

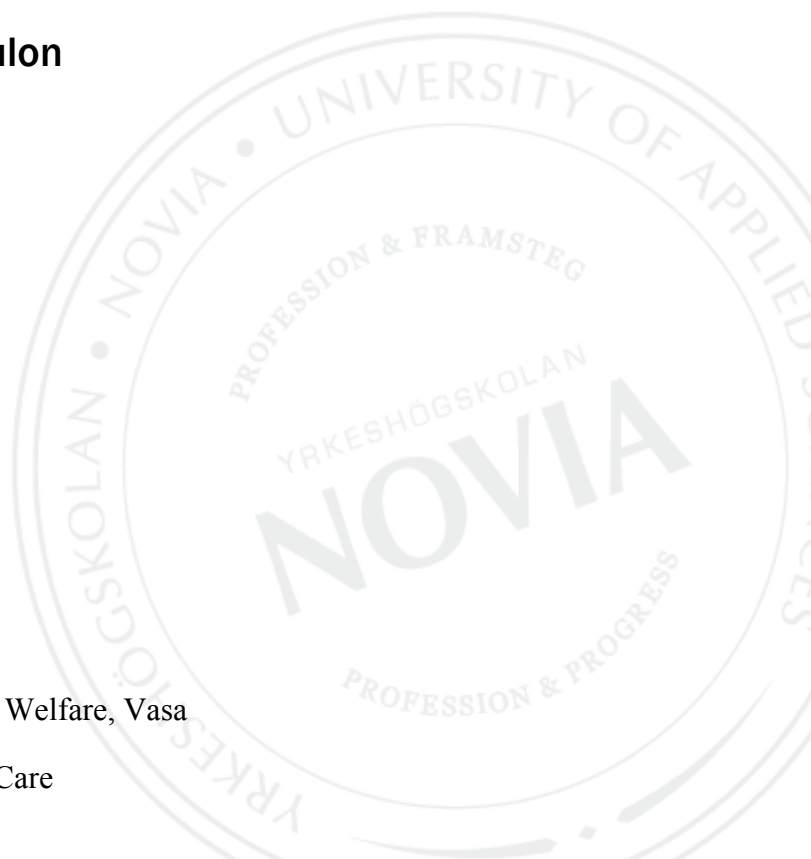
# **The Nursing Management of Emergence Delirium: A Mixed-Methods Study**

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## BACHELOR'S THESIS

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### Summary

The aim of the study was to determine the current management of Emergence Delirium in a perioperative context and explore what current research reveals about the prevention, risk factors and alternative interventions of Emergence Delirium. In collecting data, the systematic review is utilized. This study follows a mixed method research design and content analysis is used to analyze the content of data retrieved; a deductive approach is utilized to analyze and merge both qualitative and quantitative data as described by Polit and Beck (2012) and Elo and Kyngäs (2007). In analysis and categorization of the results from articles gathered, three major categories were established: Prevention, Risk Factors, and Intervention. In order to integrate the entire study according to a theoretical framework, Kolcaba's *Comfort Theory* was chosen.

The result of this study found that current research is significantly focused on identifying risk factors for Emergence Delirium; current research assumes that through identification of risk factors, nurses and healthcare professionals can establish preventive measures. Our results revealed that prevention of Emergence Delirium is scarcely discussed in current research. Pharmacological intervention of Emergence Delirium was found to be interconnected and equally significant as alternative interventions, all of which, ultimately promote optimal and holistic *comfort* for patients experiencing agitation during emergence.

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**Language:** English **Key words:** Emergence Delirium, Emergence Agitation, Anesthesia Delirium, Post-anesthesia Delirium, Anesthesia Emergence, Delirium after Surgery, Delirium and Anesthesia, Holistic Comfort, Comfort Theory, Perioperative, Nursing

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## **LIST OF ABBREVIATIONS**

<b>AD</b>	Anno Domini
<b>ASA</b>	American Society of Anesthesiologists
<b>CHEOPS</b>	Children's Hospital of Eastern Ontario Scale
<b>EBSCO</b>	Elton B. Stephens Co. (Electronic Database)
<b>ED</b>	Emergence Delirium
<b>ENT</b>	Ear Nose Throat
<b>ICD</b>	International Classification of Diseases
<b>IV</b>	Intravenous
<b>LOC-RASS</b>	Level of Consciousness-Richmond Agitation and Sedation Scale
<b>MEDLINE</b>	Medical Literature Analysis and Retrieval System Online
<b>MD</b>	Medical Doctor
<b>PACU</b>	Post anesthesia Care Unit
<b>PAED</b>	Pediatric Anesthesia Emergence Delirium Scale
<b>PIA</b>	Potent Inhalational Anesthesia
<b>PONV</b>	Postoperative Nausea Vomiting
<b>PTSD</b>	Post-traumatic Stress Disorder
<b>TIVA</b>	Total Intravenous Anesthesia
<b>UK</b>	United Kingdom

**USA**

United States of America

**WHO**

World Health Organization

## 1 Introduction

Imagine one day, you woke up acting strangely, so much so that you could not even recognize yourself and your behavior; seeing a faceless entity trying to attack you and being surrounded by people you don't recognize – transformed from a kind, normal person, into an aggressive and uncontrollable individual. These are the situations you can experience during an episode of a phenomenon called Emergence Delirium.

Of the millions of the surgical procedures conducted annually worldwide, up to sixteen percent of surgeries conducted result in postoperative complications (WHO, 2009), of which three to five percent of complications result in cognitive agitation and confusion. Emergence Agitation, also known as, Emergence Delirium, is when “[t]he patient is in a dissociated state of consciousness and is inconsolable, irritable, uncompromising or uncooperative, typically [...] verbally abusive, crying, moaning, thrashing, and incoherent.” (Mason, 2009, p. 1).

Our first impression of patients experiencing Emergence Delirium was during the first surgical nursing clinical at a postoperative orthopedic ward. We remember being confused, and not fully understanding why some patients who were seemingly able to live functional lives as an average person preoperatively, developed into disoriented and erratic individuals postoperatively.

We inquired further from more experienced nurses who worked at the ward about why patients acted out in this way. Detailed information was not provided, however nurses knew agitation was an expected part of postoperative complications and interventions toward characterizing symptoms were geared towards anxiolytics, more anesthetic agents or restraints. The nurses we inquired did not have a terminology for this phenomenon and often wondered why patients were *still* erratic five to six days postoperatively. The authors decided to probe further to make sense of why patients were exhibiting these symptoms. Nurses at the ward were also asked if they had ever heard of the term "Emergence Delirium" and many nurses were unaware that this

phenomenon, a common and expected postoperative complication, actually had a terminology.

We noticed that there was paucity in literature on Emergence Delirium, which prompted us to sift through other sources in order to be able to get a better understanding of Emergence Delirium. We looked through several sources in order to investigate patients' own experiences and how this phenomenon is managed currently. A patient exhibiting signs of Emergence Delirium is at risk for self-inflicted injury, increase in pain, bleeding, and removal of intubation and catheter tubes, greatly impacting their recovery process after a surgery. Emergence Delirium and complications associated with anesthesia emergence account for nearly three to five percent of all perioperative complications in patients ranging from children to the elderly (Rose, 1996, p. 116-128).

Several studies have been conducted on Emergence Delirium; however, our area of interest remains unexplored. Little is understood about the phenomenon of people who undergo surgery and manifest characterizing symptoms of Emergence Delirium. Current management of complications associated with Emergence Delirium is approached as an assessment process dependent on pharmacological intervention of symptomatic variables, however little is shown on the perioperative nursing provision of care involving comfort and management of Emergence Delirium.

## **2 Aim and Research Question**

The aim of this study is to determine what new research describes as perioperative management of Emergence Delirium, to recognize and shed light on what can be done in the perioperative nursing setting in order to prevent discomfort caused by Emergence Delirium.

The research questions are,

1. How can emergence delirium be prevented?
2. What factors affect the occurrence of agitation during emergence?
3. Which alternative interventions exist for complications related to emergence from anesthesia?



### 3 Theoretical Background

Emergence delirium, emergence agitation, and postoperative cognitive dysfunction are the most common terms used by many researchers to define the phenomena of a patient experiencing cognitive-behavioral changes, postoperatively, within the first three days. Emergence is the term used when a patient regains consciousness after receiving anesthesia and when the patient starts to respond to a verbal command in a non-reflex manner (Hight, Dadok, Szeri, Garcia, Voss and Sleight, 2014).

Emergence is the moment when the patient regains consciousness after induction of anesthesia (Bhaskar, 2013). Delirium, on the other hand, is a psychomotor dysfunction, which is either hyperactive (combative and restless behavior) or hypoactive (lethargy and inactiveness) or a mixed subtype that could elate from hypoactive to extreme hyperactive (Clarke, McRae, Signore, Schubert and Styra, 2010). Due to the overwhelming use of terminology, an average reader can be easily confused; hence, this study solely uses the term *Emergence Delirium*. This term is used due to its relation to multiple outcomes such as self-extubation, unexpected violence to self and staff, and unintended removal of tubes and lines (Wofford and Vacchiano, 2011), all of which were primarily, the core reason why the authors chose this area of study. In the subsequent areas of this study, Emergence Delirium will be abbreviated as ED.

The two most conflicting terms are Postoperative Delirium and Emergence Delirium. Wofford and Vacchiano (2011, p. 336-337) described that the first author to speculate about the concept of ED was Savage; the author's speculation brought up a distinction between ED and Postoperative Delirium. The most significant difference between Postoperative Delirium and ED is that Postoperative Delirium occurs in a distinct age group of elderly patients, whereas ED occurs in all age groups (Stoicea, 2013, p. 15-16). Wofford and Vacchiano differentiated the two terms – on one hand, Postoperative Delirium is a change in cognition which occurs within 24-72 hours postoperatively, and

clinical manifestations include, decline in ability to maintain focus, or shift in attention that is not related to preexisting or evolving diseases such as dementia or psychosis. Severity of Postoperative Delirium may or may not fluctuate during the day, and perception, language and memory may be interrupted. Given these points, Wofford and Vacchiano (2011, p. 335) refer to these types of fluctuations and interruptions in cognition as “the prototype for adverse cognitive change after surgery”. On the other hand, ED is a cognitive change after the surgery, however, more related to psychomotor behavior manifested by agitation ranging from frequent, non-purposeful movement to bold physical aggressiveness occurring either immediately or shortly after emerging from anesthesia. Wofford and Vacchiano (2011, p. 336) added that investigations about ED alone became prominent after the presence of post anesthesia care units (PACU) were established.

Additionally, Scott and Gold (2006) described ED as a cerebral dysfunction characterized by short-term confusion accompanied with many different manifestations such as hallucinations, restlessness and hypersensitivity to stimuli. ED is observed in patients in transition from a state of sedation to consciousness. A patient experiencing ED typically exhibits signs of convulsions, a state of disorientation and agitation, while transitioning from a repeated state of unconsciousness and consciousness. Often, patients are unresponsive to any given command and continuously convulse and act out in an erratic hypnotic state. Impaired awareness, cognition and focus, resulting in agitation as a result of sedation are referred to as a phenomenon called Emergence Delirium (ED) (Vacanti, Segal, Sikka and Urman, 2011, p. 317-318).

Historically, during the 16th century, ED was already recognized however was first known as acute postoperative psychosis and was first documented in 1819, and as clearer understanding of the phenomena has evolved, it has received many different terms such as acute state of confusion, mental dysfunction, emergence agitation, and many others (Parikh and Chung, 1995). Eckenhoff described signs of ED in 1960 as manifestations of hyper excitation by children when specific anesthetic agents were administered. Still, the cause of ED has never been fully understood and definitions

deviated depending on the signs and symptoms and the period or length of the ED which varied from person to person (Vlajkovic and Sindjelic, 2007).

The term delirium was first used by the Roman physicist, Aulus Cornelius Celsius, during the first century AD; he described delirium as a cognitive deficiency resulting from fever or traumatic head injury – the word *delirium* is derived from *deliria* which means “off-path” (de Rooij, Schuurmans, van der Mast and Lev 2005, p. 609). The World Health Organization’s (WHO) International Classification of Diseases (ICD-10) defines ED as a set of behavioral and mental disorders associated with the withdrawal state of sedatives and hypnotics along with delirium. (WHO, ICD-10, 2015)

### **3.1 Expected outcomes of Anesthesia Emergence**

In order to grasp the implications of ED, it would be useful to be aware of normal and expected outcomes of emergence from anesthesia. Awareness of normal expected outcomes assist in developing baseline findings, from which, a healthcare professional can discern and anticipate symptoms of ED.

Various studies have been conducted in order to determine the presence of ED in the post anesthesia setting; many scales are utilized to determine abnormal emergence from anesthesia and levels of consciousness, however in order to determine whether a patient exhibits signs of inadequate emergence from anesthesia, it is important to understand normal and expected outcomes of emergence from anesthesia. Bold and Sury (2010; p. 361-362) define unconsciousness as the inability to react to external stimuli; their study conducted in the UK revealed that expected outcomes of anesthesia emergence in neonates included crying, rapid movements of the limbs, gagging reflex due to tracheal tube, open eyes and scanning of the environment around them indicating alertness.

Bold and Sury conducted a follow up study in 2011 to define the normal emergence of anesthesia in infants and how consciousness can be measured in infants; Bold and Sury (2011, p. 364) point out that anesthesia has a similar purpose when given to both infants and adults. The authors define consciousness as the presence of a thought-

process; however, determined that the terms 'awake' and 'asleep' are more suitable for infants (2011, p. 364). The use of the Vancouver Sedative Recovery Scale was used to determine the level of consciousness in infants and used terms such as awake and alert, awake and drowsy, asleep and easily aroused, asleep and difficult to arouse and asleep and unable to arouse.

In adults, normal emergence is determined by level of consciousness and types of behaviors exhibited by patients during the emergence phase (Hudek, 2009, p. 513). The Riker-sedation agitation scale defines emergence behavior when a patient does not communicate or react to external stimuli and is unarousable and unable to follow commands; when a patient is able to react to physical stimuli, moves sporadically and cannot communicate or follow commands, they are considered to be very sedated. When patients are difficult to awaken and drift off easily, however, react to verbal and gentle physical stimuli and are able to follow simple commands, they are still considered to be under sedation. A patient, who arouses easily, calmly and is able to easily follow commands, is sedated but calm and cooperative. The Riker-sedation agitation scale considers any other additional, sporadic behaviors beyond this point to be abnormal emergence, which may vary from, agitated to dangerous agitation (Munk, Andersen and Gögenur, 2013, p. 251).

### **3.2 Task in the Perioperative Setting**

Due to the perioperative nature of ED, and the purpose of viewing the study perioperatively, it is important to consider that perioperative nursing begins when the patient is informed of the need for surgery up until the patient resumes a usual routine and activity. The surgical experience is divided into three segments: (1) preoperative, (2) intraoperative, and (3) postoperative, and the perioperative nurse provides nursing care in all phases (Goodman and Spry, 2014; Lemone, Burke and Bauldoff, 2011).

### **3.2.1 Preoperative Phase**

Preoperative Nursing care accounts for the patients' initial impression and understanding of the entire surgical process; preoperative preparations, in a majority of cases, begin at home. It is the nurse's responsibility to ensure that the patient and their family are informed adequately before a surgery and that the pre-operative instructions are taught correctly to the patient in order to ensure a successful surgery. It is also of importance that nurses take into account the patients' and their families' feelings and emotions before the surgery in order to maintain reassurance (Rosdahl and Kowalski 2008, p. 719).

