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EXPLORING THE EFFECTIVENESS OF AUDIOVISUAL EDUCATIONAL INTERVENTIONS ON PREOPERATIVE ANXIETY IN PEDIATRIC PATIENTS

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ABSTRACT

PURPOSE: The purpose of this review is to synthesize the literature to determine if educational audiovisual interventions reduce preoperative anxiety levels. Additionally, if they do reduce anxiety, the goal is to determine if educational audiovisual interventions reduce anxiety as well as or better than traditional preoperative anxiety treatments.

DESIGN AND METHODS: A review of the literature published after 2000 on three databases including PubMed, CINAHL, and Web of Science using the terms (preoperative OR intraoperative OR surgery) AND anxiety AND (pediatrics OR children OR kids) AND (audiovisual OR electronic OR video OR application OR visual OR technology). 203 articles were returned between the three databases and screened for inclusion and exclusion criteria. 185 articles were excluded resulting in 11 articles selected for this review to be analyzed.

RESULTS: Multiple interventions were reviewed including videos, online educational programs, and text-message based interventions. Educational interventions were found to be more effective at reducing anxiety than those that distracted the patient. Video interventions reduced anxiety significantly more than the controls. Online educational programs had mixed effects on preoperative anxiety. Text-messaged based interventions significantly reduced anxiety.

DISCUSSION: Educational audiovisual interventions show promise in regards to preoperative anxiety reduction but efficacy is highly dependent on the quality of intervention designed by the researchers. More research needs to be conducted where educational audiovisual interventions are directly compared to pharmacological interventions.

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Chapter 1

Introduction

In 2015, it was estimated five million children undergo surgery and that 75% of them experience significant preoperative anxiety (Perry, Hooper, & Masiongale, 2012). This results in approximately 3.75 million children having preoperative anxiety per year. Children are more susceptible to anxiety compared to adults due to incomplete cognitive and behavioral development (Lee et al., 2013). Preoperative anxiety in young children has shown to have numerous post-operative consequences such as emergence delirium, pain, analgesic use, general anxiety, sleeping problems, decreased postoperative eating improvement, maladaptive behavior, and overall worse recovery (Kain, Mayes, Caldwell-Andrews, & McClain, 2006).

Anxiety is defined as "an unpleasant state of uneasiness or tension, which may be associated with abnormal hemodynamics as a consequence of sympathetic, parasympathetic, and endocrine stimulation" (Jawaid, Mushtaq, Mukhtar, & Khan, 2007). The experience of preoperative anxiety can occur from when the procedure is prescribed to when the procedure or anesthesia begins. Surgery can be a stressful event for a child of any age because of child's fears of separation from parents and home, unfamiliar routines, surgical instruments, and hospital procedures (Corman, Hornick, Kritchman, & Terestman, 1958; Kain, Mayes, O'Connor, & Cicchetti, 1996; Schwartz, Albino, & Tedesco, 1983).

Preparation programs designed to educate patients about the procedure and to help them form proper coping skills prior to surgery can result in the reduction of stress levels (Brewer, Gleditsch, Syblik, Tietjens & Vacik, 2006) and an increase of child's cooperation and

compliance with medical procedures (LeRoy, Elixson, O'Brien, Turpin, & Uzark, 2003), thereby reducing the negative effects of preoperative anxiety. Preparation programs can range from the healthcare personnel distributing pamphlets about the surgical procedure to giving a tour of the surgery suite to even using virtual reality to expose patients to the surgical setting, tools, and personnel (Eijlers et al., 2017; LeRoy et al., 2003). The main purpose of the preparation programs is to prepare the patient for surgery either by reducing their anxiety, furthering their education about the procedure, or distracting them from the overly stimulating healthcare setting (O'Conner-Von, 2008).

Preparation programs for the perioperative experience can be primarily broken into two categories: distraction and education. Distraction-based programs focus on distraction of the patient from the procedure or stress (Chow, Van Lieshout, Schmidt, Dobson, & Buckley, 2016. But, it has been shown that gradual education and exposure to the surgical procedure and experience is a more effective way to reduce anxiety in children than just distraction (Kendall & Southam-Gerow, 1996). Jaaniste, Hayes, and Baeyer (2007) describe how educating the child on the surgery and medical procedures will allow the child to cope with the stress of the procedure. Children between two and six years old will be most receptive to a description of the procedural process such as illustrating what will happen in the treatment room and things they may hear or smell (Jaaniste et al., 2007). However, children seven to twelve years old are more receptive to connecting their symptoms with the procedure they are getting, for example "you may notice a cool feeling in your arm when the medicine goes in" (Jaaniste et al., 2007). When a child is around thirteen years old or older, more detailed information can be included into the preparation program for perioperative education because teenagers are able to understand information about internal body structures involved with a surgery as well as the results of the procedure (Jaaniste

et al., 2007). Children of all age ranges without accurate information may have an increase in their worries, fears, and anxiety if not properly educated (Jaaniste et al., 2007).

Despite the rise of technology in everyday life and in the medical field, there is a lack of reviews of the literature on technology-based preparation programs for perioperative education, in particular, ones that strive to educate the pediatric patient prior to the procedure rather than distract them. In 2015, a comprehensive review of the literature at the time was conducted by Chow et al. on audiovisual interventions for reducing preoperative anxiety in pediatric patients. As one of the only reviews on audiovisual interventions' effect on pediatric preoperative anxiety, it found that generally audiovisual interventions were more effective than standard care and just as effective as midazolam at anxiety reduction. One of the limitations of this review was that from the eighteen articles reviewed, six were published prior to 2000. Due to the rapid advancements and changes in technology, these methods of preparation programs for perioperative education quickly become outdated. Out of the twelve remaining articles, over half of them did not educate the patient but instead distracted them from the procedure and stress associated with it. This review strives to not repeat the methods of Chow et al. (2015) but rather focus on the educational interventions in order to provide the best patient-centered care. By educating the patient about their procedure, it incorporates them into the perioperative process rather than intentionally obscuring details about their care and distracting them with material not relevant to their procedure.

This literature review was conducted due to the limitations of reviews done previously and a lack of reviews on educational audiovisual interventions on pediatric preoperative anxiety. The purpose of this review is to synthesize and evaluate the literature that has been published

since 2000 that pertains to educational audiovisual interventions that are available to reduce preoperative anxiety in the pediatric patient. This review aims to answer the following questions:

1. Do educational audiovisual interventions reduce preoperative anxiety levels in the pediatric patient?

2. If so, do educational audiovisual interventions reduce anxiety as well as or better than traditional preoperative anxiety treatments?

Overall, preoperative anxiety is a pervasive and serious issue affecting both the perioperative setting and the pediatric patient. Anxiety alone is a detrimental experience for the patient, but it can also cause numerous post-operative complications, which can prolong and worsen the patient's recovery. Educational audiovisual interventions show promise as an effective means of preoperative anxiety reduction. And despite only one study has done a cost-effectiveness analysis; the automatic and reusable design of audiovisual interventions may be a financially advantageous decision for healthcare organizations (Chow et al., 2015). This review aims to explore the efficacy of these interventions and make recommendations of future practice and research in order to continue the improvement of patient care and increase patient education.

Chapter 2

Background

Purpose

Preoperative anxiety is a harmful experience that can be measured in numerous ways and can result in many post-operative complications. Researchers have worked to develop ways to quantify and prevent pediatric preoperative anxiety due to the negative post-operative complications that it can cause. Children are more susceptible to anxiety compared to adults due to incomplete cognitive development therefore making it a prevalent but difficult issue to treat due to varying levels of development in children (Lee et al., 2013). The purpose of this chapter is to provide pertinent information on preoperative anxiety in the pediatric patient and relevant topics. There is also an overview of previous systematic reviews on topics related to this review's subject matter such as the effects of non-pharmacological interventions on pediatric preoperative anxiety or more specifically, audiovisual interventions. This overview shows the gap in the literature reviews previously done on educational audiovisual interventions.

Negative Effects of Preoperative Anxiety

Preoperative anxiety has been implicated in numerous maladaptive preoperative and postoperative behaviors. It is important to understand the consequences that can arise from preoperative anxiety because it directly impacts the quality of the patients' experience in the surgical setting. Multiple studies that are synthesized in this review use the presence of postoperative pain and maladaptive behaviors as indications of the effectiveness of the

audiovisual preoperative anxiety treatment. Postoperative maladaptive behaviors, sometimes called postoperative negative behavioral changes, encompass any behaviors that interfere with daily functioning (Kain et al., 1996).

Postoperative Pain

It has been found that children with high levels of anxiety report higher levels of postoperative pain and analgesic use. Patients with preoperative anxiety have been shown to be at three times the risk of exhibiting postoperative anxiety and moderate-to-intense pain (Caumo et al., 2000). In another study, children in the high-anxiety group reported consistently higher levels of pain than those in the calm group (Kain et al., 2006). During home recovery, children with high anxiety consumed significantly more codeine compared to those in the low-anxiety group, therefore indicating higher levels of pain (Kain et al., 2006).

Post-Operative Maladaptive Behaviors

Due to their interference with daily functioning and correlation with preoperative anxiety, post-operative maladaptive behaviors are a subject of focus in multiple articles analyzed in this review. Post-operative maladaptive behaviors include "any behaviors that interfere with daily functioning after surgery" such as emergence delirium, disturbed eating habits, and altered sleep patterns (Kain et al., 2006). Preoperative anxiety in children has been found to increase attention seeking, temper tantrums, waking up at night, eating problems, generalized anxiety and regression (Power, Howard, Wade & Franck, 2011). The behaviors can extend even further into post-operative recovery, as far as 2 to 4 weeks, thereby prolonging the healing process and the patients' return to baseline behaviors and health (Power et al., 2011). Anxiety prior to surgery

can also lead to anxiety in the post-operative period such as general anxiety, sleep anxiety, and separation anxiety that was not present in the child previously (Power et al., 2011).

Emergence delirium is defined as “a disturbance in a child’s awareness of and attention to his or her environment with disorientation and perceptual alterations including hypersensitivity to stimuli and hyperactive motor behavior in the immediate postanesthesia period” (Smessaert, Schehr & Artusio, 1960). It is a concerning occurrence for health care workers because it can lead to injury of the child or disruption of the surgical site, drains, or IV (Banchs & Lerman, 2014). A pediatric patient who is experiencing emergence delirium can require additional nursing care and also more sedatives; both of which can result in longer hospital stays and avoidable health care costs to the patient and hospital (Banchs & Lerman, 2014). It has been shown that children with higher levels of anxiety preoperatively are significantly more likely to be assessed as agitated while in post-anesthesia care (Kain et al., 2006). Management of anxiety in the preoperative period by using psychological approaches could help with the prevention of emergence delirium and reduce the unnecessary psychological stress on the patient (Dahmani, Delivet, & Hilly, 2014).

Children who were more anxious during the preoperative period showed different eating habits than those who were less anxious (Kain et al., 2006). On post-operative days one and two, children with lower anxiety showed significantly improved eating behavior than those with higher anxiety (Kain et al., 2006). In the same study it was found that, children with higher levels of preoperative anxiety have been found to have a lower quality of sleep 24 hours after surgery and also at home during recovery (Kain et al., 2006). While in the hospital, the patients with high-anxiety have more problems falling asleep and staying asleep along with waking up crying (Kain et al., 2006). Also while at home, high anxiety children have increased trouble falling

asleep and subsequently staying asleep (Kain et al., 2006). A lack of sleep can have numerous health consequences and also delays the recovery of the patient.

