THE EFFECTS OF HYPNOSIS ON ACUTE PAIN AMONG ADOLESCENTS UNDERGOING SURGICAL PECTUS EXCAVATUM REPAIR

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by
ELIZABETH EDMUNDSON

B.S.N., William Jewell College, 1992

Kansas City, Missouri

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THE EFFECTS OF HYPNOSIS ON ACUTE PAIN AMONG ADOLESCENTS UNDERGOING SURGICAL PECTUS EXCAVATUM REPAIR

Elizabeth Edmundson, Candidate for the Doctor of Philosophy Degree

University of Missouri-Kansas City, 2016

ABSTRACT

In the United States, approximately four million surgical procedures are performed on children every year. Unfortunately, severe post-surgical pain is common. Children are at risk for the development of chronic postsurgical pain and the deterioration of their health-related quality of life when moderate to severe postsurgical pain exists one month after a surgical procedure. Despite the significant negative effects that postsurgical pain can have on a child, it is often inadequately assessed and treated because of the incorrect perception that children neither endure or feel pain, nor respond to or remember painful experiences to the same extent as adults.

Although past research has documented the positive effects of children and adolescents learning hypnosis prior to undergoing painful procedures, research that assesses the effectiveness of hypnosis for this population is lacking. Addressing these challenges will provide health

professionals with evidence based data and a process to address concerns that could eventually have a positive impact on postoperative pain management among this population.

APPROVAL PAGE

The faculty listed below, appointed by the Dean of the School of Nursing and Health Studies, have examined a dissertation titled, "The Effects of Hypnosis on Acute Pain Among Adolescents Undergoing Surgical Pectus Excavatum Repair", presented by Elizabeth Edmundson, candidate for the Doctor of Philosophy degree, and certify that in their opinion it is worthy of acceptance.

Supervisory Committee

Patricia Kelly, PhD, MPH, APRN committee chair
University of Missouri - Kansas City, School of Nursing and Health Studies

An-Lin Cheng, PhD
University of Missouri-Kansas City, School of Medicine

Mark Connelly, PhD
University of Missouri-Kansas City, School of Medicine

Karen Cox, PhD, RN, FACHE, FAAN
University of Missouri-Kansas City, School of Nursing and Health Studies

Maithe Enriquez, PhD, RN, ANP-BC, FAAN
Sinclair School of Nursing

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CHAPTER 1

INTRODUCTION

Acute pain is one of the most common unpleasant stimuli experienced by children (American Pain Society [APS], 2011). This pain can occur as a result of traumatic injury such as bone fracture, illnesses like pharyngitis, and/or necessary medical procedures (APS, 2011). Despite the significant negative effects that acute pain can have on a child, it is often inadequately assessed and treated because of the incorrect perception that children neither endure or feel pain, nor respond to or remember painful experiences to the same extent as adults (Gehdoo, 2004). There is wide-ranging literature that describes how to evaluate and treat acute pain in children using economical, readily accessible, convenient, and safe techniques; this information, however, has not been readily applied (Chou et al., 2016; Curtis, Wingert, & Ali, 2012; Czarnecki et al., 2011; Evans, Tsao, & Zeltzer, 2008; Gray, Garza, Zageris, Heilman, & Porges, 2015; Lee, Yamada, Kyololo, Shirkey, & Stevens, 2014; McMurtry, Chambers, McGrath, & Asp, 2010; Moore, Anderson, Bergman, & Dowswell, 2012).

Background

In the United States, approximately 4 million surgical procedures are performed on children every year (Chou et al., 2016). Unfortunately, severe postsurgical pain is common and can control the stress response after surgery, which may result in a delayed recovery with considerable postsurgical pain, possibly progressing to chronic pain (Chou et al., 2016). Children are at risk for the development of chronic postsurgical pain and the deterioration of their health-related quality of life when moderate to severe postsurgical pain exists one month after a surgical procedure (Chou et al., 2016; Rabbitt, Palermo, Zhou, & Mangione-Smith, 2015; Taddio et al.,

2010). This substantial evidence supports the benefits of treating acute pain not only for humane and ethical reasons, but also because of long term benefits to the child's health and welfare (Friedrichsdorf et al., 2015; Patterson, 2010).

Hypnosis for Invasive Procedures

An invasive procedure is defined as a "surgical or nonsurgical procedure that put patients at more than minimal risk" (The Joint Commission, 2009, p.3). Hypnosis is a particularly promising nonpharmacological intervention that empowers children to manage pain associated with invasive procedures (Patterson, 2010; Schnur, Kaferm, Narcus, & Montgomery, 2008; Thrane, 2013; Uman, Chambers, McGrath, & Kisely, 2006). When used in conjunction with pharmacological interventions, the use of hypnosis can provide substantial relief from this pain (Fanurik, Kon, Schmitz, & Brown, 1997; Kazak et al., 1996; Liossi & Franck, 2008; Lobe, 2007; Manworren et al., 2015; Tomé-Pires, C., & Miró, 2012; Uman et al., 2013). Hypnosis may be especially effective due to the predictability of procedural pain (Patterson, 2010).

Hypnosis is described as "the absorption of the child into an altered state of consciousness in the service of creating a therapeutic change in perception, emotion, behavior, or experience" (Wester & Sugarman, 2007, p. 6). Contrary to the images of hypnosis produced by entertainment, all hypnosis is self-hypnosis. Examples of extemporaneous self-hypnosis include children entranced by a television cartoon or people deep in thought (Anbar, 2006).

Despite hypnosis being a promising intervention for managing pain associated with invasive procedures in children and adolescents, research has been limited by the lack of a clear definition for hypnosis and no clear delineation between hypnosis and similar techniques, such as guided imagery and autogenic training (Wester & Sugarman, 2007). Having multiple definitions

within the field of hypnosis adds to the complexity of conducting research and interpreting findings of the studies that have been conducted.

Adolescents

Physical illness can have an immense effect on adolescents. This is true both for illnesses that have a visible bearing on the adolescent's appearance, such as a pectus excavatum deformity, as well as for less visible ailments, such as irritable bowel syndrome and chronic kidney disease. Most teens utilize their own internal resources and their support system of family and friends to cope with medical challenges (Hazen, Schlozman, & Beresin, 2008). The sheer number of painful procedures that an adolescent may undergo throughout the course of his or her life warrants the need for a better understanding about the efficacy of integrative pain reduction strategies, such as hypnosis, as an adjunct pain reduction treatment. These numerous painful procedures may also predispose adolescents to developing chronic pain in adulthood (Anand, Stevens, & McGrath, 2007; Holsti, Grunau, Oberlander, & Whitfield, 2004; Rabbitt et al., 2015; Versloot, Veerkamp, & Hoogstreaten, 2008).

The successful use of hypnosis requires careful attention not only to the particular clinical needs of the patient, but also to the adolescent's developmental level (Wester & Sugarman, 2007). Adolescents are somewhere between their childhood innate capacity to use their imagination and the more reality focused adults they are becoming (Wester & Sugarman, 2007). Their attention can often be captured when the provider adds surprise, fun, and innovative play to a hypnotic intervention.

Adolescents possess unique developmental considerations with reference to "physical, cognitive, emotional, social, and behavioral development" (American Psychological Association [APA], 2002). Entering puberty marks the physical changes of adolescence. However, these

physical changes represent just a segment of the age-related changes that adolescents experience. The adolescents' maturing brains bring new intellectual skills that enhance their ability to reason and to think conceptually. They are developing emotionally in an attempt to launch a new view of who they are and who they want to become. Adolescent social development involves connecting in new ways to both peers and adults, and the start of testing new behaviors as they transition from childhood to adulthood (APA, 2002).

Pectus Excavatum

Pectus excavatum is a congenital chest wall deformity, also known as sunken or funnel chest, occurring in an estimated 1 in 400 births (Gasior, Weesner, Knott, Poola, & St. Peters, 2013). Boys are affected five times more frequently than girls, and approximately 95% of participants are Caucasian (Gasior et al., 2013). Roughly 15% of these adolescents will seek surgical correction for this (Fonkalsrud, Dunn, & Atkinson, 2000). Because the appearance of the chest can be unsettling to adolescents, self-esteem and body image struggles are frequently reported in these patients (Roberts, Hayashi, Anderson, Martin, & Maxwell, 2003).

Pectus excavatum occurs when an excessive growth of the connective tissue that joins the ribs to the breastbone causes the sternum to grow inward. The exact cause is unknown. Pectus excavatum can occur independently, or there may be a family history of the condition. Other medical problems associated with this condition include Marfan syndrome, Noonan syndrome, Poland syndrome, Rickets, and Scoliosis (National Institutes of Health, 2015). Surgery is usually recommended if the condition is severe, and the heart and lungs are affected (National Institutes of Health, 2015).

Pectus excavatum repair was first attempted in the early 1900s. The initial surgical technique is described as an *open approach* perfected by Dr. Ravitch in 1949 and subsequently

used by most surgeons for the next 50 years. This *open approach* repair typically took three hours to perform and was associated with moderate blood loss. In 1998, Dr. Donald Nuss reported a *minimally invasive* approach to pectus repair. This *minimally invasive* repair typically took only one hour to perform, with minimal blood loss. This new surgical technique, the Nuss procedure, was quickly adopted as the most common procedure for pectus excavatum repair and still remains the predominant technique used today (Laituri, Garey, & St. Peter, 2010).

Nuss repair of pectus excavatum involves the placement of a metal rod under the sternum at the area of the most severe depression. Although the procedure is minimally invasive, requiring only small incisions, the operation induces more pain than traditional *open approach* operations, resulting in longer hospital stays (Fonkalsrud et al., 2000). Pain management for patients recovering from pectus repair is a challenge. While the use of patient controlled analgesia (PCA) with intravenous opioids and thorascopic epidural catheter analgesia are the most prevalent pain management regimens, this is a marginally explored topic with a significant variance of research findings across institutions (Johnson, Fedor, & Singhal, 2014; Lobe, 2007; Manworren et al., 2015; Mavi & Sadhasivam, 2014; St. Peter et al., 2012). The current state of the science leaves many opportunities to improve upon the postoperative pain management strategies for patients recovering from pectus excavatum repair.

Problem Statement

Although past research has documented the positive effects of hypnosis for children and adolescents undergoing painful procedures, research that assesses the effectiveness of hypnosis for this population is lacking (Tome-Piro & Miro, 2012; Uman et al., 2013; Woragidpoonpal, Yenbut, Picheansathian, & Pimpaporn, 2013). Addressing these challenges will provide health

professionals with evidence based data and a process to address concerns that could eventually have a positive impact on postoperative pain management among this population.