The list of preparations in the preoperative phase requires the nurse's time and attention to detail. The nurse is required to scan through the preoperative instruction checklist and ensure that the client has abided by the at-home instructions, has been fasting for the required amount of time before the surgery, has been informed about the surgery by the surgeon, consents to the surgery and if the client has any wills or testaments which need to be taken into consideration before the surgery as well as if the client has any religious beliefs which may affect the surgery, for example, refusing to receive blood transfusion (Rosdahl and Kowalski 2008, p. 719).

The nurse is also responsible for checking through the patient's medical history, which medications the patient needs to take before the surgery, all sample blood tests have been conducted, prepare the patient for surgery by providing them with surgical gowns and showering and shaving patients before the surgery, if necessary. The concept of preparation and teaching during the preoperative phase is intended to ease the patients' and families' worries during a stressful time and to ensure that postoperative complications will not arise; Rosdahl and Kowalski (2008, p. 736) state that "preoperative teaching is the first line of defense against postoperative complications."

### **3.2.2 Intraoperative Phase**

Intraoperative nursing starts between the admission of the patient in the surgery room and ends when the patient is transmitted to the post anesthesia care unit (PACU) or recovery room. Because of the complexity of the intraoperative environment, it is built up of a surgical team in order to function coherently, and each member has specialized training and skills that are necessary for the good outcome of surgery. (LeMone, Burke and Bauldoff, 2011).

The actual operation happens during this period, and the roles of the nurses include: preparing the patient, although some preparation of the patient already started in the preoperative phase, the nurse in intraoperative area prepares the patient's skin by disinfecting the operating site accordingly, this may also involve hair removal; positioning the patient depending on what type of surgery and taking care of the non-sterile area is the role of the circulating nurse. On the other hand, a scrub nurse assists the surgeon during the operation and handles the instruments, by intensively following the surgery and has a good knowledge of anatomy and physiology in order to give appropriate instruments to the surgeon. Lastly, anesthesia nurses, if present, regulate the hemodynamics of patients and give anesthetic agents according to the anesthesiologist's order. (LeMone, Burke and Bauldoff, 2011).

### **3.2.3 Postoperative Phase**

There are many factors in the postoperative phase, which require monitoring by the nurse. When a patient arrives at the post anesthesia care unit (PACU), they are to be carefully monitored until their recovery. Close monitoring of patients' vital signs is important upon arrival at the PACU unit; maintaining a patent airway directly after surgery is the most significant basic need monitoring required immediately after a surgery. Nurse anesthetists, anesthesiologists and circulating nurses should be readily available upon patients' arrival at the PACU unit in order to ensure that the patient is in stable condition; the anesthesia personnel provides the report regarding special orders or requirements of the client to the PACU personnel. The PACU personnel's task is to

monitor patients for any immediate postoperative complications such as hemorrhage, shock, lack of oxygen and hypothermia (Rosdahl and Kowalski 2008, p. 727-729). Postoperative nursing tasks also include monitoring of patient discomforts related to pain, thirst, bowel movements and bloating in the abdominal region due to anesthesia, nausea, and retention of urine, constipation, insomnia and restlessness (Rosdahl and Kowalski 2008, p. 730-731).

### **3.3 Previous Research**

Articles for our previous research were gathered over a period of time during our data collection process. Any article that was deemed non-relatable to our results and discussed ED or concepts related to ED were included in this section; some articles we found fit the scope of our time frame in current research; however, we decided to exclude them in our results due to methodological differences. Some articles were excluded due to methodological differences. The majority of articles used in this section are literature reviews.

Previous research suggests that preoperative anxiety is a recurring factor linked with ED (Hudek 2009, 510, p. 747-753; Mason, 2009; Neugeborn, 2009; Kain 2004, 1648-1654; Wells 1999, p. 1308-1310). Bailey (2010) explores the impact anxiety plays in the perioperative setting, citing Grieve's (2002) claim that anxiety triggers stress responses, which hinder the healing process. Anxiety is also shown to require increased amounts of anesthesia, which is detrimental to patients' health and short-term healing (Bailey, 2010; p. 445). Grieve (2002) suggests that underlying anxiety stems from possessing negative connotations related to surgery, such as having no control, alterations in the body and pain. Increased levels of anxiety have also been found to increase postoperative pain (Stirling, Raab, Alder and Robertson, 2007; Spaulding, 2003). Providing adequate preoperative information has been shown to reduce levels of anxiety (Bailey, 2010; Spaulding, 2003; Ng, Chau and Leung, 2004).

In children, anxiety has been found to be a vital factor that leads to ED (Hudek, 2009; Key, 2010), in order to help reduce anxiety in children, a behavioral preparation program may be conducted including hypnosis and music therapy (Key, 2010). Hudek (2009, p. 513) recommend that patients and families should visit the hospital before planned procedures as studies have shown that patients who are familiar with the hospital environment prior to any surgery or procedure tend to have lower anxiety levels. Hudek's study suggests that parental presence may cause more anxiety because parental anxiety is conveyable to children.

Preventable factors of agitation experienced by patients include pain, urinary retention, hypoxia, sepsis, immobility and fluid and electrolyte balance among others (Aitken, et al., 2008; Maccioli et al., 2003; & Hudek, 2009). Monitoring oxygen levels in patients who undergo surgery is of great importance in order to prevent hypoxia, or the lack of oxygen. Patients experiencing agitation may hinder the maintenance of a patent airway, intubation, thrusting of the jaw and lifting of the chin may be necessary in order to establish a patent airway; however, the possibility exists that patients' aggressive nature may impede the establishment of a patent airway – in such situations, chemical treatments may be used in order to ensure that a patent airway is established (Hudek, 2009).

Furthermore, bulky saturation monitors may often disconnect from patients' fingers due to agitation or restlessness; the use of an adhesive saturation monitor attached to patients' toes rather than fingers is preferred, as an adhesive monitor attached to the toe would be more discreet and less likely to irritate the patient. Another proposition suggests a nursing intervention which enables the intake of oxygen by placing patients in the semi-fowler position and ensuring that patients' chests are free from obstruction or heavy items such as plaster wrapped around an arm (Hudek, 2009). Nasal cannulas and oxygen masks can also irritate patients, however Hudek suggests that patients find nasal cannulas more tolerable when they are placed near the lips.

In cases of hypotension, or low blood pressure, nurses are advised to check and revise any possible side effects of medications the patient has received and whether they may have an effect on the patient's blood pressure, whether the patient is



positioned properly and whether there may be any signs of bleeding or loss of fluid. Another nursing intervention would be to increase the speed of intravenous infusions, if not damaging to the patient, in order to raise their blood pressure (Hudek, 2009, p. 511).

Neugeborn (2009) linked pain in the incidence of ED due to immediate discomfort a patient faces after surgery. Hudek (2009) asserted that patients are often unable to adequately express pain felt after a surgery hence it is vital that nurses pay attention to nonverbal cues which indicate signs of distress. Patients' vital signs and body language may indicate expressions of pain such as wincing, reaching towards or trying to support the area of injury, high blood pressure and elevated, feeble or gradually leaping pulse rate.

ED would be challenging to identify on children, due to children's inability to vocalize pain, or if the behavioral change is due to hunger or fear. This has lead to the use of pain scales, that have been widely discussed and studied in parallel to ED; a commonly used scale in the pediatric setting is the Pediatric Anesthesia Emergence Delirium (PAED) scale which identifies five different types of expressions which may be apparent in pediatric patients during the emergence phase. Expressions vary from determining whether the patient makes eye contact, carries out normal and expected actions, is attentive and conscious of their surroundings and is agitated or uncomfortable; each characteristic is ranked on a scale from zero which represents extremely to four which represents not at all (Sikich and Lerman, 2004). Studies have shown that a PAED score of twelve or higher indicates ED (Bajwa et al., 2010).

Other types of pain scales used to assess agitation include the Riker sedation-agitation scale and the Richmond sedation-agitation scale as they possess a high level of reliability and are generally easy to utilize in crisis situations (Hudek, 2009; 511; Riker, 2001; Sessler, 2002). These agitation scales assist in determining variations in actions and level of consciousness; the Riker sedation-agitation scale is capable of determining a broad range of results based on the level of consciousness -- the scale can determine if a patient is unconscious or exhibiting severe signs of delirium and agitation (Riker, Picard and Fraser, 1999). Merkel, Voepel-Lewis and Shayevitz (1997)

suggest that healthcare professionals should utilize pain scales available in order to assess pain when patients may be unable to express themselves verbally.

A patient experiencing ED is typically experiencing an altered state of consciousness and is disoriented and agitated. Patients often do not remember their family members nor do they identify with any familiar objects; the decline in cognitive behavior often leads to patients not responding to healthcare professionals in a way, which is conducive to their long-term healing process after surgery (Wells and Rasch, 1999, p. 1308-1310).

Inflammation has been linked to have an impact in developing cognitive disturbance during the emergence phase after experiencing a traumatic event to the tissue caused by surgery. (Hshieh et al., 2008). Sansoni et al. (1993) suggested that in an ageing brain there is a peculiar and prolonged central nerve system immune production causing an increase in brain inflammation that is associated in cognitive changes. An increase in cytokine may induce cognitive behavioral changes perioperatively; the immune production response was also comparable to young adults between nineteen to thirty-six years old.

ED is a complex phenomenon accompanied with various dilemmas that according to researchers, needs further study (Hudek, 2009). According to Scott and Gold (2006), a lack of focus on the cause of the delirium yields wrong treatment methods leading to longer stay in the hospital and more expenses towards courses of treatment as a result of unpleasant effects after emerging from anesthesia. Sikich and Lerman (2004) also highlighted the absence of guidelines concerning a diagnosis for ED. Hence, it is important for perioperative nurses to comprehend emergence delirium, since it can occur in all ages and from different types of anesthesia used (Hudek, 2009).

## **4 Theoretical Framework**

The comfort theory as formulated by Kolcaba (2001) considers the patient beyond physical realms and seeks to address the cognitive, metaphysical and sentimental

aspects of the patient's healthcare needs and recovery process. The comfort theory model provides a framework of several variables, which, when combined or in collaboration with one another, may lead to an optimal degree of comfort in which the patient finds courage – either consciously or unconsciously – towards an enhanced state of recovery (Wilson and Kolcaba, 2004, p. 165-166). The Comfort Theory is developed to operationalize comfort as an outcome of care (1992b) and has been tested in several intervention studies (Kolcaba 1999, 2003, 2004; Kolcaba, Tilton and Drouin, 2006); in 2001 the theory was refined to include hospital based-outcomes.

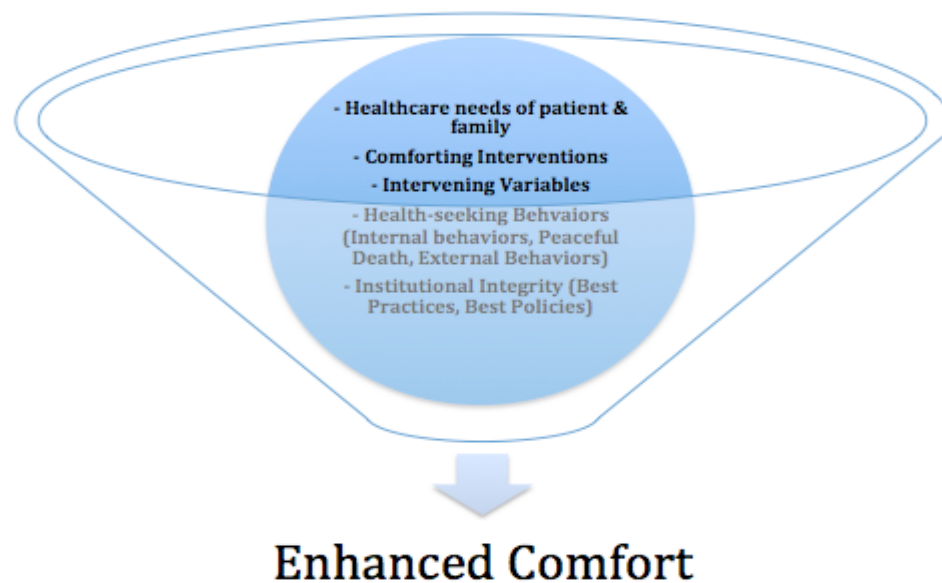
#### **4.1 Conceptual Framework of Comfort Theory**

In the context of the theory, health care needs is defined as needs for comfort arising from stressful health care situations that cannot be achieved by traditional support. Although Kolcaba mentions that comfort is the traditional passion and mission of nursing, in order to render holistic comfort, the recipient must be given verbal or nonverbal reports, requiring educational capabilities of the nurse, according to the patient's pathophysiologic needs (Parker and Smith, 2010, p. 390-391). Comfort intervention is described as an intentional rendition of interventions to accommodate the specific needs of the recipient. Comfort intervention is categorized into three types, first, is a sort of action that requires basic skills; Kolcaba referred to this as a technical intervention, where the nurse inserts intravenous (IV) cannulas, provides medications, and monitors intake and output. The last two types of comfort interventions are more time-consuming and require confidence. When the nurse actively listens to the patient, and knows how to refer the patient to another health care professional, it is referred to as coaching.

Lastly, Kolcaba defined food for the soul as additionally exceptional, where mostly non-pharmacologic intervention is rendered and providing time to the patient, such as back massage, walking with the patient outside, music therapy and making arrangements with the family (Parker and Smith, 2010, p. 390-391). Parker and Smith (2010), argue that most nurses focus on technical intervention and that the latter two

types of intervention are only applied when time permits. It is said that, coaching and food for the soul is always memorable; patients often do not account for technical part, because they assume that nurses are expected to give medications and follow up.

The intervening variables are variables, which influence the patient's view of total comfort, such as age, attitude, emotional state, support system, cultural background, finances, past experiences, and the sum of the patient's experience. Enhanced comfort is measured through the taxonomic structure resulting in elevation of comfort experience for the patient compared to a pre-intervention baseline (Parker and Smith, 2010, p. 390-391). Health seeking behaviors are variables, which can be sought out through internal or external behaviors and lead to either an enhanced state of health or a peaceful death. Internal health seeking behaviors can include healing, immune responses in the cellular level or improved breathing, meanwhile, external health seeking behaviors are sought through therapy, length of hospital stay, mobilization and ability to perform activities of daily living (Kolcaba, 2003, p. 107). Kolcaba emphasized the need of documenting comfort interventions as she referred to as enhanced comfort, thereby, through documentation, nurses can provide real contributions to elevate institutional outcomes as manifested by patient satisfaction, lesser readmission, or shorter length of hospital stay. When Institutional integrity is achieved it can produce best policies and best practices (Parker and Smith, 2010, p. 390-391). The figure below shows Kolcaba's Conceptual Framework for Comfort Theory (Figure 1).



**Figure 1: Kolcaba's Conceptual Framework (Parker and Smith, 2010, p. 390-391).**

## **4.2 Metaparadigm Concepts of Comfort**

Kolcaba's comfort theory is built upon metaparadigm concepts utilized in all nursing theories – Kolcaba identifies these metaparadigm concepts with comfort needs interrelated to one another through the elements of nursing, patient, environment and health. The patient is composed of the individual, family and the surrounding community need of health care. The nursing element represents the assessment and designing assessment methods for comfort needs. The nursing element also represents the evaluation of implemented care of action related to comfort as well as the comparison of outcomes to previous baseline measurements. The environmental element focuses on outside influences such as the physical room, organization and protocols which can be re-evaluated into enhancing the state of comfort needs provided. The element of health takes into consideration optimal function of the patient, their family and their surrounding community due to the application of care focused on providing comfort needs (Kolcaba, 2003, p. 68).

