted and 102 consented to participate and comprised the study group (Figure 1). Inclusion criteria were preschool age and Swedish-speaking parents and Swedish-speaking child. The children were scheduled for examination of the eardrum (paracentesis or insertion of grommet (52%), adenoidectomy (11%) (procedures that were carried out on day admission) and tonsillectomy (37%) (carried out with overnight stay). In 87 cases one parent accompanied the child (68 mothers and 19 fathers). In seven cases both mother and father came and in one case a grandmother came with the child.

Anaesthesia was conducted using propofol, alfentanil or fentanyl and sevoflurane, either with mask or laryngeal mask.

The original sample included 59 boys (57.8%) and 43 girls (42.2%). The mean age was 60 months (sd 15.5) with the range from 2 years and 7 month to 7 years and 1 month.

The mean age of the parents was 33.4 years (sd=4.9) excluding the grandmother.

Socioeconomic classification was made according to “Statistic Sweden” (74). No significant difference between this group and a representative cross section for Swedish citizens was seen.

Fifteen nurse anaesthetists participated in the study.

Paper IV

Forty-nine children were randomly selected (using a pre-printed random number list) from the original population and were invited to a play therapy session 14 days after surgery.

Methods

On the day of surgery the researcher or a research assistant met the subject prior to the premedication routine. The child was interviewed and asked to answer the Fears Survey Schedule for Children-Revised (FSSC-R) and the parent was asked to answer the Preschool Behaviour Check List questionnaire (PBCL) and State-Trait-Anxiety-Inventory (STAI), (see below). None of the children were given any special child-centred preoperative information but questions from the child or parent(s) were answered.

At the time for premedication the patient and parent went to a premedication room where a video camera, placed on the wall was started. The nurse anaesthetist joined and started the anaesthetic process and gave premedication. When it was time for anaesthesia induction, the nurse anaesthetist and patient with one parent went into the operating theatre where another camera was placed over the operating table. The camera was started when the child entered the room and stopped when the child was at sleep.

The routine of the ward was to give the children 0.5 mg/kg Midazolam either orally or rectally. The nurse anaesthetist decided which route was to be used. In Sweden the nurse anaesthetist, under supervision by anaesthesiologists performs routine anaesthesia. In papers II and III we only used the film until the point where the child had taken the premedication or a decision about the premedication had been made.

The routine of the anaesthetic ward was to insert an intravenous (i.v.) needle prior to induction. If this was not done successfully, or if the child did not accept the i.v. needle then the nurse proceeded with mask induction.

When the child was asleep, the parent was shown to a separate room to take part in a semi-structured interview concerning: the child's earlier experience in hospital, how the child reacted when given vaccination at the child welfare centre (CWC), if and how the child had shown motivation for the operation, and how the parents had prepared the child at home for the planned operation.

After a child had surgery, he or she might be invited to a play therapy session in the hospital with a kindergarten teacher working as a play therapist. Each play therapy session was scheduled 14 days after surgery. The play therapy session was video-filmed. All the selected children and their parents agreed to participate. The play therapy session was held in a specially arranged room. In the room there was a table with anaesthetic equipment (laryngoscope, needles, anaesthetic masks,

syringes, EKG electrodes, and stethoscope). There was also a bed with 2 dolls, one large doll the size of a 3 year old child and a very popular TV-bear dressed in operating theatre clothes, a play anaesthetic machine and clothing (the same kind that were used by parent and personal during the anaesthetic induction and operation), a book-shelf with papers and pens for drawing, a jigsaw puzzle and 2 picture books for children about how it is to come to a hospital.

When the child came into the room, the child and parent were greeted and if the child started to play with the anaesthetic equipment the play therapist joined the child, otherwise she introduced the equipment to the child when she felt that the child was secure enough. The play therapist asked the child if he/or she could tell and show how it was for him/her to be at the hospital and to sleep during the operation.

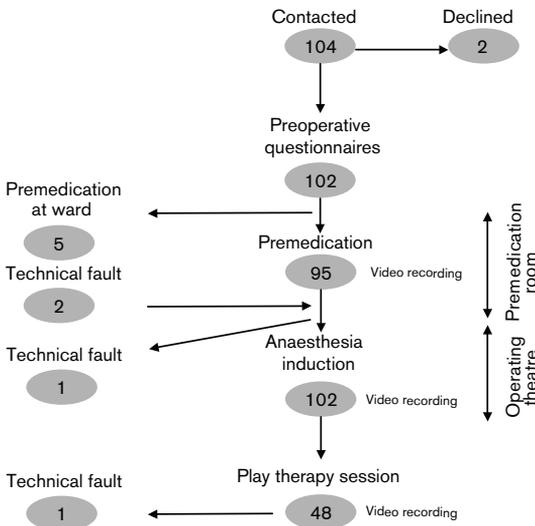


Figure 1: Flow sheet, number of patients, drop outs and recording.

Analysis

In paper I eight films were transcribed in order to more accurately evaluate both behaviour and communication. Four situations were identified as *compliant situations*; premedication (Table 1), sedation (Table 2), compliance during induction (Table 3), and how the child fell asleep (1. calm, 2. anxious, crying). To evaluate compliance during induction we developed the Distraction Short Scale (DSS, Table 3). DSS was developed in order to provide an instrument that could be used easily in daily practice.