Study Purpose and Specific Aims

The primary purpose of this study, guided by the Gate Control Theory and Erickson's Eight Stages of Psychosocial Development, is to provide critical information about how hypnosis impacts the postoperative course of adolescents undergoing Nuss procedure for pectus excavatum repair. In depth, broader, systematic research is needed to address the pain management needs of adolescents undergoing invasive procedures.

Specific Aim 1 (SA 1)

To identify the effect of hypnosis training on the length of hospitalization and the use of pain medication between adolescents who learned and did not learn hypnosis prior to their Nuss procedure. The research question related to this aim is: What is the difference between the pain medication usage and length of hospitalization between participants who learned and did not learn hypnosis prior to their Nuss procedure?

Specific Aim 2 (SA 2)

To identify the differences in age, gender, and race/ethnicity between adolescents who learned and did not learn hypnosis prior to their Nuss procedure.

Definition of Terms

Nociceptive pain is defined as pain from "actual or threatened damage to tissue due to the activation of nociceptors, the high threshold receptors of the peripheral nervous system that are capable of transducing noxious stimuli" (International Association for the Study of Pain, [IASP] 2014).

Pain is "whatever the experiencing person says it is, existing whenever he or she says it does" (Paero & McCaffrey, 2011, p.2).

Pectus excavatum is a medical term that describes an abnormal formation of the ribcage that gives the chest a caved in or sunken appearance.

Pediatric or children, in this study, refers to all individuals in the pediatric age range from neonates through adolescents.

"*Hypnosis* is a state of inner absorption, concentration and focused attention" (American Society of Clinical Hypnosis, 2012). The primary aims of hypnosis are to manage pain and distress, capture children's attention, reduce distress, reframe pain experiences, and help children dissociate from the pain (Chen, Joseph, & Zeltzer, 2000).

Chronic post-surgical pain is pain that "develops following surgical intervention, after exclusion of other causes, lasting longer than two months, and unrelated to a condition preceding surgery" (IASP, 2014).

Assumptions

Assumptions for this study include the following:

1. The participant data is an accurate account of the adolescent pre and postoperative course.
2. The principal assumptions of the proposed theories apply to the use of hypnosis for adolescent pain management following Nuss procedure for pectus excavatum repair.

Theoretical Frameworks

Scholars are influenced by a variety of disciplinary backgrounds, each with different theoretical reference points. Theoretical frameworks can inform both the topic of investigation and the selection of study methods (Sandelowski, 1993). Several theories are available to help

frame research related to hypnosis, pain, and adolescence. No single theoretical model of hypnosis is entirely adequate to explain what actually happens in hypnosis (Elkins & Hammond, 1998). Therefore, both Melzack and Wall's (1965) gate control theory and Erickson's Eight Stages of Psychosocial Development will guide this study (Erikson, 1993).

Gate Control Theory

In 1965, Melzack and Wall introduced the gate control theory of pain, which is the prevailing theory accepted today. The gate control theory suggests that the perception of pain is the result of a complex interaction of afferent nociceptive stimuli and modulating factors such as efferent stimuli, environmental events, emotional reactions, and cognitions (Melzack, 1996). The gate control theory blends physiological and psychological variables, providing a multidimensional appreciation of the multifaceted experience of pain and its many influences (Melzack, 1996). This theory purported that the pain signal is transmitted from the peripheral nervous system to the central nervous system (Melzack, 1996). In the central nervous system, the pain signal is then modulated by a gating system in the dorsal horn of the spinal cord prior to reaching the brain; thus, the pain perception can be intensified or diminished depending on influences on the gating system.

There are two courses to affect the gating mechanism. First, descending nerve impulses from the brain can interfere with the ascending pain signal from the tissue. These signals from the brain might include "cognitive or emotional factors, such as thoughts, beliefs, emotions, mood, prior experience, expectations, memories, attention, and cultural attitudes" (Melzak, 1996, p.973). For example, memories of a past negative event or anxiety might amplify the pain experience; whereas, an optimistic mood or pleasurable distraction might decrease the pain.

The second mechanism is ascending signals from the peripheral nerves, which serve competing sensory data (Melzak, 1996). Melzak (1996) proposed that a person could modulate their pain by using external influences such as emotions and previous encounters with pain. Therefore, the gate theory explains that if a patient is utilizing a distracting sensation (which in this case, would be hypnosis) the acuity of pain is diminished because the interpretation of pain is modulated by the distracting sensation.

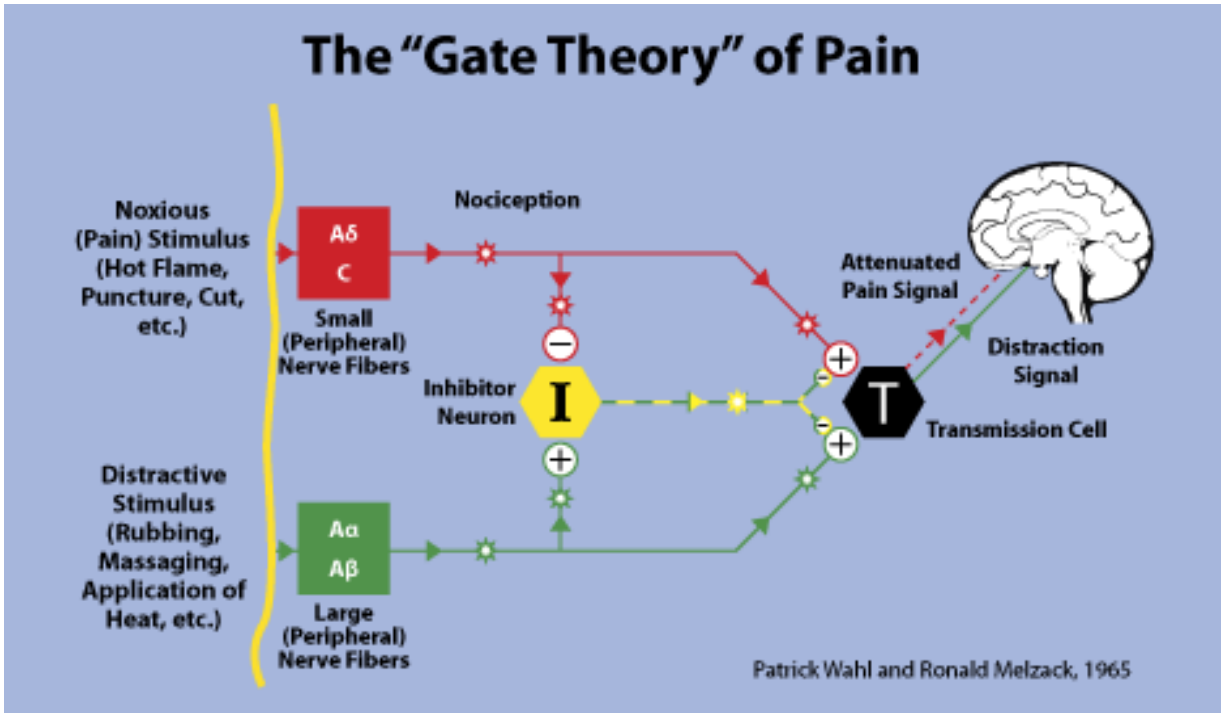

Figure 1. Gate Control Theory of Pain (Genesis Medical Clinic, 2017)

Erickson's Eight Stages of Psychosocial Development

The second theory framing this research is Erickson's Eight Stages of Psychosocial Development, which is outlined in Figure 2 (Erickson, 1993). Erickson's theory places adolescents in Stage 5, Identity vs. Role Confusion (Erickson, 1993). In this stage, adolescents

between the approximate ages of 14 and 20 years old are between their childhood ability to imagine and the reality oriented adults they are becoming (Erickson, 1993; King, 2002; Wester & Sugarman, 2007). Erikson looked at adolescence as a phase of identity development and separation from adult caregivers. Because of individual and social variability, the most useful definition of adolescence is not by age only, but by the developmental tasks that are attained throughout this stage. Table 1 shows that these processes often are placed into distinct domains, such as physical, cognitive, psychological, and moral development (Hazen et al., 2008).

Social-Emotional Development

1.	Basic trust	versus	mistrust
2.	Autonomy	versus	shame
3.	Initiative	versus	guilt
4.	Industry	versus	inferiority
5.	Identity	versus	role confusion
6.	Intimacy	versus	isolation
7.	Generativity	versus	self-absorption

Figure 2. Stages of Social-Emotional Development (Erikson, 1993)

Table 1

Tasks of Adolescent Development

Stage	Characteristic Development Milestones and Tasks
Physical	Growth spurt Growth of pubic and body hair Growth and maturation of reproductive organs Boys: ▪ Increased muscle mass ▪ Onset of sperm production Girls: ▪ Development of female body shape, including breast development ▪ Menarche
Social and Emotional	Emotional separation from parents Greater sense of personal identity Identification with a peer group Exploration of romantic relationships and a sense of one's sexuality
Cognitive	Increased capacity for abstraction and advanced reasoning Greater impulse control More effective assessment of risk versus reward Improved use and manipulation of working memory Improved language skills Increased capacity to self-regulate emotional states

(Hazen et al., 2008, p. 161-168)

Adolescents are in a period of transitioning to self-care and loosening ties to parents and guardians (King, 2002). They are experiencing an increased capacity for logical thinking and are defining their own values and beliefs (King, 2002). Hypnosis provides them with perspective in which to employ their curiosity, while generating a unique experience that increases their control over cognitive and physical response patterns (Wall, 1998). However, because of their

developmental shift away from imagination toward logic, adolescents may be some of the more challenging patients with which to work (Wester & Sugarman, 2007).

King (2002) breaks the period of adolescence into three developmental phases: early (10 to 13 years), mid (14 to 16 years), and late (17 years and older). The early phase finds adolescents experiencing expanded proficiency in common-sense thinking and assimilating physical changes into their sense of self (King, 2002). During the mid-phase, adolescents are characterizing their values and beliefs as diverse from those of their caregivers, investigating relationships with their peers and the opposite sex, and learning to take responsibility for their scholastic pursuits (King, 2002). They will move into the late stage of adolescence as they attempt to stabilize their sense of identity within society (King, 2002). Each developmental phase identifies how adolescents are undergoing dramatic shifts in their relationship to their bodies, parents, peers, and self-image (Table 1).

CHAPTER 2

REVIEW OF THE LITERATURE

The background and literature review helps to lay the foundation for a study, evaluates the current state of the science, and enables authors to make recommendations for change (Polit & Beck, 2006). The literature review for this proposed study examines past and current research related to the concepts of hypnosis and adolescent surgical pain management.