All of these factors are an indication that the amount of recovery time is impacted by the level of preoperative anxiety and as healthcare providers, the goal should continuously be to get the patient back to baseline as soon as possible. Overall, post-operative maladaptive behaviors slow the healing process of the patient and therefore should be curtailed as much as possible by healthcare professionals. The positive correlation between preoperative anxiety and postoperative maladaptive behaviors is highlighted through numerous studies included in this review. Therefore, postoperative maladaptive behaviors levels are included in Chapter 4 with the implication that if preoperative anxiety levels are reduced so will the amount of post-operative maladaptive behaviors.

Measures of Pediatric Preoperative Anxiety

Due to the impact preoperative anxiety has on preoperative and postoperative behaviors, a variety of scales have been developed in order to measure its occurrence. The studies in this review use six different scales total to measure the levels of preoperative anxiety in the pediatric patient. Therefore, it is pertinent to provide background information of each of the measures in order to create a holistic picture of each of the studies reviewed and what factors were measured in the patients. The scales either employ self-reporting or observer-reporting measures. With self-reporting measures, such as the CSWQ, the patient rates their own anxiety on a scale. Observer-reporting measure use others present in preoperative setting such as parents, anesthesiologists, or psychologists to rate the child's anxiety, expressed both verbally and nonverbally.

CSWQ

The Child Surgery Worries Questionnaire (CSWQ) was created because, although there were scales at the time to measure the child's worries due to the hospital experience, there was a lack of specific tools that could be used to measure children's anxiety prior to surgery (Mendez, Quiles, & Hidalgo, 2001). The CSWQ has 23 items, which has been found to be one of the weaknesses of the measure because there are so few questionnaire items (Mendez et al., 2001). The questionnaire measures three dimensions of preoperative worries: hospitalization, medical procedures, and illness and its negative consequences (Quiles & Ortigosa, 1999). "Worries about hospitalization" has 11 items, "worries about medical procedures" has 6 items, and "worries about the illness and its consequences" has 6 items (Quiles & Ortigosa, 1999). Participants are asked to rate their level of worry about each statement using a 5-point Liker scale ranging from 0= not at all worried to 4 = extremely worried (Quiles & Ortigosa, 1999). Therefore, higher scores indicated higher worries about the surgery (Fernandes, Arriaga, & Esteves, 2015). Although the CSWQ has a low amount of variance, it has a satisfactory internal consistency and a high temporal stability, making it an effective instrument for developing and evaluating preparation programs (Mendez et al., 2001).

STAI-C

The State Trait Anxiety Inventory (Form C-1) is a 40 item self-report tool designed to measure both the presence and severity of symptoms of anxiety within children ages 5 and older (Julian, 2011). This tool is divided into two subsets of measuring the current state of anxiety and then the predisposition to have anxiety (Julian, 2011). Within each subtest, the participant can score in a range of 20 to 80 points, with a higher number of points indicating a higher level of

anxiety (Julian, 2011). State Anxiety (S-Anxiety) measures the "current state of anxiety, asking how respondents feel "right now," using items that measure subjective feelings of apprehension, tension, nervousness, worry, and activation/arousal of the autonomic nervous system" (Julian, 2011). Responses of the participants' current feelings are recorded on a scale of "1) not at all, 2) somewhat, 3) moderately so, and 4) very much so" (Julian, 2011). Trait Anxiety (T-anxiety) measures "relatively stable aspects of "anxiety proneness," including general states of calmness, confidence, and security" (Julian, 2011). T-Anxiety measures the frequency of these feelings with a scale of "1) almost never, 2) sometimes, 3) often, and 4) almost always" (Julian, 2011). The STAI-C's design allows for it to be quickly administered and quickly scored hence its increased usage for children undergoing invasive procedures in the healthcare setting (Schisler, Lander, & Kerry, 1998).

MYPAS

The Modified Yale Preoperative Anxiety Scale (mYPAS) was developed due to the limitations of the STAI-C, in particular, focusing on administration time and ages it can be used with (Kain et al., 1997). The STAI-C takes approximately five to ten minutes to complete while the mYPAS took less than one minute to be completed (Kain et al., 1997). As a self-report measure, the STAI-C is limited in administered to children less than five because of their inability to verbally communicate, while the mYPAS, because it was observer based, could be used for pediatric patients of any age (Kain et al., 1997).

The mYPAS consists of 27 items as an observational measure of pediatric preoperative anxiety (Kain et al., 1997). The mYPAS is divided into 5 categories- activity, vocalizations, emotional expressivity, state of arousal, and use of parent. Activity was categorized on a scale of

1- “Looking around, curious, playing with toys, reading (or other age-appropriate behavior); moves around holding area/treatment room to get toys or to go to parent; may move toward operating room equipment” to 4-“Actively trying to get away, pushes with feet and arms, may move whole body; in waiting room, running around unfocused, not looking at toys, will not separate from parent, desperate clinging” (Kain et al., 1997). Vocalizations were categorized on a scale of 1- “Reading (non-vocalizing appropriate to activity), asking questions, making comments, babbling, laughing, readily answers questions but may be generally quiet; child too young to talk in social situations or too engrossed in play to respond” to 6- “Crying, screaming loudly, sustained (audible through mask)” (Kain et al., 1997). Emotional expressivity was rated on a scale of 1- “Manifestly happy, smiling, or concentrating on play” to 4-“ Distressed, crying, extreme upset, may have wide eyes” (Kain et al., 1997). State of apparent arousal was rated from 1- “Alert, looks around occasionally, notices or watches what anesthesiologist does (could be relaxed)” to 4-“ Panicked whimpering, may be crying or pushing others away, turns away” (Kain et al., 1997). The last category, use of parents, was rated on a scale of 1- “Busy playing, sitting idle, or engaged in age-appropriate behavior and doesn't need parent; may interact with parent if parent initiates the interaction” to 4- “Keeps parent at distance or may actively withdraw from parent, may push parent away or desperately clinging to parent and not let parent go” (Kain et al., 1997). Scores can range from 22.5 to 100, the higher the score indicating a greater level of anxiety (Kain et al., 1997).

Wong-Baker FACES Scale

Although the Wong-Baker FACES rating scale was developed for the purpose of evaluating pediatric pain, it has also been used for the pediatric anxiety rating (Wakimizu

Kamagata, Kuwabara, & Kamibeppu, 2009). The scale consists of 6 faces that "represent varying degrees of facial grimace" (Wong & Baker, 1988). Participants are asked which face represented his or her feeling, whether pain or anxiety, on the six-face scale (Wong & Baker, 1988). Variations of this scale have been made to expand it to 10 faces rather than six, but regardless of the number of items for the children to choose from; a higher score indicates a higher level of anxiety (Wong & Baker, 1988). Its simple concept and quick application are beneficial for the cognitive processing abilities of children and also the fast-paced operative setting (Wong & Baker, 1988). However, the scale does not allow for identification of anxiety producing stimuli or characteristics of the anxiety, which limits its use, and descriptiveness of the patient experience.

Visual Analog Scales

Visual Analog Scales (VAS) are a method of evaluating anxiety where children physically mark on a scale what they would rate their anxiety (Wewers & Lowe, 1990). The VAS is a straight line marked on each end with the extremes of the sensation, in the case of preoperative anxiety, one end would be no anxiety and the opposite end would indicate the highest anxiety (Wewers & Lowe, 1990). The length of the VAS can vary based on the investigator's preference, but a horizontal VAS has shown more uniform distribution of scores than a vertical VAS (Wewers & Lowe, 1990).

Lebaron and Zeltzer's 8 item Self-Report Instrument

Lebaron and Zeltzer, in their 1984 study, developed a behavioral checklist designed to measure acute pain and anxiety in children and adolescents. A list of eight behaviors (muscle

tension, screaming, crying, restraints used, pain verbalized, anxiety verbalized, verbal stalling, physical resistance) was compiled after extensive research associated at least occasionally with pain and anxiety during those procedures (Lebaron & Zelzer, 1984). An observer rates each of the eight behaviors on a 1-5 scale with 1= very mild and 5= extremely intense (Lebaron & Zelzer, 1984).

Current Approaches to Preoperative Anxiety

In addition to determining if audiovisual educational interventions reduce preoperative anxiety in children, one of the goals of this review is to determine if audiovisual educational interventions work as well as or better than traditional approaches to preoperative anxiety treatment. Therefore, it is important to highlight the most common treatments of preoperative anxiety in children to serve as a comparison to the interventions reviewed. Pharmacological interventions, in particular Midazolam, are one of the most common forms of anxiety reducing measures in the preoperative setting. But despite its quick onset, it has shown to not be a perfect solution to preoperative anxiety. Non-pharmacological interventions have been increasingly studied in order to provide an alternative method of anxiety reduction.

Midazolam

Midazolam is a benzodiazepine that was developed in 1976 (Reves, Fragen, Vinik, & Greenblatt, 1985). It has anxiolytic, hypnotic, anticonvulsant, muscle relaxant, and antegrade amnesic effects (Reves et al., 1985). Midazolam can be given orally, intra-nasally, sublingually, rectally, intramuscularly or intravenously (Kogan, Katz, Efrat, & Eidelman, 2002. When 5 mg of midazolam was administered intravenously in adults, anxiolytic and hypnotic effects began

within one to two minutes (Reves et al, 1985). For pharmacologic premedication, midazolam has been used in 90% of pediatric preoperative cases (Kain et al., 2004).

Despite its popularity in the United States, studies have shown that midazolam did not produce "satisfactory" results in some children (Kain et al., 2004). In Coté et al (2002) it was found that it was found that although 97.5% of children receiving midazolam achieved "satisfactory anxiolytic response," only 86% had "satisfactory anxiety ratings" at face mask application. In 2011, Ferguson et al. studied the anxiolytic properties of midazolam in the pediatric patient (two to six years old) prior to a voiding cystourethrogram and found that midazolam did not significantly improve anxiety. Disadvantages of premedication as a treatment for preoperative anxiety include refusal of the drug, failure of the drug to produce the desired effect, adverse reactions such as disinhibition and dysphoria, postoperative behavioral changes and prolonged recovery times (Ullyot, 1999). Other complications include safety concerns (airway obstruction or respiratory depression in unmonitored situations); costs of pharmacy; additional nursing staff and equipment; list delays; and delayed discharge (Cray, Dixon, Heard, & Selsby, 1996). In a single-blinded randomized controlled study, it was shown that interactive distraction reduced pediatric preoperative anxiety along with emergence delirum and postoperative length of stay more than oral midazolam (Stewart, Cazzell & Pearcy, 2018).

Non-pharmacological Therapies

Although non-pharmacological therapies have been mainly used in pain management techniques, they have been found to be an effective tool in anxiety management. Non-pharmacological therapies can include but are not limited to: "acupuncture therapy, massage therapy, osteopathic and chiropractic manipulation, meditative movement therapies Tai chi and

yoga, mind body behavioral interventions, dietary components and self-care/self-efficacy strategies" (Tick et al., 2018). Preoperative anxiety management treatments such as parental presence, clown doctors, pamphlets, booklets, videos, video games, phone applications, music therapy, art therapy, and others have been critically reviewed (Chow et al., 2015; Manyande, Cyna, Yip, Chooi, & Middleton, 2015; Yip, Middleton, Cyna, & Carlyle, 2011). In 2009 a Cochrane review of non-pharmacological interventions for pediatric preoperative anxiety was done and was later updated in 2015 (Manyande et al., 2015; Yip et al., 2009). Both reviews concluded that non-pharmacological interventions (such as clown doctors, hypnosis, low sensory stimulation, and handheld video games) were as effective as pharmacological treatments (Manyande et al., 2015; Yip et al., 2011). Interventions analyzed in Cochrane review were of interest to this review because it showed that alternative interventions could be a replacement for pharmacological interventions. One article that was reviewed in Manyande et al. (2015) that was included in this review focused on computer and interactive package program (Campbell, Hosey, & McHugh, 2005).