1	2	3
Takes the premedication without hesitation.	Takes the premedication hesitant, after persuasion from staff or parent and with help from staff or parent	Takes the premedication under great hesitation or under protest

Table 1. Assessment of how the child took the premedication

The assessment were dichotomized as an outcome variable (group 2 and 3 were unitized)

Table 2. Sedation scale: measured one minute before start of needle insertion or placement of mask.

1	2	3	4	5
Agitated: clinging to parent and/or crying	Alert: awake but not clinging to parent, may whimper but not cry	Calm: sitting or lying comfortable with eyes spontaneously open	Drowsy: sitting or lying comfortable with eyes spontaneously closing but responds to minor stimulation	Asleep: Eyes closed, rousable but does not respond to minor stimulation

Sedation grade was dichotomised when analysed (group 1 and 2 = non-sedated)

1	2	3	4	5
Lies calmly and is focused on parent or staff distraction activity.	Lies calmly and is focused on needle insertion or participate when mask is put on the child's face.	Is focused on needle insertion or mask induction but expresses distress, is distractible within 30s.	Expresses distress/fear verbally. Is not distractible.	Expresses distress/fear verbally and by body movements. Is not distractible.

Table 3. Assessment of anaesthesia induction. Distraction Short Scale (DSS). Dichotomized when analysed (group 4 and 5 = non compliant behaviour).

Two *preoperative behaviours* were identified: placement (1. Independently, 2. Nearby parent, 3. In parent's lap) and child's initial answer to the nurse anaesthetist's initial greetings (1. Verbally answer, 2. No answer). Ten films (others than the first eight) were analysed separately by two of the authors and inter-observer reliability was calculated using Cohen's kappa. These films were then discussed and an evaluation was agreed upon and another 10 films were evaluated separately. Kappa calculations were made and Kappa values reached acceptable levels. ($\kappa = 0.66-1.0$).

For paper II and III all communication was transcribed and identified as utterances (an utterance is a whole sentence, a question or an answer one word or longer. From the child we also included nodding, positive or negative as an utterance). The utterances were then categorized, both the films and transcriptions

were used during evaluation. In paper II, the focus was placed on categorizing who spoke and to whom. Only communication to the child was categorized according to “what” the parent or staff talked about (Table 4). In paper III, all communication about premedication was identified and categorized (Table 5). Another preoperative behaviour that was identified was eye contact (1. Good eye contact, 2. Hesitant eye contact). The type of placement was dichotomized: (1. Independently, 2. Nearby or in parents lap). To obtain a kappa value the same procedure was used as described above ($\kappa = 0.78-0.84$).

In paper IV behaviours indicative of approach or avoidance toward anaesthetic equipment were identified. We wanted to identify if the children had experienced a respondent learning and generalisation to objects in the situation. The analysis was made globally by both the play therapist and researcher ($\kappa = 0.67-0.94$), (Table 6).

1	2	3	4	5	6	7
Total amount of parental communication	Parental utterances supporting that anaesthetic nurse’s communication to the child. <i>(Answering when the child could not answer, filled in to help the child to understand)</i>	Parental utterances directly to the child holding the child’s focus. <i>(Talking to the child excluding the anaesthetic nurse)</i> a. About non-procedural things b. About procedural things	Total nurse utterances	Nurse utterances directly to the child <i>(Talking to the child excluding the parent)</i> a. About non-procedural things b. About procedural things	Anaesthetic nurse utterances supporting parental communication to the child	Anaesthetic nurse utterances directly to the parent.

Table 4. Communication categories

1	2	3	4	5	6
Self determination The child chooses whether he or she wants to take the premedication or not.	Compromise The child chooses whether he or she wants oral or rectal premedication.	Negotiation The nurse offers the child something in exchange for child compliance in taking premedication.	Questioning The nurse questions the child about.	Information The nurse informed the child about.	No decision-making communication existed
Negotiation A. Parent participation: He/she is able to help with premedication or to sit in parents' lap. B. Nurse participation: The nurse complies with child's wish for her to go away, not look, or assist the child in some designated way. C. Own responsibility: He/she is allowed to self-administer the medication. D. Get acquainted with the premedication: He/she can smell at the premedication or take a sip. E. Bribe: He/she can have something as a reward if he/she takes premedication.		Questioning A. The process: If the child can take the premedication? If the child senses the smell? If the child can take the premedication all at once? If the child can drink the premedication or take it rectally now? If the child would like to feel the applicator for rectal use? B. Earlier experience: If the child usually takes medicine orally or rectally? If the child likes orange-juice (the smell of the premedication)? If the child has taken premedication before? C. The child's feelings: If he/she dislikes medicine? If something is good/bad? D. The child's knowledge about what is going to happen: If the child knows what is going to happen?		Information A. What is going to happen: That the child will get some medicine. How the child should take the medicine. That he/she will have some juice or water afterwards. B. What the experience will be like: Informing about the taste or how it will feel to take premedication rectally. C. Why the child should have some premedication: describing the effects of the premedication. The smell of the premedication	

Table 5. Decision-making communication categories with exemplifications.

1	2	3
How the child approached the anaesthetic equipment.	How the child answers questions about the things on the table or what had happened.	What kind of memories the child told the play therapist.
<ol style="list-style-type: none"> Starts playing without hesitation. Does not want to play with the anaesthetic equipment or dolls. 	<ol style="list-style-type: none"> Tells willingly about the things. (approach) Does not want to answer or just says not to the questions. (avoidance) 	<ol style="list-style-type: none"> Gave mostly specific memories not mentioned by the therapist. (approach) Gave mostly yes or no answers, unspecific memories. (avoidance)

Table 6. Assessment of approach/avoidance to anaesthetic play.