### **4.3 Structure of Comfort**

Kolcaba has created a taxonomic structure, a grid that is composed of the three distinct types of comfort and the four context of experience. The structure is similar to an umbrella of outcome towards relieving discomfort such as pain, anxiety, environmental stressors, and/or social isolation. Comfort is between total comfort in the extreme end, and suffering on the other end (Parker and Smith, 2010, p. 390-391).

### **4.4 Types of Comfort**

As Kolcaba (1994, p. 7-14) tried to define and understand the meaning of comfort, she found in her literature search, that comfort originally meant “to strengthen greatly,” and she defined the outcome of comfort as “[t]he immediate experience of being strengthened when needs for relief, ease, and transcendence are addressed in four contexts of experience.” She categorized comfort in three distinct types; namely – relief, ease and transcendence using three nursing theories in order to get comfort satisfaction from stressful moments that arise in health care situations (Parker and Smith, 2010, p. 390). Ease is defined as calmness and contentment (Kolcaba, 1994, p. 1178-1184; Peterson and Bredow, 2009, p. 257) and ease was derived from Henderson's 13 basic functions of human that needed to be maintained for homeostasis (Parker and Smith, 2010, p. 390). Relief was defined as the experience of having special needs met (Kolcaba, 1994, p. 1178-1184; Peterson and Bredow, 2009, p. 257) – this was framed from the works of Orlando (1961/1990), who stated that nurses relieved the needs expressed by the patients. Synthesized transcendence, discussed by Paterson and Zderad (1976), propagates the idea that patients could rise above their difficulties with the help of the nurses (Parker and Smith, 2010; 390).

### **4.5 Context in which comfort occurs**

According to Wilson and Kolcaba (2004, p. 165-166), comfort occurs in physical, psychospiritual, and environmental and sociocultural contexts of experience. The

physical context in which comfort occurs relates to sensations felt by the physical body, mechanisms to achieve homeostasis and stability as well as immune functions of the physical body. Kolcaba indicates that in order to meet the comfort needs of a patient experiencing post anesthetic anxiety, psycho-spiritual contexts of comfort should also be considered. The patient experiencing discomfort in a psycho-spiritual context where anxiety is present is defined by Kolcaba as a result of confusing, incomplete or negative information as well as uncertain and dangerous diagnoses, fear and possibility of changes in routine health status. Kolcaba specifies various factors, which affect psycho-spiritual well-being of a patient in the post anesthesia care setting.

The author elucidates isolation from family, cultural and traditional disregard, anxious and non-caring attitude and behaviors of nurses, lack of quality assurance in the type of healthcare provided, lack of social support and restricted resources for ongoing support and care after being discharged from the hospital as some of the major detractors of optimal comfort in a psycho-spiritual context. Environmental contexts in which comfort occurs pertains to the surrounding environment which shapes experience; Kolcaba relates environmental factors to light, sound, smell, color as well as how furniture is placed and how the landscape surrounding the patient is designed. Sociocultural contexts relate to interpersonal relationships with family, surrounding society and professional and/or career status. Sociocultural contexts are also interrelated to practices within traditions, religions and customs (Wilson and Kolcaba, 2004, p. 165-166).

## **5 Method**

This study is conducted using systematic review to collect data and determine what data should be included for the study. The data gathered were both qualitative and quantitative articles, thus, making our study's research design mixed methods and content analysis was used to analyze and merge the data collected. Polit and Beck (2012, p. 603) postulated that a good mixed methods research does not only comprise

of qualitative and quantitative data, but also integrates and draw inferences using both methods in one study.

### **5.1 Systematic Review**

In this study, systematic review is utilized to collect data from numerous databases. Utilization of the systematic review requires gathering a wide range of research related to the research topic and consideration of inclusion and exclusion criteria for the initial data collection process; its purpose is to accumulate and integrate comprehensive research information on a topic and draw a conclusion based on the evidence. Systematic reviews maintain reliability and refrain from reaching incorrect or misleading conclusions (Polit and Beck, 2008, p. 32 and p. 668; Polit and Beck, 2012, p. 9). In utilizing systematic review, Polit and Beck suggest the involvement of at least two reviewers in order to minimize the workload and reduce the presence of subjectivity in how the data is collected. Researchers using systematic review must use a methodological procedure so that the study is reproducible and verifiable. Although subjectivity cannot be entirely eliminated in any research, utilizing the systematic review approach to collect data, promotes discreteness and disciplines the reviewer to adhere to predefined rules; data collected in this way, according to Polit and Beck (2012, p. 653), allow reviewers to judge the conclusions.

### **5.2 Data Collection**

Different authors used several terms interchangeably in order to define cognitive changes patients manifest after surgery. In recent years, an outburst of study has been conducted regarding this phenomena, and within the year 2010, the MEDLINE search tool, using keywords such as postoperative delirium, postoperative cognitive dysfunction and emergence delirium generated more than 2000 articles (Wofford and Vacchiano, 2011); Postoperative delirium was also used as a keyword for searching articles in the beginning, because a professor from North Carolina, USA suggested the term, which according to her, postoperative delirium is the most common term used in



the United States. However, after reading through several articles, the authors determined that there are disparities in the usage of terms, which, according to Munk et al. (2013) represents a lack of focus on the problem for the reason that, there are no clear guidelines concerning diagnoses leading to extended hospital stay or higher hospital costs. Additionally, Wofford and Vacchiano (2011) described the difference between the terminological use, therefore, other terms such as *Postoperative Delirium*, and *Postoperative Cognitive Dysfunction* were placed in the exclusion criteria, for the purpose of avoiding the mixture of terms and focus on Emergence Delirium.

Due to the wide scope of this study, systematic review was applied and utilized inclusion and exclusion criteria in order to filter what is necessary and best applicable to this study. The authors of this study decided to exclude literature reviews, because this study does not intend to perform meta-analysis or meta-synthesis. Consequently, ample numbers of qualitative studies were eliminated, as most of the studies conducted in the scope of ED were conducted in a quantitative manner. As a result, the authors included quantitative research articles in the results. A table of inclusion and exclusion is tabulated below, to easily visualize the criteria of the study.

<b>Keywords</b>
Emergence Delirium, Emergence Agitation, Anesthesia Delirium, Post-anaesthesia Delirium, Anaesthesia Emergence, Delirium after Surgery, Delirium and Anesthesia
<b>Inclusion and Exclusion Criteria</b>
<p><b>Inclusions:</b></p> <ul style="list-style-type: none"> <li>• Studies published within 10 years 2005-2015</li> <li>• Peer-reviewed</li> <li>• Nursing Field</li> <li>• Studies published in EBSCO for reliability</li> <li>• Published in Journals</li> <li>• Studies that includes all ages</li> <li>• Methodologies: <ul style="list-style-type: none"> <li>Qualitative</li> <li>Quantitative</li> </ul> </li> </ul> <p><b>Exclusions:</b></p> <ul style="list-style-type: none"> <li>• Studies more than 10 years old</li> <li>• Non-English language</li> <li>• Dissertations/theses</li> <li>• Studies in which data is not analyzed or interpreted</li> <li>• Commentary Articles (Opinions, Speeches)</li> <li>• Methodologies: <ul style="list-style-type: none"> <li>Literature Review</li> </ul> </li> </ul>

Table 1 Keywords and Inclusion and Exclusion Criteria

In order to retrieve the data used, a tracking chart was made so even after a lapse of time, searching articles for articles will be readily accessible. In our tracking chart, we have listed the authors' names, years published, titles, keyword/s used, which searching engines were used either manual sources such as books, or the University's library platform and particularly, a link (if the article was found online); this way, the workload in retrieving the articles was reduced. A final compilation of our data collection is represented at the end of this study, in Appendix 1.

## 6 Research Conduction

To be able to conduct this study, data was collected from various types of sources such as online electronic resources, journals, using research keywords, in order to gather information from previous studies. Systematic review was utilized in our data collection process. Inclusions and exclusion criteria were implemented in order to

narrow down specific information that was needed. Through reading and analyzing the articles, common categories were found and all information that belonged under a similar category was gathered.

## 6.1 Mixed Methods

The authors in this study were required to consider the significance of mixed methods due to data collection results, which revealed both quantitative and qualitative articles. Mixed methods are a research design, which utilizes philosophical underpinnings to direct the collection and analysis of data, which requires merging qualitative and quantitative approaches in individual studies or several studies (Creswell, 2006). Creswell highlights the implementation of mixed methods research in various ways; the authors in this study found that merging qualitative and quantitative articles into the results would yield a broader and more consistent result, which coincided with our research questions. There are three ways in collecting data in sequencing mixed method: collecting qualitative data first, quantitative data is collected first, or simultaneously collecting both types of data. In this study, the authors first collected qualitative data, analyzed and coded it, found out that some data do not fit the criteria and aim of the study, and found related quantitative articles. According to Creswell (2006), collecting qualitative and quantitative data into one study is no new method, however putting both methodologies together, as a distinct method of conducting a study is new.

According to Polit and Beck (2012, p. 620) qualitative data can be utilized in numerical form and this transformation is called *Quantitizing*; every time a researcher used quantifying words in conveying the frequency of occurrence of a theme/category/pattern in a qualitative study, it is considered quantitizing. After quantitizing the qualitative article, both results of the data were coded in the coding sheet and came up with the matrixes. In coding the categories extracted from all the data, deductive approach of content analysis was exploited.



**Figure 2: Merging Data in Mixed Methods Research (Creswell, 2006)**

Mixed methods represents this study as a research design, however, a method of analysis is required in order to derive content from both qualitative and quantitative articles if they are to be merged into the results. The mixed methods definition only provides a general idea that qualitative and quantitative data can be merged into the results however, it does not provide the researcher with analytical methods, which are required to derive understanding, meaning and relationship between data collected. The authors of this study decided to use content analysis in order to decipher the contents of the articles collected before the data merged into the results; this way, the data is more organized and easy to understand.

## **6.2 Content Analysis**

Quantitative and qualitative data can be used in conducting content analysis and it can also either be carried out in an inductive or deductive way. Content analysis is a method in analyzing visual communication messages, verbal or written data, which employs systematic and objective scheme in describing quantifying phenomena (Elo and Kyngäs, 2007).

According to Stemler (2001), content analysis is a systematic tool for compressing material using explicit coding, which keeps the data replicable and a powerful tool in determining authorship. Meanwhile, Polit and Beck (2012, p. 723) described content analysis as “[t]he process of organizing and integrating material from documents, often narrative information from a qualitative study, according to key concepts and themes.” Meanwhile Elo and Kyngäs (2007), argued that content analysis was not qualitative enough thus some authors used content analysis in quantitative field in a simplistic technique but not inclining on detailed statistical analysis. Cavanagh (1997) added that content analysis allows researchers to test the theoretical hypothesis to a

better comprehension of the available data, and through content analysis, it is possible to condense data that share the same meaning by putting the information together into categories.

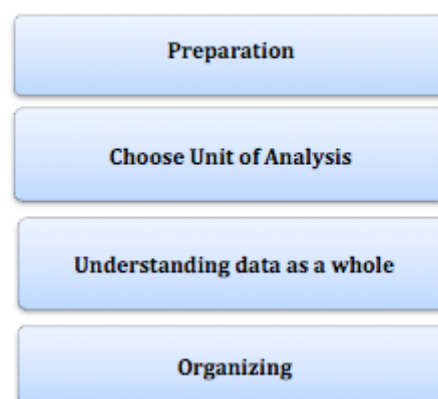
Weber (1990); Elo and Kyngäs (2007); Cavanagh (1997) said that there is no universal rule in analyzing data, but the main point is categorizing all the information in either a theme or a word into a smaller content category. There are three main phases in applying content analysis; the first step is *preparation*, followed by *organizing* and lastly *reporting* which is either done inductively or deductively. The preparation phase, is when the author chooses what type of data to analyze, and decides the details of which to analyze. When starting to analyze, the author must choose whether to focus on the latent content or manifest content (Elo and Kyngäs, 2007). Manifest content are the visible and countable components of the message, meanwhile, latent content refers to the meaning of the message that lie behind it (Rose et al., 2015). Elo and Kyngäs added that, the aim of latent content is that, through interpretation, the silent meaning of the message is taken out.

The author must then read the articles several times, in order to get a good grip of the information and become more familiar with the topic. When the author has understood and made sense of the data, the next step is either choosing inductive or deductive approach. Figures 3 and 4 below are re-designed illustrations taken from Elo and Kyngäs (2007) about the process of content analysis and deductive content analysis.

Content analysis is used in this study because it analyzes the content of the narrative data that involves making categories by breaking down data into smaller units that help identify common patterns among the categories in all the research findings (Polit and Beck, 2012, p. 564). Thus Polit and Beck (2012, p. 723) described content analysis as “[t]he process of organizing and integrating material from documents, often narrative information from a qualitative study, according to key concepts and categories”. Schreier (2012, p. 1) references Stemler’s (2001, p. 1) definition of content analysis as “a method for systematically defining the meaning of qualitative material [...] by classifying material as instances of categories of a coding frame.”

There is a degree of interpretation to analyze own data, hence, issues in the trustworthiness of content analysis has also recently emerged (Elo, Kääriäinen, Kanste, Polkki, Utriainen and Kyngäs, 2014; Stemler, 2001).

O’leary (2010; 270) presumes that content analysis is a thematic analysis by coding and involves linguistic quantification wherein the words and text are sources to be analyzed. Content analysis is one of the most readily available methods for qualitative research requiring analysis and interpretation of data (Elo and Kyngäs, 2014). Content analysis is a widely used research methodology technique and has an improved method. According to Hseih and Shannon (2005), content analysis is not a single method, rather, current content analysis is applied through three approaches: conventional, directed and summative; furthermore, these approaches are used to interpret the context by maintaining a naturalistic paradigm. Conventional content analysis is coding derived from a data source – directed approach is used to analyze a theory or research finding that serve as guidelines in coding data. Lastly, the summative approach categorizes and compares – usually, through keywords or content, followed up by context interpretation.



**Figure 3: Content Analysis**



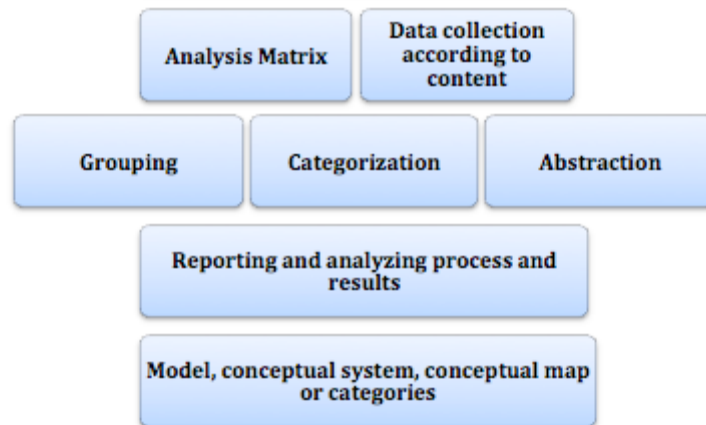


Figure 4: Deductive Content Analysis

### 6.3 Deductive Content Analysis

In this study, deductive content analysis is applied, thus, the deductive approach will be described in this section. The authors of this study followed the deductive approach until data was gathered by content, and as Figure 3 and 4 illustrate above, the deductive approach can meet the inductive approach at the grouping phase and render the same results; content analysis allows flexibility to call this procedure of deductive content analysis although there was a transition in analysis toward more inductive approaches – this approach is possible because the result is ultimately the same. The authors decided this approach was in the best interest of their study since hypothesis testing would not have been possible with the overwhelming amount of categories, which were gathered. Since the authors chose the deductive method, the next step according to Elo and Kyngäs (2007) is to develop an analysis matrix where the authors read and jot down notes at the same time, and the materials are read through many times to be able to write as much as possible. The author writes down all the categories found and as many that has been found. In this study, we made a matrix of all the results found in our articles. The articles gathered were qualitative and quantitative materials and the categories in the result section of each study were recorded into a ‘category chart’, and the names of each corresponding author were written in matrixes.