Pain

Pain affects people of all ages, socioeconomic levels, and racial backgrounds. Pain is the most common chief complaint in primary care. Twenty percent of patients reported chronic pain during their visit to their primary care providers (Marcus, 2003). According to the IASP (2014), the official definition of pain is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (Pain section, para. 1). Pain is a complex phenomenon affected by time and place, emotional associations, and individual interpretation (Wester and Sugarman, 2007).

Pediatric Pain

Pediatric pain is a traumatic experience for both the patient and the family members. Pediatric pain management is unique and complex because children are often unable to describe their pain thus leading to incorrect interventions (Uman et al., 2006). A key aim of pain management is to eliminate pain related suffering. However, abundant myths, deficient caregiver expertise, and deficient application of pediatric pain comprehension contribute to the paucity of effective pain management (APS, 2011). Personal values and beliefs of caregivers about the significance of pain in the development of the child and about the management of pain can stand

in the way of the optimal recognition and treatment of pain (Figure 3) (Manworren, 2000; McCaffrey, 2003; Pasero & McCaffrey, 2011).

Barriers to Pain Treatment

- Myth that children, especially, infants, do not feel pain the way adults do, or if they do, there is no untoward consequence.
- Lack of assessment and reassessment for the presence of pain.
- Misunderstanding of how to conceptualize and quantify a subjective experience.
- Lack of knowledge of pain treatment.
- The notion that addressing pain in children takes too much time and effort.
- Fears of adverse effects of analgesic medications, including respiratory depression and addiction.

Figure 3. Barriers to the Treatment of Pain in Children (Pasero & McCaffrey, 2011)

A child's previous pain experience encompasses several aspects: the number of pains, the type of pain, the strength of pain, and the quality of the experience (e.g., positive or negative) (McGrath & Hillier, 2003; Taddio et al., 2010). Children with negative previous experiences will likely expect a continuing negative experience, display more anxiety and distress, and be at risk for heightened pain (Anand et al., 2007; McGrath & Hillier, 2003). Interventions are needed to ease both the negative experience of emotional distress as well as the possible damaging downstream consequences related to surgical procedures. To ease both the direct negative experience of emotional distress related to surgical procedures, as well as the possible damaging downstream consequences of such distress, interventions that substantially reduce pain are needed to improve the adolescent's experience. Fortunately, multiple pharmacologic and

nonpharmacologic options exist for optimally preventing and managing pain associated with invasive procedures (Accardi & Milling, 2009; Gold, Kent, Belmont, & Butler, 2007; Liossi & Franck, 2008; Slifer, Tucker, & Dahlquist, 2002; Woragidpoonpol, Yenbut, Picheansathian, & Klunklin, 2013).

Pharmacologic interventions can be valuable, but they are not without cost. Opioid pain management regimens can cause their own side effects (Chou et al., 2016; Flory, Maertinez-Salazar, & Lang, 2007; Hollenhorst et al., 2001). Furthermore, the administration of pain and anxiety relieving medications generally require increased monitoring which can place additional demands on nursing care (Murphy & Brunberg, 1997). Most major children's hospitals have dedicated pain services to provide evaluation and immediate treatment of pain. A multimodal approach to preventing and managing pain is generally used (Chou et al., 2016). A combination of mild analgesics, local and regional analgesia, together with opioids when indicated minimizes the potential side effects of individual drugs or techniques. The analgesic requirement following surgery does not rest singularly on the age of the patient, but rather on the type of surgery and the pain tolerance of the child. (Pasero & McCaffrey, 2011).

Intravenous patient-controlled analgesia (IV-PCA) is one of the most effective methods to achieve optimal postoperative analgesia in adults and children (Verghese & Hannallah, 2010). IV-PCA provides effective pain management, allows the patients to be in control of their pain medication dosing, and regulates the dose according to the particular patient's needs (ASA, 2012). Morphine is the most commonly used opioid for pediatric IV-PCA while Hydromorphone is frequently used as a substitute to morphine in children who are intolerant to morphine (Verghese & Hannallah, 2010). IV-PCA regimen has been shown to reduce post-surgical

morphine requirements and the opioid-related adverse effects (American Society of Anesthesiologists [ASA], 2012).

Ketorolac is an IV NSAID that, when combined with IV-PCA pain medications, can provide optimal postoperative analgesia. Due to its opioid sparing effects, ketorolac may reduce the incidence of opioid related adverse effects such as respiratory depression and nausea and vomiting (Verghese & Hannallah, 2010). Ketorolac has also been associated with a shortened length of hospitalization and lower pain scores (Verghese & Hannallah, 2010).

Psychological interventions, such as hypnosis, may reduce the need for or the amount of pain and anxiety relieving agents, primarily by distracting attention away from painful stimuli. Several studies have demonstrated psychological approaches in some cases to be as effective as, or more effective than, pharmacological agents, such as EMLA cream, a eutectic mixture of lidocaine and prilocaine topical anesthetic (Cohen, Blount, & Panopoulos, 1999), diazepam (Jay, Elliott, Ozolins, Olson, & Pruitt, 1985), midazolam (Calipel, Lucas-Polomeni, Wodey, & Ecoffey, 2005), fentanyl with midazolam (Lang et al., 2000) and intrathecal/ intravenous post-operative opioid regimens (Lobe, 2007; Manworren et al., 2015).

Hypnosis

Hypnosis is a nonpharmacologic intervention, with no known specific side effects (Lynn, Martin, & Frauman, 1996; Rhue, Lynn, & Kirsch, 1993) and which has the potential to help reduce the symptoms of a wide variety of diseases and conditions (Saadat & Kain, 2007). The American Psychological Association (2016), Division of Psychological Hypnosis defines hypnosis as:

> A procedure during which a healthcare professional or researcher suggests while treating someone, that he or she experiences changes in sensation, perception, thought, or behavior. Although some hypnosis is made to make people more alert, most hypnosis includes suggestions for relaxation, calmness, and well-being. Instructions to imagine or think about pleasant experiences are also commonly included in hypnotic inductions. People respond to hypnosis in different ways. Some describe hypnosis as a state of focused attention, in which they feel very calm and relaxed. Most people describe the experience as pleasant. (Definition section, para. 1)

The principal aims of hypnosis are to reduce pain and distress, capture the child's attention, reframe painful events experiences, and assist the child in dissociating from their pain (Chen, Zeltzer, Craske, & Katz, 2000). A provider may teach pediatric patients hypnotic interventions to assist in developing and utilizing coping strategies to manage pain and, when developmentally appropriate, help the child understand how their thoughts and behaviors can change the experience of pain (Liossi & Hatira, 2003). Hypnosis is particularly effective with children, due to their vivid imagination. Children as young as five to six years of age are capable of being hypnotized (Rogovik & Goldman, 2007). "Children usually embrace the increased self-mastery that results from the use of hypnosis because attaining such mastery is an important task of childhood" (Anbar, 2006, p.438).

Hypnosis for Children Undergoing Invasive Procedures

A chronological review of the state of the science reports a substantial body of knowledge, strong evidence, and continuing support for hypnosis as an efficacious intervention for reducing pain and distress during invasive procedures, but this evidence primarily surrounds the pediatric oncology population (Birnie et al., 2014; Liossi, 2000; Rape & Bush, 1994; Uman

et al., 2008). With this strong historical evidence base, it now appears the research is moving towards exploring the use of hypnosis with patients with diagnoses other than cancer undergoing painful procedures. Review articles report that hypnosis is beneficial in reducing pain related to invasive procedures other than those pertaining to the oncology population (Chou et al., 2016; Flory et al., 2007; Redd, Montgomery, & DuHamel, 2001; Uman et al., 2013). Recent work has also been conducted in the area of pediatric pain management for patients who are not chronically ill, but are undergoing invasive procedures, such as voiding cystourethrography (Butler, Symons, Henderson, Shortliffe, & Spiegel, 2005), fracture reduction (Iserson, 1999), dental procedures (Al-Harasi, Ashley, Miles, Parekh, & Walters, 2010; Peretz, Bercovich, & Blumer, 2013), abdominal surgery (Calipel et al., 2005), and pectus excavatum surgical repair (Lobe, 2007, Manworren et al., 2015).

Hypnosis for Surgical Pain Management: Adults and Children

Appropriate pain relief is a significant concern and subject of emphasis in the United States today. Preoperatively, one of the most commonly asked questions, pertains to the amount of pain the patient will experience after the surgery (Vadeivelu, Sukanya, & Narayan, 2010). Because of its association with clinical outcomes and acute post-operative wellbeing, pain is also a key concern of surgeons (Vadeivelu et al. 2010). A national survey reported that 80% of patients said they experienced acute pain after surgery (Apfelbaum, Chen, Mehta, & Gan, 2003). The authors concluded that despite an increased concentration on pain management, the clinical reality is, regrettably, still far from acceptable (Apfelbaum et al., 2003).

Adults

The use of hypnosis for surgical procedures can be found in the literature as far back as the 1800s (Lobe, 2007). More recently, a 2002 meta-analysis summarized the positive effects of

hypnosis with pain and symptom management for adults undergoing breast, cardiac, gynecologic, ophthalmology, head and neck, and maxillofacial surgeries (Montgomery, David, Winkel, Silverstein, & Bovbjerg, 2002). The authors concluded that patients in hypnosis treatment groups had better clinical outcomes than 89% of patients in control groups. Even with strong patient satisfaction results, the literature examining the use of hypnosis during the surgical process is meagerly established in the adult population.

Children

Reports estimate that 60% of children and up to 80% of adolescents feel anxious immediately prior to surgery (Kuttner, 2012). Anxiety is known to exacerbate the experience of pain. With evidence supporting the positive effects of hypnosis for children undergoing a wide variety of painful procedures, it is concerning that there is a substantially deficient research base to demonstrate the effectiveness of hypnosis for children undergoing surgical procedures. Only four studies focusing on the use of hypnosis for children and adolescents to manage postsurgical pain are reported in the literature.

Lambert (1996) randomized 26 pairs of children scheduled for elective spinal fusion, orthopedic surgery, cardiac and thoracic surgery, or general surgery to an experimental or control group where the children were matched for age and diagnosis. The experimental group was taught hypnosis during their preadmission visit one week prior to surgery. The average length of hospitalization was significantly shorter for the experimental group (p=<.05) and the same children reported their pain was significantly lower than the children in the control group (p=<.01). There was no difference in the amount of pain medication received between the two groups.

Calipel and colleagues (2005) compared preoperative hypnosis training to preoperative midazolam for children undergoing ambulatory lower abdominal surgical procedures. The researchers reported that the children who received the preoperative hypnosis intervention exhibited lower anxiety during induction (p=0.03) and fewer postsurgical behavioral problems (p=0.01).

