



POST-OPERATIVE PAIN MANAGEMENT IN PEDIATRIC PATIENTS

A LITERATURE REVIEW

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Degree Thesis
Bachelor of Nursing
2017

DEGREE THESIS	
Arcada Department of Health and Social Work	
Degree programme:	Nursing 2016
Identification number:	19939
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Title:	Post-operative pain management in pediatric patients
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Commissioned by:	
<p>Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Post-operative pain is connected with psychological and physiological distress that may obstruct post-operative recovery and lead to increased depression and development of chronic post-surgical pain. Nurses are in the front line to witness the patient's suffering and pain, giving them greater duty to act upon promoting comfort and alleviation of pain. The purpose of this study is to provide a better understanding regarding post-operative pain in paediatrics in contrast to adults. The importance of the study is to narrow the gap in knowledge the pediatric nurses may be having. The theoretical framework used in this study was Kolcaba's theory of Comfort. The research question is two in one which is how do nurses assess and intervene in post-operative pain management in pediatrics and methodology followed is a literature review, with inductive data analysis. Four databases were searched for data retrieval which are CINAHL, Academic elite search, SAGE journals and PUBMED, resulting in a total of 10 articles selected for the findings.</p> <p>Findings indicated that pediatric pain assessment and intervention is a process that is in 5 stages documentation, pain scale selection, pharmacological/drug administration methods, non pharmacological methods and educational intervention.</p> <p>In conclusion, management of post-operative pain in pediatric patients could also be improved with the help of increased cooperation among healthcare professionals and parents, good planning, documentation, good routines, education about pain management and its consequences, pediatrics pain behavior might also as well improve the nurse's ability to manage the pain in pediatric patients. Post-operative pain management should be always put as a priority especially for pediatrics so as to decrease the short term and long term consequences that may come along with it. Recommendations are that research focusing on finding out whether post-operative pain is really being managed is highly encouraged.</p>	
Keywords:	Post-operative pain, infants, assessment, management, children, pediatrics, non pharmacological, pharmacological
Number of pages:	54
Language:	English
Date of acceptance:	4.12.2017

TABLE OF CONTENTS

TABLE OF CONTENTS	ii
ACRONYMS	iii
1 INTRODUCTION	1
2 BACKGROUND	3
2.1 Pain	3
2.1.1 <i>Types of pain and classifications</i>	6
2.1.2 <i>Myths, misconceptions and evidence of pain</i>	8
2.2 Post-operative pain	9
2.2.1 <i>Assessment tools of post-operative pain</i>	10
2.2.2 <i>Pain management strategies of post-operative pain</i>	13
2.2.3 <i>Pharmacological intervention</i>	14
2.2.4 <i>Non-pharmacological interventions</i>	15
3 THEORETICAL FRAMEWORK	17
3.1 Kolcaba's Theory of Comfort	17
3.1.1 <i>Conceptual framework for comfort theory</i>	18
4 AIM AND RESEARCH QUESTIONS	20
5 METHODOLOGY	21
5.1 Data collection	21
5.2 Articles used in the findings	22
5.3 Data analysis	23
5.4 Ethical considerations	26
6 FINDINGS	27
7 DISCUSSIONS	34
8 CONCLUSION	38
8.1 Strengths, limitations and recommendations	39
REFERENCES	41

ACRONYMS

AAP	American Academy of Paediatrics
IASP	International Association on the Study of Pain
EFIC	European Federation of the IASP Chapters
WHO	World Health Organization
CNS	Central Nervous System
POP	Post-operative Pain
NIPS	Neonatal Infant Pain scale
FLACC	Face, Legs, Activity, Cry, and Consolability
CHEOP	Children's Hospital of Eastern Ontario Pain Scale
TPPPS	Toddler-Pre-schooler Post-operative Pain Scale
CHIPPS	Children's and Infants' Post-operative Pain Scale
PPPRS	Parent's Post-operative Pain Rating Scale
PIPP	Premature Infant Pain Profile
NSAIDs	Non-steroidal anti-inflammatory drugs
COX	Cyclooxygenase
IM	Intramuscular
IV	Intravenous
TENS	Transcutaneous Electrical Nerve Stimulation
MAP	Mean Arterial Blood pressure
FPS-R	Faces Pain Scale-Revised
PPPM	Parents' Post-Operative Pain Measure
PONV	Post-operative Nausea and Vomiting
PRN	Pro re nata
ATC	Around the clock
PCA	Patient-controlled analgesia
NCA	Nurse-controlled analgesia
UWCH	University of Wisconsin Children's Hospital

FIGURES

Figure 1: shows and illustrates the framework of comfort process.....	18
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TABLES

Table 1: Pain Classification.....	6
Table 2: Common misconceptions about pain.....	8
Table 3: Use of Behavioral Pain Assessment Tools.....	12
Table 4: Suggested Elements of Post-operative Pain assesment.....	13
Table 5: Inclusion and exclusion criteria.....	22
Table 6: Results of the literature search.....	26

FOREWORD

First and foremost, I owe this achievement to my Lord with who without any of this would be possible. It has been my faith that has guided me all the way here.