The articles used were labeled Qualitative or Quantitative and are labeled A1- A14, represented in Appendix 1 attached at the end of this study. Table 2 below will show a brief preview on how our category matrix looks; the entire table was excluded in this study due to the reason that the authors generated more than 10 pages of text for this study's category matrix. Both authors read all the articles separately and encoded all the identified categories on the category matrix. In order to make sense of how the category matrix is utilized, Appendix 2 is attached at end of this study.

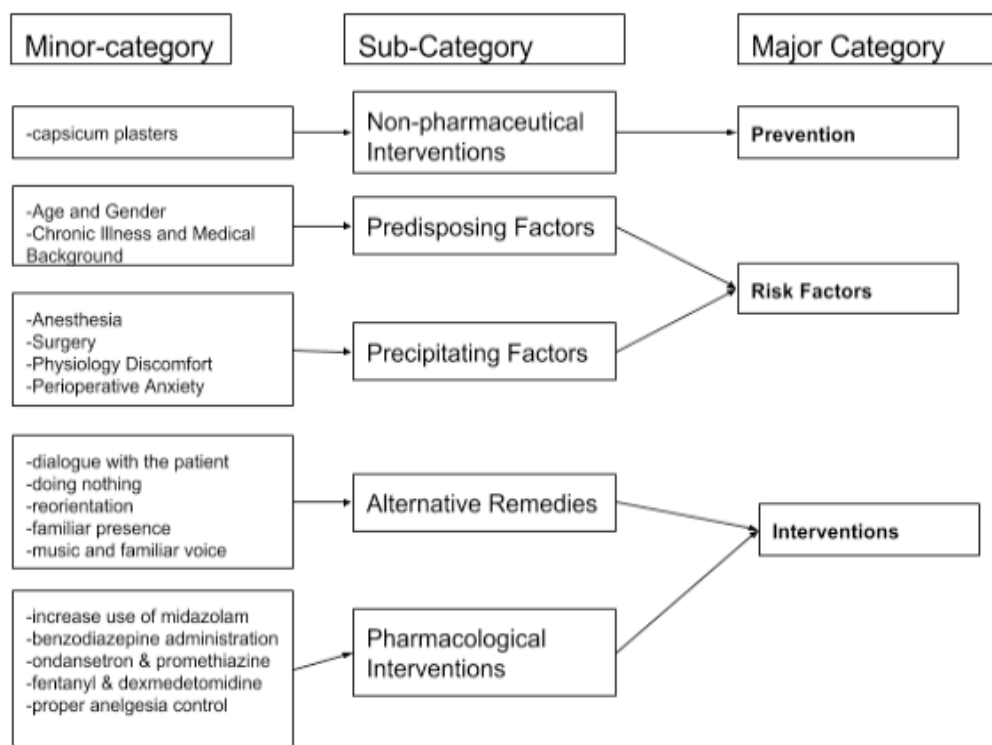
Articles	Category
<b>A1 Burns</b>	<ul style="list-style-type: none"> <li>➤ Vital signs were stable in PACU and during the operation. (Burns)</li> <li>➤ Antidepressant use (Burns)</li> <li>➤ Complete history (Burns)</li> <li>➤ Marital problems (Burns)</li> <li>➤ Sleeping pills (Burns)</li> <li>➤ Referred to psychiatric consultation (Burns)</li> </ul>
<b>A13 Yu et al.</b>	<ul style="list-style-type: none"> <li>➤ Postoperative agitation was not correlated with <b>age</b> (16-70 years old) (Yu et al. 2010)</li> <li>➤ Postoperative agitation was not correlated with <b>ASA</b> physical status. (Yu et al. 2010)</li> <li>➤ Postoperative agitation was more common in males (<b>gender</b>) (Yu et al. 2010)</li> <li>➤ Type of <b>Surgery</b>: Postoperative agitation more common in ENT procedure and surgery of oral cavity (Yu et al. 2010)</li> <li>➤ <b>Anesthesia</b>: Postoperative agitation was more common in patients who received general inhalation anesthesia than in patients who received total intravenous anesthesia. Doxapram highest risk factor (95% confidence) (Yu et al. 2010)</li> <li>➤ <b>Discomfort/Comfort</b>: Pain and presence of tracheal tube and urinary catheter resulted in postoperative agitation. Postoperative analgesia decreased postoperative agitation. (Yu et al. 2010)</li> <li>➤ <b>Longer stay</b>: Agitated patients stayed longer (105 minutes) compared to non-agitated patients (72.6 minutes) - 0.3% chance of non-reliability. (Yu et al. 2010)</li> </ul>

**Table 2** Sample Preview of Category Matrix; NOTE: All results are not included due to space limitations.

After listing all the categories, the authors printed and cut each category and clustered them by combining similar and related categories together in order to decide what major category can combine them all. The authors of this study also eliminated results



which were far beyond the scope of this study. After grouping the categories together, there were still many minor categories, and the group of texts had to be read several times and reviewed over again to find and create a wider scope of category which narrowed down all minor categories together. Finding and constructing a heading for the major category, is a process called grouping and categorizing according to Elo and Kyngäs (2007). The purpose of the categorization is to create an understanding of the phenomena and create knowledge, through observation. Generating general categories through the subcategories is called abstraction. Figure 5 below from Elo and Kyngäs (2007, p. 111) will tabulate the abstraction process with the application of the categories found in this study.



**Figure 5: Abstraction Process**

Lastly, it is the presentation of the results; moreover, the contents of the categories must be described in order for the readers to understand how the analysis was carried out. A successful analysis is simplified data derived from the categories, which responds to the purpose of the study.

In presenting the results of this study, the authors made a chart that summarizes and helps to easily visualize the significance of each minor category, and be able to identify which among the major categories have answered the study's research question according to latest research. Appendix 3 is composed of two charts (major and minor categories), which will be seen in the appendix section of this study. Both charts have calculated according to the percentage of the frequency of each category either major or minor, by dividing its frequency to the total amount of articles (14) and multiplied by a hundred to yield the percentage value of each frequency. The calculations were conducted regardless of whether the article was qualitative or quantitative, due to the structure of the matrix and how our research was conducted. The frequency and percentage of the categories helped the authors identify how many studies are conducted regarding the prevention of ED, determining the risk factors, and implementing interventions in agitated patients after emergence from anesthesia; through these statistics, conclusions are drawn to how much more is needed to fill the gap and how much is available in current research regarding ED in a perioperative context perspective.

#### **6.4 Ethical Considerations**

This study conducted content analysis of literature that was retrieved from the university's electronic data source from the Internet. Common ethical concerns regarding research using Internet as a tool, is about privacy and anonymity and informed consent if there are interviews and surveys conducted, wherein there are participants involved, participants' confidentiality is top of the priority (Association of Internet Committee, 2012; Buchanan and Zimmer, 2012).

In this study, articles are retrieved in the electronic databases without any other participants involved, thus, copyrights of the author or the publication is the major concern. In utilizing the systematic review, copyrights are considered vital in order to make it reproducible and verifiable. When the authors printed out articles from the electronic database, they were merely used for this study and in order to employ content analysis and kept private. Electronic databases are platforms that are highly

expensive because it needs to be well designed with specific formats, which need trained and educated persons to enter the information and be able to access raw data and use it. Additionally, data is stored not only in one computer storage but is also specified in order to be used as long as the information is kept in the same format, given this, keeping the privacy to the system operators who can access the information and to avoid selling the information is the challenge (Foote, 2014). In this study, several figures and charts are used to illustrate the process of the study; the tables and figures in this study are re-created based on the authors' own structural interpretations.

## 7. Result

Through analyzing the articles gathered common categories, which support the research aim and questions, were identified. Mixed methods and content analysis was utilized in order to sift through fourteen articles which were both qualitative and quantitative articles, labeled Qualitative A1 - A4 and Quantitative A1 - A10; common major, minor and general categories related to the research questions were categorized and organized. The authors identified three major categories namely, *prevention*, *risk factors*, and *intervention*. A figure below is drawn in order for the readers to follow the scheme of the results.

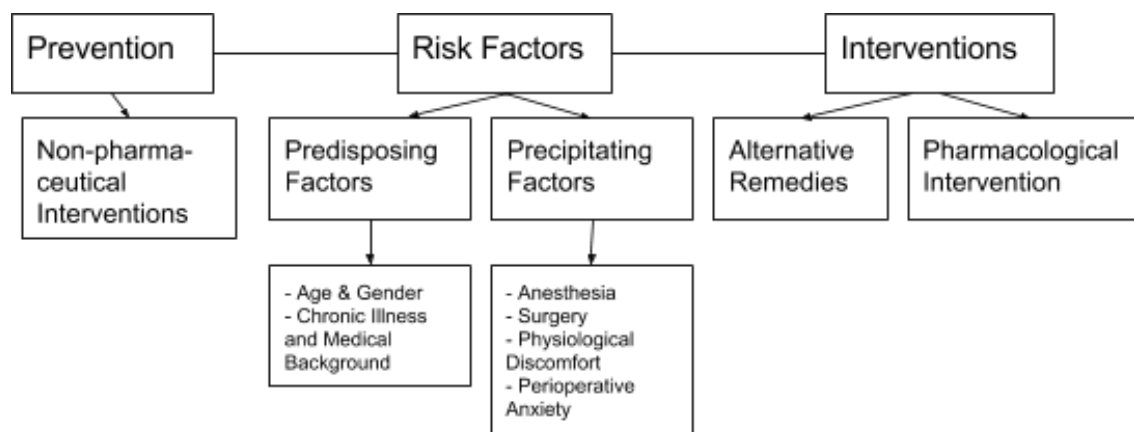


Figure 6: Presentation of the results

## **7.1 Prevention**

In the results found by the authors, out of all 14 articles one minor category determined to be related to prevention.

### **7.1.1 Non-pharmaceutical Intervention**

In a study conducted by Acar et al. (2012, p. 11105-6), capsicum plasters or patches were shown to be an effective treatment method for ED. Acar et al. found that capsicum patches placed in areas of the body which represented acupoints located on the crease of the wrists, ulnar muscle of the forearm and external flexor muscles of the outer forearm using acupuncture techniques prevented the occurrence of ED in pediatric patients undergoing elective tonsillectomy and/or adenoidectomy. Capsicum patches were placed on a test group and results were compared to that of placebo patches placed on the control group; the test group showed that the incidence of agitation during emergence from anesthesia was 32% lower than in the control group. Duration of recovery was also found to be shorter in the group that received capsicum patches.

## **7.2 Risk Factors**

In the 14 articles analyzed, 11 articles included the probable risk factors that could cause the occurrence of Emergence Delirium. Due to the wide scope of risk factors, they are divided into two categories, namely, predisposing and precipitating factors, and under these two categories reoccurring minor categories were also identified.

### **7.2.1 Predisposing Factors**

Predisposing factors are the risks factors that increase the person's susceptibility and vulnerability to the phenomena (Emergence Delirium). Factors that are already there cause the host to react towards the agent in a certain manner (Reference MD, 2012;

Thimrick, 2002).

### *Age and Gender*

Malarbi et al. (2011); Kim et al. (2010); Yu et al. (2010); and Stamper, M., et al. (2014) found that there was no statistical difference between the age, and the latter authors, also found no significant difference in gender of the retrospective group compared to the implemented group. Radtke (2010) found that young and old age are risk factor for ED. Both Chen et al. (2014) and Yu et al. (2010) found that ED occurred more in male patients. Wilson (2012) found that ED was more prevalent in young military members and related the prevalence of ED in this age group to the position of the young soldiers compared to the senior military; according to the survey, young soldiers were commonly in the front lines and were more vulnerable to traumatic brain injury, additionally, older soldiers, due to maturity have better coping mechanisms by being able to express themselves verbally and have other methods of coping. Additionally, Wilson expanded this study in 2014 and found that military members whose age was less than 30 years old was acknowledged by military nurse anesthetologists as a large risk factor for ED (Wilson, 2014).

### *Chronic Illness and Medical Background*

Burns (2009) and Lovestrand et al. (2013) emphasized the importance of complete history of patients, especially, regarding medications used. In Burns' case study, hemodynamics of a patient were stable in the perioperative phase and the patient did not receive any premedication for the face-lift cosmetic surgery and had no known systemic diseases. The patient suddenly manifested ED in the PACU and the health care member was informed, from a family member, about the patient's history of antidepressant use containing benzodiazepines and the dosage was left unknown. Burns (2009) found that depression in combination with antidepressant usage affected the central nervous system, which is potentiated to the increase of likelihood in acquiring ED.

Meanwhile, Lovestrand et al. (2013) conducted two case studies; first, a patient

diagnosed with PTSD and taking psychiatric medication had not provided this information to the perioperative medical team; under these circumstances, the anesthesiologist did not perceive behavioral changes in the patient after the surgery to be related to ED. In the second case, the patient disclosed that he had traumatic brain injury and was diagnosed with posttraumatic stress disorder and had no history of drug abuse. In this case, the health care staff prepared by making a care plan in providing optimum comfort to the patient and avoided unnecessary noxious noise and provided optimum analgesia especially in the emergence phase to avoid possible agitation brought by the entire surgery course. A study conducted by Wilson (2014) found that, military veterans who suffered with psychological problems including posttraumatic stress disorder (PTSD), anxiety and depression are at high risk for developing ED.

Antidepressants such as benzodiazepines are shown to increase the risk of developing ED (Wilson, 2014; Chen et al., 2014). Lepou    et al. (2006, p. 750) indicate that in their study, the usage of benzodiazepines before surgery was shown to double the risk of ED, additionally, Chen et al. (2014) considered long term use of benzodiazepine as an independent predictor for agitation during emergence from anesthesia. Lepou    et al. (2006) found that pre-existing illnesses reduced the incidence of emergence delirium and that a long history of antidepressant use and antipsychotic drug use were noted commonly in non-agitated patients.

In the ASA physical status classification system, both Radtke (2010) and Yu et al. (2010) found no significance towards ED. Lepou    et al. (2006) tabulated the correlation of ASA in agitated and non-agitated patients as represented in Table 3 below.

ASA	Non-agitated	Agitated
I- Normal and Healthy Patient (ASA, 2014)	30%	46%
II- A patient with mild systemic disease (ASA, 2014)	45%	40%
III- A patient with severe systemic disease (ASA, 2014)	22%	13%
IV- A patient with severe systemic disease that is a constant threat to life (ASA, 2014)	1%	0%

Table 3 Relationship of ASA to ED according to Lepousé et al.

### 7.2.2 Precipitating Factors

Precipitating factors are the components that contribute or trigger the development of the phenomena (Emergence Delirium). These factors are essential in the development of diseases, conditions, or injury (Reference MD, 2012; Thimrick, 2002).

