



Preoperative anxiety in pediatric patients undergoing elective surgery: Risk factors and nursing interventions

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ABSTRACT

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Children often experience severe anxiety before surgery and during anaesthesia induction. Nurses are challenged to deliver adequate support for children and their families during the perioperative phase. The purpose of this study was to detect risk factors that often contribute to the development of anxiety in children who are admitted for elective surgery. Another aim was to find effective and easily accessible methods for nurses and nursing students who are caring for paediatric patients and are in close contact with their families. The objective was to increase the awareness of this phenomenon among nurses and to facilitate the safety of surgical care.

The study was conducted with a qualitative approach and searches were carried out by using CINAHL, Medline, PsycINFO and PubMed databases. The data was collected between April and May in 2021. Twenty-three international studies were included in this review. Based on the results, it was concluded that the most common risk factors for development of anxiety can be further divided into influenceable and non-influenceable factors. For example, age or the temperament of a child cannot be changed, but the surroundings of the hospital environment can be arranged so that it becomes less threatening. The findings suggest that interventions, such as educational preparation, distraction methods and parental presence can significantly benefit children if used correctly. Combinations of certain interventions were found to be more effective than relying merely on a single method.

The choice of appropriate interventions requires a careful consideration of the patient's age, previous experiences, personal preference, and potential behavioural issues. Nursing interventions combined with an empathetic communication and active listening have a major impact on the whole surgical experience and make it more endurable for children and their families.

Keywords: paediatric patient, preoperative anxiety, risk factors, interventions, patient safety

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1 INTRODUCTION

Surgical operation is one of the most significant life events and it can trigger difficult emotions and feelings in all ages, but especially within children. Hospitalization often provokes a stress response, especially for those who are admitted for surgery. Illness of a child can be a frightening experience for both the child and family members. (Bedaso & Ayalew 2019, 1.) Surgical procedures can be extremely worrisome for patients, and it may be difficult to remain calm before an operation. Children can perceive hospital admission even more threatening, because of their tendency to get influenced by things faster and more seriously compared to their older counterparts. (Nightingale, 1859.)

The prevalence of severe surgery related anxiety is estimated to be over 50% in all child patients in the preoperative holding area of the hospital. Even higher prevalence (81.6%) was observed at the time of an outpatient preoperative evaluation. (Moura, Dias & Pereira 2016, 6.) The underlying reasons for this are various: developing cognitive capabilities, lack of self-control and poor reflexional skills cause a greater dependence on the parents or legal guardians of children. Limited life experience and poor understanding of the healthcare system can also cause behavioral issues and negatively influence the patient safety and outcomes of a surgery. (Perry, Hooper & Masiongale 2012, 69.)

Regardless of high prevalence, pre-operative anxiety is often left without appropriate attention. This concerns especially patients undergoing minor surgeries. (Bansal & Joon 2016, 37.) Anxiety is a normal emotional response during the preoperative phase, but it should never be left without attention by health care providers (Yahya AL-Sagarat et al. 2017, 102). By preparing the child correctly, nurses can alleviate behavioral issues and help family members to cope better with the situation (Perry et al 2012, 69). One of the primary goals of this literature review is to find the most common risk factors that can cause pre-operative anxiety in children. Since anxiety can compromise patient safety, the objective is to find effective nursing interventions to prevent complications which are related to intense surgery related fear. Another aim is to raise awareness of preoperative anxiety in children through evidence-based practice.

2 PURPOSE, AIM AND RESEARCH QUESTIONS

The purpose of this bachelor thesis is to conduct a literature review and identify the most common risk factors contributing to preoperative anxiety in pediatric patients. The objective is to discover the most effective, safe, non-pharmacological and easy-to-use interventions for reduction, possible prevention and management of severe anxiety related to a surgery. The aim of this thesis is to positively influence patient safety by increasing general knowledge of the issue among health care professionals. By choosing and applying appropriate interventions at the right time, nurses can remarkably enhance patient safety.

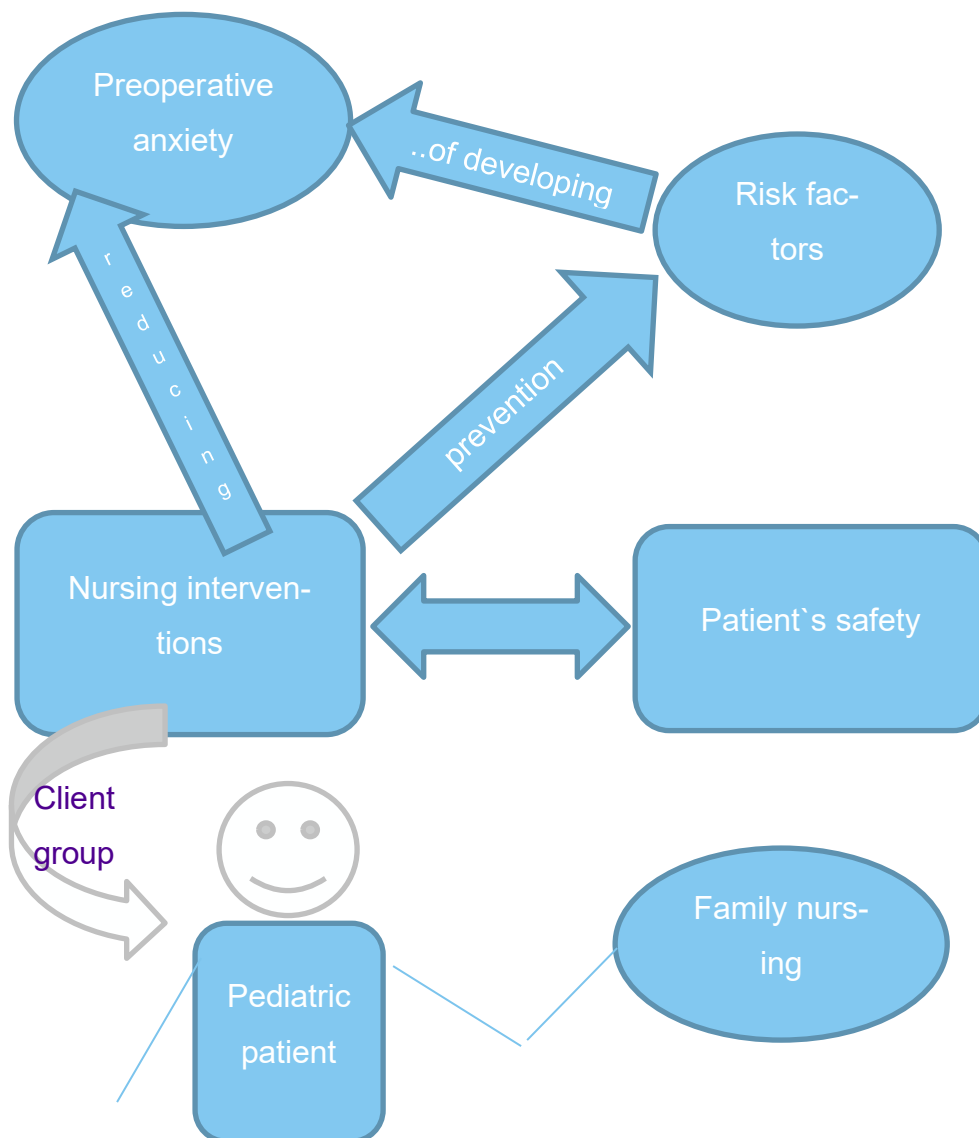
Research questions:

1. Which factors commonly contribute to the development of pre-operational fear and anxiety in pediatric patients between 6-9 years of age?
2. Can pre-operative anxiety be managed or prevented and what interventions registered nurses can use to reduce pre-operational fear and anxiety?

3 THEORETICAL STARTING POINT

The main theoretical points are paediatric patient, preoperative anxiety, nursing interventions, family nursing, risk factors and patient safety. The connections between the concepts are illustrated on the mind map below (MIND MAP OF THEORETICAL CONCEPTS) and further discussed on the page seven.

MIND MAP OF THEORETICAL CONCEPTS



The main reason for the topic selection is to improve patient safety of pediatric surgical care. Another of the two research questions tries to find out whether anxiety can be prevented by nursing interventions. Risk factors are discussed under the chapters 2.6 and 5.1 with an explanation of which factors commonly contribute to the development of preoperative anxiety in children. The concept of family nursing will be defined in detail because children are expected to be supervised by their parents or guardians.

3.1 Patient safety

Nursing interventions, if applied correctly and at the right time, can improve patient safety. Patient safety refers to the principles and actions of individuals and organizations in healthcare, which ensure the quality of care. It involves the safety of medication, the safety of treatment, and the safety of medical equipment. Every health care unit in Finland must have a system, which is used for reporting all care related incidents systematically by health care workers. (EU-healthcare.fi n.d.)

Nursing interventions, aiming for anxiety reduction in children, not only increase patient safety, but also ensures the quality of care. By building a trusting relationship with the child, consensus can be gained for medical procedures, and this enables the child to participate in decision making. Secondly, it can help empowering children and restoring their sense of being in control. If the child remains calm and compliant, it is less stressful for the medical team to complete surgery related procedures and prevents them making shortcuts in safety protocols. (Fernandes et al. 2014, 1071.) It is worth mentioning that clear guidelines for treatment of preoperative anxiety in children have not yet been rooted in the Finnish health care. This may be a potential risk in patient safety of paediatric surgical care.

3.2 Paediatric patient

Perioperative care of paediatric patients is different from adult practice and age of patients can be anything from premature neonates to mature teenagers. Variation in physiological, anatomical, pathological, and pharmacokinetic characteristics is noteworthy and general anaesthesia is usually required for all surgical operations, imaging, and examinations, as opposed to adult patients. Parents are involved in each stage of the care path and time should be allowed for their questions and information requirements must be addressed. (Doyle 2007, 50.)

Preoperative assessment of a paediatric patient includes same elements as with adult patients, but the physiological and cognitive development is still ongoing, creating special needs concerning their care and ways of communication. Preoperative assessment can be a frightening experience for a child patient. White coats should be avoided if possible and staying at eye level with the child is preferred. Risks can be discussed if appropriate and information should be clear and truthful: anesthesia gas does smell, and needles can hurt. (Doyle 2007, 52.)