To my mom, dad and the rest of my family and who prayed for me through these years thanks for understanding when I got too busy to communicate due to the workload. Thanks for supporting my dreams. I love you all. Thanks to my lecturers and friends too in all the aspects each helped.

"It always seems impossible until it is done." - Nelson Mandela

1 INTRODUCTION

According to the Merriam Webster medical dictionary (2017), it defines pain as “*a state of physical, emotional, or mental lack of well-being “or“ a physical, emotional, or mental uneasiness that ranges from mild discomfort or dull distress to acute and often unbearable agony*”. Since pain is a consequence of being injured/hurt physically and/or mentally, one can refer to it as “*A state of derangement caused by either disease and/or injury as through disease*” (Merriam Webster medical dictionary 2017).

Paediatrics according to Medicinenet (2016) *is the field of medicine that deals with the health of infants, children, and adolescents, their growth and development; and their opportunity to achieve full potential as adults*. Herein this thesis the use of paediatrics, infants and children will be used interchangeably.

Post-operative pain is a complicated response to tissue trauma during surgical procedure which involves direct pain related to the surgery (Drugs.com 2017). Naturally surgical procedures cause pain, being the common reason for postponed admission and longer stay of patients. Post-operative pain care should be organized before surgery by the pre- and post-operative team, patient, care provider and family.

Pain is usually an indicator that tends to alert us to underlying and mostly harmful issues or situations. Unfortunately, sometimes, pain occurs for unknown reasons. It can as well be very severe which affects normal life and activities. Pain assessment and management is a very important concern for children with pain or pain causing ailments. When a child has a pain causing disease, their greatest fear, and for their parents, is the pain that comes along with it and how to manage it. The different stages of children’s cognitive and physical development will influence how they respond and understand painful experiences. It is very important to deal with potentially painful situations effectively, as this may be the child’s first contact with healthcare professionals (Twycross et al. 2013). An optimistic experience during childhood may prevent fear and anxiety associated with pain in the future (Noel 2012).

Post-operative pain affects a very large number of paediatric patients that have undergone surgical procedures worldwide. During nursing care, that is after surgical proce-

dures, it is crucial that nurses have good knowledge, skills, and attitudes of competency care to evaluate and assess patients especially in hospital settings and after hospital departure to provide optimal post-operative pain management and comfort.

Earlier, it was once highly thought that infants and children did not feel pain, but it is being known to be false; in fact, that they feel it intensely which could affect their brains (Windsor 2013). Anything that hurts an adult, it so does a child. Pain is a common problem amongst children and the most common reason as to why they visit health care professionals (Goldberg & McGee 2011).

Children often experience and communicate about pain differently than adults do thus the need for immediate action. The importance of pain management in infants and children must be recognized by healthcare professionals including nurses, who are the ones responsible for the assessment, prevention and alleviation of pain in infants. Treatment of pain is usually guided by the history of the pain, its intensity, duration, aggravating and relieving conditions, and the cause of pain. Pain, being a symptom to many ailments, could be part of an underlying issue that could require both parents and health care providers. Since pain is unique, just as the infants, parents play a crucial role of understanding and relating to their kids on a personal level. This lays a foundation for the health care providers to do their job on a professional level. Either acute or chronic pains the healthcare providers can evaluate pain with the help of parents for example; parents observing and asking their children about how and where the pain could be, as directed by the healthcare providers.

Research on operative and post-operative pain has contributed enormously to the understanding of effective assessment and treatment of pain, and this knowledge can be applied to many other areas of paediatric pain management (AAP 2001). In the past decades, post-operative pain has been intensively studied to quantify its epidemiology, risk factors, pathophysiology, prevention and treatment (Neil & Bannister 2015). However, this thesis was set out to understand the roles of nurses while they assess post-operative pain and the methods used for the pain management in children from surgical procedures and in surgical settings. It is conducted through literature review, which is a thorough, comprehensive, clear and unbiased collection and evaluation of useful published literature that supports a study (Rhoades 2011, p63).

2 BACKGROUND

This chapter discusses pain, its types and classifications, myths and misconceptions of pain in infants, pain assessment tools, pain management strategies and post-operative pain. It gives a brief history of how pain has evolved to be of a global concern, the varying definitions of pain and classes, past misconceptions and myths that have been corrected through evidence based research and lastly post-operative pain management strategies which include the use of pharmacological and non-pharmacological intervention modalities.