#### *Anesthesia*

A study conducted by Lepousé et al. (2006, p. 748-751) revealed that inhaled anesthetics caused more agitation in patients than those who received Propofol; the study also found that there was no significant difference found in agitation depending on the type of inhalation anesthetic used and neuromuscular block usage resulted in significantly more agitated patients (61%) than non-agitated patients (40%). Wilson's (2014) study found that 64% of respondents believed that ED is related to the type of anesthesia used – 88.6% of respondents believed ED occurred due to potent

inhalation anesthesia and 63.6% believed ED occurred due to Ketamine.

There were 63% in the sevoflurane group who yielded  $\geq 16/20$  in PAED scale while, 53% in the propofol group during the evaluation conducted by Pieters et al. (2010), subsequently, the extubation time (end of surgery until extubation) and postoperative nausea and vomiting was higher in the propofol group than the sevoflurane group; however, the length of stay in PACU and hospital in general was the same between the sevoflurane and propofol group.

Wilson and Pokorny (2012) found that total intravenous anesthesia was the best type of anesthesia for patients with traumatic brain injury and PTSD – many respondents believed that emergence from anesthesia was smoother when total intravenous anesthesia was given to patients experiencing symptoms of ED. Three participants found that Ketamine was ideal for alleviating ED; the combination of Ketamine with total intravenous anesthesia was shown to alleviate ED and had a positive correlation with smoother anesthesia emergence (Wilson and Pokorny, 2012). Radtke et al. (2010) found that the type of anesthesia had significant influence on development of emergence delirium (0.3% chance of non-reliability) and that patients who received etomidate as anesthesia showed more frequent occurrence of ED (12.6%) compared to those who received Propofol (3.8%; 0.1% chance of non-reliability) and thiopental (5.2%; 1.6% chance of non-reliability). Higher incidence of ED was noted in patients who received fentanyl (3.7%; 0.5% chance of non-reliability) compared to those who received remifentanyl (2.3%; 0.5% chance of non-reliability) intraoperatively.

Yu et al. (2010) found that postoperative agitation was more common in patients who received general inhalation anesthesia than in patients who received total intravenous anesthesia; Doxapram was found to be the highest risk factor (95% confidence reliability of findings). Lovestrand et al. (2013) found that a patient in their first case study, who received a combination of midazolam, fentanyl, lidocaine, propofol and hydromorphone intraoperatively exhibited symptoms of ED compared to a patient in their second case study, who received a combination of midazolam, fentanyl, propofol, ondansetron, dexamethasone, ketorolac and clonidine as well as bupivacaine as a



local anesthetic had a smoother emergence from anesthesia. In Chen et al.'s (2014) study, total intravenous anesthesia had no significance in causing ED when dependent on shorter or longer duration of anesthesia. A large proportion of patients who experienced ED in Chen et al.'s study received a balanced mixture of anesthesia including neuronal depressants and inhalants; a higher occurrence of ED was noted when induction lasted longer than five to seven hours.

Yu, et al. (2010) found that ED was significantly increased when inhalational agents were used compared to total intravenous anesthesia (TIVA). Pieters et al. (2010) found no difference between inhalation agents and total intravenous anesthesia TIVA administration. Burns (2009, p. 67) found that blocking muscarinic cholinergic receptors in the central nervous system, so called "central anticholinergic syndrome" could precipitate delirium after induction of anesthesia.

### *Surgery*

Both Kim et al. (2010) and Burns (2009) found no relevance between ED and vital signs. In Kim's study there were no significant hemodynamic changes found, and vital signs were completely stable on the case study conducted by Burns both intraoperatively and during the PACU stay.

Using the Pediatric Anesthesia Emergence Delirium Scale (PAED scale), Stamper et al. (2014) has identified endoscopy (17.7%), general surgery (13.1%) and orthopedics (11.1%) as the top three highest types of surgery causing ED in children using PAED scale. Yu et al. (2010) found more incidences of ED in ENT and oral cavity surgeries.

Lepousé et al. (2006) found that agitation increased 5 times more in breast surgery and 3 times more in abdominal operation. In patients who underwent endoscopies, there were more non-agitated patients (12%) compared to agitated patients (1%) and the average length of delirium was 15-20 minutes.

Lepousé also found that, the longer the surgery duration, the higher the chance of developing ED postoperatively, and when patient exhibits signs of ED, the length of stay will also be longer. Lepousé et al. (2006), found that patients who had surgery

within the past 3 three months were at risk for agitation during emergence after surgery. Radtke (2010) found that patients with hypoactive emergence stayed longer (8.2 days) compared to patients with normal emergence (5.2 days). Yu et al. (2010) found that patients with ED after the surgery had longer hospital stays compared to non-agitated patients. Lepousé et al. (2006) did not find an impact on the interval between the admission and day of surgery to the incidence of ED.

A study conducted in China regarding risk factors and consequences of ED in patients who underwent elective craniotomy for brain tumor by Chen et al. (2014), ascertains that frontal approach of the operation is an independent risk factor due to the brain functions of the frontal lobe that delicately play a role in cognitive and emotional behavior. Location of tumors in the frontal lobe of the brain was not found to cause ED; the authors did not find a rationale for why this would be the case. In the same study, episode of ED was expected at least within 12 hours of surgery.

#### *Physiological discomfort*

Lepousé et al. (2006) found that suspected causes of ED in their studies were related to physiological discomforts such as tracheal tubes in 51.5% of participants, pain in 19.6% of participants, the need to urinate and indwelling catheters in 4.5%, neuromuscular block in 3%, acute urinary retention in 3% and intolerance to oxygen catheters in 3% of participants. Lepousé et al. describe that the frequent urge to urinate as a contributing factor toward developing emergence delirium as patients are often caught off guard or are not properly informed of prior insertion of indwelling catheters responsible for urine elimination after surgery. Consequences of ED in the same study were listed, wherein self-extubation was observed prominently (4.7%), injured patients (bruises) (3%), and injuries to the staff (4.5%), in some degree resulted to the staff members to restrain and calm the patient. Wilson (2014), found that traumatic brain injury and pain (86.8%) as the highest physiologic factor causing ED.

Lepousé et al. (2006, p. 752) found that endotracheal tube removal was associated with pain; hence, early removal of endotracheal tubes showed decreased intensity of

ED and exhibited calmer recovery process. In their study, pain was always expected during, and, as a result of surgery -- therefore, analgesic intervention was a part of the pre-planned outcome of surgery. ED was commonly observed in patients who had endotracheal tubes; they observed that the removal of endotracheal tubes as early as possible minimized the intensity of ED and patients exhibited a calmer recovery process. In Malarbi et al.'s (2011) study, 39.9% of participants had an agitated recovery and displayed similar signs of ED or definitive signs of ED due to pain and tantrums; 60% of participants in Malarbi's study had non-agitated recoveries.

### *Perioperative Anxiety*

Lepousé et al. (2006), found more non-agitated patients with identified preoperative anxiety in 15% of the participants, preoperative anxiety was positively correlated with the occurrence of agitation with 12% of agitated patients exhibiting signs of preoperative anxiety compared to 5% of non-agitated patients. Wilson (2014) listed the top five psychological factors according to his study and anxiety was second highest factor (84.8%) according to the military nurse anesthesia providers. Studies have shown that administration of antidepressants by anesthesia care providers as an anxiety relieving agent is prevalent however antidepressant agents such as benzodiazepine have paradoxical effects which cause irritability, aggressiveness and increase confusion (Wilson, 2014; Lepousé et al., 2006, p. 752). Meanwhile using the mother's recorded voice did not help reduce anxiety among pediatric participants and ED was also not affected by the content of the recordings (Kim et al., 2010).

## **7.3 Intervention**

In the 14 articles analyzed, there are 12 articles that described interventions toward Emergence Delirium. The categories were divided into two, namely, alternative remedies and pharmacological interventions.

### 7.3.1 Alternative Remedies

Wilson (2012, p. 264 and 2014, p. 358) found that, military nurses ranked “talking to the patient” as the second most effective intervention during episodes of ED; actively listening to the patient was also found to be an effective intervention during episodes of ED. Another intervention found effective according to the survey in Wilson’s study suggests doing nothing and allowing time to lapse until signs and symptoms of ED disappear. Respondents in Wilson’s study perceived talking to service members and administering analgesics helped reduce ED by 89%. Wilson (2012) found that talking to patients and encouraging a dialogue ensured a smoother emergence from anesthesia; reorienting patients through communication, according to one respondent, was found to be 50% more effective in ensuring a smoother emergence from anesthesia.

Lovestrand et al. (2013) found that reorientation attempts of a military personnel experiencing ED by staff members was unsuccessful; the study also found that using military language and orders issued by fellow military personnel was also unsuccessful in reorienting the patient. Lovestrand et al. informed post anesthesia care unit (PACU) personnel to prepare postoperative pain control before the patient left the operating room in order to avoid uncontrollable pain in the postoperative period; the PACU was also informed of ensuring a minimally stimulating environment which promoted relaxation and quietness prior to the patient’s arrival. A study using mother’s recorded voice used towards ED conducted by Kim et al. (2010) found that the maternal recorded voice decreased ED more in girls compared to boys. The same study found that reducing external environmental noise even without music showed reduced spectral index (a monitor for determining the depth of anesthesia), which reduces the requirement of more administration of anesthesia resulting in rapid emergence.

In Lovestrand (2013) et al.’s study, the wife of a patient exhibiting signs of ED was brought in to sit by his bedside in order to promote familiarity during the patient’s emergence from anesthesia however this was found to be unsuccessful. In another patient case, similar staff and caregivers were available from the preoperative phase through to the postoperative phase in order to minimize confusion for the patient and

promote smoother emergence from anesthesia and orientation; the patient in this case experienced an eventless emergence from anesthesia. Wilson (2014, p. 359) has found that in combat veterans, instead of family, a “battle buddy” was present in the post anesthesia care unit to help alleviate ED, results showed that it was not considered the best essential intervention. Malarbi (2011) et al.’s study revealed that the presence of ED was 95% higher when the primary caregiver was absent during the emergence period.

### **7.3.2 Pharmacological Interventions**

The use of pharmaceuticals to treat emergence delirium has been debated (Lepoué et al. 2006; Burns, 2003). One frequent intervention used by 53.7% of respondents prior to induction of anesthesia, was to increase the dose of midazolam – this intervention was found to prevent or reduce ED in the study conducted by Wilson (2014); additionally the top intervention used by the military anesthesia provider in the same study was benzodiazepine administration. In Lovestrand (2013) et al.’s study, a patient experiencing postoperative nausea vomiting (PONV) while exhibiting signs of ED was treated with ondansetron, however this had no effect on PONV; promethazine was administered toward PONV with a successful outcome and the patient woke up from this treatment oriented and back to reality.

In the study conducted by Stamper et al. (2014), patients who experienced ED were either given fentanyl or dexmedetomidine according to anesthesiologist’s own preference because ED is self-limiting and resolves with time and there was no data collected on how anesthesiologists decided which medication to use, nor whether it was chosen due to pain or ED. Analgesics (fentanyl) and sedatives (propofol or midazolam) were used in controlling either pain or agitation after the craniotomy (Chen et al., 2014). Meanwhile, in the study done by Pieters et al. (2010), fentanyl is used either as a pain medication, or when the child is crying two-consecutive times within 5 minutes. In addition, Yu et al. (2010) asserted that proper analgesia postoperatively helped lessen ED.

## 8 Critical Review

In the critical review of our study, certain segments of Long's (2005) guidelines on critiquing mixed methods research are followed. As nurses, critical thinking is an important skill, which is learned -- questioning, the ability to see several sides of an argument and the development of objective, rather than subjective thinking is all encouraged within the nursing field (Ingham-Broomfield, 2014). The same concept of critical thinking and constructive approach is applied in research circles.

Ingham-Broomfield (2014) recognized any critical examination of research requires a fair and unbiased assessment; the critic should take into account the positive and negative implications of the methods utilized as well as its applicability in practice. A critical review must also be conducted in an objective, analytical manner in order to understand the core subject that steers the research; according to Ingham-Broomfield, the ultimate goal in critically evaluating any nursing research is to identify its usefulness in practice. In choosing the type of data, a peer review (critically reviewed by qualified experts; usually anonymous so authors and reviewers do not know its identity) will improve the research quality (Litman, 2012).

The authors used the evaluation tools for mixed methods study design by Long (2005). The criteria used are study evaluative review, study and its context, and lastly, ethics.

### 8.1 Study Evaluative Review

This section entails the bibliographic details, purpose and aim of the study and the evaluative summary (strength and weaknesses of the study, theory, policy and practice implementation). Source referencing is utilized and we used the Harvard citation style, so the readers will identify whose idea the authors are discussing; moreover, content analysis was used in this study, in order to make the data replicable and provide valid inferences (Elo and Kyngäs, 2007).

The purpose of this study entails wide range of scope therefore, there are pro's and

cons identified. The data used is not big enough thus this study suggests further research to develop the area of interest, however, this study has also found the gap in the context of perioperative intervention, which also implies the need of developing more study.

## **8.2 Study and Context**

Following Long's (2005, p. 1-2) guidelines of critical review, we critically examine the study's purpose and structure. What type of study is this? We can determine that this study followed a mixed methods research design, which utilized content analysis, specifically – deductive content analysis, in order to make sense of collected data related to the study's research questions. What is the relationship of the study to the area of topic review? The relationship between the study conducted and the utilization of a mixed methods review guideline is to critically review this study in the context of its research design, which is mixed methods; since the authors of this study analyzed results which were both qualitative and quantitative, mixed methods assigns itself as our primary research design.

Is sufficient detail given about the setting? Since this study was conducted solely on the basis of data analysis, a context setting was not established for our study due to access limitations as first-degree students; perhaps the results of our study can be more actual if or when applied to context settings in the future. What were the inclusion/exclusion criteria? This study utilized various inclusion and exclusion criteria of collecting data; these criteria are represented in Table 1. Perhaps a larger scope of inclusion and exclusion criteria could have been implemented for this study however we felt that based on the narrow scope of data available on ED, a concise and flexible set of criteria would be more productive.

Is there sufficient contrast of two or more perspective and insight into one single depth? We stayed neutral to contradicting findings in the results section to maintain objectivity but contrasted and interpreted these findings in our discussion section by presenting both positive and negative outcomes of our findings in relation to our

research questions. We tied our previous research, theoretical background and theoretical framework to our results and discussed all areas of our research in context to ED.

### **8.3 Ethics**

Obtaining ethical committee approval, and informed consent and addressing ethical issues are the components of the critical evaluative on ethics according to Long (2005). However in this study, there were no participants involved, thus, there was no need for ethical committee approval, and informed consent. Most of the data was gathered in the electronic databases, and dealt with articles; hence the major ethical issue was proper sourcing, how the data was obtained and keeping the integrity of the electronic database platform, which was discussed in the ethical considerations in the earlier chapter of this study. Charts and pictures that are included in this study as well as figures and tables, were rephrased and tabulated slightly different from the original but kept the same ideas, due to its copyright concerns.

The authors used reliable sources such as journals, and peer reviewed articles, and excluded commentary articles and articles that needed translation (non-English articles). Commentary articles were excluded, to maintain the scientific level of research. Peer reviews on the other hand were utilized, to enhance the validity of the study. And lastly, since this study is written in English, non-English articles were excluded, also to ensure valid inferences and to allow reproducing of the original data.