This review focuses primarily on children in their middle childhood, between six to nine years of age. According to Piaget, children are at the end of the preoperational stage at this point of their development, and at the beginning of concrete-operational stage. During this developmental phase, children start to use symbolic play, and this stage is also characterized with a strong verbal development and ability to produce speech. (Kagan, Bornstein & Lerner 2020.) The decision, to limit age range from six to nine years of age, was made because it allows investigation of more specific interventions, which are particularly suitable for this age group representatives.

3.3 Preoperative anxiety

The outcomes of a surgery can be negatively impacted by preoperative anxiety in paediatric patients. Preoperative anxiety can be described as a strong feeling of discomfort, which begins in the planning stage of a surgical procedure, increases immediately before hospital admission and peaks when entering the operation room. Severe anxiety can cause physiological changes in the body leading to a change in the circulatory system. (Mushtaq, Mukhtar & Khan 2007.) It can cause tachycardia, hypertension, or lead to excess bleeding. There is also a correlation between high level of anxiety and increased post-operative analgesia requirement. Anxiety is also characterized with impaired thinking and decision making, and poor perception and concentration. (Bedaso & Ayalew 2019.) If anxiety is addressed well before the day of surgery, a child can be prepared for the operation, and it will lead to a decreased risk of complications.

The source of preoperative anxiety is often nonspecific and unknown to the patients (Sigdel 2015, 17). Occasionally, anxiety in children can be so intense, that children may wet themselves. The situation can lead to an attempt to escape from the healthcare providers, which evidently can risk the patient safety. (Fortiera & Kain 2015, 4.) Authors have reported, that up to 25% of young children, who have not received sedative premedication or non-pharmacological interventions, must be forcefully held down during the induction of anesthesia (Fortiera & Kain 2015, 4).

3.4 Nursing interventions

Nursing interventions are actions and procedures taken by nurses based on symptoms, medical history, doctor's orders, and diagnosis. They are meant to promote well-being of a patient by pain reduction, symptom management or by bringing comfort during an illness, crisis, or other health condition. The concept has become more complex because of the continuous development of nursing field and there is a growing need for globally and nationally regulated guidelines

and interventions in health care. Broadly accepted and tested interventions ensure the quality and consistency of care and improve surgical patient safety. (Eustace 2015.) Children suffering from anxiety in pre-operative phase could benefit from nursing interventions, but nurses may not have the time, clear guidelines, resources, or information to meet the needs of patients. Children may also be unable to express their feelings constructively and comprehensively, leaving them in a vulnerable situation.

3.5 Family nursing

The definition of family has not reached a wide agreement. Traditionally, families are established through blood ties, guardianship, adoption, or marriage. However, the term can hold different meaning for everyone, and families come in all forms and sizes (Kaakinen 2010.) The term can be defined by the individual itself and has no obligation for any legal or biological means. This diversity must be honored by nurses. (Lodge 2011.)

Child's growth and development are greatly dependent on their family's support. Parents should be involved in every stage of the perioperative care path because an illness of a child can be a tragedy both for the child and families. Family centred approach in surgical paediatric care is crucial in maximizing the outcomes of a child patient. Parents usually are the best specialists of their child's care and can provide more information than any available chart or an assessment tool. By collaborating closely with the parents, nurses can develop the most optimal plan of care. Decisions related to the care of a child should be informed to the parents or guardians, and nurses' role is to make sure the information is completely delivered to them. (Saleeba 2008.) Successful family nursing involves an assessment of the strengths and needs of all family members, and it can have a major impact on the care of a child during the perioperative phase (Kaakinen 2010). If parents are allowed to be present in all stages of care, children are found to require less medication, remain less restless, cry less, and sometimes being discharged earlier from the hospital (Saleeba 2008).

3.6 Risk factors

Early detection of risk factors, which can cause anxiety in children, can help to improve patient safety. When appropriate actions are taken by nurses to reduce anxiety levels, medical procedures may be completed without the child forcefully resisting the care. When assessing risk factors, family nursing plays an important role. Parents can provide a great amount of information, for instance, they might mention that the child suffers from fear of needles, which could lead to a failed attempt to collect a blood sample from the child or lead to a needle stick injury. This information enables nurses to apply interventions well before the medical procedure, which subsequently can relieve anxiety levels. (Saleeba 2008.)

The ability to identify and react to risk factors requires an understanding of the different needs of pediatric patient group. Behavior patterns and reactions to stressful events, such as an upcoming surgical operation, can be very intense among children and require special attention from nurses. (Medical Dictionary, risk factors n.d.) Risk factors for severe anxiety before a surgery can arise from different sources and some of them can be removed and maybe even prevented, whereas others are innate or caused by environmental- or social factors, such as age and socioeconomic status (Medical Dictionary, risk factors n.d.).

4 LITERATURE REVIEW

4.1 Searching the literature

Once research questions have been created, a systematic search strategy will then be applied. It will help identifying the most relevant published material for answering the research questions. Systematic search strategy entails development of search terms that are logical and relevant for the search, and are extracted from literature review questions, by using inclusion and exclusion criteria. Searches were conducted by using the selected search terms on reliable databases. (Aveyard 2014, 74.)

To answer the first research question, all appropriate combinations of preoperative anxiety with Boolean phrases OR were tested. The final version was: (“preoperative anxiety” OR “preoperative fear” OR “surgical anxiety” OR “surgical fear”). The literature review considered only child patients thus search terms included “paediatric” OR “pediatrics” OR “paediatric” OR “children” OR “child”. To answer the second research question, the combinations of search terms included “management” OR “intervention” OR “reduction” OR “prevention”. The search terms were then combined with Boolean phrase AND. The final version was: (“preoperative anxiety” OR “preoperative fear” OR “surgical anxiety” OR “surgical fear”) AND (“paediatric” OR “paediatrics” OR “paediatric” OR “children” OR “child”) AND (“management” OR “intervention” OR “reduction” OR “prevention”).

During the search, inclusion and exclusion criteria were applied. Aveyard (2014, 77) mentions that the criteria is beneficial when searching for literature which is directly related to the research questions. The reviewed studies considered mainly child patients in their middle childhood; therefore, the age range was first set between six to twelve (6-12) years of age. Language limitation was used in the search and all the reviewed articles are written in English. To increase the validity of the thesis, it was ensured that the chosen articles have been published in widely accepted and well-known nursing journals and all articles have been

peer-reviewed. As an additional exclusion criterion, a year limitation was set between 2008 – 2021.

For the initial search, different bibliographic databases were employed, such as CINAHL (Cumulative Index to Nursing and Allied Health Literature), MEDLINE (Medical Literature On-Line), PubMed (National Library of Medicine) and PsycINFO (Psychological information database).

It was challenging to develop a suitable search phrase for the purposes of the bachelor's thesis at the beginning. Several search words with combinations of different Boolean phrases were carried out during the manual search. The results showed one or two relevant articles out of hundred, or no results at all. With the advice of supervising teachers, sufficient results were eventually achieved by creating a successful search phrase. It was later decided to use the same phrase for all chosen databases as other phrases were not shown to provide satisfactory results. Extension of the initial publication year limitation by additional three (3) years was then decided, since research articles written before the year 2010, considering the nature of the topic, may have not yet become obsolete. The results are represented in TABLE 1.

TABLE 1. Search

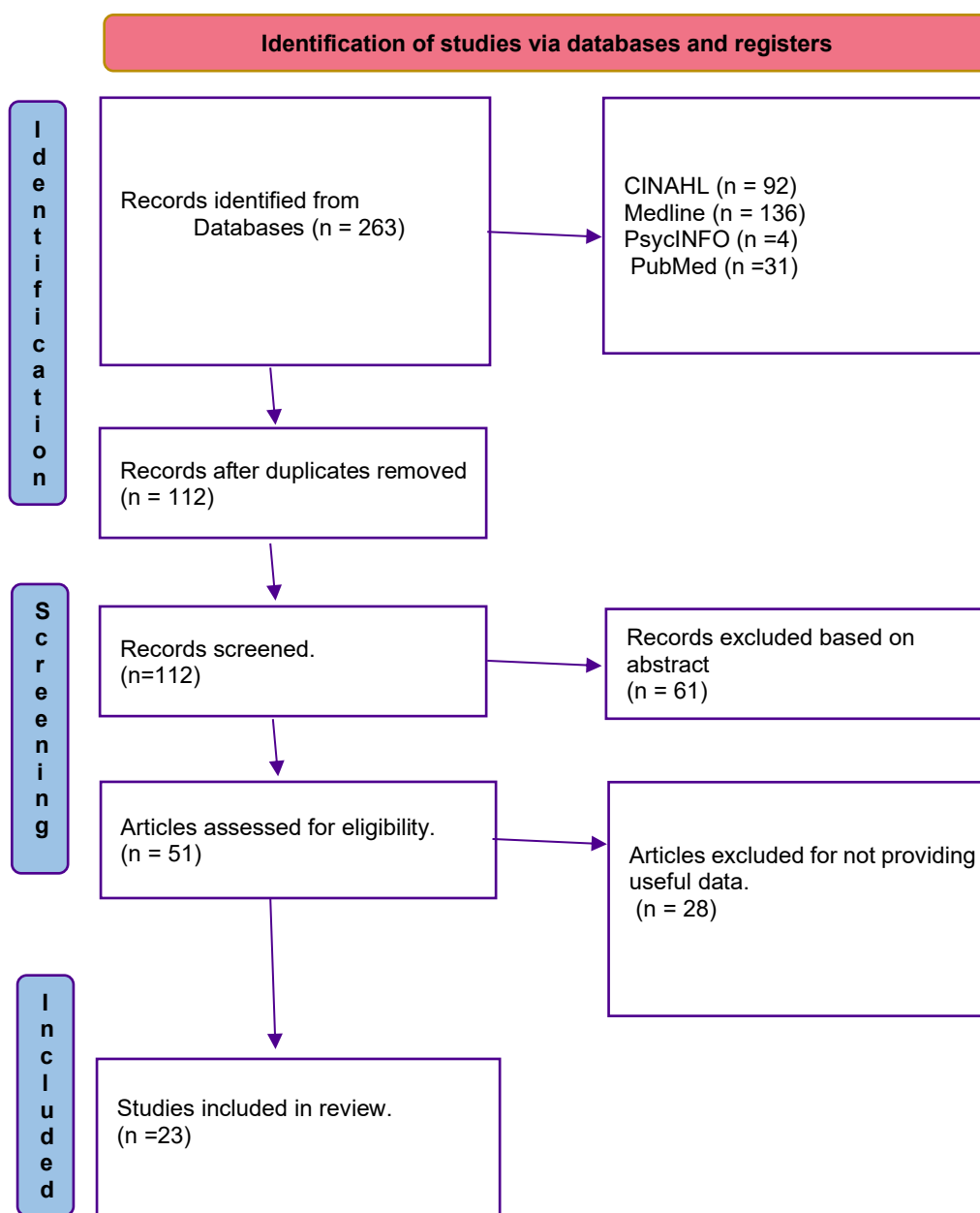
Databases	Search phrase	Inclusion and exclusion criteria
CINAHL Medline PsycINFO PubMed	("preoperative anxiety" OR "preoperative fear" OR "surgical anxiety" OR "surgical fear") AND ("pediatric" OR "pediatrics" OR "paediatric" OR "children" OR "child") AND ("management" OR "intervention" OR "reduction" OR "prevention").	Scholarly (Peer Reviewed) Journals. Date: 2008-2020 Language: English Age Group: 6-12 years old