Audiovisual Interventions

Audiovisual interventions have been implemented in the preoperative setting for children as far back as the 1970s (Melamed & Siegel, 1975). Audiovisual interventions are interventions that incorporate both an audio component and visual stimulus (Melamed & Siegel, 1975). Prior to 2000, the majority of audiovisual interventions for pediatric preoperative anxiety focused around using a video, whether informational or just as distraction (Chow et al., 2015). As technology has continued to develop, so have the types of interventions in the operative setting. The use of video games created with the purpose of health education has grown significantly in

recent years (Kato, 2010). In 2006, Patel et al. investigated the effects of handheld video games on anxiety prior to surgery. Lee et al. (2013) further researched the effect of interactive games by studying the effect of smartphone game applications on preoperative anxiety. As technology continues to advance, the medical field is challenged to continue to integrate these new developments in a way that can improve patient care.

Previous Literature Reviews on Preoperative Interventions

Despite a well-developed body of literature reviews analyzing the effects of preoperative anxiety in the adult population, the same cannot be said for the pediatric patient. The following section contains three reviews done that are relevant to this review's topic based on the interventions and setting they were implemented in. Lee, Chui and Gin (2003), conducted a review of the literature at the time on educational media-based interventions on preoperative pediatric anxiety. Due to the age of the review and the rapid evolution of technology, a large number of the studies reviewed are outdated but it set the basis of knowledge for future reviews to be conducted. In 2015, Manyande et al. and Chow et al. both published systematic reviews. Manyande et al. (2015) focused on non-pharmacological interventions for assisting in the induction of anesthesia, which is one of the most anxiety producing points for children in the perioperative experience. Chow et al. (2015), focused on audiovisual interventions' effects on pediatric preoperative anxiety and numerous related factors. All of these reviews illustrated a need for this review to be conducted. Lee et al. (2003) displayed the need for a more current review to be conducted. While Manyande et al. (2015) showed the lack of previous reviews' focus on audiovisual interventions. Chow et al. (2015) highlighted the gap in the literature reviews focusing on educational interventions.

In 2003, Lee et al. reviewed the current literature at the time pertaining to media-based interventions on preoperative pediatric anxiety. Interventions included in their review were video, pamphlets, booklets, audiotapes, and Internet-based (Lee et al., 2003). Seven of the studies reviewed used a version of the State Trait Anxiety Inventory and all of the interventions resulted in decreased levels of state anxiety (Lee et al., 2003). Other studies reviewed did not use the same scale but the review did not attempt to pool their results (Lee et al., 2003). The conclusion of the review was that media-based interventions caused a significant reduction in preoperative anxiety, but those amounts were small in clinical significance (Lee et al., 2003). One limitation of this review is that it is now over fifteen years old and the definitions of media do not line up with the definition of audiovisual interventions. Although it does target educational interventions for reduction of pediatric preoperative anxiety, there has been a large development of literature dedicated to the use of technology in pediatric preoperative preparation.

In 2015, Manyande et al. conducted a systematic review of the literature on non-pharmacological interventions for assisting in the induction of anesthesia in children. The goal of the review was to synthesize the data on seventeen chosen interventions out of twenty-eight studies (Manyande et al., 2015). The review concluded that non-pharmacological interventions (such as clown doctors, hypnosis, low sensory stimulation, and handheld video games) were as effective as pharmacological treatments (Manyande et al., 2015). Despite the wide breadth of studies synthesized in this review, the majority of the studies were focused on parental presence and out of the remaining twelve studies, only six incorporated technology into the preparation program (Manyande et al., 2015). Furthermore, only one of the studies with technology in the preparation program was designed to educate the patient in some form (Manyande et al., 2015).

In 2015, Chow et al. conducted a systematic review of the literature on "AV interventions … reducing preoperative anxiety and its associated postoperative outcomes such as pain, postoperative maladaptive behaviors, recovery (e.g., decrease in discharge time) in children receiving elective surgery under general anesthesia" (p. 184). The review synthesized 18 papers that covered interventions such as videos, music, Internet preparation, interactive games or multifaceted extensive AV preparation programs (Chow et al., 2015). Multifaceted extensive AV preparation programs are defined as those "that included a combination of two or more interventions (e.g., a program that included the use of imagery booklets, a videotape, and an audiotape)" (Chow et al., 2015). The review found that generally audiovisual interventions were more effective than standard care and just as effective as midazolam at anxiety reduction (Chow et al., 2015). But, despite the research being published relatively recently, there are multiple limitations of the review. One limitation of this study is that six of the articles reviewed were published prior to 2000 leaving the results to be possible out of date (Chow et al., 2015). Out of the twelve remaining articles, over half of them did not educate the patient but instead distracted them from the procedure and stress associated with it (Chow et al., 2015).

Conclusion

Preoperative anxiety is a pervasive problem in the care of pediatric patients. With numerous complications such as postoperative pain, delirium, eating difficulties, and sleep problems, it can be traumatic experience for the pediatric patient. It is imperative that the most effective form of preoperative anxiety reduction be found in order to optimize the patient experience. Despite the numerous ways to measure pediatric preoperative anxiety, the most common treatment for it has multiple disadvantages. Non-pharmaceutical interventions for

preoperative anxiety provide a promising method of anxiety reduction without the negative side effects that medications such as Midazolam can bring. Although it has been shown that distraction based, non-pharmaceutical therapies can be more effective at anxiety reduction in the pediatric patient, there is a lack of literature reviews about the use of educational, technology-based, non-pharmaceutical therapies. This review will attempt to close that gap in the literature.

Chapter 3

Methods

In order to form a comprehensive review of the effect of audiovisual interventions on preoperative pediatric anxiety, a literature search was done in multiple databases. PUBMED, CINAHL, and Web of Science databases were used due to their relevance in preoperative nursing care. This chapter describes the search strategy used to obtain the articles that were analyzed in this review.

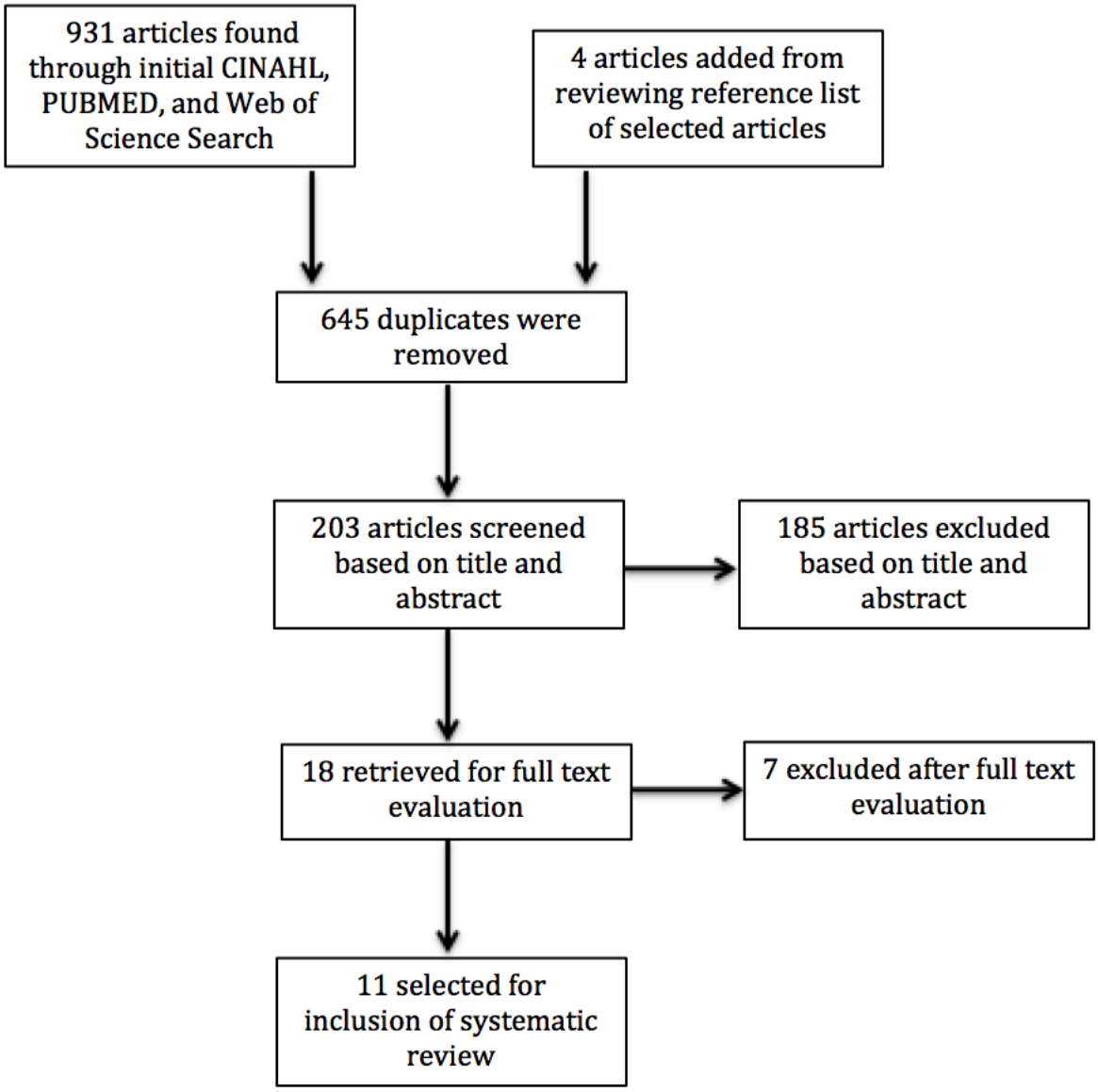
The initial search of the literature was done in February 2018 and began with the terms "preoperative" AND "anxiety" AND "pediatric" to form an initial assessment of the published studies. Over 10,000 articles appeared on both databases with the initial search, so more specific terms were added. The final literature search comprised of (preoperative OR intraoperative OR surgery) AND anxiety AND (pediatrics OR children OR kids) AND (audiovisual OR electronic OR video OR application OR visual OR technology). This returned 931 articles between the three databases. Once duplicates were removed, 203 articles remained and were screened for title and abstract evaluation. 185 were rejected due to being irrelevant to the research questions of the review based on their title or abstract or were duplicates. 14 articles were retrieved for full text evaluation. 7 were excluded after full text evaluation- 6 were determined to be unrelated to research questions of this review and 1 was found to be the study protocol of one of the other papers included in this review. 2 articles were added after reviewing the bibliographies of the articles being reviewed. 2 more articles were added after analyzing the systematic review Chow et al (2015). In total 11 articles were selected for this review

Inclusion and Exclusion Criteria

Articles were included in the study if they were (1) were original research articles (2) in English; (3) published in 2000 or after; (4) with their patient population being 18 years old or younger and; (5) implemented some form of educational audiovisual intervention to reduce preoperative anxiety. Due to the rapid development of technology over the past decades, the review was limited to research published since 2000.

The Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide was used to evaluate each study (Dang & Dearholt, 2017). Level of evidence was rated on a five-point scale from level I to level V, with level I being the highest level of evidence. After the level was determined, each article was rated from A to C, with A being “high quality” and C being “low quality or major flaws”. See Appendix 1 for full level of evidence and quality criteria. The 11 articles that met the inclusion criteria for this review were rated by the author using this scale and all articles were included regardless of their strength of evidence rating.