The other two studies examined the effects of hypnosis on postsurgical pain in adolescents who underwent surgical repair of pectus excavatum. Lobe (2007) examined the effects of hypnosis on 10 adolescents scheduled to undergo this procedure. All 10 participants received postoperative pain management to include intravenous, epidural, and oral pain medications. Five of the adolescents were taught hypnosis pre-surgically as a postoperative pain management strategy. The hypnosis group findings were associated with trends in postoperative discomfort being better controlled with oral analgesics and less parenteral narcotic use. Preoperative hypnosis was associated with a shorter length of hospitalization (p< 0.01) in patients undergoing the Nuss procedure for pectus excavatum. However, the participants who learned hypnosis prior to Nuss procedure received IV-PCA supplemented with oral opioids, whereas the participants who did not learn hypnosis received regional analgesia supplemented with IV and oral opioids. This lack of standardization in the methods of analgesia delivery limits the ability to conclude the intervention was responsible for the positive effect of hypnosis.

Within the parent study for this secondary data analysis, Manworren and colleagues (2015) report that eight of 22 adolescents received preoperative hypnosis education prior to Nuss procedure. The hypnosis education occurred 1-20 days prior to surgery and consisted of 60-80 minute training sessions designed for the individual participant using information about the

patient's interests and activities as reported by the patient on a standardized imagery questionnaire.

All adolescents received a standard postoperative pain management regimen, including epidural analgesia with local analgesia, IV opioids by patient controlled analgesia (PCA) opioids, IV NSAIDS (ketorolac), and eventual transition to oral opioids and NSAIDS (ibuprofen). Epidural bupivicaine infusion and IV-PCA was initiated in the postanesthesia care unit (PACU) with additional opioids administered as necessary to ensure comfort before transfer to the medical-surgical unit. Patients were transitioned from IV opioids by PCA to oral opioid analgesics typically on the fourth postoperative day. Some adolescents also received the muscle relaxant methocarbamol when reporting pain or chest tightness not controlled by other analgesic treatments. Postoperative hypnosis coaching sessions were offered to the hypnosis participants but were based on the availability of the hypnosis interventionist. Post-operative hypnosis sessions, lasting 20-80 minutes, focused on the individual's current needs for comfort, anxiety control, or other post-surgical symptom management. Adolescents in the hypnosis group had statistically significant improved pain control ($Z= 2.04$, $p=0.041$) and overall used statistically significantly less milligrams per hour of morphine equivalents ($Z=2.521$, $p=.012$).

With evidence supporting the positive effects of children and adolescents learning hypnosis prior to undergoing surgical procedures, research that assesses the effectiveness of hypnosis for this population is lacking.

Pain management for adolescents recovering from pectus repair is a challenge. While the use of PCA with intravenous opioids and thorascopic epidural catheter analgesia are the most prevalent pain management regimens, this is a marginally explored topic with a significant variance of research findings across institutions. (Johnson et al., 2014; Lobe, 2007; Manworren

et al., 2015; Mavi & Sahasivam, 2014; St. Peter et al., 2012). The current state of the science leaves many opportunities to improve upon the postoperative pain management strategies for adolescents recovering from pectus excavatum repair.

Nursing's Role in Managing Pain during Invasive Procedures

To lessen both the negative experience of emotional distress related to inadequate postsurgical pain management, as well as the potential negative long term consequences of such distress, nurses must put aside personal beliefs and values and look towards evidence based interventions that significantly reduce distress, improve the patient's experience, and help guide their nursing care.

The American public is demanding that hospitals integrate Complementary and Alternative Medicine (CAM) therapies, such as hypnosis, into the care they receive in the hospital. The American public spends billions of dollars annually on CAM providers and services (Samueli Institute, 2010). A 2009 survey of health care consumers found that alternatives to conventional health services are attractive to a sizeable segment of consumers (Samueli Institute, 2010).

- One in five consumers preferred alternatives to traditional healthcare (Samueli, Institute, 2010).
- Twelve percent of consumers voiced strong preference for natural therapies over pharmacologic treatments (Samueli, Institute, 2010).
- Ten percent of consumers say they preferred providers who have knowledge of holistic or CAM therapies (Samueli, Institute, 2010).

Parent requests for adjunct therapies to pharmacologic interventions are becoming more prevalent throughout healthcare (Lohman, 2003). In a 2001 survey of pediatric patients, 20% to

30% reported the use of one or more CAM therapies, with more recent surveys reporting that children with chronic and recurrent conditions such as cancer, asthma, rheumatoid arthritis, migraine headache, and cystic fibrosis used CAM at rates of 30% to 70% (Ottolini et al., 2001; Saddat & Kain, 2007).

Nurses are the health care providers that are most often present with the patient during painful procedures and during postoperative stays. These situations can be traumatic to children, whether they are chronically or acutely ill. Two guiding nursing organizations reviewed the important role of nursing in the management of pain. One of the professional tenants of nursing from The American Nurses Association (2015) states that nurse-patient relationships "have as their foundation the promotion, protection, and restoration of health and the alleviation of pain and suffering" (p.7). The American Society for Pain Management Nursing (2016) mission statement mandates that nurses "advance and promote optimal nursing care for people affected by pain by promoting best nursing practices" (para. 1).

For the past 14 years, the public has voted nurses as the most honest and ethical profession in America (Samueli, Institute, 2010). The public's trust (that of patients and their families) should keep the nursing profession's ethical tenants at the forefront of planning each and every day. It is the professional responsibility of nurses to make a powerful effort to utilize all of the resource available to them to manage their patients' pain competently and compassionately.

Discussion

With a strong historical research base supporting the positive effects of hypnosis for children undergoing a wide variety of painful procedures, it is concerning that there is a substantially deficient research base to demonstrate the effectiveness of hypnosis for children

undergoing surgical procedures. For many children preparing to undergo surgical procedures, hypnosis offers an empirically supported coping technique that can be individualized for specific patient populations, developmental ages, and treatment objectives. Hypnosis has been found to be a risk free and inexpensive intervention and would provide children with an additional comfort measure to utilize during their postoperative pain management course.

Recommendations

There is a paucity of literature in the field of hypnosis research for children undergoing surgical procedures. However, four published studies have concluded that hypnosis may be an effective tool to decrease postoperative pain for adolescents (Calipel et al., 2005; Lambert, 1996; Lobe 2007; Manworren et al., 2015). There is a need to improve postoperative pain management strategies for adolescents recovering from surgical procedures, such as pectus excavatum repair. The proposed study will provide the researcher with a better understanding of the effects of hypnosis for managing postoperative pain for adolescents recovering from pectus excavatum repair.

CHAPTER 3

METHODOLOGY

Research Design

A secondary data analysis of selected variables from two previously conducted studies performed at Connecticut Children's Medical Center (CCMC) was conducted. This study examined the impact of hypnosis on the postoperative course of adolescents who underwent Nuss procedure for pectus excavatum repair.

Secondary Data Analysis

Secondary data analysis involves the use of previously studied data amassed to test new hypotheses or to study new relationships among the variables (Church, 2002). When secondary data are available, researchers save time and money by utilizing existing data to avoid duplication of effort (McCaston, 2005). Secondary analysis allows researchers to obtain a better understanding of a particular situation, suggest areas of for improvement, and/or design follow-up studies (McCaston, 2005).

Sample

During the years 2011 to 2015, Dr. Renee Manworren, PhD, APRN, BC, PCNS-BC conducted two studies seeking to better understand the effect of hypnosis on the postoperative course of adolescents who had undergone Nuss procedure for pectus repair (Figure 4).

The initial study *retrospectively* reviewed the medical records of 53 patients who underwent Nuss procedure for pectus excavatum repair. This study was conducted in two phases. During January 2011 to December 2011, phase one was conducted. Phase one was a

retrospective review of 22 medical records, and the findings were subsequently published (Manworren et al., 2015). Results from this study are described in Chapter 2 of this dissertation.

During January 2012 and December 2013, phase two of the initial study was conducted. Phase two was a retrospective review of 31 additional medical records. The data from this phase has not been published. The combination of phase one and phase two allowed for a total of 53 medical records to be retrospectively reviewed in the initial study. Of the total 53 participants reviewed, 23 participants had agreed to learn hypnosis.

Subsequently, during the years December 2013 through December 2015, Dr. Manworren conducted a *prospective* study providing an additional 22 participants for analysis. This cohort of participants included 19 additional participants who agreed to learn hypnosis prior to Nuss procedure. Therefore, the total number of participants available for secondary data analysis is 75 (Figure 4).

Figure 4. All Participant Information

Research Setting/Location

This analysis was performed using data from study data obtained from:

Connecticut Children's Medical Center

282 Washington Street

Hartford, Connecticut

Dr. Manworren, PhD, APRN, BC, PCNS-BC, the principal investigator for these studies, was a staff member at CCMC within the Department of Pain and Palliative medicine during the time these studies were conducted.

Independent and Dependent Variables

The specific variables utilized from the data set from CCMC were age, gender, race/ethnicity, whether or not hypnosis was learned, length of hospitalization, PCA use, ketorolac use, supplemental medication use, combined opioid use, and combined total medication use. Table 2 outlines all variables used in the current study.

Table 2

Independent and Dependent Variables

Variable	Definition	Variable Type
Age	Age on day of surgery (months)	Independent variable
Gender	1=Male 2=Female	Independent variable
Hypnosis	1=Yes 0=No	Independent variable
Race/ethnicity	1=White 2= Black 3= Asian 4= Hispanic 5= Pacific Islander 6= more than one race 7= unknown	Independent variable
Length of Hospitalization	Hours from post op hour 0 to discharge time	Dependent variable
PCA use	Calculated in mg/hr morphine equivalents in 12 hr post op intervals	Dependent variable
Ketorolac use	Calculated in mg/hr morphine equivalents in 12 hr post op intervals	Dependent variable
Supplemental medication use	Calculated in my/hr morphine equivalents in 12 hr post op intervals	Dependent variable
Combined opioid use	Cumulative opioid total. Calculated in mg/hr morphine equivalents in 12 hr post op intervals	Dependent variable
Combined medication use	Cumulative medication use total. Calculated in mg/hr morphine equivalents in 12 hr post op intervals.	Dependent variable

Data Analysis Plan

The secondary data set was received in Excel format. Data were imported into and analyzed using the Statistical Package for the Social Sciences (SPSS) 23.0. The data set

contained data for 75 participants. A significant level of 0.05 was used for all research question analysis.