Questionnaires

The Preschool Behaviour Check List (PBCL), Fear Survey Schedule for Children – Revised (FSSC-R) and the State and Trait Anxiety Inventory (STAI) are three well-known and often used questionnaires.

The PBCL is a widely used screening instrument for behavioural problems in preschool children. PBCL has good psychometric qualities (75–77). It was translated into Swedish using a translation-back translation method with good agreement when compared with the original instrument after back-translation. In these studies we used a shortened version comprising 21 questions, excluding questions that were aimed for day-care personal and observation in a group setting. A score of seven or more was used as a cut-off value for indicating behaviour problems. Twenty-two percent of the children had scores above the cut-off. The original scale used in a normal population identified 20% of the children as having behaviour problems.

The FSSC-R (78) is widely used and has been translated into Swedish (79). In this study, a shortened version was used (including 48 questions). The cut-off point was set to 54.

Parental anxiety was assessed using the State-Trait Anxiety Inventory. This self-report anxiety instrument contains two separate 20-item subscales that measure Trait (base-line) and State (situational) anxiety. The State-Trait Anxiety Inventory is widely used and is seen as the gold standard in this field of research in evaluating parental anxiety (80, 81).

Violation of study design

In five cases the premedication was given before the child arrived at the operation ward. Six children refused to take premedication, and were grouped as “unwilling to take premedication”. One child did not need to take the premedication. He was categorised as “taking premedication willingly”.

In one case the video-camera had not been turned on in the premedication room and the interaction was only filmed in the operating theatre. One film was accidentally destroyed after the first analysis (Paper I). In one case an operation device made observation of the child’s behaviour impossible during needle insertion. In one case there was a technical fault of the video film during the play session (Figure 1).

Limitations

Some difficulties appear in any effort to study children. Behavioural assessment is undertaken on the assumption that the child's emotions will be expressed by behaviours. The evaluation of inhibited, shy or passive children is considerably more difficult than the evaluation of acting-out children.

Self-assessments do not always produce reliable results since young children do not always understand and cannot always differentiate between different aspects of feeling or cognition.

The analysis of the films was done with a quantitative approach with as little interpretation as possible. We have not looked at the goal of interaction, building trust. Using a qualitative approach may provide more knowledge of the components that trust is built on.

To be sure to capture all the different behaviours that a specific emotion, i.e. fear, might lead to requires that a high degree of complexity be built into the assessment tools. This complexity makes it difficult however to use the assessment tool in daily work.

Using video filming ensures that the behaviour in focus can be observed over and over again to ensure a stringent assessment. A stationary video camera put in place and left untouched by any staff member is less intrusive than an observer. An observer may on the other hand be more sensitive to tensions developing during a situation, but use of an observer eliminates the possibility of re-analyzing if uncertainties arise and also lessen the possibilities of stringent analyses. The presence of an observer also creates a risk of interaction between family and observer. Using cameras makes it possible to optimize the utility of the material.

Filming in a situation like this may be regarded as more intrusive to the patient/parents integrity than an observer and may also create situations where the patient, parents and staff would feel tenser and use other behaviour than they would without a camera. This could not be observed.

Statistical methods

Logistic regression was used to establish associations between risk factors and outcomes. A univariate logistic regression was first used to identify those risk factors that showed significant signs of association to the outcome measured, followed by a multiple logistic regression model for the significant risk factors. To deepen the knowledge of an association the Mann Whitney test was used in papers II–III. This test was chosen because some of the categories had a skewed distribution. In paper IV chi-square analysis was used instead. For calculation of statistics SPSS 10.5–15.0 (SPSS Inc., Chicago, IL, USA) was used and p value of <0.05 were considered significant.

Ethical considerations

The nurse anaesthetists who participated in this study were informed several months before the collection of data was started. During discussions participants agreed upon that the normal schedule of rotation should continue. If any of the nurse anaesthetists felt that he or she did not want to participate then the head of the department could be informed to arrange for rescheduling during data collection. No one expressed this wish, however.

One-week prior to surgery the family was sent written information about the study. Two days later the researcher contacted the parents to give further information, answer questions and gain consent from the parent. At the same time the researcher urged the parent to inform the child and other caregivers about the study. On the day of surgery a researcher or research assistant met the parent(s) and child. Full information was given again about the aim and procedure of the study, about the video-film, questionnaire and interview and about the confidentiality of the data. Both parent and child were informed that participation was voluntary and could be ended whenever they wanted. After questions had been answered a formal verbal consent by the parent and child was obtained.

All but two of the families contacted gave their consent to participate. These two families had already said no during the initial telephone-information. The reason for not participating was not given in one case and in the other case the parent feared that the child would react negatively.

Using a video camera can be seen by one or more of the participants - parent, child or staff - as being intrusive and being aware of the camera can lead to behaviour that would not ordinarily be displayed. No such effect could be observed in the films. There seemed to be an adaptation to the camera on the part of the participants.

The study was approved by the Human Research Ethics Committee, Faculty of Health Sciences, Linköping University; No. 97374

Results

Paper I

Child related background factors affecting compliance with induction of anaesthesia

In this study we identified four critical compliance situations and behaviours (outcome factors) and identified associations between these outcome factors and child background factors and initial child behaviour. Descriptive statistics regarding background factors and behaviours and outcome factors can be seen in Table 7–8.