Figure 1: PRISMA Flow Diagram for Article Selection



Chapter 4

Results

The previous chapters provided the necessary background of the effects of educational audiovisual interventions on pediatric preoperative anxiety as well as details of the design of this review. The purpose of this chapter is to fully analyze each aspect of the current literature on educational audiovisual interventions for pediatric preoperative anxiety. Also, to critically appraise and synthesize the literature in order to determine if the interventions reduce preoperative anxiety levels in the pediatric patient and if so, provide an effective alternative to pharmacological therapies.

Overall, the majority of the articles (8 out of 11) reviewed were randomized controlled trials that filled the necessary criteria to earn a 1/A on the Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide. This indicated a strong research base for the review done because the studies were all randomized control trials and adequately detailed the components of their study such as sufficient sample size, a control variable, adequate references and results that could be generalized. Those that did not received a 1/A rating did so because of a lack of reporting study methods or they were a quasi-experimental design. Further detail on the justification for each of the ratings can be found later in this chapter.

Study Design

Eleven articles, published between 2000 and 2018 were included in this review (Batuman, Gulec, Turktan, Gunes, & Ozcengiz 2016; Campbell et al., 2005; Fernandes, Arriaga, & Esteves, 2014; Fernandes et al., 2015; Fortier et al., 2015; Huntington et al., 2018; Karabulut

& Cetinkaya, 2011; O'Conner-Von, 2008; Tourigny, Clendinneng, Chartrand, & Gaboury, 2011; Wakimizu et al., 2009; Yang et al., 2016). Two studies were blinded randomized control trials (Campbell et al., 2005; Huntington et al., 2018). Eight studies were randomized control trials (Batuman et al., 2016; Fernandes et al., 2014; Fernandes et al., 2015; Fortier et al., 2015; O'Conner-Von, 2008; Tourigny et al., 2011; Wakimizu et al., 2009; Yang et al., 2016) One study was a non-randomized control trial (Karabulut & Cetinkaya, 2011). Sample sizes ranged from 42 to 166 participants. Patient populations ranged from as young as two years old up to eighteen years old.

Anxiety Measurement Tools

One of the crucial components of each study was how they measured preoperative anxiety levels in the pediatric patient. The modified Preoperative Anxiety Scale (mYPAS) was used by three of the articles reviewed (Batuman et al., 2016; Fortier et al., 2015; Huntington et al., 2018). Two articles used the State Traits Anxiety Inventory for Children (STAI-C) (Karabulut & Cetinkaya, 2011; O'Conner-Von, 2008). Both articles authored by Sara Fernandes used the Child Surgery Worries Questionnaire (CSWQ) (Fernandes et al., 2014; Fernandes et al., 2015). Two articles used a Visual Analog Scale (Campbell et al., 2005; Tourigny et al., 2011). Wakimizu et al. (2009) used the Wong-Baker Face Scale. Yang et al. (2016) utilized a behavioral checklist developed by Lebaron and Zeltzer which was comprised of eight operationally defined behaviors: muscle tension, screaming, crying, restraint used, pain verbalized, anxiety verbalized, verbal stalling, and physical resistance that were rated on a scale of one to five. A wide variety of scales can be used to measure pediatric preoperative anxiety, which shows increased focus and

development in the field but a lack of a "gold standard" of measures for the process. Further information on these measurement tools can be found in Chapter 2.

Types of Surgery

The majority of the studies focused on patients receiving same day surgery. Five of the studies had a patient population receiving different types of surgery (Batuman et al., 2016; Fernandes et al., 2014; Fernandes et al., 2015; Fortier et al., 2015; Tourigny et al., 2011). The surgeries in these studies comprised of adenoidectomies, cataract surgeries, circumcisions, dental surgeries, excisions, eye surgeries, herniorrhaphies, hydrocele repairs, hypospadias surgeries, myringotomies, otoplasties, strabismus surgeries, and tonsillectomies. Fortier et al. (2015) did not specify which surgeries in particular were performed but instead categorized them by ENT, general, urology, ophthamalogy, plastics, and orthopedic surgeries. Four of the studies focused solely on dental surgeries and tonsillectomies (Campbell et al., 2005; Huntington et al., 2018; O'Conner-Von, 2008; Yang et al., 2016). Two studies focused solely on hernia repair (Karabulut & Cetinkaya, 2011; Wakimizu et al., 2009).

Preoperative Anxiety Reduction

The goal of this review is to present the evidence on preoperative anxiety reduction in pediatric patients with the use of educational audiovisual interventions. The examination of the literature is centered on finding educational audiovisual interventions that reduce pediatric anxiety and if they can be an effective alternative for traditional preoperative anxiety treatments such as midazolam. The quality of the studies that develop these interventions also dictates the implications of the data and conclusions made by the research, therefore the Johns Hopkins

Nursing Evidence-Based Practice Evidence Level and Quality ratings and justifications were included in the following section.

Three of the studies reviewed implemented educational videos as the intervention for preoperative pediatric anxiety. Batuman et al. (2016) created a video that shows a young girl and her mother receiving preoperative education about the surgery. The video was split into two scenes, one beginning at admission where the anesthesiologist shows what the patient will be going through in regards to the type of surgery being performed and administration of anesthesia (Batuman et al., 2016). The second scene focused on the day of surgery where the patient meets the surgeon and it ends with the child calmly waking up in the recovery room (Batuman et al., 2016). This intervention is strong because it addresses the child's fear of pain and the anesthesia process and models a calm behavior for the patient when separated from their parent and also when reawaking from surgery (Batuman et al., 2016). It was found that in all five of the mYPAS categories there was a statistically significant reduction of anxiety (Batuman et al., 2016). The total mYPAS score for the intervention group was 27.8 ± 7.8 while the control group was 78.9 ± 12.9 (Batuman et al., 2016). In the category of "activity", the intervention group scored 1.1 ± 0.3 and the control group scored 3.1 ± 0.8 (Batuman et al., 2016). In the "vocalization" category, the intervention group scored 1.3 ± 0.6 and the control group scored 4.3 ± 1.0 (Batuman et al., 2016). For "emotional expression" the intervention group scored 1.3 ± 0.6 and the control group scored 3.2 ± 0.5 (Batuman et al., 2016). In the "degree of arousal" category the intervention group scored 1.1 ± 0.4 and the control group score 3.2 ± 0.5 (Batuman et al., 2016). In the last category, "response to parent", the intervention group scored 1.2 ± 0.6 and the control group scored 3.3 ± 0.7 (Batuman et al., 2016). Although all of these scores are favorable for audiovisual educational interventions, it must also be considered that the sample size was only

42 patients, which is the smallest of the sample sizes of the studies reviewed (Batuman et al., 2016). Despite the small but sufficient sample size, the study was still rated 1/A on the Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide because of the detail provided and the randomization of the participants (Batuman et al., 2016). Another strength of the article was that it employed the mYPAS to evaluate the anxiety levels of the patient, which allowed for detailed, third person scoring of anxiety levels (Batuman et al., 2016).

Fernandes et al (2014) also focused on educating the patient through video about the standard hospital stages such as explanations about healthcare professionals, medical instruments, clinical procedures and induction of anesthesia. The intervention group was then further split into three groups, which were delivered the same information but in different modalities: booklet, video, and board game (Fernandes et al., 2014). The education was then compared to the same modalities (booklet, video, and board game) that were designed to entertain and distract the child (Fernandes et al., 2014). The booklet was a Calvin and Hobbes comic strip, the video was a Tom and Jerry cartoon, and the game was "Snakes and Ladders" (Fernandes et al., 2014). The intervention of interest for this review was the comparison between the educational video game, the Tom and Jerry cartoon, and the control of no invention. The results showed significantly lower preoperative worries scores on the CSWQ in the intervention group than both the comparison and control group - 0.47, 1.35, and 1.52 respectfully (Fernandes et al., 2014). This study was one of the strongest in the review (a rating of 1/A) with a large sample size (n=125) and employing not only a control group that received no intervention, but also exploring if having any type of intervention would be effective in reducing pediatric preoperative anxiety or if the educational aspect of the intervention was the reason for reduced anxiety levels (Fernandes et al., 2014). This study also showed that there was no significant

difference between each of the intervention modalities as it tested the booklet, video, and board game interventions against each other, but that education worked better than distraction in all cases (Fernandes et al., 2014).

A week prior to surgery, all patients in the study conducted by Wakimizu et al. (2009) viewed a video about usual care for elective herniorrhaphy told through the experience of five-year-old boy. The experimental group was able to take the video home with them and view the video as frequently as they wanted. The children's anxiety levels on the FACES rating scale during the preoperative period showed that the experimental group scores (1.30 ± 1.42) were significantly lower levels ($p=0.02$) than in the control group (2.06 ± 1.89) (Wakimizu et al., 2009). One of the weaknesses of this study was that the control group and the intervention group both watched the educational video prior to surgery which draws into question if the study measured the effectiveness of the video intervention or that being able to view the video multiple times is more effective than just once (Wakimizu et al., 2009). All participants viewed the video prior to hospitalization in a group, which eliminated the individualized attention that many of the other studies had in the healthcare setting but allowed the participants the comfort of their own home (Wakimizu et al., 2009). And as detailed in Chapter 2, there are limitations with using the Wong-Baker FACES scale for detailing an experience as multifaceted as preoperative anxiety. Although the study was a randomized control trial with all the necessary components to be rated 1/A, its strength of evidence for the reduction of preoperative anxiety is less than other studies in this review.

Karabulut & Cetinkaya (2009) also tested the efficacy of an educational video on preoperative anxiety but also tested a comparison booklet that presented the same information to the patients in a different form. The intervention group was presented the video at 48 hours prior

to surgery and the comparison group was presented the booklet at the same time (Karabulut & Cetinkaya, 2011). The control group received no intervention (Karabulut & Cetinkaya, 2011). At 48 hours prior to surgery the scores on the STAI-C for the intervention, comparison, and control group were 40.93± 3.36, 34.70± 3.65, 38.13± 5.85 (Karabulut & Cetinkaya, 2011). 24 hours prior to surgery the intervention, comparison, and control group scores were 23.93±2.92, 28.60±3.92, and 40.37±5.68 (Karabulut & Cetinkaya, 2011). And 24 hours after surgery the scores for the intervention, comparison and control were 22.23± 1.19, 27.40± 3.94, and 30.50 ± 7.08 (Karabulut & Cetinkaya, 2011). The biggest weakness of this study was semi-experimental design and not having the randomization of participants, hence the 2/B rating (Karabulut & Cetinkaya, 2011). There is also a lack of reporting of exclusion criteria and demographic information of the participants, which limits the ability for the experiment to be recreated (Karabulut & Cetinkaya, 2011). Although the study reported that the video intervention significantly lowered anxiety levels, there was a lack of data on if the video intervention reduced anxiety levels significantly more than the other interventions tested, which is pertinent information for the second research question of this study (Karabulut & Cetinkaya, 2011).

A video game designed with multiple levels each dedicated to explaining a different hospital procedure was found to successfully lower ($p<0.01$) pediatric preoperative anxiety (Fernandes et al., 2015). Children who were in the experimental group reported significantly lower mean level of worries about hospitalization (0.37 ± 0.29), compared to both the entertainment (1.24 ± .81) and control group (1.43 ± 0.86) (Fernandes et al., 2015). This also occurred in the category of medical procedures for the intervention, comparison, and control group (0.44 ± 0.33, 1.82 ± 0.92, 2.21 ± 1.09 respectively), and illness and negative consequences (0.58 ± 0.36, 1.63 ± 0.83, 2.08 ± 0.97) (Fernandes et al., 2015). Much like Fernandes et al.

(2014), this study used a comparison group to increase the validity of the results. By creating a video game, it also actively engaged the patient with the intervention and the preoperative information, which could assist with comprehension and anxiety reduction. The study was strengthened by assessing the child's worries on specific categories of the preoperative process, which can be used for further development of future interventions that can be more tailored to patient. Although specific demographics were not reported on the participants, the study was rated 1/A due to its design and adequate reporting of all other components of the design.