The first search was completed in CINAHL, and it retrieved a little less than a hundred articles. Most of the results were excluded based on the non-relevant headlines. The biggest number of articles was retrieved through MEDLINE, but it

was soon discovered that MEDLINE provided the same results as CINAHL regarding the nursing point of view of the research question. After the removal of duplicates and non-relevant articles, thirteen eligible articles remained which met the criteria.

Database search was continued in PsycINFO and the final contribution to the results was four peer-reviewed articles. PubMed search resulted in three articles after the removal of duplicates. After screening through the results, including reading the abstracts, more articles were discarded. The reason for exclusion was based on differences in the content represented in the articles, such as post-operative anxiety or parents' anxiety as the main topic. Fifty-one articles were chosen for further assessment of eligibility. After reading the full text of each article, the main reason for exclusion was the age group which the research had included in the study. For example, if the mean age was five years or less, or over nine years of age, the article had not met the quality appraisal criteria. The results are presented in the PRISMA FLOW DIAGRAMME, page 15.

PRISMA FLOW DIAGRAMME



4.2 Critical appraisal of data

Critical appraisal evaluates the trustworthiness of the evidence, which is represented in the research articles. It assesses the methodological value through a systematic review of the data. The process uses a set of domains for filtering out irrelevant studies. For example, an inappropriate study design was a reason to discard an article. Other reasons for exclusions were lack of trustworthy or transparency, or if the studies did not mention limitations. This review uses the quality appraisal criteria by Kangasniemi et al. (2013) and is shown in detail in TABLE 2.

The critical appraisal instrument includes six propositions: Study design adequately described, Research methods appropriate, Explicit theoretical starting point, Limitations presented, and Implications discussed. These propositions were after careful examination marked either y=yes, p=poor or nr= not reported. Most of the answers were “yes” with a few exceptions, indicating a high quality of study design and eligibility of the studies. (Kangasniemi et al. 2013.)

4.3 Extracting the data

Twenty-three articles were included in the final review (TABLE 2). The chosen articles represent relevant findings and answer the research questions. Methodological design in most of the articles was randomised control trial, but some articles presented quasi-experimental design, blinded clinical trials, prospective observational study, univariate and multivariate analysis of data, case report Modified Yale Preoperative Anxiety Scale, State–Trait Anxiety Inventory, Likert scale, Facial anxiety scale (FAS) and Visual FAS were used to assess the outcome of the intervention. Studies and trials were conducted in many countries.

TABLE 2 The description of twenty-three eligible studies (See appendix 4. for full records)

Authors, year, country	Purpose of the study	Design and tools	Sample size and characteristics	Quality appraisal criteria (scale: y=yes, p=poor, nr= not reported)
Shaheen et al. 2018. Jordan.	To test the effectiveness of age-appropriate preoperative information session in reducing anxiety levels of school-age children.	Quasi-experimental design.	126 children were divided randomly into control- and intervention groups.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Moura et al. 2016. Brasil.	To estimate the prevalence and factors associated with preoperative anxiety in children.	Cross-sectional analysis of baseline data of a prospective cohort and open study.	210 children of both sexes. Age group: 5-12 years.	(y)Aim and objectives clearly described. (p)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (nr)Limitations presented. (y)Implications discussed
Dionigi & Gremigni. 2016. Italy.	To test combined intervention of art therapy and clown visits could reduce anxiety at parental separation prior to induction of anesthesia.	Observational study	78 children (aged 3–11 years) undergoing general anesthesia for surgery.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed

4.4 Analysing the data

Thematic analysis is one of the methods to analyse qualitative data. It is usually used to apply for when the research has many academic research texts and articles. The researcher closely examines the content to seek for topics, ideas or patterns that would come up with frequency. This method is a suitable approach to research about people's experiences from a set of qualitative data. (Caulfield, 2019.)

There are two main approaches for data analysis: inductive and deductive (Theophilus 2018, 391). Inductive approach was used in this literature review; thus, the themes were named after the searches were completed in databases. Inductive approach made it possible to create and categorize main- and sub themes from the articles and enabled to first observe fragments of information and then create more generalized propositions towards the end of the process.

First step of thematic analysis is to get familiar with the data, which involves reading carefully all the chosen articles and identifying results of each study (Aveyard 2014, 143). During this step, thirty-eight quoted phrases which answers our research questions, were extracted.

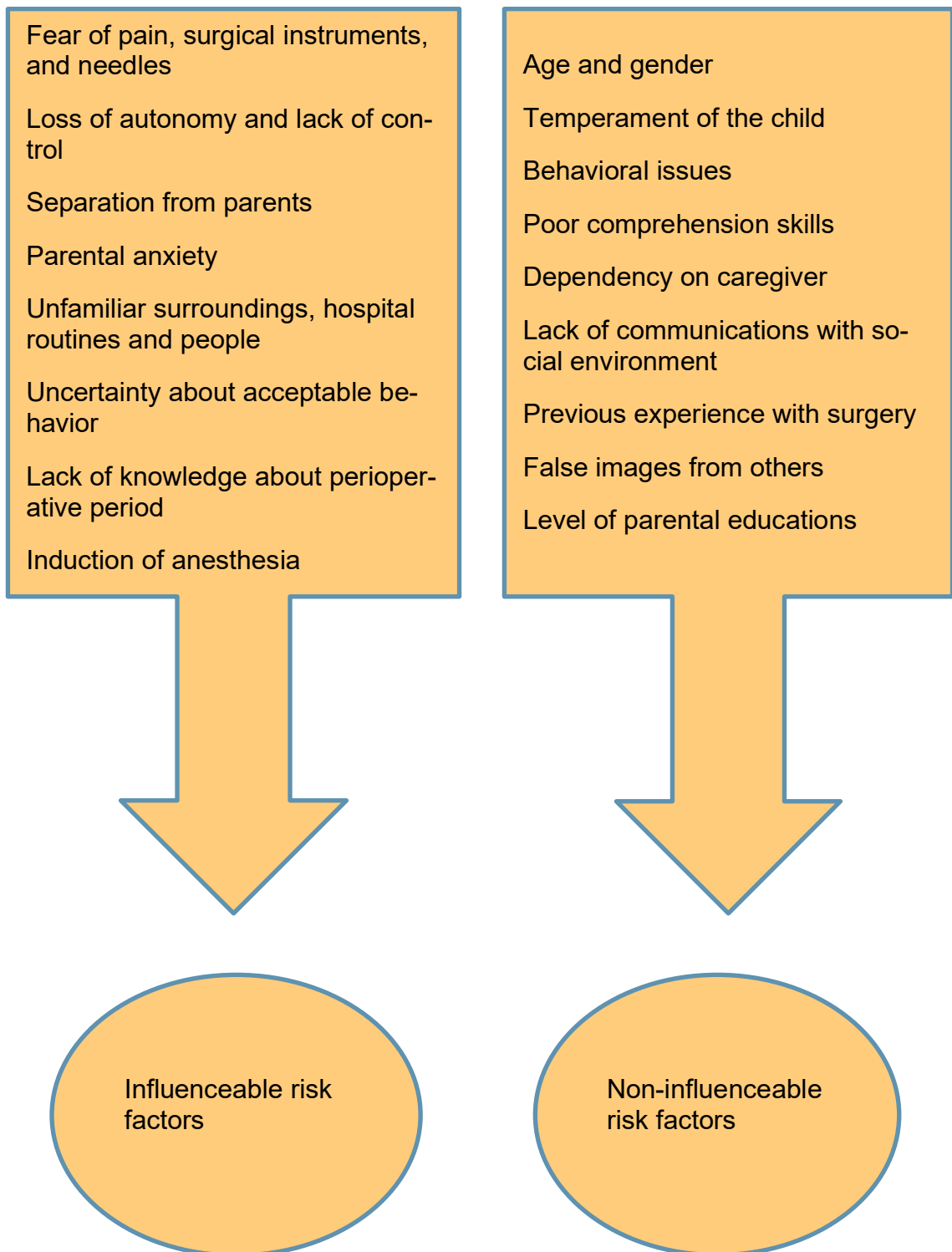
Quoted phrases example (See appendix 5. for full records)

Kassai et al. 2016	"Information on anesthesia and surgery procedures given in a comic leaflet to children is worth implementation before surgery because it is cheap and seems effective in reducing preoperative anxiety	Comic leaflet with preoperative information
Chaurasia et al. 2019	"Various factors like unfamiliar surroundings, separation from parents, or fear of needles and sharp instruments contribute to preoperative anxiety in kids." "Use of incentive-based game therapy reduces the anxiety scores during induction of	Risk factors Incentive based game intervention (play therapy, famil-