Compliance during premedication

A non-compliant behaviour was seen in 42% of the children.

There was a statistically significant higher odds ratio for taking the premedication unwillingly if the child had experienced a previous traumatic hospital event (OR=9.5; $p=0.002$), if the child placed him/herself in the parents lap (OR=9.5; $p=0.005$) or nearby the parent (OR=7.1; $p=0.015$) compared to the child who placed her/himself independently. This model explained 72% of the cases and R^2 was 0.435. (Table 1, Paper I, Figure 2)

Valid subjects		Frequency	Mean (sd)
Gender	Boys	59 (58%)	
	Girls	43 (42%)	
Age	31–47 months	28 (27.5%)	
	48–59 months	19 (18.6%)	
	60–71 months	25 (24.5%)	
	72–85 months	30 (29.4%)	
Earlier traumatic hospital events (100)	Yes	33 (33%)	
	No	67 (67%)	
Motivation (91)	Did not want to come to hospital	19 (20.9%)	
	Did not comment on going to hospital	37 (40.7%)	
	Wanted to go to hospital	35 (38.5%)	
Parental preparation (92)	Very little preparation	9 (9.8%)	
	Telling about hospital and operation but not much	32 (34.8%)	
	Talking about the hospital stay and operation several times	51 (55.4%)	
CWC(vaccination) (82)	Negative reaction	33 (40.2%)	
	Normal reaction	49 (58.9%)	
PBCL			4.7 (2.6)
FSSC-R			24.1 (19.7)
Communication before premedication (97)	Passive or no communication	40 (41.2%)	
	Active communication	57 (58.7%)	
Communication after premedication (99)	Passive or no communication	49 (49.5%)	
	Active communication	50 (50.5%)	
Placement	In parents lap	29 (28.7%)	
	Nearby parent	21 (20.8%)	
	Independently	51 (50.5%)	

Table 7. Frequencies for background factors and behaviours.

		Frequency (%)	
Premedication compliance (95)	Non compliant	55	(57.9%)
	Compliant	40	(42.1%)
Sedation (101)	Calm or giggling	87	(86.1%)
	Anxious	14	(13.9%)
Compliance venous access or mask (101)	Non compliant	16	(15.8%)
	Compliant	85	(84.2%)
Put to sleep (102)	Calm	74	(72.5%)
	Anxious or crying	28	(27.5%)

Table 8. Frequencies for outcome factors

Sedation

Fourteen percent of the children were unsedated measured one minute before start with the needle procedure.

There was a nearly statistically significant higher OR for being anxious or crying (unsedated) if the child had previously experienced a traumatic hospital event (OR=4.5; $p=0.056$) and there was a statistically significant odds ratio if the child had taken the premedication unwillingly (OR=5.9; $p=0.042$). The model explained 84.9% of the cases correctly and R^2 was 0.298. (Table 2, Paper I, Figure 2)

Compliance during venous access or mask on face

A non-compliant behaviour during intravenous needle insertion or during anaesthetic mask placement could be seen in 16% of the children.

There was a statistically significant higher odds ratio that the child would be non-compliant during needle insertion or placement of the mask on the child's face if the child had experienced a negative behavioural reaction during vaccination (OR=9.9; $p=0.007$) or if the child was anxious or crying after premedication (sedation grade) (OR=6.0; $p=0.025$). The model explained 85.1% of the cases and R^2 was 0.375. (Table 3, Paper I, Figure 2)

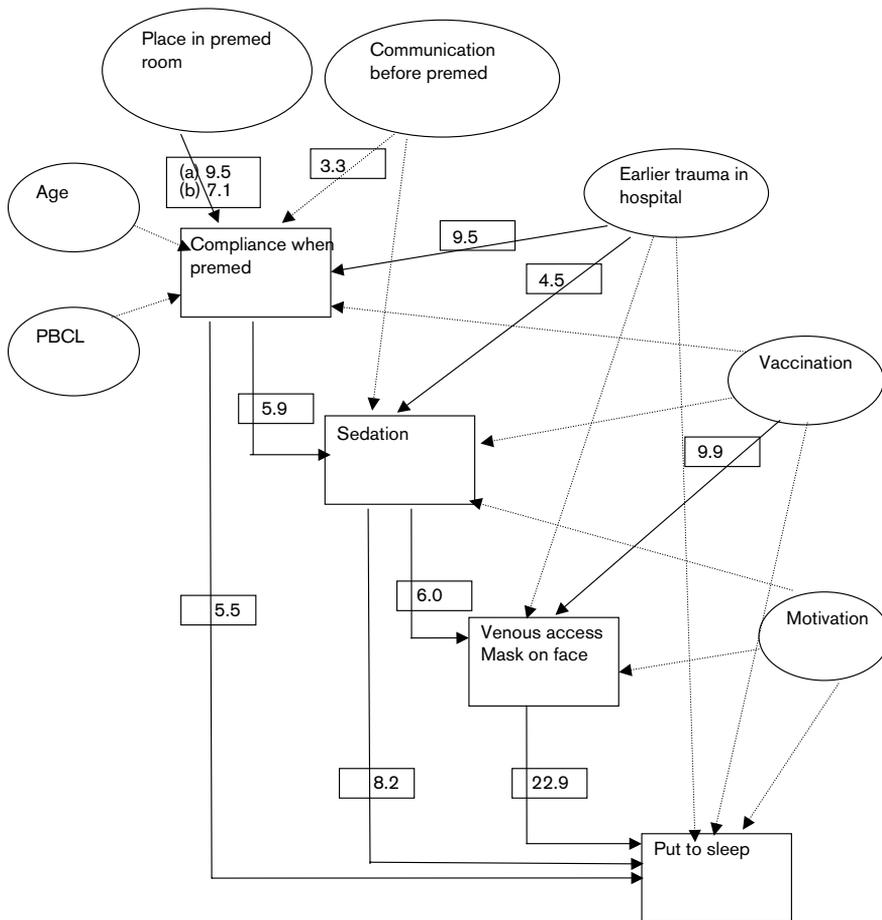
Put to sleep

Twenty-eight percent of the children were anxious or upset when put to sleep.