Fortier et al. (2015) supports the results of Fernandes et al. (2015) with a tailored web-based program tested in a well-designed randomized control trial as one of the strongest studies in this review (1/A). Designed for children ages 2-7 years old, the website factors in the children's trait anxiety along with type of surgery to provide tailored information about the surgery and coping skills (Fortier et al., 2015). This intervention was found to significantly reduce the patient's preoperative anxiety levels at the entrance to the OR ($p= 0.02$) and during induction of anesthesia ($p=0.01$) (Fortier et al., 2015). At the entrance to the OR, the intervention group scored 36.2 ± 14.1 on the mYPAS and the control scored 40.7 ± 16.6 (Fortier et al., 2015). At the introduction of the mask, the intervention group scored 43.5 ± 21.7 and the control group scored 57.0 ± 21.2 (Fortier et al., 2015). At the beginning of monitoring of anxiety levels when the child was separated from the parent to go to the OR, there is no significant difference between the two groups ($p=0.23$) (Fortier et al., 2015). The intervention group's mYPAS score was 36.4 ± 12.7 and the control group's score was 40.7 ± 16.6 (Fortier et al., 2015). The ability for the intervention to be tailored to each of the patients based on surgical and personality characteristics is a major strength for the study because it allows for widespread use at minimal

costs (Fortier et al., 2015). Individualization coupled with the engagement of a computer-based program allows for the best chance at clinically significant outcomes (Fortier et al., 2015).

Conversely, the other Internet and multimedia preparation programs reviewed saw no significant difference in anxiety reduction in relation to both comparison and control groups (Huntington et al., 2018; O'Conner-Von, 2008; Tourigny et al., 2011). Huntington et al. (2018) designed an online program that involved the patient to click through a series of 22 screens of a cartoon story, which shows appropriate behavior and coping skills. When the link was sent out approximately one week prior to surgery, the intervention group could access the online site as often as they desired (Huntington et al., 2018). The placebo group received a hand-washing tutorial in the same format as the intervention (Huntington et al., 2018). The control group received the standard care packed about fasting and wound care instructions (Huntington et al., 2018). The intervention group's mYPAS score was 47.6 ± 22.2, the placebo group score was 45.1 ± 20.5, and the control group was 43.2 ± 20.7 (Huntington et al., 2018). The p-values between each of the group was >0.05 (Huntington et al., 2018). The study thoroughly described its randomization process along with the referencing numerous other studies, some of which were included in this review, therefore was rated 1/A. One of the strengths of the study was that it directly compared educational audiovisual interventions to educational non-audiovisual interventions on the same material (Huntington et al., 2018). But the placebo group also received an educational audiovisual intervention just not information relevant to the procedure the patient was about to undergo (Huntington et al., 2018). In the intervention group, less than half of the group chose to access the online preparation at home therefore much like Wakimizu et al. (2009), the study may have tested patient adherence to prescribed treatment rather than the efficacy of the treatment itself (Huntington et al., 2018).

O'Conner-Von (2008) tested the effectiveness of an Internet program on four different factors: preoperative anxiety, knowledge acquisition, post-operative pain, and satisfaction with method of preparation (O'Conner-Von, 2008). The study overall provided a thorough review of and references to the literature and recognized the limitations of the study (O'Conner-Von, 2008). This, coupled with a randomized experiment designed, provided justification for the rating of 1/A on the Johns Hopkins scale. The intervention was designed by the author and was named "Tonsils! Who Needs 'em?" (O'Conner-Von, 2008). The program presented information about the routines of outpatient surgery and also what treatment would be like post-op (O'Conner-Von, 2008). The program showed no significant difference in scores on the STAI-C for the state or trait anxiety in the Internet preparation, placebo, and control group (O'Conner-Von, 2008). For state and trait anxiety the Internet preparation group scored 34.54 ± 7.37 and 32.36 ± 6.82 (O'Conner-Von, 2008). In the placebo group, the state and trait anxiety scores were 37.38 ± 8.60 and 34.33 ± 8.23 (O'Conner-Von, 2008). In the standard preparation group the state and trait anxiety scores were 33.57 ± 6.42 and 33.29 ± 7.16 (O'Conner-Von, 2008). The chi-square analysis for the difference in scores between the Internet program group and the standard preparation group was non-significant for state anxiety ($p=0.319$) and trait anxiety (0.632) (O'Conner-Von, 2008). A change in the trait anxiety is not expected because "T" anxiety is relatively stable whereas state anxiety analyzes the levels of anxiety the patient is feeling at the moment the test is administered (O'Conner-Von, 2008). The study does acknowledge that previous research shows that preparation for surgery does decrease preoperative anxiety and that the calm, cooperative behavior of the adolescents in this particular study indicate an already preexisting knowledge of healthcare that would not have be impacted by the preparation implemented (O'Conner-Von, 2008).

Tourigny et al. (2011) designed a virtual tour that the participants in the intervention group were able to access online during their pre-op clinic visit and day of surgery. This was tested in a pre-experimental, one-group, pretest-posttest design that lacked randomization, which is why it was rated 2/A on the Johns Hopkins scale for this review (Tourigny et al., 2011). Levels of anxiety were measured using a visual analog scale at both of those times and scores were split between children (6 to 12 years) and adolescents (13 to 18 years) (Tourigny et al., 2011). At the pre-op clinic visit the adolescent intervention group scored 3.8 ± 2.7, while the control adolescent group scored 3.5 ± 2.7 (Tourigny et al., 2011). The children group scored 3.7 ± 2.3 and 3.2 ± 2.5 respectively (Tourigny et al., 2011). On the day of surgery, the adolescent intervention group scored 4.5 ± 3.3 and the control group scored 3.5 ± 2.7 (Tourigny et al., 2011). In the children groups the intervention group scored 3.7 ± 2.7 and 3.5 ± 2.5 on the day of surgery. The p values were not reported if they were not less than or equal to 0.05 (Tourigny et al., 2011). The use of two age groups was a strength of the study because of the developmental differences between children and adolescents (Tourigny et al., 2011). However, one of the main weaknesses of this study was that it implemented a visual analog scale that was designed by the authors (Tourigny et al., 2011). This type of scale, much like the Wong-Baker FACES scale, lacks the descriptive quality that other studies had when implemented other scales (Tourigny et al., 2011).

In a unique approach where the preoperative information was sent to the participants over a series of ten texts in the week prior to surgery, patients in the experimental group were found to be less anxious post-operatively than those in the control group (Yang et al., 2016). Although a thoroughly conducted randomized experiment, which is why it was rated 1/A, the focus was not primarily upon preoperative anxiety reduction (Yang et al., 2016). Out of the 10 text messages

that were delivered to the patient, only 2 occurred during the preoperative period (Yang et al., 2016). Furthermore, anxiety levels were measured twice throughout the experiment, once in the preoperative and once in the postoperative period. In the experimental group, children's anxiety was 8.19 ± 0.23 in the preoperative period and 9.22 ± 0.88 in the postoperative period (Yang et al., 2016). For the control group, the children's anxiety was 8.41 ± 0.21 preoperatively and 11.56 ± 0.79 postoperatively (Yang et al., 2016). Although both groups saw an increase in anxiety levels from the preoperative to the postoperative period, the intervention group saw a significantly less increase (Yang et al., 2016). This does not show however, if the intervention worked in reducing preoperative anxiety (Yang et al., 2016).

Post-Operative Complications

Pain

Although a strong trend was shown with lower pain scores for those in an Internet preparation group (O'Conner-Von, 2008), there was no significant difference found in requesting analgesics and postoperative pain scores at two different time intervals (Huntington et al., 2018; O'Conner-Von, 2008). Postoperative pain scores were measured at both two hours and twenty-four hours after surgery for those and there was no difference found between an educational Internet preparation group, a placebo video group, and standard preparation group (O'Conner-Von, 2008).

Post-Operative Maladaptive Behaviors (POMB)

Those who did not receive preoperative education via video had an increase in all measured post-operative maladaptive behaviors: "difficulty getting to sleep, nocturnal enuresis,

nightmares, fear of dark, crying or upset when left alone for a few minutes, temper tantrum, nail biting, disturbance in toilet training, refusal to comply with parents, object to go to bed at night, shyness, decreased appetite, and being indifferent to around" (Batuman et al., 2016, p.539). Statistically significant differences in behaviors occurred in difficulty getting to sleep, nocturnal enuresis, fear of dark, decreased appetite, and objecting to go to bed at night (Batuman et al, 2016). Fortier et al (2015) found that those who received preoperative Internet preparation showed significantly lower ($p=0.04$) emergence delirium in the PACU. On the Pediatric Anesthesia Emergence Delirium test, the patients in the intervention group scored a mean of 12.3 ± 2.9 while the control group scored 13.6 ± 2.9 (Fortier et al., 2015).

Post-Intervention Knowledge

Adolescents who participated in an Internet program showed a significant difference in knowledge acquisition scores compared to a standard preparation program (O'Conner-Von, 2008). The scores on the "Knowledge Questionnaire" indicated the understanding of "the health care environment, equipment, and personnel" (O'Conner-Von, 2008, p.391). Both children (ages 6 to 12 years old) and adolescents (13 to 18 years old) showed a significantly higher post-intervention knowledge score after taking an Internet virtual tour designed to introduce the operative setting to the patient (Tourigny et al., 2011).

Recommendations From the Current Evidence

Anxiety is a subjective and unique experience for the pediatric patient; therefore several of the research studies provided recommendations for further research that can be done in the preoperative setting. In general, the increase in research done in regards to the adult preoperative

patient needs to be extended to the pediatric population (O'Conner-Von, 2008). Research should continue to expand in evaluating the effects of educational audiovisual preoperative programs on the wide variety of invasive medical procedures and determining the most effective timing and composition of the information presented to the patients. (Batuman et al., 2016; Fernandes et al., 2014). In the future, research should be dedicated to making intervention tools as specific as possible in regards to culture, disease, and age (Wakimizu et al., 2009). Tourigny et al. described the need for supporting the data of the effectiveness of Internet-based preoperative preparation programs. Further discussion of recommendations will follow in the next chapter.

Chapter 5

Discussion

Purpose

The goal of this review is to review, synthesize and evaluate the literature that has been published since 2000 that pertains to educational audiovisual interventions that are available that reduce preoperative anxiety in the pediatric patient. This review is one of the first to be done of this specific subject due to the lack of literature and reviews done previously. The aim is to answer the questions:

1. Do educational audiovisual interventions have a negative effect on preoperative anxiety levels in the pediatric patient?
2. If so, do educational audiovisual interventions reduce anxiety as well as or better than traditional preoperative anxiety treatments?

The purpose of this chapter is to summarize the findings and recommendations in the literature as well as provide recommendations for future research and practice in the area of pediatric preoperative anxiety management.

Summary of Findings

In regards to the research questions for this review, it can be concluded that educational interventions reduce preoperative anxiety levels in the pediatric patient. But the research is inconclusive on if they are an effective alternative to traditional preoperative anxiety treatments due to the lack of studies that directly compare the two. Studies that were given a higher quality

rating on the Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide were considered to be more informative than those with lower ratings. This was because the higher quality of the research done should be considered more impactful to the current state of the literature than studies that did not display the same level of thoroughness. This impacted the conclusions drawn from the review and also recommendations. For articles that received ratings lower than 1/A, results were not considered as significant unless they supported the conclusions of higher rated articles. For example Karabulut et al. (2009) was given a rating of 2/B due to its non-randomized design and a lack of reporting inclusion and exclusion criteria, but because the same conclusions were made in Campbell et al., (2005), it was used to further bolster that point.