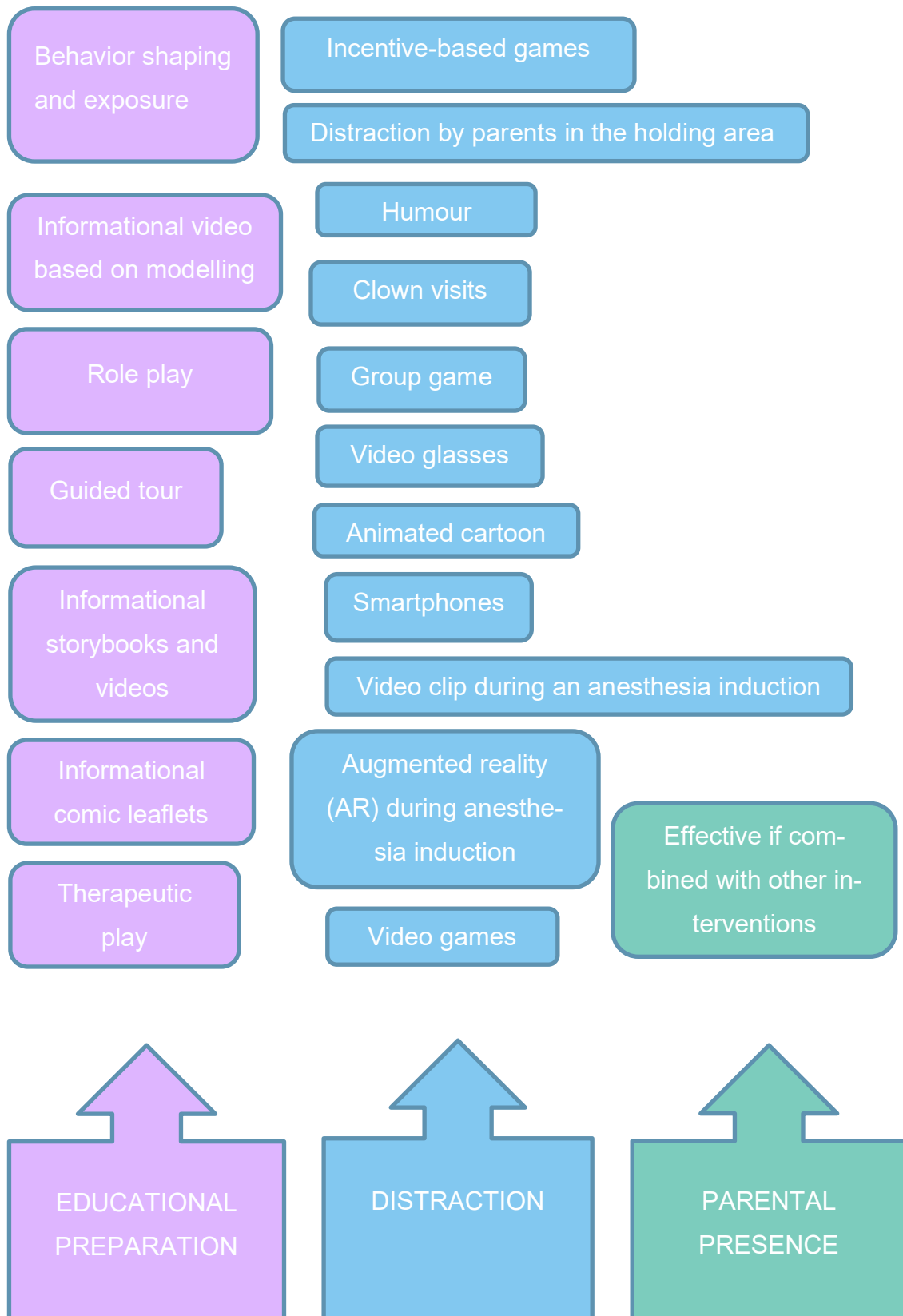
	anesthesia and improves the compliance to facemask induction in children undergoing surgery.	iarization, incentives, parental presence)
Rasti et al. 2014	<p>“The presence of parents has no useful and significant effect on children’s anxiety undergoing surgery and thus in order to reduce complications due to surgery anxiety, other effective interventions should be investigated.”</p> <p>“Factors cause anxiety - Physical damages or injuries, separation from parents and relationship with strangers in the absence of family; fear of unknowns; uncertainty about the limits of acceptable behaviors; loss of autonomy, control”</p>	<p>Parental presence</p> <p>Risk factors</p>

Extracted phrases were further allocated to either *risk factors* or *interventions* group, as illustrated in the table above. Risk factors were summarised and categorised into two groups. Large number of frequently occurring intervention themes emerged and were highlighted from the data. To compile an understandable representation of the themes, they were categorized into main- and sub themes. All themes were evaluated, named, and compared with each other and decided whether they could be logically allocated under the main themes. (Aveyard 2014, 143.) This process is illustrated on the Risk factors mind map and Nursing interventions mind map, page 25 and 26.

RISK FACTORS



NURSING INTERVENTIONS



5 FINDINGS

5.1 Risk factors

Children separated from their family or parents, and the sense of losing control, were considered the most concerning issues for children. The article by Fernandes, Arriaga and Esteves (2014, 1069) concluded that premonition of pain, sense of danger, concern of the instruments and the procedures themselves, with the non-familiarization of the people, are factors that add the possibility of negative outcomes for surgical patients. The research by Chaurasia, Mehta, Gandhi, and Mathew (2019, 1629) mentioned factors which resembled Fernandes' findings: parental separation, strange surroundings, and fear of surgical instruments caused negative emotional response within children. He et al. (2015, 1040) also highlighted the unfamiliarity of the places and procedures and sense of losing control, as major stressors for paediatric patients.

The article by Moura, Dias and Pereira (2016, 2) mentioned few risk factors that cannot be influenced by nursing interventions: The temperament of a child, age, behavioural patterns, negative experiences, level of parental education and maternal anxiety. Especially highly sensitive children, or children considered "shy", were more likely to experience distress before a surgery. Nevertheless, some risk factors that could be influenced by nursing interventions, were identified as well: poor understanding of what was happening, fear of physical injury, being apart from parents, and knowing the date of surgery, were likely to create anxiety in all children regardless of their temperament type, age, or sensitivity. (Moura et al. 2016, 2.)

Rasti, Jahanpour and Motamed (2014, 10) noticed that if parents were not present, physical contact as part of medical procedures or preparations, was experienced intimidating by children and strongly associated with anxiety. Secondly, they discovered that children were often concerned of outcomes of surgeries and worried about acquiring physical damage as a result. In addition, children were often confused of how to behave appropriately during the procedures and what

was expected from them. Tunney and Boore (2013, 320), and Hatipoglu, Gulec, Lafili and Ozcengiz (2017, 792) came forth with same risk factors as mentioned previously, with one age related addition: patients under the age of seven years (7), were most likely to experience anxiety in comparison to other age groups. Uncertainty of what was happening, created a dependency on the mother, lack of communication with people around them, and a decrease in the ability of dealing with stress (Hatipoglu et al. 2017, 792).

Delivet et al. (2018, 987) mentioned that child's age, type of temperament and pre-medications are considerable variables. Furthermore, face masks and unfamiliarity with the anaesthesia safety-protocols made children feel nervous.

It was concluded that knowing other people's poor outcomes, the shock of a new diagnosis, and procedures that might involve pain and discomfort, caused distress aggravating anxiety. Sometimes the procedure itself could be the main reason for anxiety (Jones et al. 2021, 75). Mifflin, Hackmann & Chorney (2012, 1162) stated that the induction of anaesthesia is the most stressful moment during the perioperative phase, showing signs of uncontrollable anxiety approximately in half of the patients.

5.2 Nursing interventions

Educational preparation

Paediatric patients who received educational and informational material had lower anxiety levels than those who were only entertained on the day of surgery. This result is from a study by Fernandes, Arriaga and Esteves (2014, 1070). The educational preparation provides best results when initiated in two to four (2-4) weeks prior to surgery and can effectively alleviate worries and fears concerning the hospital stay and the surgical operation (Fernandes et al. 2014, 1071).

Comic information leaflet providing information for paediatric patients about the upcoming surgery is found to be effective means of reducing preoperative anxiety. Vast majority of the paediatric patients (90%) found the leaflet comforting and useful. (Kassai et al. 2016, 95–100.)

One study found a link between anxiety and age. A *storybook* used as part of psychological preparation, was found to be particularly useful among female patients aged seven (7) years old according to Tunney and Boore (2013, 331). Another discovery was that younger children experience higher anxiety levels in general than older children and the anxiety levels peaks at the age of five. The results are supported by Piaget's cognitive development theory. It states that children aged 6-8 years old have reached the concrete operational phase and this age group particularly learns effectively from images and pictures which are found in story books. (Tunney & Boore. 2013, 333.) A study by Shaheen et al. (2018) also used an informational *storybook* as an intervention. The results revealed that information provided a day before the surgery lowered the anxiety and children displayed deeper knowledge of their upcoming surgery compared to children who were not prepared. Blood pressure and heart rate of children were measured after the intervention and both values were reduced. (Shaheen et al. 2018, 1.)

Another study implies that the most effective pre-operative preparation intervention is the development of coping skills followed by *modelling, guided tour, printed material or play therapy*. The study defines modelling as "a technique in which the child practices indirectly anaesthesia and surgery by a video demonstrating positive coping behaviours." Batuman et al. (2016, 537) found that informative video presentation led to decreased anxiety scores at induction of anaesthesia and less postoperative inappropriate behaviour.

Practicing the use of an anaesthesia mask at home, before the surgery, is a preparation method that is shown to be significantly effective tool to reduce anxiety. This exposure technique combined with parental planning and distraction helped remain anxiety on a moderate or low level through the preoperative phase. (Fortier et al. 2011, 715.) This result is supported by Dwairej, Obeidat and Aloweidi (2019). They combined *video game distraction* and *anaesthesia mask exposure and shaping* intervention in their study. The combination was found to

be effective in reducing children preoperative anxiety and enhance children anaesthesia induction compliance. (Dwairej et al. 2019, 1–2.)

The efficacy of an *orientation tour* in a hospital environment can be effective especially for school-age paediatric patients. A guided tour builds up a deeper level of knowledge of the hospital environment, medical equipment, and the upcoming surgery and benefits children to cope better with the fears related to preoperative phase. (Karimi et al. 2014, 1–13.)