Upon initial review, it was necessary to modify the data set in two situations. First, the data that had been entered as "." was reentered as "0" so all data points would be represented within the analysis. In the original data set "." values represented 0 but if left that way would have been interpreted by SPSS as missing values. Thus, "." was recoded to "0" for the current analysis. Secondly, medication doses that had been entered within timeframe 169-180 hours (combined total medication use [1.04 milliequivalants(meq)] and combined opioid use [1.04 meq]) along with the medication dose entered within timeframe 181-195 hours (combined total medication use [1.04 meq]) had to be deleted. During data analysis, it was identified that the PCA, torodol and supplemental medication meq's that make up these combined medication dose timeframes were not entered for one subject. Following the identification of this data entry error, an intense review was performed to assure that this problem had not occurred within other timeframes.

Independent sample *t*-tests were performed to look for differences in the five medications: 1) PCA use, 2) ketorolac use, 3) supplemental medication use, 4) combined opioid use, and 5) combined total medication use for the participants who used and did not use hypnosis prior to Nuss procedure. The data for the five medications were provided in 12 hour meq/hr increments. For example, PCA use was delivered in 14 individual 12 hour meq/hr increments, beginning with 0-12 hours and ending with 157-168 hours. A new variable calculating the average amount of medication given over 0-168 hours was created for analysis of all individual five medications.

Cohen's d was calculated to assess the effect size of the intervention. Most social scientists use Cohen's classification to interpret the resulting number:

- < 0.1 = trivial effect
- 0.1 - 0.3 = small effect
- 0.3 - 0.5 = moderate effect
- > 0.5 = large difference effect (Cohen, 1988)

Reporting effect size allows a standardized metric to communicate the practical significance of results instead of only reporting the statistical significance (Lakens, 2013). While a significant *p* value alone can be a strong indicator of which intervention is more effective it does not tell you *how much* better the intervention is. *P* values are considered to be confounded because of their dependence on sample size (Lakens, 2013). Unlike significance tests, effect size is independent of sample size (Lakens, 2013).

Specific Aim 1 and the research question addressed: What is the difference between the pain medication usage and length of hospitalization between adolescents who learned and did learn hypnosis prior to Nuss procedure? This portion of the study examined the influence of hypnosis on postoperative pain medication utilization and length of hospitalization (LOH). This question was explored through the use of *t*-tests. *T*-tests were used to compare pain medication utilization and similarities and differences between the participants.

Specific Aim 2, to characterize the demographics of age, gender, and race/ethnicity between adolescents who learned and did not learn hypnosis prior to Nuss procedure, was assessed using *t*-tests to compare similarities and differences between the participants' ages. Chi square testing was used to compare similarities and differences between the participants' race/ethnicity and gender.

Ethical Considerations

This doctoral student underwent a data sharing agreement with CCMC to procure this study data to perform a secondary data analysis (Appendix A). No identifiable information was shared for the purposes of conducting this dissertation study. The data for this study was secured by a password protected computer located at Children's Mercy Hospital in Kansas City, Missouri. The researcher completed CITI training as of November 23, 2016 and was certified for two years (see Appendix B).

Methodological Limitations

There are limitations associated with secondary data analysis. These limitations include data limited to the research questions and data collection procedures associated with the CCMC data set, lack of control over the variables, and the possibility of missing data (Boslaugh, 2007). A major limitation of secondary data analysis is that there is considerable information that cannot be recovered in the reported published findings (Church, 2002). To avoid this limitation, a data sharing agreement was agreed upon between the University of Missouri-Kansas City (UMKC) and CCMC (Appendix A).

CHAPTER 4

RESULTS

Introduction

The purpose of this study was to identify the effect of hypnosis training on length of hospitalization and on the use of pain medications among adolescents during their postoperative course following Nuss procedure. The research question for the study was: What was the difference between pain medication usage and length of hospitalization (LOH) between participants who learned and did not learn hypnosis prior to Nuss procedure. This portion of the study examined the influence of hypnosis on postoperative pain medication utilization and LOH.

Demographics

Participants ranged in age from 9.75 years to 19.75 years (M=15.3 years). There was a greater percentage of white (76%) males (88%) who participated in the study. This was anticipated since pectus excavatum is primarily a white male congenital defect (Gasior et al., 2013). For the analysis of race/ethnicity there were eight (10.7%) participants who reported their race/ethnicity as unknown. These responses were recoded as missing data. A new variable was created combining the ten non-white responses (African American [0], Asian [2], Pacific Islander [0], Hispanic [5], and greater than 1 race [3]). Analyzing this data with a newly created variable allowed for easier interpretation of the data due to low number of participants included in the various non-white categories. Fifty-seven (85.1%) participants were coded as white and ten (14.9%) as non-white.

The results of independent sample *t*-tests comparing age, gender, and race/ethnicity in participants who learned and did not learn hypnosis prior to Nuss procedure found no significant

difference in age between the hypnosis (M=182.2, SD= 24.3) and no hypnosis (M=184.6, SD= 25.8) groups (*t* =.228; df =73; p=.819). There was no significant difference in gender between the hypnosis and no hypnosis groups (χ^2 = .001; df =1; p =.997). There was also no significant difference in race/ethnicity between the hypnosis and no hypnosis groups (χ^2 = 4.940; df= 3, p=.176). Overall the analysis suggests that while there where significantly more white males participating in the study, there was no differences in demographics between hypnosis and no hypnosis group participation (Table 3 and 4).

Table 3

*Comparison of Age among Adolescents who Learned Hypnosis versus those who did not learn hypnosis – Month(years)**

	Mean	**SD**	**Range**
Learned hypnosis (n=42)	182 (15.17)	24.36	117 – 237 (9.75- 17.75)
No Hypnosis (n=33)	184 (15.33)	25.79	128 – 234 (10.67-19.5)
Total (n=75)	183 (15.25)	24.84	117 – 237 (9.75-17.75)

** P = 0.820*

Table 4

Comparison of Gender and Race/Ethnicity among Adolescents who Learned Hypnosis versus Those who Did Not Learn Hypnosis

	Total (n=75) N (%)	**Hypnosis (n=42) N (%)**	**No Hypnosis (n=33) N (%)**	**p-value**
GENDER				
Male	66 (88%)	37 (88%)	29 (88%)	P = 0.624
Female	9 (12%)	5 (12%)	4 (12%)	
RACE/ETHNICITY				
White	57 (85%)	32 (76%)	25 (76%)	P = 0.820
Non-White	10 (15%)	6 (14%)	4 (12%)	
Unknown (Missing)	8 (11%)	4 (10%)	4 (12%)	

Hospitalization and Pain Medication

The mean LOH of all participants in the study was 126 hours (SD 25.79). Pre-surgical hypnosis training was associated with a significantly shorter LOH of 17 hours (t=3.070; df= 73; p=0.003, d=0.35) between the participants who learned (M=118.57, SD =22.01) and did not learn hypnosis (M=136.02, SD=27.23) (Table 5). A decrease in LOH averaging 17 hours suggests a potential decrease to inpatient hospital costs, which average $4000 to $5000 per day. Additionally, a decrease in LOH could positively impact patient and family satisfaction by being discharged home a day earlier.

Pre-surgical hypnosis training was associated with the use of significantly fewer milligrams per hour of morphine equivalents over the course of the subject's hospitalization in four of the five medications (Table 5). *T*-tests indicated a decrease in medication use was identified between participants who learned hypnosis compared to those who did not learn hypnosis in three of the five medications: PCA use (t =2.709; df= 43.75; p=0.01, d=0.35), combined opioid use (t= 2.887; df=42.61; p=0.006, d=0.37), and combined total medication use

(*t*= 3.427; df=44.87; *p*=0.001, *d*=.43). No decrease in medication use was found in the use of ketorolac (*t*=1.820; df=66.69; *p*=.073, *d*= 0.21) or supplemental medication use (*t*=1.448; df=52.48; *p*=0.15, *d*= 0.18) between participants who learned hypnosis compared to those who did not learn hypnosis.

Table 5:

Relationship of Hypnosis to Medication Use and Length of Hospitalization

	Total N=75 Mean (SD)	**Hypnosis N=42 Mean (SD)**	**No Hypnosis N=33 Mean (SD)**	**P value**	**Cohen's *d***	**95% Confidence Interval ***
Length of Hospitalization (Hours) 91-195 Hours	126 (25.79)	118.57 (22.01)	136.02 (27.23)	P=0.003	d=0.35	(6.1, 28.8)
PCA Use (mg/hr in meq's) 0-168 Hours	0.51	0.97 (0.48)	1.48 (0.99)	P=0.01	d=0.35	(0.13, 0.89)
Ketorolac Use (mg/hr in meq's) 0-168 Hours	0.12	0.85 (0.29)	0.97 (0.30)	P= .073	d=0.21	(-0.01, 0.26)
Supplemental Medication Use (mg/hr in meq's) 0-168 Hours	0.07	0.19 (0.16)	0.26 (0.24)	P= 0.15	d=0.18	(-0.03, 0.17)
Combined Opioid Use (mg/hr in meq's) 0-168 Hours	0.57	1.2 (0.49)	1.7 (1.05)	P=0.006	d=0.37	(0.17, 0.97)
Combined Total Medication Use (mg/hr in meq's) 0-168 Hours	0.70	2.0 (0.54)	2.7 (1.1)	P=0.001	d=0.43	(0.29,1.1)

CHAPTER 5

DISCUSSION

Hypnosis has been documented to have a positive impact on pain management for children undergoing invasive procedures (Patterson, 2010; Schnur et al., 2008; Thrane, 2013; Uman et al., 2006). However, the study of the impact of hypnosis for children who have undergone surgical procedures is limited. This research study addressed the use of hypnosis on pain medication usage and length of hospitalization for adolescents recovering from Nuss procedure for pectus excavatum repair.

This study provides evidence supporting that adolescents who learned hypnosis prior to Nuss procedure, compared to those that had not, reported a statistically significant decrease and moderate effect size in LOH, PCA use, combined opioid use, and combined total medication use. Effect sizes for the statistically significant group differences were found to be moderate to large. No significant differences were found between the hypnosis and no hypnosis groups related to ketorolac or supplemental medication use. These results suggest that this decrease in LOH and opioid medication use is related to learning hypnosis prior to Nuss procedure. The results of this study were consistent with the findings of previously mentioned pre-surgical hypnosis interventions, which showed a decrease in pain scores, anxiety, length of hospitalization, and pain medication use (Calipel et al., 2005; Lambert, 1996; Lobe, 2007; Manworren et al., 2015).