Interventions such as tablet applications, videos, and computer programs and text messages all showed a reduction in preoperative anxiety (Batuman et al., 2016; Campbell et al., 2015; Fernandes et al., 2014; Fernandes et al., 2015; Karabulut & Cetinkaya, 2011; Wakimizu et al., 2009; Yang et al., 2016). Despite the results of Huntington et al., it can be concluded that educational interventions are more effective at reducing preoperative anxiety than those designed to distract the patient. Huntington et al had multiple limitations such as a limited sample age range and also that the intervention was began over a week in advance. This allowed for the participants to become sensitized to the information, which may have limited the anxiolytic effects. In studies conducted by Fernandes et al. (2014, 2015), it was shown that educational material in the form of booklets, board games, videos, and tablet applications were all more effective reducing preoperative anxiety than distraction-based methods. All forms of the educational interventions were compared to distraction methods of the same type.

But it is unclear if audiovisual interventions are more effective than non-audiovisual or paper based interventions. In the dental anesthesia setting and prior to abdominal surgery, when given the same information by video or in paper form, the video was more effective at reducing the preoperative anxiety of the child (Campbell et al., 2005; Karabulut & Cetinkaya, 2011). But in other research, when delivering the same preoperative educational material, it was shown that the mode of intervention was not as significant as the material delivered (Fernandes et al., 2014; O'Conner, 2008).

Recommendations

In the field of nursing research, healthcare professionals constantly strive to give patient centered care. Due to the rise of outpatient and day surgeries rather than inpatient surgeries, children spend a reduced amount of time in the healthcare setting than they had previously. This leaves less time for healthcare professionals to work with the child and help reduce their preoperative worries. Therefore, it would be beneficial to assess the child's preoperative worries several days before surgery or even when the surgery is first prescribed (Fernandes et al., 2014). Even further, because of the developmental differences between ages of children, these differences should be considered during the assessment (O'Conner-Von, 2008). By assessing the patient prior to the surgery, the healthcare professional can tailor the preparation to the needs expressed by the child and create a more efficient intervention.

Intervention tools should be created to be as specific as possible in regards to both the procedure and the patient. By doing so, it optimizes the patient's healthcare experience by individualizing the preoperative preparation to their needs. Technology is advantageous for this individualization because it allows for those updates to be made to align with the most recently

published research on the matter at little cost to the hospital or healthcare system, unlike paper based materials. A cost-benefit analysis showed that preparation programs could reduce individual and overall medical costs and that healthcare systems could benefit financially from it (Wakimizu et al., 2009).

It is clear that when preoperative preparation is developed and implemented properly, it can have positive effect for children and even their parents (Jaaniste et al., 2007). This review in particular has shown the benefit of educational audiovisual interventions and how they can reduce preoperative anxiety in children. It would be beneficial to both the healthcare system and the patients if the health care system develops their own audiovisual preoperative preparation.

Future Directions of Research

As seen in the articles reviewed, the field of educational audiovisual preoperative programs shows promise as a form of preoperative preparation. It combines the continuously evolving features of technology with the engagement of the patient through education. But, despite this being a well-researched area for the adult patient population, there is a deficit in literature focused on the pediatric patient experience. This is one of the first reviews to focus on educational audiovisual interventions as its own category of non-pharmacological therapies for pediatric preoperative anxiety. There needs to be further research into the multiple components of educational audiovisual interventions to properly draw comparisons between it and current therapies.

With Midazolam being the most common form of preoperative anxiety treatment, a direct comparison between educational audiovisual preoperative programs is necessary to evaluate its true efficacy. In 2018, a study was conducted to compare the effect of tablet-based interactive

distraction and oral Midazolam on pediatric preoperative anxiety, emergence delirium, and post-anesthesia length of stay (Stewart et al., 2018). It was found that the tablet intervention had significantly lower mYPAS scores at parental separation ($p=0.006$) and mask induction ($p<0.001$) (Stewart et al., 2018). This was from a baseline where there was no significant difference in mYPAS scores between the tablet distraction group and the midazolam group (24.4 ± 3.7 and 25.3 ± 5.0) (Stewart et al., 2018). At parental separation, which was one minute after the child was given the tablet, the tablet intervention scores were 25.7 ± 8.7 and for the midazolam group 29.3 ± 12.2 (Stewart et al., 2018). At induction of the mask, the tablet intervention group scored 28.6 ± 11.6 and the midazolam group scored 35.7 ± 16.4 (Stewart et al., 2018).

As shown by the studies analyzed in this review, educational based audiovisual interventions are more effective at reducing pediatric preoperative anxiety than distraction-based audiovisual interventions (Fernandes et al., 2014; Fernandes et al., 2015). Though it could be said that because of those studies that it can be deduced that education based preoperative programs are more effective than midazolam in reducing pediatric preoperative anxiety, there is no literature to back up that claim. Therefore, further research must be done in a controlled environment where Midazolam and educational audiovisual preoperative programs are directly compared within the same patient population.

Educational audiovisual interventions also need to be compared against each other. Although systematic reviews such as Chow et al. 2015 exist for reviewing the efficacy of audiovisual interventions, each study approaches the method of intervention differently. Some studies use no preoperative preparation as a control to compare to educational audiovisual interventions while others use non-technological interventions as the control. Future research

could investigate how effective different forms of audiovisual interventions such as videos, video games, phone applications, and even virtual reality are on preoperative anxiety even when they deliver the same exact information. By directly comparing each form of educational audiovisual interventions, it allows researchers to see which method truly reduces preoperative anxiety best.

Additionally, future studies could also focus on the type of information presented in audiovisual interventions. More specifically, research could focus on if teaching coping mechanisms or about the actual procedure the child is about to undergo is more effective in reducing preoperative pediatric anxiety.

Strengths and Limitations

The biggest strength of this review is that it is one of the first of its kind. There is a lack of reviews done specifically on educational audiovisual interventions despite it being a promising field for anxiety reduction. By consolidating all of the current literature into a review, it allows for readers to develop a quick grasp of the literature and what other promising directions research could go in. Another strength of this review is that there is an expanded literature search to three different databases in attempts for all relevant research to be included. By expanding the search to multiple databases with different focuses, it allows more access to different research that would not have been previously considered.

One of the main limitations of this review is that there is no standard definition of educational audiovisual interventions, which caused an inconsistency in comparisons between each of the articles. There are multiple interpretations of what the patients could be educated on. For example, Fernandes et al. (2015) focused on educating patients on the procedures of the surgery such as the health care staff, hospital rules, and medical instruments. But other studies

such as Huntington et al (2018) focused on teaching appropriate modeling and coping behaviors. Although both studies can be classified as educational because they work on teaching the patient relevant information, the approaches are very different; which makes it difficult to make direct comparisons between the two. Also, audiovisual is a broad term that can encompass many forms of media such as videos, video games, text messages, and others. So, if there is variation in both the type of education given and the form it is given in, comparing the effectiveness of each intervention to each other can be difficult due to the lack of similarities.

A second limitation of this review was the variety of scales used to measure preoperative anxiety throughout all of the research reviewed. Although the results of each of the studies can be standardized through p-values to analyze significance, the actual criteria measured by the difference scales causes a difference in results. The Wong-Baker FACES scale reduces the anxiety experienced down to a numerical value while the STAI-C assesses multiple components for state and trait anxiety. The level of detail of each of the scales is pertinent to creating a holistic picture of the patient's anxiety. Therefore, future research should be dedicated to standardizing a method of anxiety measurement that allows for all of the components and characteristics of preoperative anxiety to be measured.

Conclusion

The literature reviewed provides a wide variety of approaches to educational audiovisual interventions for pediatric preoperative anxiety. While some studies showed that audiovisual interventions such as videos and Internet preparation programs lead to less anxiety than the comparison interventions or control, other studies showed no statistical difference in the anxiety levels. Other research showed though that the interventions lead to statistically significant

increase in post-operative knowledge, decrease in post-operative maladaptive behaviors, and use of sick–behaviors as coping mechanisms, all of which were affected by preoperative anxiety. Additionally, patient's report of pain and requesting of analgesics was unaffected by the Internet preparation programs.

Although the use of audiovisual interventions provides as an effective anxiolytic, it has been shown that there is a need for further research done specifically for the pediatric population to determine all of the possible benefits. Focus needs to be done on types of interventions, educational topics, and ages the intervention is designed for, because as technology continues to advance, so must the accompanying research.

Appendix A:

Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide

Johns Hopkins Nursing Evidence-Based Practice

Appendix D

Evidence Level and Quality Guide

Evidence Levels	Quality Ratings
Level I Experimental study, randomized controlled trial (RCT) Explanatory mixed method design that includes only a level I quaNtitative study Systematic review of RCTs, with or without meta-analysis	**QuaNtitative Studies** **A <u>High quality</u>**: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence. **B <u>Good quality</u>**: Reasonably consistent results; sufficient sample size for the study design; some control, fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence. **C <u>Low quality or major flaws</u>**: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn.
Level II Quasi-experimental study Explanatory mixed method design that includes only a level II quaNtitative study Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis	**QuaLitative Studies** No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria. *For meta-synthesis, there is preliminary agreement that quality assessments of individual studies should be made before synthesis to screen out poor-quality studies*[1]. **A/B <u>High/Good quality</u>** is used for single studies and meta-syntheses)[2]. The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry. Evidence of some or all of the following is found in the report: • Transparency: Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated. • Diligence: Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence. • Verification: The process of checking, confirming, and ensuring methodologic coherence. • Self-reflection and scrutiny: Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations. • Participant-driven inquiry: Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated. • Insightful interpretation: Data and knowledge are linked in meaningful ways to relevant literature. **C <u>Low quality</u>** studies contribute little to the overall review of findings and have few, if any, of the features listed for high/good quality.
Level III Nonexperimental study Systematic review of a combination of RCTs, quasi-experimental and nonexperimental studies, or nonexperimental studies only, with or without meta-analysis Exploratory, convergent, or multiphasic mixed methods studies Explanatory mixed method design that includes only a level III quaNtitative study QuaLitative study Meta-synthesis	

Appendix B: Summary of Studies Reviewed

Table 1: Summary of Reviewed Studies

Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade
Batuman, A., Gulec, E., Turktan, M., Gunes, Y., & Ozcengiz, D. (2016). Preoperative informational video reduces preoperative anxiety and postoperative negative behavioral changes in children. *Minerva anestesiologica*, *82*(5), 534-542.	To evaluate the effect of an information al video based on role-play modeling on preoperative anxiety and post-operative maladaptive behavior (POMB).	***Inclusion*** - ASA physical status I-II - Scheduled for elective outpatient surgery - Accompanied by a mother or father and having Turkish language were enrolled in this study. ***Exclusion*** - Developmental delay - Chronic disease - Psychiatric or neurological disease - Emergency surgeries.	*Ankara, Turkey* Yeni Mahalle Training and Research Hospital N= 42 Ages= 5-12 ***Intervention:*** N= 21 Mean age 7.9±2.3 years Surgery time= 56.2±22.8 min. ***Control:*** N=21 Mean age= 8±2.4 years Surgery time= 55.5±24.3 min.	**Randomized Control Trial** ***Intervention:*** - A 340 second preoperative informational video created by the authors - Standard Care: preoperative anesthesia examination, hospital visit 1 day prior to surgery, taking children into preparation unit with parent on day of surgery ***Control:*** - Verbally informed about anesthesia and analgesia, the 6 hour fasting period and the use of drugs post-surgery. - Standard Care **Anxiety levels were measured using mYPAS**	Intervention had significantly lower Total MYPas scores compared to control: 27.8±7.8 vs 78.9±12.9 ($P< 0.05$) **Additional Outcomes** - A positive correlation between anxiety and post operative maladaptive behaviors was found - The intervention significantly ($p<0.05$) decreased POMB such as difficulty getting to sleep, nocturnal enuresis, fear of dark, decreased appetite, objecting to go to bed at night	1/A

Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade
Campbell, Caroline, Marie-Therese Hosey, and Siobhan McHUGH. "Facilitating Coping Behavior in Children Prior to Dental General Anesthesia: A Randomized Controlled Trial." Pediatric Anesthesia 15, no. 10 (October 1, 2005): 831–38. https://doi.org/10.1111/j.1460-9592.2004.01565.x.	To test the effectiveness of two preparation packages (a paper-based cartoon and interactive computer program) of facilitating coping behavior of pediatric patients having dental general anesthetic tooth extraction	***Inclusion*** - Scheduled for dental general anesthesia tooth extraction - English was first language - Age from 3 to 10 years olds ***Exclusion*** - Previous experience of medical or dental general anesthesia	*Glasgow, Scotland* Glasgow Dental Hospital and School N= 191 ***Control*** N= 66 Median age= 5 Male= 41 Female= 25 ***Computer*** N= 63 Median Age= 5 Male= 35 Female= 44 ***Cartoon*** N= 63 Median age= 5 Male= 33 Female= 30	**Blinded Randomized Control Trial** ***Intervention- Computer*** - An 8 screen program of a male child going through the Dental General Anesthesia (DGA) relating to the child's view ***Comparison- Cartoon*** - 12 cartoons depicting the scenes from the DGA experience mounted on laminated cardboard. ***Control*** - Verbal preparation only **Anxiety levels were measured using the Visual Analog Scale**	Computer program had significantly lower (p=0.014) induction visual analog scores compared to control Computer program had significantly lower (p=0.016) recovery visual analog scores compared to cartoon.	1/A

Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade
Fernandes, S. C., P. Arriaga, and F. Esteves. "Providing Preoperative Information for Children Undergoing Surgery: A Randomized Study Testing Different Types of Educational Material to Reduce Children's Preoperative Worries." *Health Education Research* 29, no. 6 (December 1, 2014): 1058–76. https://doi.org/10.1093/her/cyu066.	To develop three types of educational preoperative materials (video, booklet, and board game) and examined their effectiveness in preparing children for surgery and reducing preoperative anxiety in comparison to entertainment materials of the same modality and no intervention at all.	***Inclusion*** - Between 8-12 years old - Scheduled for minor, outpatient surgery ***Exclusion*** - Children and parents who did not speak Portuguese - Children with sensory or mental disabilities	*Lisbon, Portugal* N= 125 (99 males, 26 females) Ages: 8 -12 (M=10.09; SD=1.43) ***Intervention (Educational):*** N= 45 Mean Age- 10.29±1.25 - Booklet (n = 15) - Video (n = 15) - Board-game (n = 15) ***Comparison (Entertainment):*** N= 45 Mean Age- 9.84 ±1.48 - Booklet (n = 15) - Video (n = 15) - Board-game (n = 15) ***Control:*** N= 35 Mean Age- 10.14 ±1.57	**Randomized Control Trial** ***Intervention:*** *(~15-20 min)* *Educational Booklet* - Picture, text, and coloring book with information about the hospital stages *Educational Video* - Video filmed in hospital with child actor presenting information *Educational Board Game* - game cards have information on them ***Comparison****: (~15 min)* *Entertainment Booklet* - Calvin and Hobbes comic strip - *Entertainment Video* - Tom and Jerry cartoon movie *Entertainment Board Game* - Snakes and Ladders board game ***Control:*** No intervention **Anxiety levels are measured with CSWQ**	Children in the experimental group reported statistically significant lower preoperative worries than children in both the comparison: t(118) 1⁄4 -6.79, P < 0.001, and the control group: t(118) 1⁄4 -8.26, P < 0.001, **Additional Outcomes** No statistical differences between the types of material in the experimental group (all p>0.05)	1/A

Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade
Fernandes, Sara, Patrícia Arriaga, and Francisco Esteves. "Using an Educational Multimedia Application to Prepare Children for Outpatient Surgeries." *Health Communication* 30, no. 12 (December 2015): 1190–1200. https://doi.org/10.1080/10410236.2014.896446.	To test the effectiveness of a multimedia application called "An Adventure at the Hospital" on preoperative anxiety levels in children ages 7 to 11.	***Inclusion*** - Ages 8 to 12 years old - Scheduled for minor ambulatory surgery - Accompanied by parent - Have parental consent to participate ***Exclusion*** - Non-Portuguese speakers - Non-Portuguese speaking parents - Developmental delay - Underlying complicating conditions	*Lisbon, Portugal* 3 undisclosed hospitals N= 90 (69 males and 21 females) Ages: 8 to 12 (*M* = 10.20; *SD* = 1.54 ***Intervention (Educational Application):*** N=30 ***Comparison (Entertainment Application)*** N= 30 ***Control (No intervention)*** N=30	**Randomized Control Trial** ***Intervention*** *(~15 min)* *Educational Application on personal Tablet Computer* - "An Adventure At The Hospital" was created by the authors - 7 levels that were each stage of the hospital stay 1) Hospital Admission 2) Health care staff and hospital rules 3) Medical Instruments 4) Medical Procedures 5) Surgery Room 6) Recovery Room 7) Aftercare and going home All levels are designed to be interactive and guarantee the child understood the information on each level before moving on ***Comparison*** *(~15 min)* - Played Super Mario, Angry Birds, or FIFA for the equivalent amount of time ***Control*** - No intervention	Intervention group reported significantly lower mean levels of worries about hospitalization, medical procedures, and illness and negative consequences than the comparison and control group ($p<.01$) Comparison group reported lower mean levels of worry about illness and negative consequences than the control group ($p= .024$) No significant difference was found between the comparison and the control group on worries about hospitalization ($p= .297$) and medical procedures ($p = .083$)	1/ A

				Anxiety levels are measured with CSWQ		
Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade

Fortier, Michelle A., Elizabeth Bunzli, Jessica Walthall, Ellen Olshansky, Haleh Saadat, Ricci Santistevan, Linda Mayes, and Zeev N. Kain. "Web-Based Tailored Intervention for Preparation of Parents and Children for Outpatient Surgery (WebTIPS): Formative Evaluation and Randomized Controlled Trial." Anesthesia and Analgesia 120, no. 4 (April 2015): 915–22. https://doi.org/10.1213/ANE.0000000000000632.	To evaluate the efficacy of a web-based, tailored behavioral preparation program (WebTIPS) on reducing preoperative anxiety levels in both the pediatric patient and their parent.	***Inclusion*** - ASA classification I and II - Ages 2-7 years old - Born at least 32 weeks gestational age - No developmental delays or cognitive impairment ***Exclusion*** - ASA status III or higher - Receiving services for developmental delay or cognitive impairment that could impact surgical recovery - did not speak English	*Children's Hospital of Orange County* and *Yale-New Haven Children's Hospital* N= 82 (44 males and 38 females) **Intervention** N= 38 Ages: 4.3 ± 1.8 Male= 24 Female= 24 <u>Procedure (%):</u> ENT: 54 General: 5 Urology: 22 Ophthalmology: 14 Plastics: 3 Orthopedic: 3 **Control** N= 42 Ages: 4.4 ± 1.7 Males= 22 Female= 22 <u>Procedure (%):</u> ENT: 59 General: 23 Urology: 7 Ophthalmology: 7 Plastics: 2 Orthopedic: 2	**Randomized Control Trial** **Intervention** *"Web-based Tailored Intervention Preparation for Surgery"* - Animated based childrens website and a multimedia parent website - 4 sections covering the perioperative period: Home (preoperative), preoperative holding area & anesthesia induction & surgery, postanesthesia care unit (PACU), and home (postoperative) - Provided link to the website that could be access an unlimited number of times 7 days prior to and after surgery - Website tailored based on children's trait anxiety and type of surgery - Information includes information provision, modeling, and coping skills - Intervention group also receive standard preparation the day of surgery **Control:** Standard preparation **Anxiety levels are measured with mYPAS**	Intervention group had significantly lower anxiety at entrance to the OR (p=0.02) and introduction of anesthesia mask (p=0.01) than control **mYPAS score** *Separation to OR* Intervention: 36.4±127 Control: 40.7±16.6 p=0.23 *Entrance to OR* Intervention: 36.2±14.1 Control: 46.0±19.0 p=0.02 *Introduction of Mask* Intervention: 43.5±21.7 Control: 57.0±21.2 p=0.01 Intervention group experienced significantly less emergence delirium (p=0.04) than control No significant difference in intraoperative analgesic use or length of surgery between two groups	1/A
Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade

Huntington, Corinne, Christina Liossi, Ana Nora Donaldson, Jonathan Timothy Newton, Patricia A. Reynolds, Reham Alharatani, and Marie Therese Hosey. "On-line Preparatory Information for Children and Their Families Undergoing Dental Extractions under General Anesthesia: A Phase III Randomized Controlled Trial." *Paediatric Anaesthesia* 28, no. 2 (February 2018): 157–66. https://doi.org/10.1111/pan.13307.	To test the effectiveness of an online game (www.scottga.org) about modeling and coping skills on reducing children's anxiety related to surgery and improve parent's satisfaction with hospital experience compared to a placebo-video about hand-washing and standard care.	***Inclusion*** - 5 to 7 years old - Scheduled for general anesthesia tooth extraction ***Exclusion*** - Insufficient internet capability to access "YouTube" - children who had already experienced general anesthesia after age 2 ** Children with medical or behavioral disabilities are admitted under a different service therefore already excluded	*London, England* King's College Hospital N= 185 recruited N= 176 randomized N= 166 analyzed Ages: 5 to 7 years old Male: 86 Female: 80 ***Intervention*** (n= 60) Male: 29 Female: 31 5 years old: 20 6 years old: 19 7 years old: 21 Mean (SD): 6 (0.80) ***Placebo- Video*** (n= 57) Male: 29 Female: 28 5 years old: 18 6 years old: 21 7 years old: 20 Mean (SD): 6 (0.83) ***Standard Care*** (n= 59) Male: 28 Female: 31 5 years old: 18 6 years old: 20 7 years old: 17 Mean (SD): 6 (0.80)	**Double-blind randomized control study** ***Intervention*** *Intervention video in addition to standard care* www.scottga.org - interactive 22 screen cartoon story with 2 videos that model appropriate behavior and coping mechanisms Email prompt was sent out 1 week prior to surgery for the families to view and then the patient was given it again upon arrival to the ward ***Placebo-Video*** *Placebo video in addition to standard care* Email prompt was sent out 1 week prior to surgery like intervention group but with access to hand-washing video of similar length and target age. Also given video again upon arrival to ward ***Standard Care*** Received packet with fasting and wound care instructions along with coloring book about healthy eating choices **Anxiety levels are measured using mYPAS**	No significant difference was found in anxiety levels before going into and in the induction room before surgery between the intervention and two controls. **Additional Outcomes** The likelihood of requesting analgesic postoperatively was found to be independent from group assigned. No significant difference were found for "satisfaction with hospital service", "satisfaction with preparatory information", or "usefulness of preparatory information" between the intervention and the controls	1/A
Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade

Karabulut, Neziha, and Funda Cetinkaya. "The Impact on the Level of Anxiety and Pain of the Training before Operation Given to Adult Patients." Surgical Science 02, no. 06 (2011): 303–11. https://doi.org/10.4236/ss.2011.26065. .	Determine the effect of different training methods (video or booklet) prior to abdominal operation on the anxiety levels of the child and his or her family.	***Inclusion*** - Between 9-12 years old - Receiving inguinal hernia surgery ***Exclusion*** Not listed	*Erzurum, Turkey* Yakutiye Research Hospital of Süleyman Demirel Medical Centre N=90 Ages: 9 to 12 years ***Intervention A*** n=30 ***Intervention B*** n=30 ***Control*** n=30	**Non-randomized controlled study** The STAI-C was applied 3 times across the course of the study- 48 hours prior, 24 hours prior, and 24 hours post surgery. ***Intervention A*** 12-minute pre-operative preparation video about the hospital layout, hospital life, hospital staff, operation room, procedures to do at the recovery room and the tools. ***Intervention B*** Training with booklet that contained the same information as the video ***Control*** No intervention or training **Anxiety levels were measured using STAI-C**	Children who watched the preoperative preparation exhibited lower anxiety than those without any intervention. ***Intervention A*** 48 hours prior- 40.93± 3.36 24 hours prior- 23.93±2.92 24 hours post- 22.23± 1.19 ***Intervention B*** 48 hours prior- 34.70± 3.65 24 hours prior- 28.60±3.92 24 hours post- 27.40± 3.94 ***Control*** 48 hours prior- 38.13± 5.85 24 hours prior- 40.37±5.68 24 hours post- 30.50 ± 7.08 Statistically significant difference in scores of children in the control group ($p<0.05$) and in the VCD group ($p<0.01$) and as statistically insignificant in the booklet group ($p>0.05$)	Level 2/B
Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade

O'Conner-Von, Susan. "Preparation of Adolescents for Outpatient Surgery: Using an Internet Program." *AORN Journal* 87, no. 2 (February 1, 2008): 374–98. https://doi.org/10.1016/j.aorn.2007.07.024.	The effectiveness of an internet preparation program on patient and parental anxiety and satisfaction along with patient's knowledge acquisition and pain intensity for an outpatient tonsillectomy compared to the standard preparation program.	***Inclusion*** - Age 10 to 16 years; - Scheduled for an elective tonsillectomy with or without adenoidectomy; - Ability to read, speak, and write English; - Possession of computer skills and access to the Internet either at home, school, or in a public library - Ability to give assent to participate in the study. ***Exclusion*** - History of cognitive impairment that potentially could inhibit the ability to participate in the study - History of an underlying acute or chronic medical problem that could inhibit the ability to participate - Inability to read and complete the study questionnaires - Parents who chose not to participate in the study	Children's Non-profit Healthcare system in the Midwest N= 66 Males: 24 Females: 41 Ages: 10 to 16 years Mean Age (SD): 12 (3.3) **Intervention** N=28 10 years old- 7 11 years old- 9 12 years old- 5 13 years old- 4 14 years old- 2 15 years old- 1 16 years old- 0 **Comparison** N=14 10 years old- 5 11 years old- 5 12 years old- 2 13 years old- 0 14 years old- 2 15 years old- 0 16 years old- 0 **Control** N=24 10 years old- 3 11 years old- 8 12 years old- 2 13 years old- 5 14 years old- 4 15 years old- 1 16 years old- 1	**Randomized Control Trial** ***Intervention*** *"Tonsils? Who Needs 'em?"* A conversationally formatted internet program that educated the patient on developmentally appropriate sensory and procedure-related information. ***Comparison*** A standard in-person education program at the hospital held on a weekly basis. A nurse practitioner and child life specialist use photographs and medical equipment as teaching tools of developmentally appropriate information about the surgery. ***Control*** Those assigned to the Internet preparation program and did not view the program (n = 4) and those adolescents who were assigned to the standard preparation program and did not attend the program (n = 20). Received only the routine preparation provided by their ENT clinic and the nurses, physicians, and child life specialists on the day of surgery. **Anxiety levels were measured using the STAI-C**	No statistically significant difference between the three groups on state or trait anxiety scores. (P = .319 and P = .632 respectively) **Additional Outcomes** There is a significant difference between the Internet preparation program compared to the standard preparation program in knowledge acquisition. (P=.001) There is no significant difference in postoperative pain scores two hours after leaving the PACU while at the hospital and 24 hours after surgery between an Internet preparation program group or attending the standard preparation program group. (P=.056) ** Strong trend was shown with the internet preparation group having the lowest pain scores and the non-preparation program having the highest.	1/ A

Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade
Tourigny, Jocelyne, Debbie Clendinneng, Julie Chartrand, and Isabelle Gaboury. "Evaluation of a Virtual Tour for Children Undergoing Same-Day Surgery and Their Parents." *Pediatric Nursing; Pitman* 37, no. 4 (August 2011): 177–83.	Evaluate the virtual tour entitled, "Surgery Virtual Tour," created by the authors. The level of health care knowledge, emotional state, degree of utilization, and perceived usefulness of the Virtual Tour was tested in a pre-test, post-test design.	***Inclusion*** - 6 to 18 years of age - Able to understand or read and write in English - To be at a school-age cognitive level - To give an assent or written consent to the study ***Exclusion*** -Any developmental or physical state that could prevent them from completing the questionnaires were excluded from the study - Parents had to be able to read and write in English and con-sent to the study	Canadian university-affiliated pediatric hospital N= 138 Males: 61 Females: 77 Ages: 6 to 18 years **Intervention** (N=76) **Control** (N=62)	**Pre-experimental, one-group, pretest-posttest design** ***Intervention*** (~15-30 min) "Surgery Virtual Tour" <u>Website Layout:</u> *Pre-Assessment Clinic (PAC)* • Waiting room, Pre-assessment clinic, Registration desk, Meet the nurses, Meet the anesthesiologist *Day Care Surgery* • Before coming to CHEO, Elevator lobby, Registration, Pre-op nursing assessment, Day care waiting room *Operating Room* • Interview room, Operating room, Family waiting room *Post-Anesthesia Care Unit (PACU)* *Post-Operative* • Day care discharge, Inpatient admission, Inpatient playroom *Links- Glossary of Surgical Terms* *Each link explains the events that will occur in the area and relevant hospital equipment.* ***Control*** (N=62) Did not take "Surgery Virtual Tour" **Anxiety levels were measured using visual analog scale designed by authors**	No significant difference in children's and adolescents' level of emotional distress from preoperative clinic visit and day of surgery **Additional Outcomes** Children who took the Tour had a post-intervention knowledge score statistically and significantly higher than those who did not (p = 0.002)	2/A

Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade
Wakimizu, R., Kamagata, S., Kuwabara, T., & Kamibeppu, K. (2009). A randomized controlled trial of an at-home preparation programme for Japanese preschool children: effects on children's and caregivers' anxiety associated with surgery. Journal of evaluation in clinical practice, 15(2), 393-401.	To determine if an at-home psychological preparation program (video and booklet) prior to surgery can reduce anxiety for preschool children undergoing herniorrhaphy and their respective caregivers	***Inclusion*** - Ages of 3 to 6 - Undergoing elective herniorrhaphy for inguinal hernia and hydrocele testis. ***Exclusion*** - Chronic pain or suffering - Problems with touch, taste, hearing, eyesight and smell - Mental disorders or other diseases that require special treatments - Problems with communication - Challenges of reading and writing skills in Japanese language.	*Tokyo, Japan* Tokyo Metropolitan KIYOSE Children's Hospital N= 158 Ages: 3 to 6 years old ***Intervention*** N=77 71 completed full study Age: 59.8 ±15.8 months <u>Diagnosis</u> Left, Right inguinal hernia: 21, 35 Bilateral inguinal hernia: 6 Left, Right hydrocele testis: 3, 12 ***Control*** N=81 73 completed full study Age: 61.1± 16.9 months <u>Diagnosis</u> Left inguinal hemia: 26 Right inguinal hemia: 37 Bilateral inguinal hemia: 5 Left hydrocele testis: 3 Right hydrocele testis: 10	**Randomized Control Trial** The children's anxiety was measured: - 1 week before as the baseline - Preoperative period - The postoperative on the day of surgery - 1 week after surgery - 1 month after surgery ***Intervention:*** - Standard video about herniorrhaphy with other outpatients before hospitalization - 9-minute video showing the experience of a 5-year-old boy who is hospitalized for inguinal hernia. - Video and the booklet were given to caregiver at preoperative examination to take home a week before surgery to use as frequently as they want. - Auxiliary booklet given caregivers with basic regulations and guidelines for the video and how to answer questions the child may have ***Control*** No further preparation from the initial video about herniorrhaphy with other outpatients **Anxiety levels were measured using Wong– Baker FACES (FACES) Rating Scale**	The at-home preparation reduced the preoperative anxiety measured of the children's self-report on the FACES rating scale significantly. (P = 0.02) Intervention: 1.30 ± 1.42 Control: 2.06 ± 1.89 **Additional Outcomes** The intervention group caregivers provided significantly more information about "reason for undergoing surgery" and "anesthesia induction" than the control group (P= 0.004, P= 0.029)	Level 1/A

Study	Purpose	Inclusion/Exclusion	Setting/Participants	Design	Results	Strength/ Grade
Yang, Ji Yeon, Hanna Lee, Yongai Zhang, Ji Uhn Lee, Jun Hee Park, and Eun Kyoung Yun. "The Effects of Tonsillectomy Education Using Smartphone Text Message for Mothers and Children Undergoing Tonsillectomy: A Randomized Controlled Trial." *Telemedicine and E-Health* 22, no. 11 (May 18, 2016): 921–28. https://doi.org/10.1089/tmj.2016.0019.	To determine the effectiveness of providing caregivers with information on tonsillectomy care by smartphone text messaging in comparison to conventional textual and verbal methods in increasing their mothers' knowledge, reducing the anxiety, and improving the sick-role behavior of pediatric tonsillectomy patients	***Inclusion*** - 3 to 7 years old - ASA I or II - A mother who spoke Korean - Guaranteed access to a smartphone ***Exclusion*** -Neurocognitive deficits - Chronic pain - Undergone another surgery in the month before tonsillectomy	*Seoul, South Korea* K university hospital N= 61 Ages: 3 to 7 years old ***Intervention*** N= 34 allocated, 27 analyzed Male: 19 Female: 8 Age: 5.2 ± 1.3 ***Control*** N=34 Male: 24 Female: 10 Age: 5.3 ± 1.3	**Randomized Control Trial** ***Intervention*** Provided with information on the pre- and post-operation care of tonsillectomy in the form of 10 text messages between the initial hospitalization and the first visit to an outpatient clinic. <u>Topics of Texts</u> - Preoperative orientation, examination, and precautions - Recovery after surgery - Postoperative precautions - Wound healing after discharge; pain management - Diet management - Hemorrhage prevention - Administration of medication - Monitoring for excessive bleeding - Follow-up guidance provided by the outpatient clinic <u>Text Message Delivery Intervals</u> - On day of hospitalization - On day of the operation - On day of discharge - Every day from discharge to attendance at the outpatient clinic. ***Control*** Provided the same information by conventional textual and verbal means only **Anxiety levels were measured using a modified 8 item self-report instrument**	In both groups and at both measurement points, children's anxiety was increased, respectively (t=2.99, p=0.004 and t=3.2, p=0.002). Children in the experimental group were less anxious than those in the control group. The children's sick-role behavior increased significantly between the two groups (t = 1.86, p = 0.034) <u>Ice pack application</u> (p = 0.028). - Experimental Group (M = 1.44) - Control Group (M=1.09) <u>Chewing gum</u> (p = 0.025) - Experimental Group (M = 1.56) Control Group (M = 1.24) <u>Eating ice cream in response to pain</u> (p = 0.009) Experimental (M = 1.85) - Control (M = 1.47)	1/A

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Progressive Care and Telemetry Unit- 80 clinical hours

Student Nurse Externship- Hospital of the University of Pennsylvania
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