One study found that an informational video has a more prominent impact on anxiety levels compared to auditory presentation or music therapy (Hatipoglu et al. 2017, 792).

Therapeutic play familiarizes children with hospital procedures, and other medical events, by using videos and dolls as part of a play. Therapeutic play involves a child receiving a one-hour individual face-to-face play session and a manual of medical objects and equipment, which are used in the operation. The timing for the intervention is usually from three to seven days before the day of surgery. Therapeutic play in the study of intervention involved viewing a video entitled Preparing for Your Operation at the Participating Hospital, looking at photos of the setup and environment of the operating room, using a doll to demonstrate pre-operative procedures and anaesthesia induction (e.g., receiving oxygen and anaesthesia gas therapy, receiving intravenous therapy, and obtaining vital signs) and return demonstration. Children also received the manual describing the medical objects and equipment (e.g., pulse oximeter, ECG electrodes, blood pressure cuff and oxygen mask) that would be used during operations. (He et al. 2014, 1035.) Authors imply that therapeutic play helps children regain control and express their anxiety by helping them to switch from passive to active participation of their care (He et al, 2014, 1033). Therapeutic play significantly reduced children's negative emotional manifestations and postoperative pain and show significance in reducing children's state anxiety prior to surgery (He et al. 2014, 1038).

Jones et al. (2021, 75) support the *therapeutic play intervention*. Therapeutic play consists of unfamiliar and scary objects, such as needles and blood pressure

cuffs. Children get acquainted with the objects under supervision and the goal is to respond to these objects neutrally after an exposure and familiarization. The authors investigated effects of *medical play* intervention in a quasi-experimental study, by letting the children observe, choose their preferred equipment, and participate on a pretend play with consideration of their coping and willingness to play. The play was conducted in groups and included grabbing an anaesthesia mask, putting the mask on a doll, choosing pretend injections, and giving them to the dolls. Participants reported lowered anxiety levels, less fearful thoughts, and improved coping skills after the trial. (Jones et al. 2021, 80.)

Distraction

The study of Chaurasia et al. (2019, 1629) suggest that using an incentive-based games can be a simple and low-cost method for anxiety during an induction of anaesthesia. Authors used a game in which a child blows through a mask to inflate a balloon during the intervention. Familiarization with strange objects and incentives were found to be effective and parental presence enhanced the positive effects especially if they took part in the game and cheered children to win the game, instead of passive participation. (Chaurasia et al. 2019, 1630.)

Fortier et al. (2011, 713) analysed a family-centred preoperative intervention program. They found out that exposure to an anaesthesia mask and parental use of distraction were the two most effective interventions, not only in reducing anxiety, but keeping anxiety level on minimum during the whole preoperative period. Parents were educated beforehand to use planned distraction in the holding- and operational theatre areas and children were provided with a bag filled with toys to play with during the preoperative period (Fortier et al. 2011, 715).

The authors of "Wacky Wednesday" intervention described the use of distraction through humour to reduce preoperative anxiety in children (Berger, Wilson, Potts & Polivka 2014, 286.) During the preoperative period nursing tasks included singing a song, dancing, playing "peek-a-boo," telling a silly story, wearing funny costumes or acting in a "wacky way" to draw child's attention away from the threatening situation. The study showed that entertaining environment had an effect of

relieving stress and laughing relieved tension in child participants. (Berger et al. 2014, 290.)

Another observational study supported distraction through humour using *clown visits* as an intervention. Authors focused on assessing children's anxiety when parents were separated from them at the time of anaesthesia induction. Combinations of *art therapy* and *clown visits* were used. *Art therapy* helped to express emotions and fears without using words and clown intervention helps to distract children and create a relaxed atmosphere, and they were invited to play, interact, and laugh. (Dionigi & Gremigni 2016, 633.)

Ünver, Güray, and Aral (2020) explored the efficacy of a *group game* intervention including children and parents playing Jenga game in a waiting area approximately 20-30 minutes. Study showed decrease in anxiety levels while staying in the waiting area without any medical intervention (Unver et al. 2020, 406).

Watching age-appropriate television programmes through video glasses could provide safe and non-invasive option to relieve stress in children. Compared with pharmacological intervention, distraction through video glasses has shown a similar effectiveness. (Kerimoglu et al. 2013, 1374.) Animated cartoons in the preanesthetic holding room can be an easy, inexpensive, and safe method to alleviate preoperative anxiety (Lee et al. 2012, 1171).

Distraction strategies using smartphones were also found to be effective. While children are engaged with gadgets, they remain focused and less conscious to their surroundings, paying less attention to speech and touch, while nurses are preparing them for anaesthesia. (Cumino et al. 2017, 170.)

Mifflin et al (2012, 1165) suggest that using video distraction, by playing favourite *video clips during the inhaled induction* phase of anaesthesia, alleviate paediatric anxiety and provide a smooth transition to the anesthetized state.

Libaw and Sinskey (2020) reported three cases in which *augmented reality* was successfully used as a distraction technique in paediatric patients during induction of general anaesthesia. The study applied the AR software in the preparation

phase of children. The software used a robot character, which encouraged patients to inhale and exhale deeply during the mask induction. Patients and parents expressed huge satisfaction with the AR experience, reporting less anxiety compared with previous inductions. (Libaw & Sinskey 2020, 1-3.)

Anaesthesia mask exposure and psychological shaping combined with *video game distractions*, provided better results in anxiety reduction, and anaesthesia induction compliance, than verbal information alone (Dwairej et al. 2019, 10). In the trial, children in the waiting area, were encouraged to choose a game they liked the most. After choosing the game, the tablet was returned for the child few minutes before a transfer to the operation room, to avoid children playing for too long, and losing interest in the game. (Dwairej et al 2019, 8.) Authors concluded that video game distraction enhanced the coping skills of children and made them more compliant during the anaesthesia induction phase (Dwairej et al.2019, 10).

Parental presence

A study conducted by Rasti et al. (2014, 9) evaluated the effectiveness of parental presence on children aged 2-11 years old undergoing a surgical operation. The results indicated that the parental presence alone without other non-pharmacological interventions is not advantageous in reducing complications due to pre-operative anxiety. Another study observing the influence of parental presence, along with other combined interventions on children admitted for a surgery, showed identical results: no significant fluctuation in anxiety levels was found in the control group (Chaurasia et al. 2019, 1633). However, the group of children, whose parents were actively participating in distraction games, and not showing parental anxiety, displayed lower anxiety levels (Chaurasia et al. 2019, 1630).

Another study which used a specific preparation program ADVANCE as an intervention, noticed a lower anxiety levels in those children, whose parents were involved in the program. They practised wearing a mask at home together with the child, a day before the surgery. On the following day planned distraction by parent was applied to enhance the results in the holding area. (Fortier et al. 2011, 716.)

6 RELIABILITY AND ETHICS

The Finnish National Board on Research Integrity (TENK) has published ethical guidelines to guide authors when conducting a literature review. These guidelines are created in co-operation with the Finnish research community. The guidelines emphasize meticulousness, honesty, confidentiality, transparency, and accuracy in the process of conducting research or a literature review. Bachelor's thesis requires an institution-based permission which is part of a good research practice. (Finnish National Board on Research Integrity TENK. N.d.)

Transparency is a fundamental part of a literature review with an obligation to make every claim visible for the readers, allowing them to critically evaluate data collecting methods, interpretations, and statements from authors, and having access to data which has been used in the process of creating a literature review (Moravcsik 2019, 2). The process of manual data retrieval, and data analysis with inclusion and exclusion criteria, has been recorded accurately and can be found in detail under the chapter 4. The number of participants varied between studies, but sample sizes were large enough to estimate the prevalence of anxiety. According to authors' manual searches, research on this topic has not yet been conducted in Finland. Therefore, entire transferability of the results into Finland's public healthcare system has not been tried to estimate by the authors. Conclusions of this literature review are constructed from scientific articles which have been published within the last twelve years (2008-2021).

The diversity of paradigms and dimensions in qualitative approach of research sometimes creates challenges to ensure high level of reliability (Leung, 2015). In the process of analysing data, the consistency in methodology and little variability in results are considered as a positive marker. The reliability of this thesis is ensured by only using peer reviewed articles, which means that they have been evaluated by professionals with a deep knowledge of the topic. To improve the reliability and quality of findings, data has been retrieved from well-known and widely accepted databases: PubMed, PsycINFO, Medline and CINAHL. The achievements of the researchers have been respected by appropriately referring

to data and applying the reporting guidelines of Tampere university of applied sciences.

Three limitations were identified within this literature review that may influence the outcomes and conclusions. Digital and technological interventions are newly introduced methods in health care and are constantly evolving. Therefore, the results may become obsolete in near future and more studies are required, as new technology-based interventions are constantly utilized in health care. The second limitation concerned the methods and subjectivity of measuring anxiety levels, as some studies were focused on the physiological, whereas others on the psychological changes in the body. Thirdly, this thesis has excluded patients undergoing emergency surgeries due to lack of data. The presented interventions may not be suitable for this patient group and more research is needed.

7 DISCUSSION

Risk factors

According to the literature, the most common factors potentially causing anxiety in paediatric patients are fear of pain, separation from parents, parental anxiety, unfamiliar places, people and procedures, loss of control and not knowing how to behave, seeing needles and sharp objects. Induction of anaesthesia through face mask is considered one of the most critical moments when the anxiety reaches the highest level. Secondly, the findings suggest that stage of development, previous experience, exposure to media, and discussion with other children often may provide children a false image of surgical procedures. Therefore, they are considered as risk factors contributing to an increased anxiety and negative hospital experience.

Kar et al. (2015) identified factors correlating with high anxiety levels in children: shame, fear of pain and physical injury, anxious parents, hospital clothing and food, unsure how to behave appropriately, fear of losing control, medical terminology, exposure and touching by strangers, strange environment, and unfamiliar hospital routines.

The anxiety reaches the maximum in certain events during preoperative phase, and these periods are referred as 'stress points' by Kar et al. (2015). These events include parental separation, insertion of intravenous cannula, syringes seen by children, connection of patient monitors, placing the mask, placing the child on operation table and entry to operation room. During these times children are likely to show maximum resistance towards health care providers, and nurses may have to utilize different methods, to calm down the situation for better patient safety. (Kar et al, 2015, 2.)