There was a statistically significant higher odds ratio for the child to be upset while falling asleep if the child had a non-compliant behaviour during premedication (OR=5.5; $p=0.028$), if the child was un-sedated (anxious or crying) (OR=8.2; $p=0.037$) or if the child was non-compliant during needle insertion or having the mask put on the face (OR=22.9; $p=0.001$). The model explained 90.5% of the cases correctly, R^2 was 0.582 (Table 4, Paper I, Figure 2)

Figure 2. Model for variables that influence children's behaviour and compliance in the anaesthetic process.

Arrows with solid line represent significant values in multiple stepwise regression. Arrows with broke line represent significant values in univariate logistic regression. The number in the small boxes is odds ratio.



Paper II

Communication and child behaviour associated with unwillingness to take premedication

The average utterances from the time when the nurse introduced herself/himself until the child took the premedication were 105.1 (range 29–406). This included all communication between nurse, parent(s) and child.

Being unwilling to take premedication was associated with more parental communication and more parental communication directly to the child (both about the procedure and non-procedure related things). In the situations where the child took the premedication unwillingly, the nurse anaesthetists gave greater support to the parental communication with the child more and also talked more directly to the parent.

The nurse anaesthetist took a more active part in communication and spoke more directly, especially about procedural things with children who took their premedication willingly (Table 2, Paper II).

Predicting unwillingness to take premedication were; placement nearby or in parents lap (OR=4.0, $p<0.001$), previous traumatic hospital experience (OR=4.1, $p<0.001$), hesitant eye contact (OR=4.5, $p<0.05$), and high parental communication directly to the child (OR=4.9, $p<0.001$). The model predicted 76.3% correctly and $R^2=0.465$. (Table1, Paper II and Figure 3)

When exploring the associations between communication patterns and child factors and behaviours we found that the nurse anaesthetist talked more directly to children who had previously experienced an earlier traumatic medical situation (+6.2%, $p=0.024$) and especially more about the procedure (+4.7%, $p=0.006$).

Nurse and parents had similar communication pattern with children of younger age (<60 months old) as seen with children who took their premedication unwillingly (Table 2, Paper II).

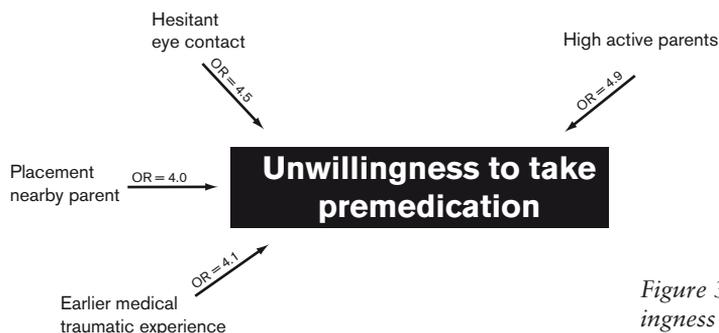


Figure 3. Predicting unwillingness to take premedication, behaviour, previous experience and high active parent

Children who placed themselves nearby their parent or in parent's lap, gave hesitant eye contact or gave no verbal answer to the anaesthetic nurse's initial greeting got more parental communication and had parents who talked directly with them more often, especially about procedure-related things (Table 2, Paper II).

Mothers got more information than fathers (+1.4%, $p=0.044$). Parents with low trait anxiety (<median) talked more directly to the child about non-procedural things (+2%, $p=0.024$) and the nurse anaesthetist also talked more about non-procedural things if the parent had low score on trait anxiety (+0.5%, $p=0.048$).

No difference in communication pattern could be seen regarding parent who scored low or high on state scale.

We also studied if the communication pattern after premedication was associated with less compliant behaviour during the anaesthetic induction but could not identify any clear pattern.

Paper III

Decision making about premedication to children

The anaesthetic nurse made a mean of 9.4 utterances about decision-making (range 2–39) to the child. The nurse decision-making communication was 10.6% (sd=5.6) of the total communication before premedication. The most common decision making communication category was giving information to the child, followed by negotiation (offering something exchange for child compliance in taking premedication, bargaining) and questioning. The percentages of the different main categories and subcategories of decision-making communication, between the nurse and the child can be seen in Table 1, Paper III.

No differences could be seen between the two age groups. Boys received more decision-making communications than girls. Children who indicated relatively more self-confidence by giving the nurse good eye contact, placed themselves independently or verbally answered the nurse anaesthetist initial questions got more information than did children who did not display these behaviours. Children who demonstrated more shyness or less self-confidence by giving non or hesitant eye contact or giving no verbal answer to the nurse’s initial greetings got more negotiation. Children who placed themselves nearby or in parent’s lap got more questions and children who did not make eye contact got more self-determination. There was also a nearly significant finding that children who placed themselves nearby or in parent lap also got more self-determination (Table 2, Paper III, Figure 4.)