As previously reviewed in Chapter 2, the Gate Control Theory blends physiological and psychological variables, providing a multidimensional knowledge of the complex experience of pain and its many influencing factors (Melzack, 1996). The theory holds that a child's pain is not entirely determined by the degree of tissue damage caused by a procedure. These study findings

are congruent with this guiding theory that confirms that a child's pain cannot be completely managed by controlling only the physical tissue damage.

Limitations

There are limitations associated with secondary data analysis. These include data limited to the research questions and data collection procedures associated with the data set, lack of control over the variables, and the possibility of missing data (Boslaugh, 2007). This secondary data analysis acknowledges similar limitations. As reported previously, a few data elements had been found to be missing or required modification, so the analysis would run correctly. Lack of information regarding medication processes, study design, and patient reported pain scores provided challenges during the interpretation of the study data.

General

There were significantly more white males participating in the study; however, there was no difference in gender or race/ethnicity in hypnosis and no hypnosis group participation. These findings are consistent with the literature surrounding pectus excavatum as primarily a white male congenital defect (Gasior et al., 2013). Of the 75 study participants, 42 self-selected to receive preoperative hypnosis training. Although there were no demographic differences in the two groups, patients were not randomized to treatment and were selected from a convenience sample. Prospective randomized controlled trials are needed to validate the effectiveness of hypnosis for symptom management after painful pediatric surgical procedures.

Threats to validity include self-selecting into the study based on pre-existing expectations of the hypnosis intervention (Reed, Kirsch, Wickless, Mofitt, & Taren, 1996). Participants may have been interested in the novelty of hypnosis, while others may have had concerns that the hypnosis interventionist could make them do something against their will similar to an

entertainment hypnotist. Additionally, the confounding variables of the intervention's Hawthorne Effect should also be considered (Monahan & Fisher, 2010). Attention from the hypnosis interventionist could have caused the participants to request less postoperative medications since the participants knew this was the purpose for them learning hypnosis prior to their surgery. Additionally, simply participating in the study (or any intervention) could have as much impact as the hypnosis intervention itself (Stern & Chur-Hansen, 2013).

A thorough discussion of the study findings are constrained by the previously mentioned limitations of secondary data analysis. Not knowing how variables were set up, which medications were ordered and administered, and not having pain scores available for analysis significantly limited a thorough discussion of the study findings. The following section will focus on the identified study limitations. Ideally, the following information would have been available for the student, so strong implications could have been developed from this data analysis.

Patient Controlled Analgesia (PCA)

While this analysis indicated a difference in PCA use between groups, a limitation to consider is related to how PCA is ordered. PCA, a method of administering IV pain medication, typically has two facets within its medication order, a continuous rate and a demand dose. The continuous rate is a pre-set dose delivered continuously over an hour. The patients have no choice in whether they receive this continuous rate medication or not. On the other hand, the demand dose is delivered per the patient's request, up to a maximum dose per hour. Daily increases and decreases in PCA continuous and demand orders are common, and medications can be changed due to patient response, such as adverse reactions. Manworren and colleagues' (2015) manuscript of the initial 21 participants within this data set reported the *typical initial*

medication regimens as "PCA morphine at 0.015-0.02 mg/kg/h and 0.03 mg/kg demand dose every 6-10 minutes with a 4 hour lock out of 0.03 mg/kg or hydromorphone at 0-0.2 mg/hr (0-0.004 mg/kg/hr) and 0.2-0.4 mg/demand dose (0.004-0.007 mg/kg) demand dose every 6-10 minutes with a 4 hour lock out of 0.06-0.07 mg/kg" (p. 64). Since this researcher is not sure of the medication ordered or the PCA continuous rates and demand doses, it is difficult to definitively state that the effects observed in the study were in fact due to the manipulation of the independent variable and not to another factor. This type of threat to internal validity is the history effect, which refers to events that occur in the environment that alter the conditions of a study, affecting the outcome (Shadish, Cook, & Campbell, 2002).

Supplemental Medications

A significant difference was found in supplemental medication use between groups. A limitation to consider is that supplemental medications were grouped together within the data set. Supplemental medications can be ordered as scheduled or as PRN medication doses. Similar to continuous PCA, scheduled supplemental medications are not patient request driven. However, supplemental medications can also be ordered PRN and administered per patient request. The supplemental medications ordered could be provider dependent, based on prior adverse reaction, or patient specific. The prior article by Dr. Manworren and colleagues (2015) described the supplemental medications for the first 21 participants as possibly Methocarbamol (muscle relaxant), IV opioids or oral opioids. Since this researcher is unaware of the specific supplemental medications that are in this data set or how they were ordered, it is again difficult to definitively state that the effects observed in the study were due to the manipulation of the independent variable and not due to another factor, which is a threat to internal validity.

Pre-operative Hypnosis Training Intervention

A treatment limitation to consider should be hypnosis provider attention. Manworren et al. (2015) reports that the hypnosis participants were seen by the hypnosis interventionist once pre-surgically for 60-80 minutes and then again as often as once a day for 1-6 days after surgery for 20-80 minutes. The additional attention that the hypnosis participants received may or may not have been a factor in the overall results, but it should be considered in the discussion of the findings.

A second treatment limitation and threat to internal validity is the complicating factor surrounding possible participant bias because of misconceptions, fears, or pre-existing affinity for hypnosis. At pre-test, variations between groups exist that may interact with the independent variable and thus be 'responsible' for the detected outcome (Shadish et al., 2002). This problem is known as selection bias which tends to arise when treatment, as in this study, is given to participants and withheld from non-participants instead of assigning subjects randomly to treatment (Brewer, 2000).

Pain Scores

Another limitation was that patient pain scores were not made available within the dataset. Having patient self-reported pain scores to compare to medication doses and LOH could have added clinical significance to the analysis. Pain scores are routinely collected during pain management studies. Using validated pain scales to collect patient self-reports of pain provides an important component of measuring the effectiveness of a pain management intervention (Turk & Melzack, 2011). Self-report measures depend on the child's subjective pain experience and do not address or signal nociception, but rather the experience of pain. Verbal self-report measures involve intentional communication by the child about his or her experience of pain. Pain can be

reported utilizing words, numbers, or pictures to indicate how much pain the patient feels. The child's perception of his/her pain is "colored by those biopsychosocial factors that the brain integrates to make sense of pain: feelings, thoughts, family history, messages about pain, condition or disease, and/or previous pain experiences. As such, it is highly personal and strictly individual" (Kuttner, 2010, p. 125).

For this study of adolescents, a verbal numeric rating scale (NRS) would have been an appropriate self-report pain measure. This scale is easily administered by asking the child for a rating of how much pain he/she is in right now on a scale of 0 to 10. The child can respond verbally or by holding up fingers to show the number. The NRS is considered suitable for most children aged eight years and up (von Baeyer, Spagrud, McCormick, Choo, Neville, & Connelly, 2009).

Implications

Pain is now regarded not merely as a symptom of a disease, as previously thought, but as a human rights issue worthy of clinical awareness and treatment (International Association for the Study of Pain, 2004). A child's memories of painful occurrences can have long term negative consequences, such as their response to later painful events, as well as their tolerance of future healthcare (vonBaeyer, Marche, Rocha, & Salmon, 2004). Relieving pain can begin the process of healing. The sole reliance on medication to relieve pain can be counterproductive to children's health and well-being (Kuttner, 2010).

Parent requests for adjunct therapies to pharmacologic interventions are becoming more prevalent throughout healthcare (Lohman, 2003). Adjunct therapies, such as hypnosis, are gaining in popularity and are being recognized as important adjuncts to standard care in both adult and pediatric populations (Tsao & Zeltzer, 2005).

Nursing Implications

As few as 25 years ago, nurses working in pediatric institutions were holding children down during bone marrow aspiration with no sedation, postoperative pain was virtually ignored or addressed with intramuscular injections, and pain in infants was viewed skeptically (Kuttner, 2010). Nursing education regarding the importance of quality pain management; the utilization of pain scales; and research guiding pharmacologic, physical, or psychological strategies was in its infancy. Today, there is strong evidence guiding nursing practice, regulatory bodies mandating those pain management practices, and families demanding that pain management practices be of the highest quality and delivered by clinicians who are experts in minimizing children's pain. Despite these improvements, a significant number of children (up to 25% in most studies), regardless of their medical problems or hospital in which they are being treated, continue to experience severe pain during their medical treatment (Kuttner, 2010).

Nurses are the health care providers that are most often present with patients while they are in pain. Nurses are uniquely positioned to utilize pharmacologic and non-pharmacologic pain management strategies that can benefit patients by promoting a patient-centered, empowering, and empathetic clinical encounter. Thought and planning for pain relief is a central part of delivering humane clinical care. Each nurse has the ethical duty to act to prevent pain.

Recommendations for Future Research

The findings from the current study provide additional evidence towards future research that examines the efficacy of hypnosis for the management of post-operative pain in adolescents. Novel forms of pain management are needed to address the reported inadequacies of pain control and the long term negative health consequences this imposes on children. While the present study is quantitatively based, potential future research could focus on the benefits from

qualitative assessments to evaluate hypnosis and its correlation with post-surgical pain management. Qualitative methodology could evaluate why certain participants chose to participate in the hypnosis intervention and others did not. This is a question that is frequently discussed within the hypnosis literature but has not been studied. Further qualitative studies could also evaluate if those who participated in learning hypnosis actually used the intervention during their postoperative course, if they felt the intervention made an impact on their pain, and if they would use their hypnosis training in the future.

A novel approach to studying post-surgical pain management would be to conduct quantitative and qualitative measures within the same study using a convergent parallel mixed methods study design. No pain management studies of this kind are found within the current literature. A mixed method study poses hypotheses to be tested with quantitative data and deductive methods, research questions to be approached inductively with qualitative methods, and research questions related to how the mixing of methods informs the study (Creswell & Clark, 2011). By utilizing a mixed-methods approach, the study findings, whether congruent or not, would provide valuable information to further the science of post-surgical pain management utilizing hypnosis. Congruence of findings contributes to their validity, while offsetting the biases, strengths, and weaknesses of each research method and converges the qualitative and quantitative results to help inform or develop each individual method (Greene, 2006) (see Figure 5). This type of design would provide an enhanced understanding of the phenomenon that would not be obtained by either type of research design separately.