Interventions

Three main methods to relieve anxiety were identified from the literature: educational preparation, distraction, and parental presence.

Distraction is a simple and effective technique, which direct the attention away from stressful situations or objects (Kollar & Godman, 2012, 653). The review shows that incentive-based games, planned distraction by parents, distraction through humour, like “Wacky Wednesday” or clown intervention, watching cartoons, playing video clips, and playing games in holding area, will help to reduce preoperative anxiety in children. Technological innovations such as smartphones, TV-programmes through 3D glasses and augmented reality, provide a variety of distraction methods, which can be used in paediatric surgical care, to reach therapeutic results (Kollar & Godman 2012, 680).

Providing information during the pre-operative phase, is another cost effective and beneficial method to strengthen the coping skills of children in perioperative phase and should be initiated at least two weeks before the day of surgery. Content of educational information need to be age-appropriate, and commonly used tools to provide information are leaflets, books, videos, and guided tours (Kar et al, 2015, 4).

Information is usually delivered to children verbally or in a written form. A guided tour, play therapy or technological gadgets, such as tablets and smartphones, are also shown to be effective tools to increase the knowledge of children concerning the surgery. The effectiveness of storybooks and leaflets is supported by Piaget’s cognitive development theory which states that children aged 6-8 years old have reached the concrete operational phase and this age group particularly learns from images and pictures and are found in story books and other informative sources (Tunney & Boore 2013, 331, 333).

If a child is very young, illiterate, or reluctant to read, a combination of exposure and behaviour shaping methods may provide better outcomes. This involves the parents, or other family members, to help a child to use an anaesthesia mask at home. When the child is exposed to an unfamiliar procedure at home, the procedure will consequently feel less intimidating in the hospital setting. (Fortier et al. 2011, 713–715.) (Dwairej et al. 2019, 1-2.)

Therapeutic play intervention can be used for one child, or for a group of children. It showed not only anxiety reduction, but also negative behaviour and

postoperative pain was reduced significantly. According to Yahya AL-Sagarat et al. (2017, 103) *therapeutic play* is a combination of different activities, which educate and prepare children for medical procedures. The goal of *therapeutic play* is to support child's emotional comfort and communication, between the child and health care providers. Chambers (2007) also stated that through play kids learn about their environment, which made play a useful method of communication.

Parental presence is generally recognized method to help children cope with pre-operative anxiety and prevent complications caused by excessive stress during perioperative phase. However, without other pharmacological or non-pharmacological interventions, it is not advantageous.

Erhaze, Maura & Declan (2016) also failed to show the efficacy of parental presence in their review. Parental presence during anaesthesia induction had no statistically significant effect to anxiety levels, in comparison to absence of parents (Erhaze et al. 2016, 399).

Nurses represent the biggest group of health care providers contributing to direct care of patients (Clancy, Farquhar & Sharp 2005, 193). Substantial data on the epidemiology of errors in the care of children has arisen, improving the *patient safety* through deeper understanding of the importance of clear guidance and guidelines. Training of new clinicians should include a careful introduction of ongoing issues, which may compromise the patient safety, so that the future health care professionals have reached competency to apply the main principles of safe surgical care of paediatric patients, as part of their everyday work life. (Mueller et al. 2019, 7.)

8 CONCLUSION

The purpose of this literature review was to identify the risk factors contributing to surgery related anxiety in pediatric patients and to find the most effective interventions to reduce or prevent preoperative anxiety levels. The results of the studies were encouraging and implied positive effects when interventions were utilized for the right patients at the right time.

Sometimes age can play a significant role in the development of anxiety and younger children in general seem to be more vulnerable for creating strong negative emotions before the surgical operation. Recognition, not just the initial need of intervention, but also the root causes of anxiety, is beneficial when choosing an appropriate intervention, as well as understanding the link between age and surgery related anxiety. Another conclusion which was drawn from the findings is that combining different interventions seems to work more effectively than relying merely on one specific intervention. For example, combining distraction and educational interventions or parental presence together with education has more positive outcomes on children's preoperative anxiety levels than parental presence alone.

Prior reviews have searched the topic, but this review, besides updating the most current research, shows different ways, other than pharmacologic, to reduce or prevent anxiety in paediatric patients. Some of these ways are simpler, inexpensive, safe, non-invasive and make the perioperative phase less distressing experience both for the children and their family members.

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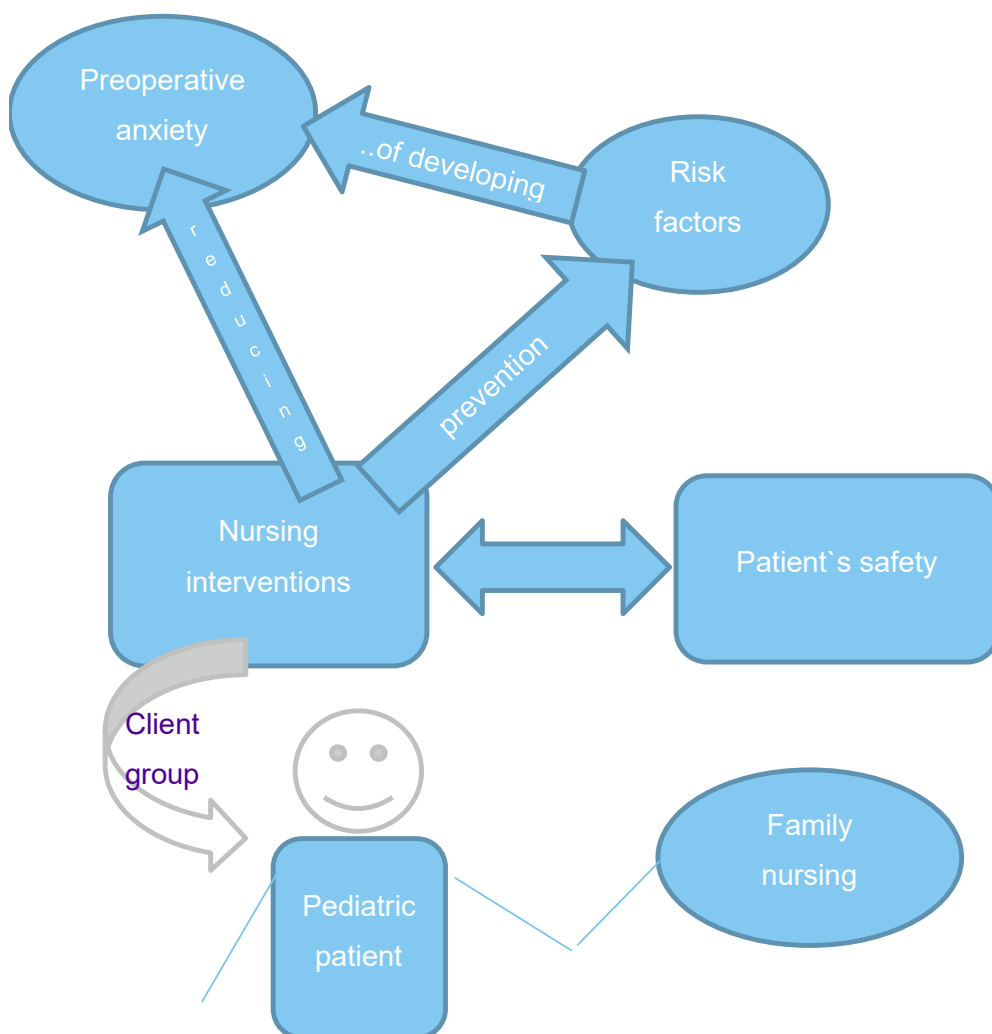
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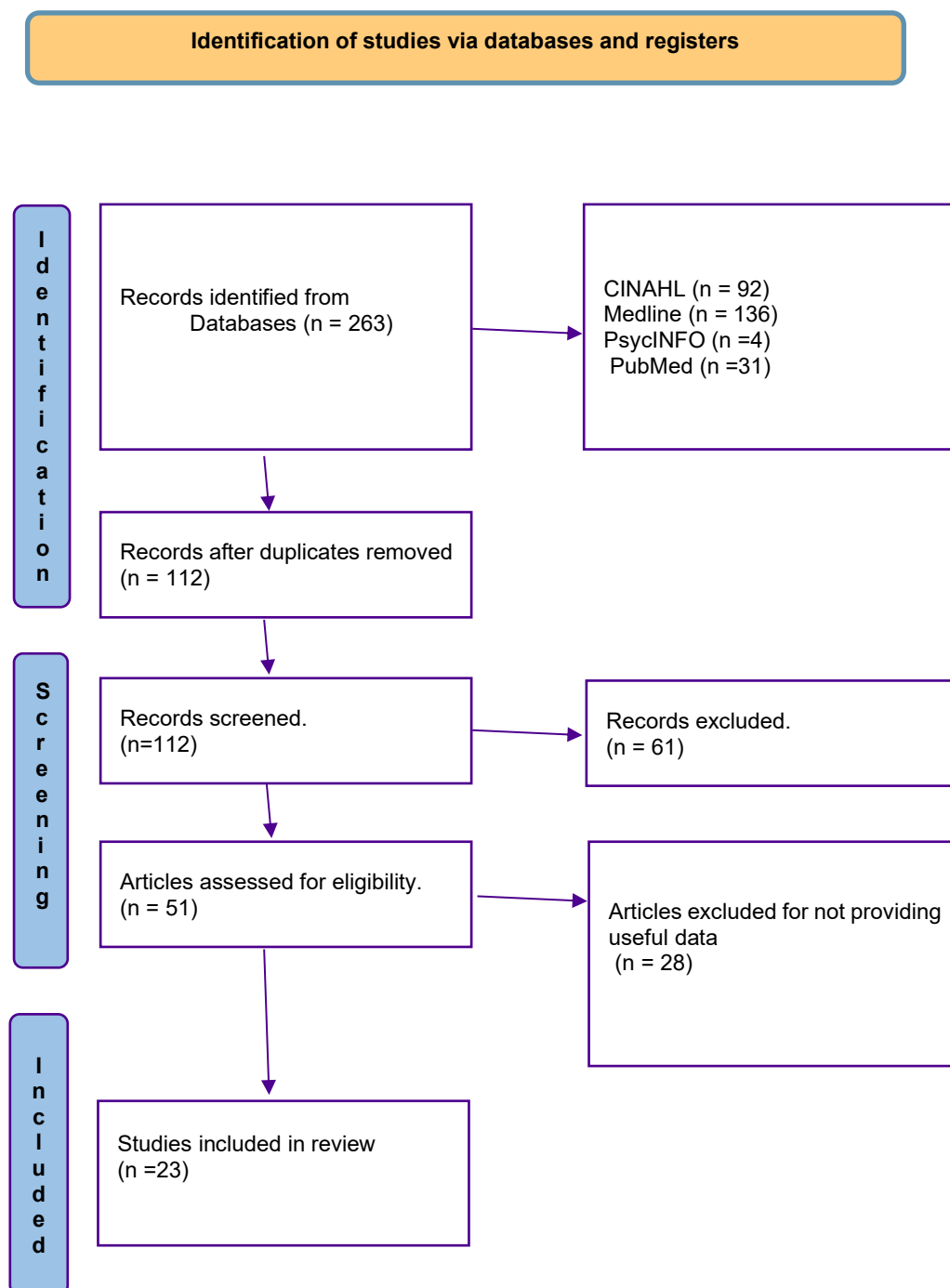
APPENDICES