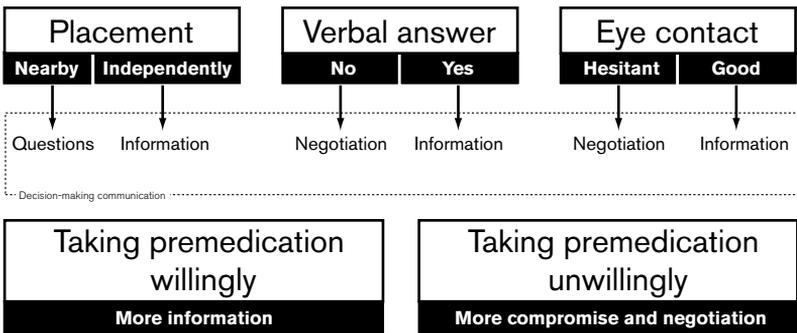


Figure 4. Decision-making communication associated with child factors and willingness/unwillingness to take premedication.

Nurse decision-making and child verbal hesitation

Children who verbally hesitated got more negotiation but this was only found to be nearly significant (Table 3, Paper III)

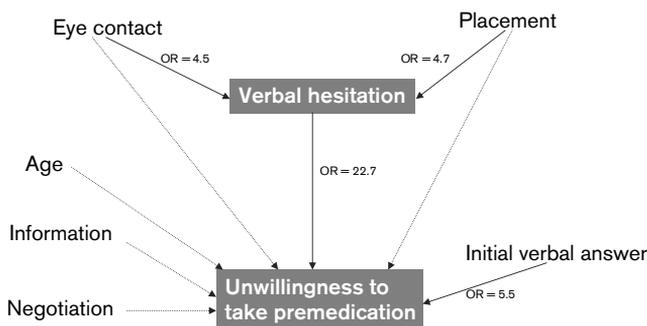
In the multiple logistic regression model significant predicting values were found for hesitant eye contact (OR=4.5, $p=0.003$) and placement nearby or in parent's lap (OR=4.7, $p=0.004$) (Table 4, Paper III). The model explained 75.5% of the results (Table 4, Paper III and Figure 5)

Decision-making and unwillingness to take premedication

Children who took their pre medication unwillingly (by being given help or who protested) were treated with offers of compromise or negotiation and were given less information (Table 3, Paper III).

Decision-making communication did not reach significant predictive value for unwillingness to take premedication in the final regression model. No verbal answer to the nurse anaesthetist's initial greetings (OR=5.5, $p=0.004$) and/or verbal hesitation from the child (OR=22.7, $p<0.001$) predicted unwillingness to take premedication. The model explained 79.8% of the results. R^2 was 0.33 (Table 5, Paper III and Figure 5)

Figure 5. Predicting verbal hesitation and unwillingness to take premedication.



Paper IV

Children's play after anaesthesia and surgery – background factors and associations to behaviour during anaesthetic induction

In this paper a randomly selected subpopulation of the original population was studied. The means, standard deviations and frequencies of the preoperative variables in this subpopulation are presented in Tables 1 and 2, Paper IV. No significant differences could be seen between any of the variables in this subpopulation and the original population. Definition of avoidant reaction can be seen in Table 6.

Approach/avoidance to play with anaesthetic equipment

The children who avoided the play situation were younger (avoidant group: mean=55±15.6 months, approach: mean=68±10.6 months, $p=0.002$). There was an association between unwillingness to take premedication and avoidance of play (chi square=11.4, $df=1$, $p=0.001$). No other variables had significant associations with avoidance to play with anaesthetic equipment.

There was a higher risk that a child would avoid the play equipment if the child had taken the premedication unwillingly (OR=12.9; $p=0.004$) and a decrease in risk with increasing age (OR0.9 for each month increase in age; $p=0.006$). The model predicted 80.9% of the cases correctly and R^2 was 0.50 (Table 3, Paper IV).

Telling about the experience

Comparisons between means showed that children who did not want to tell about their experience were younger (did not tell: mean=55±15.8 months, told: mean=66±12.1, $p=0.009$) and had a lower score on the PBCL (did not tell: mean=3.9±2.5, told: mean=5.5±2.1, $p=0.008$). In the logistic regression model

there was a higher risk that the child did not want to tell about his/her experience if the child had taken the premedication unwillingly (OR=5.6; $p=0.02$) and a decrease in risk with increasing age (OR=0.9 for each month increase in age; $p=0.03$). The model predicted correctly in 68.1% of the cases and R^2 was 0.33 (Table 3, Paper IV).

Specific/unspecific memories

There was an association between age and unspecific memories (unspecific memories: mean=50±12.9 months, specific memories: mean=67±12.3 months, $p<0.001$).

There was also an association between induction technique and memories. In a cross-table, two cells had expected counts less than 5. Fisher's exact test showed $p=0.012$, with children induced by intravenous injection having more direct memories.

The logistic regression model showed a decreasing risk for unspecific memories as the age increased (OR=0.9 for each month increase in age; $p=0.001$). There was also a nearly significant higher risk that if the child took the premedication unwillingly and could not be distracted during induction (interaction effect) he/she would tell more unspecific memories (OR=12.3; $p=0.054$). The model predicted correctly in 83.0% of the cases and R^2 was 0.46 (Table 3, Paper IV).