## **9 Discussion**

In the following section, implication of results are discussed, compared and contrasted relating back to previous research and the theoretical framework chosen for this study. In order to ensure that all results are discussed and interpreted, and to highlight the interpretation of all sub- and minor categories, the findings of the results have been bolded. In the beginning of the thesis, the research questions posed by the authors were: How can emergence delirium be prevented? What factors affect the occurrence



of agitation during emergence? Which alternative interventions exist for complications related to emergence from anesthesia?

Our results concerning the prevention of ED revealed only **capsicum patches** as an effective preventative method for ED. Wofford and Vacchiano (2011) indicated that there are currently no evidence-based methods used to prevent or treat ED; however, our results found one study conducted in Turkey by Acar et al. (2012), showing a 32% decrease in the presence of ED using capsicum patches placed on acupoints – the results of the study revealed that ED was entirely prevented by the use of capsicum patches when compared to a control group; hospital stay and recovery period were shorter in the test group. According to Chen et al. (2014) and Lovestrand et al. (2013), clarification of the risk factors will help identify the high-risk patients and help establish preventive measures for ED.

Our findings on the prevention of ED accounted for 7.1% frequency in relation to our major categories, as there were not many studies, which claimed to prevent ED. In Acar et al.'s study, acupuncture was found to decrease ED by 28% and more effective than the administration of midazolam and analgesics administered intraoperatively. Further studies would need to be conducted on a broader patient group in order to determine the reliability and effectiveness of capsicum patches on ED, given that, Acar et al.'s study was conducted on fifty children undergoing elective adenoidectomy or tonsillectomy surgeries. Munk et al.'s (2013) literature review highlights the scarcity of research regarding prevention of ED and our results reveal that research regarding prevention of ED is still scarce, however, our results reveal that a potential for further research remains regarding the use of capsicum patches to treat and prevent ED.

In this study, the majority of results discussed identified risk factors of ED. In the risk factors category, **anesthesia** 58% was discussed the most. Lepousé et al. (2006); Wilson (2014), Pieters et al. (2010); Yu et al. (2010); and Chen et al., 2014 agreed that the risk for ED is higher when inhaled anesthesia is administered. Key et al., 2010 suggested that high incidences of agitated emergence accompanied by sevoflurane and desflurane (potent inhalational agent) use is thought to be due to the low-blood

gas solubility and fast recovery characteristics of the drug. Moreover, Uezono (2000) added that sevoflurane has indicated higher incidence of ED and yet, is commonly used to maintain anesthesia in children because of its advantages such as lower solubility and better hemodynamic stability than other anesthetic inhalants and has a more tolerable odor to children. Evidence found by experimenting on animals showed that excitatory response to the locus coeruleus neuron caused by inhalational anesthesia, which involves adrenaline excitation, has been traced to cause ED (Stoicea, 2013).

On the subject of anesthesia use, total intravenous anesthesia (TIVA) has been compared to many studies with potent inhalational anesthesia (PIA), and with regards to this comparison most authors agreed that propofol (TIVA) decreases ED incidence compared to sevoflurane (PIA) (Yu, 2010; Wilson, 2014; & Lepousé 2006); additionally, according to Wilson and Pokorny (2012), total intravenous anesthesia was the best type of anesthesia. However, due to its perioperative perspective, propofol use does not secure a patient from developing ED, especially taking into consideration the study conducted by Burns (2009), where a patient manifested ED although the patient was maintained with propofol. However, Burns (2009) linked that probability to the non-disclosed history of sleeping pills and antidepressant usage whereas Pieters et al. (2010) found no difference between PIA and TIVA.

A quantitative study conducted by Stamper, et al. (2014) revealed two prominent risk factors identified in this study. First, according to statistical results, there are higher incidences of ED in patients who received sevoflurane to maintain anesthesia. Another point is, 95% of anesthesiologists increased midazolam (a benzodiazepine) preoperatively to help decrease anxiety, which has been found to be another individual risk factor, that doubles the chance of developing ED. Stamper, et al. (2014) pointed out that, the confounding effects of two medications received perioperatively prior to emergence leaves the probability of developing behavioral change during the emergence period; hence, given these points, current research discloses that, ED is an interconnecting consequence of the perioperative setting.

**Chronic illness and medical background** was a risk factor found for ED. In Burns' (2009) study, lack of proper information about a patient's use of antidepressants lead to the progression of ED as information about the patient's medical history was not accounted for prior to the patient's surgery. In a literature study conducted by Stoicea et al. (2013; p. 16), chronic illness, long-term antidepressant use and benzodiazepines were all found to be risk factors for agitation in the PACU. Burns also found that depression along with the use of antidepressants contributed to the development of ED; PTSD, traumatic brain injury and benzodiazepine use were also found to be risk factors for ED in our study (Lovestrand et al., 2013; Wilson, 2014; Chen et al., 2014; Lepou    et al., 2006).

There were disparities in findings regarding the ASA physical status as Yu et al. (2010) and Radtke et al. (2010) found that ASA physical status had no correlation to ED, however, Lepou    et al. (2006) found that ASA physical status, when compared to non-agitated patients, was positively correlated to agitated patients. Disparities in ASA findings could be due to variations in measurement variables -- it is interesting to note that in Yu et al.'s (2010) study, ASA degrees are limited from I - II and Radtke et al. (2010) examine ASA degrees I - IV by combining degree I with II and III with IV. Lepou    et al. (2006), however, examine ASA in its entirety and individual degrees from I - IV; Lepou    et al.'s findings suggest that levels of agitation vary depending on the degree of ASA, thus, the authors of this study have to consider the possibility that the latter two studies did not assess ASA variables to its full capacity as omitting certain degrees of ASA or combining degrees limit additional findings which may relate ED to ASA physical status.

In Lepou    et al.'s study, we also found that pre-existing illness was correlated to a lower incidence of agitation; the authors ascribed this finding to patient's comfort levels regarding surgery as a lower incidence of agitation in patients with chronic illnesses possibly indicate that patients are used to hospital environments and health procedures, thus, decreasing anxiety which is a major component towards the development of agitation. Lepou    et al. found that antidepressant and antipsychotic medication use was commonly noted in *non*-agitated patients; the authors ascribed

this finding to the lengthy half-life of anxiolytics which had an effect on patients' cognitive status throughout surgery, therefore, inhibiting adverse cognitive changes which resulted in agitation.

Many of the findings concerning **physiological discomfort** correlated with this study's previous research; in Lepou    et al.'s (2006) study, physiological discomfort is extensively discussed in relation to ED. In our previous research, Hudek (2009) discussed various physiological discomforts, which are known to exacerbate agitation such as pain, urinary retention and endotracheal tube removal among others. A large part of previous research in this study focused on discomfort of patients experiencing agitation; the comfort theory, as discussed earlier relates towards easing physical discomfort experienced by patients -- Kolcaba later applied this theory in the post anesthesia care unit setting and will be discussed in detail below. In interpreting physiological discomfort and its relationship to ED, we can discern that current research focuses on physiological discomforts as being a significant proponent towards agitation during emergence from anesthesia.

Type of **surgery** also affected the incidence of ED; Lepou   , et al. (2006) found that breast and abdominal surgery increased the risk of ED, meanwhile Yu, et al. (2010) found that Ear Nose and Throat (ENT) operation was a risk factor. The study conducted by Chen, et al. (2014) concerning craniotomy for brain tumor patients, show that, anterior opening of the brain and removal of tumors increases the risk for ED. However, Chen (2014) pointed out that when patient has a tumor in the anterior portion of the brain, the tumor itself does not precipitate cognitive behavioral change or agitation in patients, however when the tumor is surgically removed through a frontal approach, consequences of the surgery increases ED. This phenomena could be attributed due to the fact that, the brain functions of the frontal lobe delicately play a role in cognitive and emotional behavior (Chen, et al. 2014), and during the surgery, some parts of the brain functions will be removed, together when the tumor is being removed; meanwhile, if the tumor is just located in the frontal lobe and no intervention is taken, the brain is intact and no external factors contribute to the occurrence of ED.

In Cerejeira et al.'s study, inflammation had an impact in the development of delirium during emergence from anesthesia after experiencing traumatic event to the tissue caused by surgery (Cerejeira et al., 2012; Strøm, 2014; Stoicea, 2013). Much of the previous research in this study discussed surgery as an ingrained component of ED and not a risk factor; however, our results show that surgery is currently being discussed as a risk factor for ED in various studies.

Other predicted factors will help nurses and doctors be prepared for future occurrence of ED (Lovestrand et al., 2013; Chen et al., 2014). However, in this study, **age** was twice as much (33.3%) in not affecting the incidence of ED compared to 16.7%, which revealed ED is influenced by age. Yu et al.'s findings suggested that age was not a factor correlated with postoperative agitation and the study included participants aged 16-70 years old. On the contrary, Key et al. (2010) and Munk et al. (2013) asserted that ages 2-5 years old is the peak of ED in children and gradually declines in the age of 62 months, and the overall rate of ED in children is between 10% to 67%; due to young age, lack of life experience and developmental barriers deter them from understanding complex situations, causing elevations of fear.

However according to Wofford and Vacchiano (2011), the adult patient population is commonly affected. Given our prior understanding of the broad range of patient populations affected by ED, Yu et al.'s findings with regards to the age range of participants may be limited. Moreover, Hudek (2009) considered a probability to why ED takes longer to happen in geriatric patients; it may be affiliated to the slower rate of anesthesia metabolism due to older age. Due to vulnerability caused by old age, Strøm et al. (2014) added that in sedating elderly patients, failure to consider the pharmacokinetics and pharmacodynamics of the geriatric patients results in overdose, which relatively triggers cognitive alterations.

There were not many studies that included **gender** in identifying the risk factors for ED, but 25% showed that male patients were risk indicators, two studies considered male as a dependent factor, but in using the mother's recorded voice in preventing ED, the results yielded that recorded mother's voice resonated with and helped girls

compared to boys. According to Bhaskar (2013) female population has been found to have rapid emergence compared to men, and the reason is suggested to be due to gender pharmacokinetic differences. However, studies utilized were too limited to claim that male gender as a compelling factor for ED, thus further studies may be required.

It was largely established in our previous research that **perioperative anxiety** was a recurring factor linked with ED however anxiety was not found to be a risk factor in the study conducted by Lepousé et al. (2006). It is important to note, however, that in Lepousé et al.'s study, anxious patients were not always included in analyses. Nurses who assessed for signs of emergence delirium had access to preoperative findings leading to occasional bias in findings and authors concluded that anxiety is at the heart of ED despite finding anxiety to not be a risk factor in their study.

Conveying good communication entailing reorientation, implementing conversation with the patient, and actively listening were found to be a good **alternative remedy** during ED in a study conducted by Wilson (2012, 2014). However, an attempt to reorient a patient experiencing ED in Lovestrand et al.'s (2013) study was unsuccessful. In our previous research, it was determined that commands given by healthcare professionals were also unsuccessful as patients experiencing ED were unable to comply (Wells and Rasch, 1999, p. 1308-1310). According to Hudek (2009), important nursing care for patients experiencing ED is identifying the underlying cause of disturbed behavior, which could also be physiological discomfort experienced by the patient such as urinary retention, pain, electrolyte imbalance, hypotension, increased intracranial pressure, and many more. Given this, the authors of this study reiterate that caring for ED is to consider holistic perioperative nursing management.

Another equally important intervention in the stressful surgical environment is familiarity. In our previous research, it was established that patients experiencing ED had difficulty relating to familiar objects and did not recognize their family members (Wells and Rasch, 1999, p. 1308-1310). Wilson (2014) claimed that it was not the best essential intervention. Lovestrand et al. (2013) tested this remedy by having the wife of

the patient by his bedside; however, this was not successful in reorienting the patient. In the second case, familiar staff took care of the patient perioperatively and the patient experienced smooth emergence. In children, listening to the mother's recorded voice (Kim, 2010), and the presence of the primary caregiver (Malarbi, 2011) significantly helped children towards normal emergence. As previously stated, developmental issues of the children are the major reason for anxiety elevation due to the inability to understand the complexity of the surgical process that have been postulated and linked to ED (Key, 2010). The pharmacological intervention of ED has been largely debated (Hudek, 2009; Neugeborn, 2009; Lepousé, 2006; Burns, 2003); in Lepousé et al.'s study it was revealed that the use of benzodiazepines prior to surgery that is intended to reduce anxiety levels showed a positive effect towards preoperative anxiety; however, according to Lovestrand et al., 2013; Wilson, 2014; Chen et al., 2014; and even Lepousé et al., 2006, midazolam which is a family of benzodiazepines are also known to have and is related to contradictory effects which causes aggressiveness, confusion and irritability. It is interesting to note however, that benzodiazepines are known to be a protective method in treating delirium in elderly patients (Lepousé et al., 2006).

In the study conducted by Stamper (2014), patient were given extra fentanyl (opiate analgesia) or dexmedetomidine (sedatives) and no were data collected on how anesthesiologists decide which medication to administer and whether it was used due to pain or ED, but Stamper asserted that this remains a probability to occurrence of ED. Munk (2013) has mentioned that extra use of medication could prolong the hospital stay of the patient, however, Chen (2014) emphasized the need of more sedatives due to the severity of the agitation and to prevent harm both the patient and the personnel, which is beneficial to institutional integrity according to Kolcaba. Pain was accounted as a risk factor by several authors (Aitken, et al., 2008; Maccioli et al., 2003; Hudek, 2009; Malarbi, 2011; Wilson, 2014; & Lepousé, 2006). And in postoperative setting a part of an important assessment is pain assessment (Rosdahl and Kowalski 2008), and fentanyl was the analgesic which is an opioid medication used, in the study conducted by Chen (2014); Pieters (2010); & Stamper, towards pain

(NIH, 2012; FASS). Yu (2010) found that good pain control helps promote smooth emergence, in addition, analgesics were used as a pre-planned intervention to prevent patient agitation and discomfort in Lepouse's (2006) study. Meanwhile, Pieters (2010) asserted that identifying ED from tantrum and pain, hence, when a child was crying two-consecutive times within 5 minutes, fentanyl was given to the child postoperatively.

In the qualitative study conducted by Lovestrand (2013), ondansetron which is a specific medication for postoperative nausea and vomiting was unsuccessful in helping PONV on patients experiencing ED, however, another antiemetic was tested called promethazine and shown to be effective towards PONV and help promote smooth emergence.

Our analysis revealed studies conducted on the non-pharmacological and alternative intervention towards ED as 42.8% of our results – the same percentage value of results we found on pharmacological intervention methods significant to ED. This result reveals that alternative intervention methods are equally significant to ED as pharmacological intervention methods; no studies regarding intervention were found to be non-significant towards ED.

Wilson and Kolcaba (2004) apply the comfort theory in the perianesthesia setting; in their study the concept of holistic comfort proved to be advantageous towards dealing with perioperative discomforts experienced by patients. In the study, Kolcaba's comfort theory is divided into the three holistic comfort needs starting with part one which was identified earlier in our theoretical framework: these comfort needs range from the physical, psychospiritual, sociocultural to environmental needs of patients; examples of part one of Kolcaba's theory applied in the perianesthesia setting include the financial stability of the patient, their cognitive status, outcome of surgery and community support. Considering our previous knowledge and results regarding ED, we can establish that the patient's cognitive status related to fear and anxiety plays a role in the development of further complications related to ED.

Financial stability of the patient is perhaps related to ED in the context of Lepouse et



al.'s (2006, p. 752) findings which indicate that ED is a costly phenomenon which requires increased staff presence and financial resources however the costliness of ED can also relate to part three of Kolcaba's theory which represents institutional integrity. Community support is identified with the significance of familiarity to patients experiencing ED. In Lovestrand et al.'s (2013) study, a familiar face such as the patient's wife did not have significance towards alleviating ED, nor did Wilson's (2014, p. 359) concept of introducing "battle buddies." However, Malarbi's (2011) study revealed that the absence of a familiar primary caregiver increased the odds of developing ED by 95%.