Appendix 1. Theoretical points, mind map



Appendix 2. The search

Databases	Search phrase	Inclusion and exclusion criteria
CINAHL Medline PsycINFO PubMed	("preoperative anxiety" OR "preoperative fear" OR "surgical anxiety" OR "surgical fear") AND ("pediatric" OR "pediatrics" OR "paediatric" OR "children" OR "child") AND ("management" OR "intervention" OR "reduction" OR "prevention").	Scholarly (Peer Reviewed) Journals. Date: 2008-2020 Language: English Age Group: 6-12 years old

Appendix 3. Prisma flow diagramme

Appendix 4. TABLE 2 The description of the studies

Authors, Year, Country	Purpose of the study	Design and tools	Sample size and characteristics	Quality appraisal criteria (scale: y=yes, p=poor, nr=not reported)
Shaheen et al. 2018. Jordan	To test the effectiveness of age-appropriate pre-operative information session to reduce anxiety levels in school-aged children.	Quasi-experimental design.	126 children were divided randomly into control- and intervention groups.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Moura et al. 2016. Brasil	To estimate the prevalence and factors associated with pre-operative anxiety in children.	Cross-sectional analysis of baseline data of a prospective cohort and open study.	210 children, age: 5-12 years.	(y)Aim and objectives clearly described. (p)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (nr)Limitations presented. (y)Implications discussed
Dionigi& Gremigni. 2016, Italy	To test the effects of combined intervention of art therapy and clown visits, to reduce anxiety in children before an anaesthesia induction.	Observational study.	78 children, age: 3-11 years, undergoing general anesthesia for surgery.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed

Ünver et al. 2020. Turkey	To test the effects of a group game intervention to reduce pre-operative anxiety in pediatric patients and their parents.	Parallel group randomized controlled trial.	94 children scheduled to undergo elective minor surgery.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Karimi et al. 2014. Iran	To investigate the effects of an orientated tour in reduction of children's anxiety before an elective surgery.	Blinded clinical trial.	70 children were randomized into intervention and control groups.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (nr)Limitations presented. (y)Implications discussed
Delivet et al. 2018. France	To determine psychological factors and events involved in the development of preoperative anxiety in children.	Prospective observational study.	111 children age: 8-18 years. Anxiety trait and state assessments were quantified in mothers and children.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed.
Kassai et al. 2016 France	To determine if an introduction of an informational anesthesia comic leaflet reduces	Randomized controlled parallel group trial.	115 children age: 6-17 years	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework

	preoperative anxiety in children.			(y)Limitations presented. (y)Implications discussed.
Fernandes et al. 2014. Lisbon, Portugal	The study developed three types of educational pre-operative materials and examined their efficacy in preparing children for surgery.	Randomized controlled trial.	125 children, age: 7- 12 years.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed.
Fortier et al. 2011. Great Britain.	To identify effective components of family-centered pre-operative intervention program, (AD-VANCE) to reduce pre-operative anxiety in children.	Dismantling report (data from subjects who were randomly assigned to the AD-VANCE group in the original study.	96 children age: 2–10 years. Baseline characteristics, parental adherence to the components of program, and child and parent anxiety were assessed.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed.
Jones et al. 2021. Southeastern United States	To explore the relationship between a group medical play activity and pre-reoperative fear and anxiety in children.	Pre-post quasi-experimental study.	50 children. Age: 5–10 years, scheduled for a medical procedure.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed.
Chaurasia et al. 2019. India	To find out, if an incentive-based	Prospective randomized study.	80 children (age 4-8 years)	(y)Aim and objectives clearly described.

	game therapy in conjunction with parental involvement, would be a simple and cost-effective intervention in reducing the pre-operative anxiety in children.			(y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Tunney & Boore. 2013. Ireland	To assess the effectiveness of a storybook in reducing the level of anxiety of children.	Quasi-experimental study.	80 children 5-11 years, were allocated to experimental or control group	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Rasti et al. 2014. Iran	To examine the effects of parental presence to anxiety levels in children, during the induction phase.	Randomized clinical trial.	60 children, 2-11 years.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Kerimoglu et al. 2013. USA	To compare the efficacy of oral midazolam and behavioral distraction	Randomized study.	sample 96 children (4-9 years) divided in 3 groups (midazolam, video glasses and both)	(y)Aim and objectives clearly described. (y)Study design adequately described.

	with video glasses, in management of preoperative anxiety in children.			(y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Berger et al. 2014.	To determine the effect of distraction through humor on anxiety among children and their parents.	Quasi-experimental design using a non-randomized control group.	42 children, 4 - 17 years. Control group and intervention group.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Hatipoglu et al. 2017. Turkey	To evaluate how audiovisual and auditory presentations of the perioperative period impact preoperative anxiety and postoperative behavioral disturbances in children.	Randomized control group.	99 children, 5-12 years, randomly assigned to three groups: Audiovisual group, auditory group and control group.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Lee et al. 2012. South Korea.	To determine the effects of viewing an animated cartoon and playing with a favorite toy, in children aged 3 – 7 years in operating	Randomized controlled group.	130 children, 3-7 years. Divided into 3 groups.	(y)Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed

	room, before anesthesia induction.			
Cumino et al. 2017. Brazil	To verify if a leaflet and a distraction method (smartphone application), presented to parents/guardians and children, were effective tools to prevent anxiety during anesthesia induction.	Randomized clinical trial.	84 children. 4-8 years. Divided randomly into 4 groups: Control group, informed group, smartphone group.	(y) Aim and objectives clearly described. (y) Study design adequately described. (y) Research methods appropriate. (y) Explicit theoretical framework (y) Limitations presented. (y) Implications discussed
Milffin et al. 2012. Canada.	To examine if video distraction effectively reduces anxiety in children undergoing inhaled induction before ambulatory surgery.	Randomized controlled group.	92 children. control group=47 video group=42 Age: 2-10 years.	(y) Aim and objectives clearly described. (y) Study design adequately described. (y) Research methods appropriate. (y) Explicit theoretical framework (y) Limitations presented. (y) Implications discussed
Libaw & Sinsky. 2020. USA	To present 3 cases describing the use of AR during induction of anesthesia in children	Case study report.	3 male patients, age: 8-10 years.	(y) Aim and objectives clearly described. (y) Study design adequately described. (y) Research methods appropriate. (y) Explicit theoretical framework (Y) Limitations presented. (y) Implications discussed

Abdullah et al. Jordan. 2019	To evaluate the effectiveness of combined video game distraction and anesthesia mask exposure and shaping intervention as compared to conventional pre-operative preparation on the pre-operative anxiety.	Randomized clinical trial.	128 children 5-11 years of age. 2 different groups one with video-game distraction and anesthesia mask, the other with control group.	y) Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
Batuman et al. 2016. Turkey	To assess the effect of informational video based on role-play modelling on preoperative anxiety and postoperative behavior changes in children undergoing surgery.	Prospective randomized controlled study.	forty-two children aged 5-12 years,	y) Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed
He, et al. 2015. Singapore	To examine if therapeutic play intervention could reduce peri-operative anxiety, negative emotional manifestation, and	Randomized controlled trial.	106 children, 6–14 years of age, outcome measures were taken before surgery, on the operation day and 24 hours post-surgery.	y) Aim and objectives clearly described. (y)Study design adequately described. (y)Research methods appropriate. (y)Explicit theoretical framework (y)Limitations presented. (y)Implications discussed

	postopera- tive pain in children.			
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Appendix 5. Extracted phrases

Author(s)	Citation	Theme
Fernandes et al. 2014	<p>“Factors contribute to children’s negative responses to the hospitalization: anticipation of pain; the perception of danger; fear related to hospital procedures and surgical instruments; loss of control; unfamiliar routines and people; separation from parents; and parental anxiety.”</p> <p>“Providing children with preoperative information may decrease child’s anxiety - materials have taught children what to expect in each phase, which in turn contributed to increase their confidence and to use appropriate coping skills”</p>	<p>Risk factors</p> <p>Providing Preoperative information</p>
Kassai et al. 2016	<p>“Information on anesthesia and surgery procedures given in a comic leaflet to children is worth implementation before surgery because it is cheap and seems effective in reducing preoperative anxiety</p>	<p>Providing preoperative information</p>
Chaurasia et al. 2019	<p>“Various factors like unfamiliar surroundings, separation from parents, or fear of needles and sharp instruments contribute to preoperative anxiety in kids.”</p> <p>“Use of incentive-based game therapy reduces the anxiety scores during induction of anesthesia and improves the compliance to facemask induction in children undergoing surgery.</p>	<p>Risk factors</p> <p>Distraction - play therapy, distraction, familiarization, incentives, parental presence</p>
Rasti et al. 2014	<p>“The presence of parents has no useful and significant effect on children’s anxiety</p>	<p>Parental presence</p>