Discussion

The anaesthetic induction is one of the most stressful experiences a child can have during a hospital encounter (3–5). So to further illuminate the nature of this stressful experience we first identified four critical situations or reactions in the anaesthetic induction process. These four situations occurred in sequence and a non-compliant behaviour from the child in one of these situations predicted a higher risk for non-compliant behaviour in the next situation/reaction. The first situation “taking the premedication” was influenced by such background factors as previous traumatic hospital experience and by behaviour in the premedication room as “how the child placed him/herself”. Placement nearby or in a parent’s lap can be seen as behaviour indicating low sociability and may be a sign of shyness. Both earlier negative hospital experience and shyness and low sociability have been shown to be associated with higher preoperative anxiety (3, 12, 18, 19, 23). These results point out the importance of looking at the meeting with children before anaesthesia as an important process. Earlier learning history with negative hospital experience is one of the things that influences the level of the child’s anxiety in the beginning. This anxiety is modulated during the process.

All of the children in this study were routinely offered and given Midazolam. Forty two percent of the children took the premedication unwillingly or hesitantly and needed help from parents or the nurse. Taking the premedication unwillingly may be a starting point for engaging in the situation with more negative emotions and a raised level of anxiety. Predictive of a lower level of sedation were both unwillingness to take premedication and previous traumatic experience in a hospital. Sixteen percent of the children behaved in a non-compliant way during induction. This non-compliant behaviour was defined as verbally and/or bodily protesting so that the child could not be distracted during the needle insertion or placement of the mask on the face, behaviour leading to the need to use restraints. The extent of use of restraints was not analysed.

Observations that 16 % of the children showed high anxiety during induction are comparable with results from other studies using Midazolam as premedication (46). Reaction during vaccination was, in addition to low sedation level, predictive for non-compliant behaviour during induction. In this hospital the routine was to insert an intravenous needle and this may explain the importance of prior experience with vaccination, which is the most common first experience of needles and injections.

Going to sleep in an upset way was associated with behaviours that can be interpreted as higher anxiety in all of the situations above. More influence was seen the closer the preceding situation/reaction was. Looking at the situation from a transactional view shows that individual vulnerabilities such as age and behaviours displayed in the beginning interact with situational factors leading to reactions that can end up in a situation requiring use of restraints.

One of these situational factors is communication. By learning more about how we communicate and how communication influences the child we should be able to find new and better strategies for interventions.

We found that children who took premedication unwillingly had parents who talked more and also talked more directly with the children. Some earlier studies have shown that parental presence may not be of benefit for the child (55) and that a parent's behaviour and communication predict the child's distress behaviour, while staff behaviour and communication predict child-coping behaviour (68). In our study we could see an association between parents who talked more, talked more directly to their child, more about the procedure and unwillingness to take premedication. It is not possible, however, to determine what the causal relationships may be in this situation. Children may interpret the parent's way of communication as indicating nervousness or that the anaesthesia situation is a strange and dangerous situation, leading the child to becoming nervous by him/herself. On the other hand the parent may see that the child is already nervous so the parent wants to help the child, they may want to show that they are good parents, or even that they do not want the child to embarrass them. Thus more communication from the parent to the child can be a behaviour that should help the child to gain more trust and become more compliant in the situation yet it may have the exact opposite effect. The behaviour of the more dominant parent may result in giving the nurse anaesthetist less time for trust and alliance building.

Midazolam was used as routine medication in this operating ward during the time of observation. Midazolam affects both memory and anxiety level (26, 40-43). Looking at the communication patterns after premedication did not reveal any specific patterns associated with non-compliant behaviour during anaesthetic induction.

Inviting the children to participate in different aspects of the anaesthetic induction process can be a way to built trust. How do we invite children to participate? By identifying different utterances that could be seen as elements in the communication of decision-making or participation we found that the most common kind of utterance was to provide information followed by negotiate and asking

question. Self-determination and compromise were quite unusually elements. Unwillingness to take pre-medication was associated with more negotiation, more questioning and receiving less information. The child behaviours indicative of shyness were associated with more negotiation and questioning and receiving less information. No significant predictive effect in the final model could be seen regarding the different decision-making categories.

More negotiation may open the child's mind to the possibility that stopping the whole procedure is an option. However, none of the children who hesitated or did not want to take their premedication were given the option of stopping and rescheduling the procedure. A failed negotiation might quite simply lead to the creation of even more negative emotions.

Both self-determination and compromise can be seen as expression of greater involvement in decision-making. More involvement in decision-making is often seen as a positive factor leading to compliance during medical treatment. Participation depending on age and maturity is a right of the child (28), but there is no such evidence that more shared decision-making increase short-term compliance (32). Nor could we find that higher degree of participation could be linked to a better coping/compliance from the child. Since self-determination and compromise so seldom are used no conclusions can be drawn.

About 50% of the children displayed avoidant reactions to anaesthetic play equipment 14 days after surgery. Other studies have shown more general behavioural changes affecting up to 60% of those studied (3, 8, 13, 14, 16) during the first postoperative day diminishing after the first 2 weeks. Looking at avoidant reactions may be a means of being more specific, as avoidant reactions can be seen as a result of conditioned learning with a reaction of avoidance, having the the aim of reducing anxiety.