Part two of the theory involves the health-seeking behaviors that result consciously or subconsciously from the patient due to provision of comfort -- Kolcaba applies this part of the theory in the perianesthesia setting to vary from reduction in blood loss, less complications related to or from surgery, quicker recovery process, mobility and increased intake of fluids. Health-seeking behaviors which generate from comfort provision in patients experiencing ED would mostly relate to a calm and uneventful emergence from anesthesia as an uneventful emergence would indicate that comfort provided by the healthcare personnel has a positive effect in reducing complications related to surgery and ensures a quicker recovery process (Wofford and Vacchiano, 2011; Lovestrand, 2013).

Part three of the theory represents the institutional integrity of healthcare personnel who provide quality care, which is reliable, professional and ethical. The application of part three in the perianesthesia setting includes length of stay, cost of care, satisfaction of personnel involved and transfer rate of staff. Munk (2013) found that statistical reports of ED vary depending on the patient's population and the type of diagnostic tool used, he found that many studies used different kind of agitation scales in identifying ED, thus, guidelines for diagnosing ED is needed due to the lack of problem focus which can deter optimal care for the patients and lead to misuse of medications causing longer hospital stay and an increase in hospital cost.

During emergence from anesthesia, reorientation of the environment was found to be

a good precautionary step in preventing delirium (Wilson, 2012; Hudek, 2009). Circadian rhythm is frequently disturbed in patients experiencing delirium after surgery (Stoicea et al., 2013; Strøm et al., 2013) and a recent evidenced-based (2015) study conducted by Layne et al. included sleep intervention by using non-pharmacological methods such as dim lights, soft music, reduced noise and even decaffeinated hot tea, in addressing the sleep problem. However in this study, we found that there were not enough studies conducted in preventing ED. As previously stated, identifying risk factors will help healthcare professionals to prevent ED (Chen et al., 2014; Lovestrand, 2015).

There are three types of comfort interventions according to Wilson and Kolcaba, towards attaining maximum comfort for patients. First is the standard form of intervention, which aims to establish homeostasis including, monitoring the vital signs and lab results, and conduct patient assessments and act upon any changes observed. Hudek (2009), agreed by asserting that treating ED starts with the basics – maintaining the patient's airway as the top priority, then checking if the patient as difficulty of breathing or there is obstruction in the airway a chin lift maneuver can be done, she also added that in some cases chin lift maneuver is impossible during ED when the patient becomes restless and aggressive, thus nurses may use chemical restraints such as sedatives to relax the airway and taper laryngospasm; for the purpose that it can enable ease of breathing. In checking for the circulation, it is good to consider other alternatives than the finger, as the visible adhesive pulse oximetry is more uncomfortable and could add up to patient's restlessness.

Talking to and reorienting patients during emergence from anesthesia (Lovestrand, 2013; Wilson and Pokorny, 2012), allowing parents to escort children and be present during the entire surgery was tested and applied by Hudek (2009) and Kim (2010). Stamper et al. (2014) gives an example of a second type of comfort intervention, wherein Wilson and Kolcaba (2004, p. 164-165) termed it as "coaching." In the coaching process nurses will help relieve patients by providing reassurance, instilling hope and abundant information to the patient. Lastly, the third type of comfort

intervention, “comfort food for the soul”, aims to go beyond what physical intervention a nurse gives. This is when a patient feels strengthened and intangible, and the nurse offers personalized, memorable connections to the patient. This can be attained when the nurse gives time to the patient, by actively listening, holding and touching them and providing a suitable environment that is good for recovery according to the own needs of the patient.

Another example of comfort food for the soul intervention is music therapy, allowing patients to listen to music that they find soothing, or the mother’s recorded voice for children in order to give the child familiar auditory stimuli. The nurse must identify unattainable variables that could impede comfort intervention such as lack of financial resources, cognitive impairment that hinders appropriate intervention and comfort, but according to Wilson and Kolcaba (2004, p. 164-165) the nurse should not give up in providing comfort to the patient and trying to help patients *transcend* by providing *comfort food for the soul*.

## 10 Conclusion

Our results concerning the prevention of ED revealed that capsicum patches were the only category towards an effective preventative method for ED. The pre-eminent risk factors identified in our results, based on highest percentage revealed in our result analysis charts, were anesthesia, surgery, chronic illness and medical background. Major alternative interventions included communication, calm environment and familiarity.

As anesthesia being the major category found in this study, it was established that potent inhalational anesthesia is a high risk factor for ED. Communication and reorientation was found to be a good prevention and intervention method as well as pain management in easing discomfort faced by patients experiencing ED. In many cases of ED, patients received extra sedatives, which extended the length of stay and increased hospital costs. Benzodiazepines were a good intervention in dealing with

preoperative anxiety, however, it was found to be a high-risk independent factor of developing cognitive and motor dysfunction during the emergence state. Mostly pediatric and male patients were vulnerable to ED.

This study has examined the nursing management of Emergence Delirium in the perioperative setting. We found that there are studies lacking in the prevention of ED, however, identifying predictable risk factors help prevent occurrence of ED. We believe that nurses should apply more comfort theory interventions to help improve outcomes of emergence as our results revealed that alternative intervention methods were just as effective as pharmacological intervention methods.

Our topic of research started off as a strange and interesting phenomenon, which had to be defined, understood and conceptualized in the context of nursing. We chose a research framework where theoretical knowledge could be developed before the topic of interest could be analytically interpreted. Current research on ED is limited in the general nursing field, yet, the phenomenon is observed frequently in nursing circles. Kolcaba's theory of comfort has never been applied towards ED; we noticed that Kolcaba's theory coincides with many of the comfort needs a patient experiencing ED may require.

This study's approach towards ED has been largely built on the concept of holistic comfort and holistic nursing care, which takes ED into consideration before, during and after its possible onset. ED is a phenomenon, which is experienced by most healthcare professionals in an uninvolved and impersonal perspective. During our quest for a deeper understanding of emergence delirium, a patient's perspective of ED was unveiled in a YouTube clip we came across entitled 'The Delirium Experience' posted by the Amsterdam Delirium Study Group; in the beginning of the video we were introduced to a patient testimony where the patient recalls an episode of delirium:

*"I never want to have surgery again. If I need to have a big surgery like open-heart surgery, I'd rather die. I'm petrified that I'd have another delirium. I don't think I would survive that."* (Amsterdam Delirium Study Group: [The Delirium Experience](#) 0:00 - 0:20)

We can never forget the look of terror in the patient's eyes; the way he recounted his testimony with genuine fear motivated us approach our study in a different light. We hope that our study contributes toward future research endeavors, healthcare professionals and patients in learning how to manage and help those who are afflicted with the perioperative complication called Emergence Delirium.

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## Appendix 1

Tabulates the list of articles used in the results of our study, which are referred to as Qualitative A1-A4 and Quantitative A1-A10.

Title	Author /Year	Aim	Method	Result
<p>Delirium During Emergence from Anesthesia: A Case Study. (<a href="#">Qualitative A1</a>)</p> <p>PubMed Central</p> <p>Limitations: Within the last 10 years: 2005 - 2015; Scholarly Peer Reviewed Journals, Full Free Text</p> <p>Search Terms: MeSH terms: Anesthesia AND Adverse Effects</p> <p>Result: 900</p>	Burns, M. S. 2009.	To inform critical care nurses working in the PACU that ED can occur after all types of anesthetic techniques.	A case study of a 47yr-old woman admitted in PACU and started experiencing ED due to intravenous anesthesia and not general anesthesia for plastic surgery. A literature review	Little research has shown about ED caused by intravenous sedation, and most of the patients do not withhold information about their previous medication use, thus delivery of anesthesia is individual and the nurses should know about the phenomena
<p>Posttraumatic Stress Disorder and Anesthesia Emergence (<a href="#">Qualitative A2</a>)</p> <p>EBSCO Host, CINAHL with Full Text</p> <p><b>Limitations:</b> Publication Date: 2005 - 2014; Scholarly Peer Reviewed Journals</p> <p><b>Search Terms:</b> TX (All Text)</p> <p>Emergence agitation</p> <p><b>Results:</b> 69</p>	<p>Lovestrand , D., Phipps, P., Lovestrand S. (2013)</p>	To present 2 case studies of patients who underwent complicated surgical procedures and argue that traditional methods of reorienting agitated patients who have PTSD are not effective.	Two case studies where case one represents the outcome of a situation where traditional methods of reorientation were utilized and case two represents the outcome of a situation where evidence-based interventions were utilized.	Proper risk identification of patients risk for ED will have better interventions. Factors included in this study are minimal stimulation of the environment, intraoperative sympatholytic therapy, and patient and staff education, but needs further study to improve the outcome of this study.

<p>Experiences of Military CRNAs with Service Personnel Who Are Emerging from General Anesthesia (<a href="#">Qualitative A3</a>)</p> <p>EBSCO Host, CINAHL with Full Text</p> <p><b>Keywords:</b> emergence AND qualitative AND delirium <b>Limitations:</b> Full Text; Published Date: 2005 -2015; Scholarly (Peer Reviewed) Journals <b>Results:</b> 2</p>	<p>Wilson, J., &amp; Pokorny. M. (2012)</p>	<p>To understand the military Certified Nurse Anesthetist in working with patients emerging from anesthesia with traumatic brain injury and post traumatic disorder patients.</p>	<p>A qualitative study using hermeneutic approach in understanding the ED from CRNAs.</p>	<p>TBI and/or PTSD and ED have been shown to be an important topic for military personnel who require general anesthesia. Battlefield anecdotal evidence has shown the possibility of a relationship between ED and TBI and/or PTSD.</p>
<p>Army Anesthesia Providers' Perception of Emergence Delirium after General Anesthesia in Service Members (<a href="#">Qualitative A4</a>)</p> <p>EBSCO Host, CINAHL with Full Text, PubMed Central <b>Keywords:</b> Delirium Epidemiology <b>Limitations:</b> Full Text; Publication Date: 10 years <b>Results:</b> 381</p>	<p>Wilson, J. (2013)</p>	<p>Investigate ED among service members through the CRNAs perception, and explore the seriousness of the patient's behaviors and the consequences relevant to ED.</p>	<p>The following perceptions were examined: (1) the extent and seriousness of ED in service members, (2) effects of ED on the safety of service members and operating room/post anesthesia care unit personnel, and (3) behaviors relevant to ED in service members.</p>	<p>The result revealed that 78% of the military anesthesia provider witnessed ED, and 38% among them considered the intensity of ED problem as moderate, and the behavior mostly elicited by patients were hyperactive motor (pulling of the monitor equipment and other disruptive movements).</p>

<p>Emergence Delirium in adults in the post-anesthesia care unit (<a href="#">Quantitative A1</a>)</p> <p>PubMed Central</p> <p><b>Limitations:</b> Within the last 10 years: 2005 - 2015; Scholarly Peer Reviewed Journals, Full Free Text</p> <p><b>Search Terms:</b> MeSH terms: Psychomotor agitation</p> <p><b>Result:</b> 145</p>	<p>Lepouse, C., Lautner, C., A., Liu, L., Gomis P., Leon A. 2006</p>	<p>ED is poorly understood in the PACU. The aim of this study is to determine the frequency and risk factors of emergence delirium in adults after general anesthesia.</p>	<p>Prospective study including 1359 patients. Risk factors of emergence delirium were determined according to Riker agitation scale. Groups were divided depending on whether agitation occurred or not, exclusion of patients with preoperative anxiety and neuroleptics.</p>	<p>Sixty four (4.7%) developed delirium in the PACU displaying thrashing, violent behavior, removal of catheters and intubation tubes. Preoperative anxiety was not found to be a risk factor for ED in this study. The study found that previous illness and long-term antidepressant usage decreased the risk of ED. Preoperative medications, benzodiazepines, breast surgery, long duration of surgery were all found to be risk factors for ED.</p>
<p>Pharmacological, Physiological, and Psychological Characteristics Associated with Emergence Delirium in Combat Veterans (<a href="#">Quantitative A2</a>)</p> <p>EBSCO Host, CINAHL with Full Text</p> <p><b>Limitations:</b> Publication Date: 2006 - 2014; Scholarly Peer Reviewed Journals</p> <p><b>Search Terms:</b> Anesthesia Delirium</p> <p><b>Result:</b> 140</p>	<p>Wilson, J. 2014</p>	<p>Investigate the perceptions on ED, pharmacologically, physiologically, and psychologically associated with ED through the US Army Anesthesia Providers. And to develop clinical data of the combat army veterans who had received anesthesia</p>	<p>An online survey was sent to all active-duty Army anesthesia providers with a response rate of 34%.</p>	<p>67.1% of the Anesthesia providers agreed that ED is caused by anesthesia type of choice, and ketamine and Inhalational anesthetic agent are the most leading cause of the emergence in combat veterans.</p>

<p>Capsicum plasters on acupoints decrease the incidence of emergence agitation in pediatric patients (<a href="#">Quantitative A3</a>)</p> <p>EBSCO Host, CINAHL with Full Text</p> <p><b>Limitations:</b> Publication Date: 2005 - 2014; Scholarly Peer Reviewed Journals</p> <p><b>Search Terms:</b> TX (All Text)</p> <p>Emergence delirium</p> <p><b>Results:</b> 80</p>	<p>H. Volkan Acar, Ahmet Yilmaz, Gamze Demir, Solmaz Günal Eruyar &amp; Bayazit Dikmen (2012)</p>	<p>To determine the effect of capsicum plasters on acupoints for decreasing emergence agitation in pediatric patients undergoing tonsillectomy and/or adenoidectomy</p>	<p>Fifty patients who were undergoing tonsillectomy and/or adenoidectomy were included in the study; patients were divided into two groups and capsicum plasters or placebo plasters were placed on certain acupoints preoperatively. Pain, emergence agitation and side effects of plasters were monitored for 15 minutes postoperatively.</p>	<p>Incidence of emergence agitation and postoperative side effects were lower in acupuncture groups than in the placebo group. Recovery period was also shorter in the acupuncture group. Capsicum plasters applied on acupoints provides a choice in prevention of emergence agitation in children.</p>
<p>Incidence, Risk Factors and Consequences of Emergence Agitation in Adult Patients after Elective Craniotomy for Brain Tumor: A Prospective Cohort Study (<a href="#">Quantitative A4</a>)</p> <p>PubMed Central</p> <p><b>Limitations:</b> Within the last 10 years: 2005 - 2014; Scholarly Peer Reviewed Journals</p> <p><b>Search Terms:</b> (All Fields)</p> <p>Emergence agitation</p> <p><b>Results:</b> 2850</p>	<p>Lu Chen, Ming Xu, Gui-Yun Li, Wei-Xin Cai, Jian-Xin Zhou* (2014)</p>	<p>To identify the incidence rate, risk factors and consequences of agitation during emergence, in patients after elective craniotomy.</p>	<p>In a neurosurgical ICU in a university hospital, patients were screened on daily basis after elective craniotomy under general anesthesia. No routine was changed. Riker's sedation-agitation scale was used to identify the severity of the agitation during emergence. Riker's SAS scale was documented in an hourly basis, and nursing records were reviewed daily. Four investigators daily confirmed the maximal SAS.</p>	<p>Elective craniotomy for brain tumors has showed high emergence agitation, and extra careful for patients who had frontal approach craniotomy with balanced anesthesia.</p>