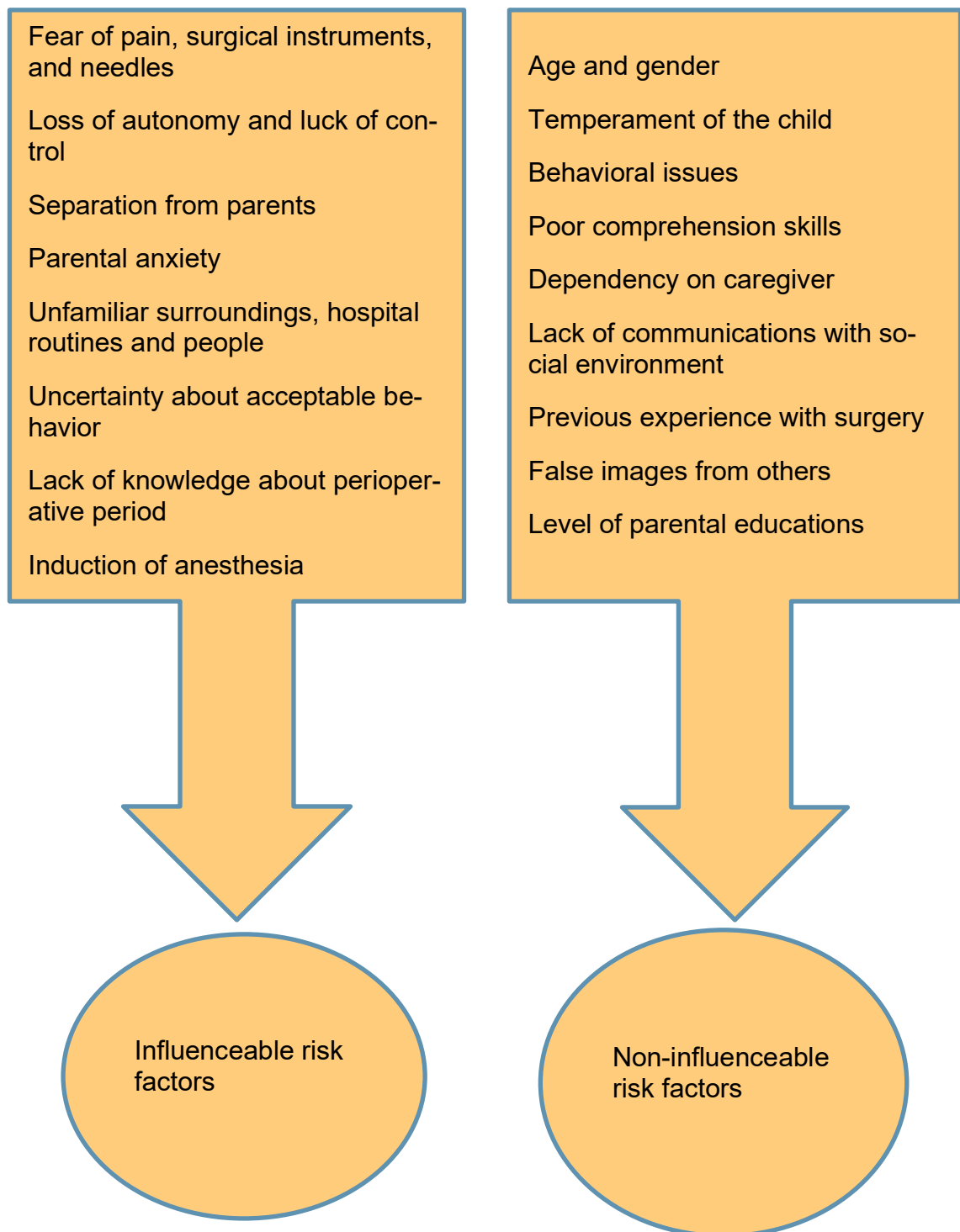
	<p>undergoing surgery and thus in order to reduce complications due to surgery anxiety, other effective interventions should be investigated.”</p> <p>“Factors cause anxiety - Physical damages or injuries, separation from parents and relationship with strangers in the absence of family; fear of unknowns; uncertainty about the limits of acceptable behaviors; loss of autonomy, control”</p>	Risk factors
Tunney &Boore. 2013	<p>“Fears can be caused by new routines and practices, the environment, and separation from family and friends coupled with loss of control and independence and fear of the unknown.”</p> <p>Storybook was found to be effective in reducing preoperative anxiety (specifically in females and children 7 years)</p>	<p>Risk factors</p> <p>Providing preoperative information</p>
Fortier et al. 2011	<p>“Home practice with the anesthesia mask, and the use of distraction by parents on the day of surgery - two components of family centered preoperative preparation that emerged having a significant impact on children’s anxiety</p>	Providing preoperative information/distraction
Delivet et al. 2018	<p>“Many risk factors for preoperative anxiety in children include child age, child temperament, pharmacological premedication, maternal anxiety, lack of knowledge about the perioperative period, lack of knowledge about anesthetic practice—and in particular gas induction via face mask, and lack of knowledge about anesthetic and surgical safety.”</p> <p>“Inpatient hospital stay may indicate surgical severity and extent, or may reflect</p>	Risk factors

	increased sensitivity to anxiety due to separation from the child's usual environment”	
Batuman et al. 2016	<p>“Informational video presentation based on modelling reduce anxiety at induction of anesthesia.”</p> <p>“...combination of a video and a role-play using teddy bear to provide information about the procedure.”</p>	Providing preoperative information
He et al. 2015	<p>“children’s surgery-related anxiety is triggered by the ‘strangeness’ or novelty of the places, objects and procedures in surgery, the lack of familiarity with the operating room environment and lack of control over upcoming medical procedures were major stressors to children.”</p> <p>“Therapeutic play intervention is effective in reducing negative emotional manifestations before anesthesia induction.”</p>	<p>Risk factors</p> <p>Therapeutic play</p>
Jones et al. 2021	<p>“Distress may be initiated by the shock of a new diagnosis, procedures likely to involve pain or discomfort, interacting with multiple providers, or learning about others’ poor outcomes.”</p> <p>” Providing children with the opportunity to explore and become familiar with medical equipment through group medical play can help to minimize preoperative anxiety”</p> <p>“Medical play generates additional coping benefits when offered in group formats.”</p>	<p>Risk factors</p> <p>Group therapeutic play</p>
Berger et al. 2014	<p>” Children often express the fear of needles, pain, and separation.”</p> <p>“The children who experienced WW (wacky Wednesday) intervention had</p>	<p>Risk factors</p> <p>Distraction</p>

	lower anxiety scores on admission, indicating that being in the “wacky” environment had the effect of reducing their anxiety. This may be explained by the relief theory of humor, whereby the environment encouraged the children to laugh, which resulted in a release of tension.”	
Shaheen et al. 2018	“Studies found that children who were prepared on the day before surgery reported a significantly decrease in the anxiety levels as compared with children who were not prepared”	Providing preoperative information
Moura et al. 2016	<p>“Evidence indicate age and temperament of the child, behavioral problems during health care, previous surgery and hospitalizations, level of parental education and maternal anxiety as factors associated with preoperative anxiety in children.”</p> <p>“The susceptibility of the child, lack of understanding about the surgical procedure, unknown hospital environment, fear of physical injury, separation from their parents and feelings of sadness and punishment related to the fact that surgery is a scheduled procedure may contribute to such discomfort.”</p>	Risk factors
Dionigi et al. 2016	<p>“Distraction techniques were found to be effective at the moment when children were separated from their parents.”</p> <p>“Combining distraction techniques with traditional anxiety-reduction approaches may be an effective and useful treatment</p>	<p>Distraction</p> <p>(Clown visits)</p>

	for reducing preinduction anxiety in children between the ages of 3–11 years.”	
Ünver et al. 2020	“The results of this study indicate that a group game for the child-parent dyad is helpful in decreasing preoperative anxiety in school-age patients and their parents.”	Distraction (group game) intervention
Karimi et al. 2014	“An orientation tour of the operating room environment for children and parents could be a simple and easy method for nurses to implement. Performing orientation tours could minimize drug consumption.”	Providing preoperative information (orientated tour)
Kerimoglu et al. 2013	“Video glasses provide a safe, noninvasive, nonpharmacologic, and pleasant alternative.”	Distraction
Hatipoğlu et al. 2017	<p>“Compared to auditory presentations, audiovisual presentations, in terms of being memorable and interesting, may be more effective in reducing children’s anxiety.”</p> <p>“Children under the age of 7 years were more anxious. Surgery creates a greater emotional stress in younger children due to poorer comprehension increased dependency on the mother, less communication with the social environment, and decreased the ability to manage anxiety.”</p>	<p>Providing preoperative information (audiovisual presentation)</p> <p>Risk factors</p>
Lee et al. 2012	“Allowing the viewing of animated cartoons by pediatric surgical patients is a	Distraction

	very effective method to alleviate pre-operative anxiety.”	Animated cartoons
Cumino et al. 2017	“Children who play with a smartphone in the holding area before surgery have significantly lower anxiety scores than other children.”	Distractions smartphones
Miffin et al. 2012	<p>“Playing video clips during the inhaled induction of children undergoing ambulatory surgery is an effective method of reducing anxiety.”</p> <p>“Induction of anesthesia has been identified as the most stressful time for children throughout the perioperative process.”</p>	<p>Distraction Video clips</p> <p>Risk factor</p>
Libaw & Sinskey. 2020	“Augmented reality (AR), a newer, interactive technology that allows users to simultaneously view the real-world environment with a digital image overlay, may also reduce preoperative pediatric anxiety.”	Distraction Augmented reality (AR)
Dwairej et al. 2019	<p>“Combined video game distraction and anesthesia mask exposure and shaping is a simple, time and cost-effective intervention and can effectively minimize the children psychological trauma associated with surgery.”</p> <p>“The level of preoperative anxiety maximizes at the time of anesthesia induction.”</p>	Distraction Video game/providing preoperative intervention (Anesthesia mask exposure and shaping intervention)

Appendix 6. Risk factors mind map

Appendix 7. Nursing interventions mind map