Avoidant reaction to anaesthetic play equipment was associated with how the child took the premedication and with the age of the child. With increasing age the child can better understand and evaluate different situations. The children in this study were premedicated with Midazolam, which has a good anxiolytic effect and anterograd amnesic effect (4, 41, 42). This may protect against a Pavlovian conditioning between anxiety (incompliant behaviour) during induction and avoidant reaction during play. Since Midazolam impairs explicit memory but not implicit memory (51, 52), using Midazolam should not be seen as a guarantee that long-term negative effects from a negative induction experience with restraint can be avoided.

Looking at the anaesthetic process from a learning theory perspective, earlier experience of a traumatic situation in hospital may lead to a situation during the next visit to a hospital with resultant aroused emotions and heightened anticipatory anxiety. This anxiety may lead to an avoidant reaction during premedication and to entering a vicious circle where the end result is an increased risk for developing a restraint situation.

How parents and staff react to the child's heightened anxiety may be critical in determining if proceeding along this vicious circle can be stopped or not stopped. A parent may feel that by being more active the parent helps their child, but we do not actually know if this is true. Spending more time with the anaesthetist may help the child to develop more trust in the anaesthetist and to development of an alliance.

Clinical implications

That 16% of the children have high anxiety and behave in an in compliant way is an unacceptably high percentage. By targeting and evaluating critical situations in daily work we should be able to individualize both psychological and pharmacological interventions. Using an outcome measure such as the DSS might improve the evaluation of these situations.

Research in the future

Focusing on anxiety or distress with the child gives only one perspective. Anxiety is something all people experience and can be of help for us in our daily life. If this distress or anxiety is so high that it becomes overwhelming, then it can be harmful for us. If this overwhelming anxiety is combined with a restraint situation requiring action from the staff then the effect on the child can be catast-

rophic. In future research being able to accurately identify overwhelming anxiety together with resulting restraint situations should help us to further understand a negative situation and help us to find interventions that are correctly targeted.

The knowledge gained in this dissertation can be used to create a new intervention programme based on changes in parental and staff behaviour. These intervention programs should be evaluated randomly in controlled studies.

Conclusions

- To anaesthetise a child is a process that will be affected by reactions and behaviours arising at the beginning of the process will influence and be associated with the behaviours seen in the end of the process.
- Taking premedication is a critical situation and how this is done will influence the rest of the process.
- Both earlier experience and behaviours in the initial phase of the process predict the child's way of taking the premedication.
- Unwillingness to take premedication is associated with more communication from the parent, and more communication from the parent is predictive for taking premedication unwillingly.
- Information is the most common decision-making communication offered to children.
- The second largest group of decision-making communications is negotiation, which is associated with unwillingness to take premedication.
- A child who takes premedication unwillingly has more often avoidant reactions toward anaesthetic equipment and anaesthetic play after surgery than do children who take premedication willingly.

Sammanfattning på svenska

Att sövas är en av de mest stressfyllda erfarenheter ett barn kan ha i samband med sjukvård. Mellan 50 och 60% av barnen känner stor eller mycket stor oro inför sövningen. Denna oro är kopplad till mindre vilja att medverka och samarbeta under sövningen. Denna oro kan också leda till beteendeproblem efter operationen.

Faktorer som är kopplade till stark oro är barnets ålder (yngre barn har mer oro/rädsla), blyghet och tillbakadragna personlighetsdrag, tidigare negativa upplevelser av sjukvården och vissa vuxenbeteenden i situationen. Denna avhandling har gjorts för att belysa processen "att sövas" och i och med det få mer kunskap om barns beteenden i situationen, föräldrar och personals kommunikation under processen, narkosköterskans medbestämmande kommunikation till barnet och hur barnet reagerar inför anestesi-lek efter operation och sövning.

Etthundratvå barn mellan 3 och 6 år som skulle genomgå öron, näsa, hals operationer videofilmades. Barnen fick fylla i enkäter om sina rädslor, föräldrarna fyllde i enkäter om barnens beteende, sina egen oro och tendens till att oroa sig. Alla barn videofilmades från det dom träffade narkosköterskan fram till det dom somnade på operationsbordet. Under själva operationen intervjuades föräldrarna. Fyrtionio barn fick dessutom komma tillbaka efter 14 dagar för anestesi-lek som också videofilmades.

Videofilmerna analyserades för att identifiera kritiska situationer och beteenden. Föräldrarnas och narkosköterskans kommunikation kategoriserades. Medbestämmande kommunikation om premedicineringen identifierades och kategoriserades.

Fyra situationer och beteenden identifierades: att ta premedicinering, sederings-grad, medverkan vid nålsättning/när narkosmasken lades på ansiktet och hur barnet somnade. Varje situation påverkade den följande och en negativ reaktion ökade risken för att nästa reaktion skulle bli mer negativ. En högre risk för att barnet skulle ta premedicineringen ovilligt fanns om barnet hade varit med om en tidigare negativ upplevelse i sjukvården, om barnet placerade sig nära eller i knät på sina föräldrar, hade tveksam ögonkontakt med narkosköterskan eller hade föräldrar som aktivt kommunicerade, speciellt med barnet. Den vanligast förekommande medbestämmande kategorin var information följt av förhandling. Att ta premedicinering ovilligt var associerat till mer förhandling och mindre

information. Ett barn som tog sin premedicinering ovilligt hade oftare ett undvikande beteende gentemot narkosmaterial och narkos-lek.

En narkosinduktion är en komplex process som påverkas av tidigare erfarenheter, egenskaper hos barnet men också av beteenden och reaktioner hos de vuxna som är med barnet. Erfarenheten är en del av barnets inlärningshistoria.

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