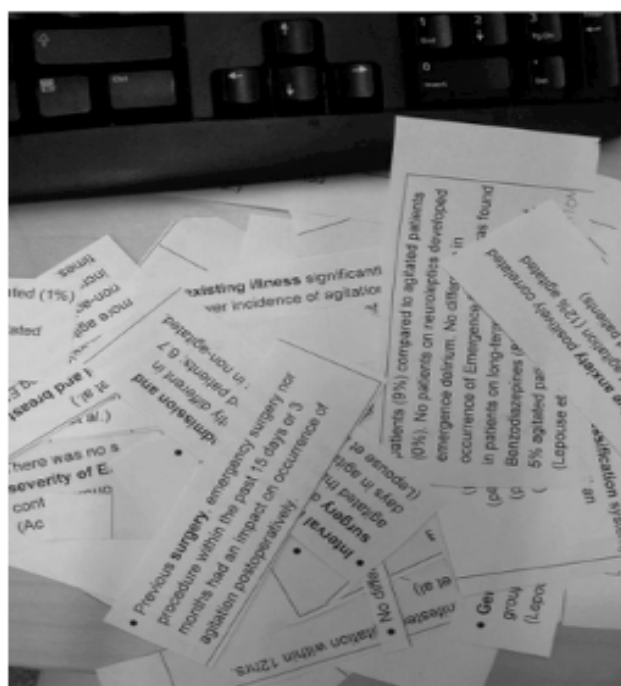
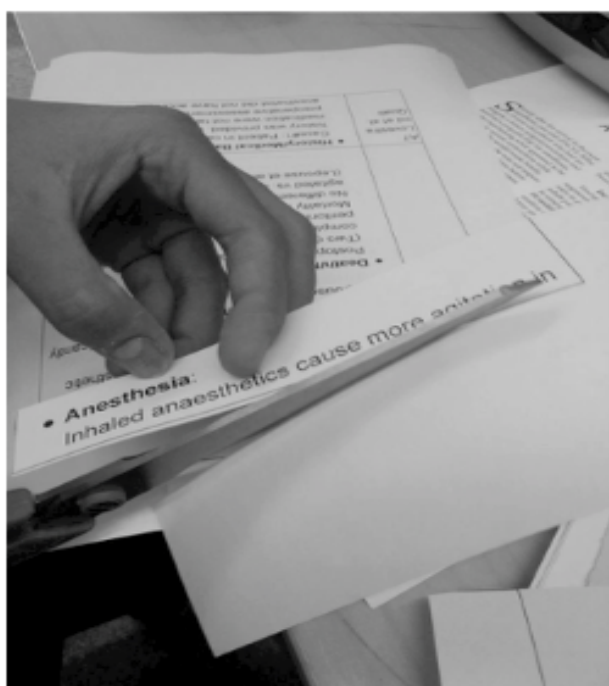
<p>Identifying Pediatric Emergence Delirium by Using the PAED scale: A Quality Improvement Project (<a href="#">Quantitative A5</a>)</p> <p><b>Boolean/Phrase:</b> perianesthesia nursing</p> <p><b>Limitations</b> Full Text Published Date: 2005-2015 Scholarly (Peer Reviewed) Journals Language: English</p> <p><b>Results:</b> 291</p>	<p>Stamper, M., Hawks, S., Taicher, B., Bonta, J., &amp; Brandon, D. (2014).</p>	<p>Evaluate ED identification in children using PAED scale.</p>	<p>Compared PAED scale to the known used agitation scale in adult (LOC-RASS) and assessed if patient's cognitive change after some identified factors affected emergence delirium such as (age, gender, medical diagnosis (ADHD), premedication with midazolam, parental presence, type of surgery and type of anesthetic agent used). And assess the fidelity of PAED scale.</p>	<p>PAED scale was identified as more sensitive tool in identifying ED in pediatric population.</p>
<p>The effect of recorded maternal voice on perioperative anxiety and emergence in children (<a href="#">Quantitative A6</a>)</p> <p>EBSCO Host, CINAHL with Full Text</p> <p><b>Limitations:</b> Publication Date: 2005 - 2014; Scholarly Peer Reviewed Journals</p> <p><b>Search Terms:</b> TX (All Text) Emergence agitation</p> <p><b>Results:</b> 69</p>	<p>Kim, S., J., Oh, Y, J., Kim K., J., Kwak, Y. - L., Na, S. (2010)</p>	<p>Assess the impact of mother's recorded voice to children undergoing cardiac catheterization. And determined its effect to parents anxiety level prior and post surgery.</p>	<p>Children were under intravenous ketamine anesthesia, and divided into controlled group (had headphones without auditory stimuli) and mother's voice (MV) group. Demographic, hemodynamics and ED score were recorded and parent's anxiety levels were recorded before and after the procedure.</p>	<p>Mother's who recorded their voice and the controlled group has the same level of anxiety preoperatively and were lower after procedure. The children's anxiety levels were lower preoperatively in MV group but there was no difference in ketamine requirement between the two groups. ED was attenuated in MV group.</p>

<p>Emergence delirium and postoperative pain in children undergoing adenotonsillectomy: a comparison of propofol vs sevoflurane anesthesia (<a href="#">Quantitative A7</a>)</p> <p>Google Scholars and EBSCO</p> <p><b>Limitations:</b> Publication Date: 2005 - 2014; Journals Search Term: Emergence Delirium</p>	<p>Pieters, B., Penn, E., Nicklaus, P., Bruegger, D., Mehta, B., &amp; Weatherly, R. (2010)</p>	<p>To be able to know incidence and severity of ED and pain in patients who went through adenotonsillectomy maintained either with propofol or sevoflurane</p>	<p>Used PAED scale and CHEOPS (Children 's Hospital of Eastern Ontario Scale) in assessing ED and pain to patients who went through adenotonsillectomy maintained with either propofol or sevoflurane. Assessed also the PONV, parental satisfaction, hospital length of stay, and anesthetic complications.</p>	<p>The median PAED score has higher in sevoflurane (17) than propofol (14).</p>
<p>Characterizing the behaviour of children emerging with delirium from general anesthesia (<a href="#">Quantitative A8</a>)</p> <p>EBSCO Host, CINAHL with Full Text</p> <p><b>Boolean/Phrase:</b> emergence delirium</p> <p><b>Limitations</b> Full Text Published Date: 2005-2015 Scholarly (Peer Reviewed) Journals Language: English <b>Results:</b> 68</p>	<p>Malarbi, S., Stargatt, R., Howard, K., &amp; Davidson, A. (2011)</p>	<p>To distinguish the core behaviors of ED from pain and tantrum</p>	<p>Children 18 months to 6yrs old were observed upon emergence from general anesthesia and recorded behaviors through structured behavioral observation.</p>	<p>ED behaviors identified were non-purposeful movements, eyes averted, stared or closed, and nonresponsive, which were also not behaviors associated with pain and tantrums according to DSM-IV/V. Associated ED behaviors found in the study were irrelevant language, activity and vocalization</p>

<p>Emergence Agitation in Adults: Risk Factors in 2000 patients (<a href="#">Quantitative A9</a>)</p> <p>PubMed Central</p> <p><b>Keywords:</b> Anesthesia General/Adverse Effects <b>Limitations:</b> Full Text; Publication date: 10 years <b>Result:</b> 826</p>	<p>Yu, D., Chai, W., Sun, X., &amp; Yao, L. (2010)</p>	<p>Determine the ED incidence after general anesthesia in 2000 adult patients and examine the associated risk factors</p>	<p>The following risk factors were examined among the 2000 adult participants after general anesthesia such as: age, gender, ASA physical status, type of surgery, anesthesia technique (inhalational or intravenous), administration of neostigmine or doxapram, adequate postoperative analgesia, pain, presence of a</p>	<p>ED was higher after inhalational anesthesia compared to TIVA and more prevalent in male patients. Agitation was more common after oral cavity and otolaryngological surgery than after other types of surgery. Doxapram and pain were considered high risk factors. Other causes were the presence of a</p>
<p>Risk Factors for inadequate emergence after anesthesia: Emergence Delirium and Hypoactive Delirium (<a href="#">Quantitative A10</a>)</p> <p>PubMed Central</p> <p><b>Keywords:</b> Delirium Etiology <b>Limitations:</b> Full text; Publication Dates: 10 years <b>Result:</b> 710</p>	<p>Radtke, F., Franck, M., Hagemann, L., Seeling, M., &amp; Spies, C. (2010)</p>	<p>To identify the risk factors and determine the different types of inadequate emergence and examine the relationship of the length of stay in the hospital.</p>	<p>A prospective observational study was used in non-intubated patients, using the Richmond Agitation Sedation Scale (RASS) every 10 minutes in identifying different forms of not normal emergence in the recovery room. Emergence delirium was defined as a RASS score <math>\geq +1</math>, and hypoactive emergence was defined as a RASS score <math>\leq -2</math>.</p>	<p>Out of 153 patients who displayed inadequate ED, 93 were confirmed experiencing ED, and 60 among them displayed hypoactive delirium. Benzodiazepine as premedication, both younger and elder patients, induction of anesthesia with etomidate, high pain scale, and musculoskeletal surgery were identified as risk factors. Patients with hypoactive emergence had a significantly increased length of stay in the hospital.</p>

## Appendix 2

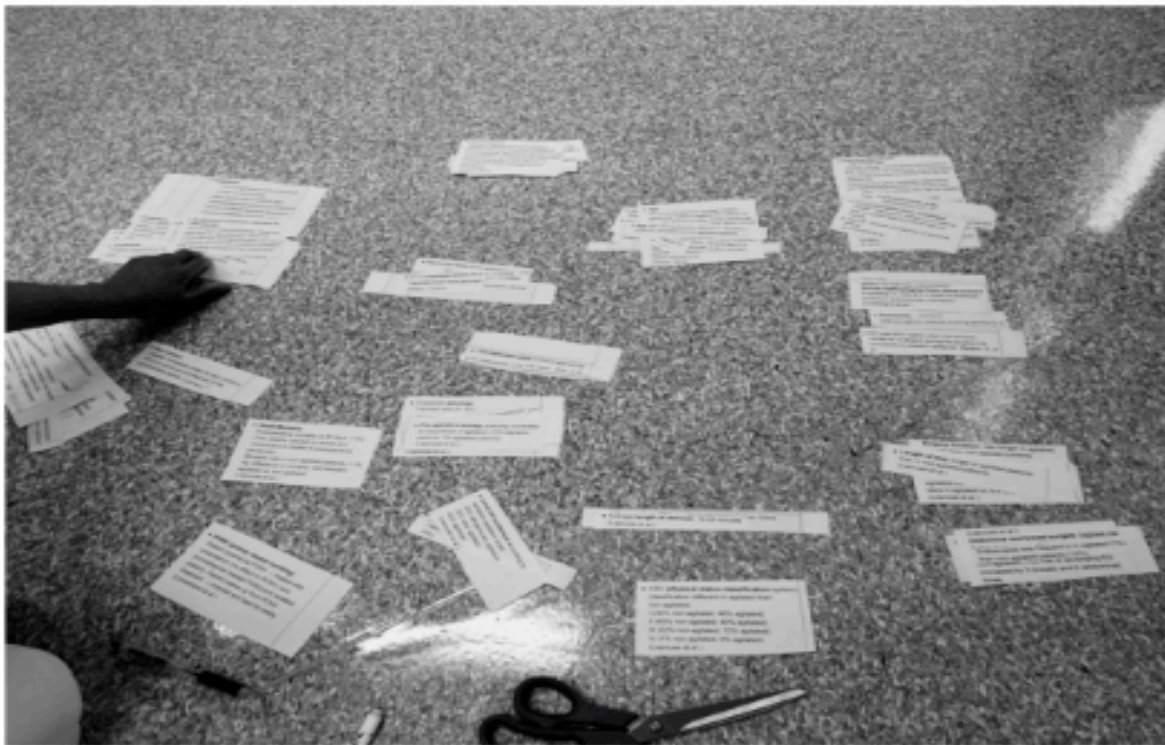
An illustration how the coded category were applied and how the authors tried to combine categories into subcategories and into a major categories. This was also the period where the authors used abstraction process and made a structured matrix, in utilizing all the identified categories.



The period where the authors used abstraction process and made a structured matrix, in utilizing all the identified categories.







### Appendix 3

#### Frequency of articles to major categories

Author	Prevention	Risk Factors	Interventions	Type of Article
Burns (2009)	0	II (2) 14.3%	I (1) (7.1%)	<b>Qualitative A1</b>
Lovestrand (2013)	0	II (2) 14.3%	II (2) 14.3%	<b>Qualitative A2</b>
Wilson & Pokorny (2012)	0	II (2) 14.3%	I (1) (7.1%)	<b>Qualitative A3</b>
Wilson (2013)	0	0	I (1) (7.1%)	<b>Qualitative A4</b>
<u>Lepouse</u> (2006)	0	III II (5) (35.7%)	1 (7.1%)	Quantitative A1
Wilson (2014)	0	IIII (5) 35.7%	II (2) 14.3%	Quantitative A2
Acar (2012)	I (1) (7.1%)	0	0	Quantitative A3
Chen (2014)	0	IIII (4) (28.6%)	I (1) (7.1%)	Quantitative A4
Stamper (2014)	0	II (2) 14.3%	I (1) (7.1%)	Quantitative A5
Kim (2010)	0	III (3) (21.4%)	I (1) (7.1%)	Quantitative A6
Pieters (2010)	0	I (1) (7.1%)	0	Quantitative A7
Malarbi (2011)	0	III (3) (21.4%)	I (1) (7.1%)	Quantitative A8
A13 Yu (2010)	0	IIII (4) (28.5%)	0	Quantitative A9
A12 Radtke (2010)	0	III (3) (21.4%)	0	Quantitative A10

### Sub-Categories

Minor category	Frequency	Percentage of categories' total frequency	Significance to ED	Non-Significance to ED
Age	III III I (7 As)	50.0%	→ 3 (21.4%)	→ 4 (28.6%) non-significance
Gender	III (3 As)	25.0%	→ 2 (14.3%) males	→ 1 (7.1%) no significance
Chronic Illness & Medical Background	III III I (7 As)	50.0%	→ 5 (35.7%) benzodiazepine use → 1 ASA (7.1%)	→ 2 (14.3%) no significance
Anesthesia	III III III (9As)	64.3%	→ 8 (57.1%) believed that ED was higher with inhalational anesthesia	→ 1(7.1%) No significance
Surgery	III III I (7 As)	50.0%	→ 5 (41.7%) believed type surgery is significant to ED	→ 2 (14.3) Vital signs had no significant effect → 1(7.1%) No significance
Physiological Discomfort	III (3 As)	21.4%	→ 2 (16.7%) believed physiological discomfort significant to ED	→ 1 (7.1%) No significance
Perioperative Anxiety	III I (4 As)	33.3%	→ 3 (25.0%) believed perioperative	→ 1(7.1%) No significance
			anxiety significant to ED	
Alternative remedies	III III (6 As)	42.8%	→ 6 (42.8%) believed alternative remedies were significant to ED	→ 0 No significance
Pharmacological Interventions	III III (6 As)	42.8%	→ 6 (42.8%) studies used medication towards ED	

## **Appendix 4**

This is an attachment of the link to the clip we came across that helped the authors understand and motivated in pursuing the study.

**Title:** Delirium Experience

**Uploader:** Amsterdam Delirium Study Group

**Link:** <https://www.youtube.com/watch?v=w113NkoGQHM>