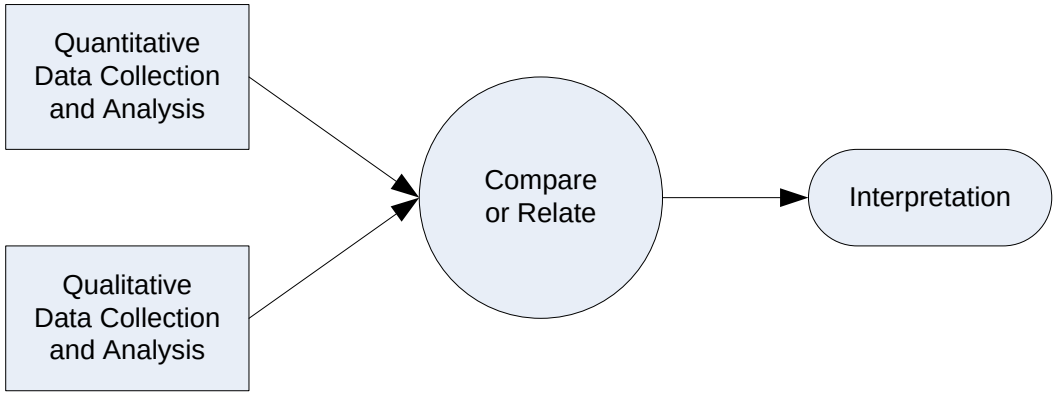

Figure 5. The Convergent Parallel Design; Parallel-Databases Variant

Currently, at Children's Mercy Hospital, opportunities exist to continue the scope of this research. The acute pain service is offering a new opportunity for patients who are preparing to undergo selected surgeries. Patients who are scheduled for surgeries that have been identified as having the potential for difficult pain management during their post-operative course will be offered pre-surgical self-regulation training. One of the self-regulation training opportunities will be learning hypnosis.

Conclusion

Effective pain management includes a psychological, physical, and pharmacological approach which is essential in a children's hospital where pain accompanies many conditions and illnesses. This approach requires collaboration of healthcare professionals across all disciplines who hold the value that pain deserves the best of their skill, talent, and efforts (Kuttner, 2010). Pain belongs to all disciplines, as each has something to contribute to reducing children's suffering (Kuttner, 2010). Despite the very best of intentions, hospital practices may still be a source of immediate and long term suffering for children and their families.

For many children preparing to undergo surgical procedures, hypnosis offers an empirically supported coping technique that can be individualized for specific patient populations, developmental ages, and treatment objectives (Schnur et al., 2008; Uman et al., 2006). Hypnosis, a reportedly risk free and inexpensive intervention, would provide children with an additional comfort measure to utilize during their post-operative pain management course. The present study findings and the current state of the science leaves many opportunities to improve upon the postoperative pain management strategies for children recovering from surgical procedures. This evidence supports the benefits of hypnosis to treat surgical pain, not only for humane and ethical reasons, but also because of benefits to the child's eventual health and welfare (Friedrichsdorf et al., 2015).

APPENDIX A

DATA SHARING AGREEMENT

AGREEMENT FOR THE TRANSFER OF DE-IDENTIFIED HUMAN DATA

This Data Transfer Agreement (the "Agreement"), effective as of February 1, 2016 (the "Effective Date") is made in response to the **University of Missouri – Kansas City** ("Recipient") request for de-identified human data derived from existing clinical records from **Connecticut Children's Medical Center** ("Provider") for research, analysis, and statistical reporting in a dissertation ("Research Project"). Recipient and Provider together will be known as "Parties."

NOW, THEREFORE, in consideration of the foregoing, and intending to be legally bound hereby, the Parties hereto agree as follows:

1. The Provider may use existing records to create a De-Identified Data Set, as defined in Exhibit A below, (the "Data"), and the Provider may disclose the Data to Recipient.

2. The Data is the property of Provider and is made available as a service to the research community.

3. The Data will not be used to treat or diagnose human subjects and will be used for teaching or research purposes only.

4. Recipient will limit the use of the Data to the individuals or classes of individuals, set forth in Exhibit A attached to and made part of this Agreement, who are employees of Recipient and who Recipient represents require the Data for the Research Project. Neither Recipient nor any of its employees shall disclose the Data to any person or entity other than the individuals or classes of individuals set forth in Exhibit A without the prior written consent of Provider. Recipient shall refer any request for Data to Provider.

5. Recipient agrees to acknowledge the contribution of Provider's surgeons and researchers who conducted the research to obtain the Data in Liz Edmundson's ("Recipient Scientist") dissertation and all written or oral public disclosures concerning Recipient's research using Data, as is appropriate. Written works and publications following the Recipient Scientist's dissertation will be performed in conjunction with Provider's researchers who conducted the research to obtain the Data. (Specifically, Dr. Renee CB. Manworren and Dr. Ana Marie Verissimo, and any members of the original research team who is needed to provided a substantial contribution to manuscript). Recipient agrees to supply Provider with copies of public materials based on the use of the Data.

6. PROVIDER MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY, OR NONINFRINGEMENT. Unless prohibited by law, Recipient assumes all liability for claims for damages against it by third parties which may arise from the use, storage or disposal of Data.

7. Recipient agrees to use the Data in compliance with all applicable statutes, regulations, and policies.

8. The Data is provided at no cost.

9. The Data has been collected from human subjects. Provider agrees the Data has been collected in accordance with federal guidelines for "Protection of Human Subjects."

10. Prior to transmitting Data to Recipient, Provider shall remove Protected Health Information ("PHI") from such Data to create a De-identified Data Set that meets the Health Insurance Portability and Accountability Act of 1996 (HIPAA)'s de-identification standards as set forth in 45 CFR §164.514(b) .

a. The Data shall exclude the following direct identifiers of the individuals or of the relatives, employers, or household members of the individuals: (i) names; (ii) all geographic subdivisions smaller than a state, including street address, city, county, precinct, ZIP code, and their equivalent geographical codes, except for the initial three digits of a ZIP code if, according to the current publicly available data from the Census Bureau, a) the geographical unit formed by combining all ZIP Codes with the same three initial digits contains more than 20,000 people or b) the initial three digits of a ZIP code for all such geographic units containing 20,000 or fewer people are changed to 000; (iii) all elements of dates (except year) for dates directly related to an individual, including birth date, date of death; and all ages over 89, and all elements of dates (including year) indicative of such age, except that such ages and elements may be aggregated into a single category of 90 or older; (iv) telephone numbers; (v) fax numbers; (vi) electronic mail addresses; (vii) social security numbers; (viii) medical record numbers; (ix) health plan beneficiary numbers; (x) account numbers; (xi) certificate/license numbers; (xii) vehicle identifiers and serial numbers, including license plate numbers; (xiii) device identifiers and serial numbers; (xiv) web universal resource locators (URLs); (xv) Internet Protocol (IP) address numbers; (xvi) biometric identifiers, including finger and voice prints; (xvii) full face photographic images and any comparable images; and (xviii) any other unique identifying number, characteristic, or code, unless otherwise permitted by the Privacy Rule for re-identification.

b. In the event that Recipient determines that the Data has not been de-identified in accordance with the above standards, Recipient shall immediately notify Provider and, if feasible, either return or destroy the Data, at Provider's option. Recipient will not keep any copies of such Data.

11. Recipient shall immediately notify Provider in the event that any part of the De-identified Data Set is used or disclosed by Recipient in violation of any provision of this Agreement. Upon becoming aware of any such breach or violation, Provider shall provide an opportunity for Recipient to cure the breach or end the violation. In the event that such steps are unsuccessful or the breach is not curable, Provider shall immediately discontinue disclosure of Data to Recipient and terminate this Agreement.

12. Any notice or other communication made pursuant to this Agreement shall be in writing and shall be given, and be deemed to have been given, if either delivered personally or mailed, postage prepaid, registered or, certified mail, addressed as follows:

To Recipient:

University of Missouri at Kansas City, School of Nursing and Health Sciences

2464 Charlotte Kansas City, Missouri 64108

Attention: Patricia J. Kelly PhD, MPH, APRN

Professor, University of Missouri at Kansas City School of Nursing and Health Sciences

To Connecticut Children's:

Lisa Butler
Contract Manager
Office of Grants and Sponsored Programs
Connecticut Children's Medical Center
282 Washington Street
Hartford, CT 06106

13. If Provider assigns a code or other means of record identification to allow the Data to be re-identified by Provider, Provider will not disclose, and Recipient will not request, the mechanism for re-identification. Recipient will not contact or make any effort to identify individuals who are or may be the sources of Data.

14. Recipient agrees to ensure that any agents, including subcontractors, to whom it provides the Data agree to the same restrictions and conditions that apply to Connecticut Children's with respect to such information.

15. In addition to the Data, the following confidential information (the "Confidential Information") will be transferred: **None**
All Confidential Information, whether disclosed orally or in writing, shall be clearly marked or identified as "CONFIDENTIAL" by Provider and maintained in confidence by the Recipient using at least the same degree of care to protect the confidentiality of the Confidential Information as Recipient uses to protect its own confidential information, but in no event less than reasonable care. The Recipient shall disclose such confidential information only to its employees having a need to know such information for purposes of the Research Project.

16. For the purposes of this Agreement, Confidential Information does not include information which:

a. has been published or is otherwise publicly available at the time of disclosure to the Recipient;
b. was in the possession of or was readily available to the Recipient without being subject to a confidentiality obligation from another source prior to the disclosure;
c. has become publicly known, by publication or otherwise, not due to any unauthorized act of the Recipient;
d. the Recipient can demonstrate it developed independently, or acquired without reference to, or reliance upon, such Confidential Information; or
e. is required to be disclosed by law, regulation or court order.

17. Data and Confidential Information will be used by Recipient solely in connection with the Research Project, and attached as Exhibit A.

18. The Agreement is effective after its execution by both Parties and is effective for a period of three (3) years from the date of final signature, unless the Research Project is terminated earlier, in which case this case shall expire upon completion of the Research Project. Either Party may terminate this Agreement without cause with thirty (30) days written notice to the other Party. In the event that either Party breaches this Agreement, the non-breaching party may terminate the Agreement if such breach is not cured to the satisfaction of the non-breaching party within fourteen (14) days after the non-breaching party has given notice thereof. When the Research Project is completed, this Agreement expires, or this Agreement is terminated, whichever comes first, Recipient shall promptly return to Provider or, at Provider's option, destroy all copies of the Data. Upon Provider's request, Recipient shall confirm in writing as to such destruction.

19. Neither Party will use the name, trade name, trademark, or other designation of the other Party in connection with any products, promotion, advertising, press release, or publicity without the prior written permission of the other Party.

20. This Agreement shall in all respects be governed by and construed according to the laws of the State of Connecticut, without regard to its choice of law provisions. The Parties hereto hereby consent and submit to the venue and jurisdiction of the State courts sitting in Connecticut as the sole and exclusive forum for such matters of dispute.

21. The Parties agree to negotiate in good faith to amend this Agreement to comport with changes in federal law that materially alter either or both Parties' obligations under this Agreement; provided however, that if the Parties are unable to agree to mutually acceptable amendment(s) by the compliance date of the change in applicable law or regulations, either Party may terminate this Agreement as provided in section 18.

22. Nothing in this Agreement will confer upon any person other than the parties and their respective successors or assigns, any rights, remedies, obligations, or liabilities whatsoever. The Parties acknowledge that this Agreement does not create a fiduciary relationship among them and that othing in this Agreement is intended to make one Party an agent, legal respresentative, subsidiary, joint venture, partner, employee, or servant of the other Party for any purpose whatsoever.

23. This Agreement is binding upon and inures to the benefit of the parties hereto and their respective successors and permitted assigns. However, neither party may assign any of its rights or delegate any of its obligations under this Agreement without the prior written consent of the other party, which consent shall not be unreasonably withheld or delayed. Notwithstanding any provisions to the contrary, however, Provider retains the right to assign or delegate any of its rights or obligations hereunder to any of its wholly owned subsidiaries, affiliates or successor companies. Assignments made in violation of this provision are null and void.

24. This Agreement may be executed in one or more counterparts, each of which will be deemed an original, but all of which together will constitute one and the same instrument.

25. This Agreement and its Exhibit constitutes the entire Agreement between the Parties concerning the matter described herein and all other prior negotiations, representations, agreements and understandings are superseded by this Agreement. No agreements modifying, amending, or supplementing the terms may be made without written approval signed by both Parties.

SIGNATURES FOLLOW ON NEXT PAGE

RECIPIENT INFORMATION and AUTHORIZED SIGNATURE
Recipient Organization:

Signature of Authorized Official — Date: 2-2-16

Name: Patricia J. Kelly PhD, MPH, APRN
Title: Professor, University of Missouri Kansas City Nursing and Health Sciences

READ AND UNDERSTOOD BY
Recipient Scientist/Investigator:

Signature — Date: 2-2-16

PROVIDER INFORMATION and AUTHORIZED SIGNATURE
Provider Organization: Connecticut Children's

Signature of Authorized Official — Date: 2/11/16

Name: Patrick Garvey
Title: Senior Vice President & Chief Financial Officer

READ AND UNDERSTOOD BY
Connecticut Children's
Scientist/Investigator:

Signature — Date: 2/11/16

EXHIBIT A
Research Project

Name of Research Project:

What patient factors mediate the opioid-sparing effect of pre-operative self hypnosis training in adolescents having Nuss procedure for pectus excavatum repair.

Individuals or classes of individuals who are employees of Recipient who need the Limited Data Set for the purposes set forth in Section 1.1 of the Agreement:

1. Liz Edmundson, PhD(c), RN, NE-BC
   Doctoral Candidate, University of Missouri Kansas City
   Nurse Manager at Children's Mercy Hospitals and Clinic, Kansas City, Missouri
2. Pat Kelly, PhD, MPH, APRN
   Professor, University of Missouri -Kansas City School of Nursing and Health Sciences
   Committee chair for Liz Edmundson
3. Ann Lin Cheng, PhD Statistician
   Associate Professor, University of Missouri-Kansas City School of Nursing and Health Sciences
   Committee member for Liz Edmundson
4. Mark Connelly, PhD Psychologist
   Director for Pain Research at Children's Mercy Hospitals and Clinics, Kansas City, Missouri
   Adjunct Faculty, University of Missouri-Kansas City School of Nursing and Health Sciences
   Committee member for Liz Edmundson

Purpose of project/purpose of data transfer:

Liz Edmundson, PhD(c), RN, NE-BC is a doctoral student at the University of Missouri at Kansas City. Ms. Edmundsons' doctoral work is examining the effects of self-hypnosis on adolescents undergoing painful procedures. Dr. Manworren and Dr. Verissimo recently presented findings on 22 adolescent subjects who learned hypnosis prior to undergoing pectus repair. They have obtained additional data during two subsequently conducted research studies to provide Liz Edmundson with a unique secondary data set of 72 adolescent subjects who learned hypnosis prior to undergoing pectus repair. Adding this secondary data set to Liz Edmundson dissertation work will add to the body of information available to support her research question: What patient factors mediate the opioid-sparing effect of pre-operative self hypnosis training in adolescents having Nuss procedure for pectus excavatum repair.

Data to be transferred:

Variable		Data from published study 12-050 N=22	Data from additional study 12-050 N=31	Data from prospective study 13-095 N=21	**Total N=72**
Age	Age on day of surgery: ____ months	All 22	All 31	All 21	**All 72**
Gender	____ male ____female	All 22	All 31	All 21	**All 72**
Weight	Patient weight: ____ kg	All 22	All 31	All 21	**All 72**
Hypnosis	Hypnosis: _ Yes _ No	All 22, 8 hypnosis	All 31, 15 hypnosis	All 21, 18 hypnosis	**All 72, 41 hypnosis**
Activities Question #14	Identified as most fun activities: (circle activity) Dancing, Hiking, Karate, Listening to music, swimming, basketball, playing a musical instrument, soccer, snow skiing, acting, ice hockey, water skiing, singing, baseball, other	Only hypnosis 8/22	Only hypnosis 15/31	Not abstracted,	**23 hypnosis patients**
Race /Ethnicity	White or Black or Asian or Hispanic or Pacific Islander or More than one Race	18/22, 4 unknown or blank	27/31, 4 unknown or blank	All 21	**Of 72, 8 unknown or blank**
Length of stay	hours (from post-op hour 0 to discharge time)	All 22	All 31	All 21	**All 72**
Opioid use	cumulative opioid total Calculated in mg/hr morphine equivalents in 12 hr postop intervals	All 22	All 31	All 21	**66**
Local (LA) anesthetic	Epidural or Regional	All 22, All Epidural	All 31, 13 Epidural 18 Regional	All 21 All Regional	**66, 35 Epidural 36 Regional**
LA infusion	Type, rate & hours of infusion	All 22, All Epidural	All 31, 13 Epidural 18 Regional	All 21 All Regional	**66, 35 Epidural 36 Regional**
Other analgesic use	Toradol calculated in mg/hr morphine equivalents in 12 hr post op intervals.	All 22	All 31	All 21	**66**
Question #2	The pain and recovery from the surgery was: <, > or about what I was led to believe	5 of 22, 3 hypnosis	7 of 31, 4 hypnosis	None	**12 7 hypnosis**
Question #3	My recovery back to school took: <, > or about what I was led to believe	5 of 22, 3 hypnosis	7 of 31, 4 hypnosis	None	**12 7 hypnosis**
Question #4	At _ # months after surgery, I am not back to normal activity and what I want to do _yes _no	5 of 22, 3 hypnosis	7 of 31, 4 hypnosis	None	**12 7 hypnosis**
Question #5	At this time, I think the surgery to correct my pectus was worth the discomfort _ yes _ no	5 of 22, 3 hypnosis	7 of 31, 4 hypnosis	None	**12 7 hypnosis**
Haller Index	Measure of pre-op pectus severity	All 22	29 of 31	All 21	**70**

APPENDIX B

ELIZABETH EDMUNDSON

INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM) CERTIFICATE

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Elizabeth Edmundson (ID: 3251091)
- **Email:** eedmundson@cmh.edu
- **Institution Affiliation:** Children's Mercy – Kansas City (ID: 3255)
- **Phone:** 816 802 1228

- **Curriculum Group:** Human Subjects Research
- **Course Learner Group:** Group 2: Social & Behavioral Researcher
- **Stage:** Stage 3 - Refresher Stage

- **Report ID:** 20908769
- **Report Date:** 23-Nov-2016
- **Current Score**:** 100

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
SBE Refresher 2 – Informed Consent (ID: 12620)	23-Nov-2016	1/1 (100%)
SBE Refresher 2 – Privacy and Confidentiality (ID: 12622)	23-Nov-2016	1/1 (100%)
SBE Refresher 2 – Assessing Risk (ID: 12624)	23-Nov-2016	1/1 (100%)
SBE Refresher 2 – History and Ethical Principles (ID: 12702)	23-Nov-2016	1/1 (100%)
SBE Refresher 2 – Defining Research with Human Subjects (ID: 15038)	23-Nov-2016	1/1 (100%)
SBE Refresher 2 – Federal Regulations for Protecting Research Subjects (ID: 15040)	23-Nov-2016	1/1 (100%)
SBE Refresher 2 – Research in the Public Schools (ID: 15042)	18-Dec-2014	1/1 (100%)
SBE Refresher 2 – Research with Children (ID: 15043)	23-Nov-2016	1/1 (100%)
SBE Refresher 2 – International Research (ID: 15045)	18-Dec-2014	1/1 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: https://www.citiprogram.org/verify/?f0c62098-a4fb-4b39-8bc2-75c340014964

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

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VITA

Elizabeth Ellen Edmundson was born on May 23, 1963 in Manhattan, Kansas. She was educated in the North Kansas City, Missouri local public schools and graduated from Oak Park High School in 1981. She received her Bachelor of Science degree in Nursing (BSN) from William Jewell College in 1992. During nursing school, she worked as a Student Nurse Technician in Same Day Surgery and the Operating Room at Children's Mercy Hospital in Kansas City, MO. Upon graduation, she started her nursing career there in the Post Anesthesia Care Unit (PACU). In 1993, Ms. Edmundson took a clinical position to help build sedation team services for Children's Mercy Hospital. She became a nurse manager for sedation and pain management services in 1995. During the next 3 years Ms. Edmundson assisted in merging sedation services with Radiology nursing and opening the first postsurgical observation unit. In 2005, she opened the first Pain Management clinic at Children's Mercy Hospital.

Ms. Edmundson continues to work at Children's Mercy Hospital, as she has for the past 26 years. She is currently the Nurse Manager for Comprehensive Pain Management. Her research interest is non-pharmacologic approaches to managing pediatric pain. Ms. Edmundson is a member of the American Society for Pediatric Nursing (ASPMN), the Society for Pediatric Sedation (SPS), Missouri Organization of Nurse Leaders (MONL) and the American Association for Ambulatory Care Nursing (AAACN). She is nurse executive-board certified (NE-BC) and has achieved training in Reiki and Hypnosis. Ms. Edmundson and a colleague were awarded the American Nurses Credentialing Center (AACN) research poster award during the 2007 National AACN Magnet nursing conference.

In 2006, Ms. Edmundson began the pursuit of her Ph.D. in Nursing at the University of Missouri-Kansas City, School of Nursing and Health Studies. Upon completion of her degree,

she plans to continue her work in her current role in Comprehensive Pain Management and build a program of research focused on using non-pharmacological pain strategies available at Children's Mercy, such as aromatherapy, massage therapy, and hypnosis.