2.1 Pain

In 2004, the International Association on the Study of Pain (IASP), the European Federation of the IASP Chapters (EFIC) and the World Health Organization (WHO) organized the first Global Day against pain which sought to draw global attention to the urgent need for better pain relief for sufferers from diseases such as cancer and AIDS (WHO 2004). Such urgency however was not only limited to sufferers of diseases but also to any pain causing condition. According to IASP, EFIC and WHO, it was recognized that pain relief is an important part to the right of attaining the highest level of physical and mental health (WHO 2004). In the same year 2004, as the WHO urged all governments to urgently act against pain, the European council formulated a set of recommendations on palliative care including management of pain that gave detailed guidelines for setting up national policy (WHO 2004). This showed the absolute necessity of acting against pain; since pain was (and still is) the most common reason for seeking healthcare (Cohen et al. 2008).

According to statistics released by IASP and EFIC, one in five people suffer from moderate to severe chronic pain, and that one in three are unable or less able to maintain an independent lifestyle due to their pain (WHO 2004). This has been revealed mainly from patients' self-reporting of pain, but also important to note that the incapacity to communicate orally.

Pain in infants is an important clinical issue that is being highly researched. The difficulty in communicating with infants usually brings about the complexity of recognition of pain or it being considered absent. However, potential causes of pain and discomfort in infants are infections, injuries, diagnostic tests, surgical procedures, and disease progression which should be treated with the presumption that pain is present (Herr et al. 2006). Furthermore, a recent study at the University of Oxford, where an MRI was used to study infant pain, revealed that babies experience pain much like adults and they also have a lower pain threshold (University of Oxford 2015).

The study of infant pain has revealed that neonates can feel pain from 23 to 24 weeks' gestation and exposure to repetitive untreated pain has immediate and long-term consequences on behavioural and neurological outcomes (Roofthoof et al. 2014). In addition, recent studies show that nurses and other caregivers are reluctant to prescribe analgesics to neonates for the fear of adverse effects, drug tolerance and dependence, with a lack of dosing guidelines and pharmacokinetic data on common drugs for neonates lacking (Roofthoof et al. 2014).

Pain management should be planned and considered the age and development of the child that's experiencing pain. Health professionals have an ethical duty to ensure that pain in infants and children is recognized by observation and asking about it respectfully and managed. There are several tools and techniques available to help assess pain in children. There exist many definitions of what pain is, and these vary depending on the context, individual and institution concerned.

According to the International Association for the Study of Pain, pain is defined as: "*An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage*" IASP (2012). This emphasizes that Pain is multidimensional in nature (Reaney 2007). Similarly, a broad definition of pain is: "*Whatever the person says it is, existing whenever the experiencing person says it does*" (McCaughey & Beebe 1989). This definition explains the highly subjective nature of pain.

The way in which pain is expressed and experienced, differs per person or individual in different situations i.e. two different people with a similar physical injury will report the levels of pain differently. Therefore, the validation of the existing pain is mainly Infec-

tions, injuries; diagnostic tests, surgical procedures, and disease progression are possible causes for pain in infants and young children and should be treated with the press based on the patients' report that exists. Pain always exists when the patient says it does (McCaffrey & Pasero 1999). It is a feeling that alerts an individual that tissue damage has occurred or may be occurring. It is both a sensory and emotional personal experience, making assessment complex (Melzack & Wall 1965). This feeling is always triggered in the nervous system and can be sharp or dull in the way it affects. Pain can always go away once it is well taken care of, but it can sometimes go on for weeks, months or even years which is then referred to as chronic pain. This chronic pain can be due to serious diseases such as cancer or even at times the cause of pain is totally unknown (MedlinePlus, 2017).

Associated to nursing, pain management is considered such an important part of care that the American Pain Society noted, "*Pain: The fifth vital sign*" (Campbell 1995). This declaration suggests that the assessment of pain among health care professionals should be as automatic as taking patients' vital signs such as blood pressure and pulse.

Post-surgical or post-operative pain is defined as a complex response to tissue trauma during surgery that stimulates an aversion of the central nervous system. Management of post-surgical pain is a basic patient right. According to the pain community centre, the purpose of post-operative pain management action is to alleviate the pain of the individual as early as possible by getting them eating and drinking as soon as possible and make sure they can get back to their feet. If well planned, it can be effective. There are many factors that can cause post-operative pain which then means not any two patients who have had the same operation will as well experience the same exact pain hence regular evaluation. It is very important for nurses and healthcare professionals to be very aware of this. Thus, if patients are not given good post-operative pain management they have an increased risk of chest infections, hypoxia and cardiac problems, pressure sores, deep vein thrombosis, depression, anxiety, anorexia, increased wound infection rates, etc (Kehlet et al.,2006).

2.1.1 Types of pain and classifications

Though pain is not a disease, rather a symptom, it disables and distresses more people than any single disease. Pain can be classified based on pain physiology, intensity, temporal characteristics, type of tissue affected, and syndrome (Seen in table 1)

Table 1: Pain Classification (University of Wisconsin 2010)

Pain physiology	Nociceptive, Neuropathic, Inflammatory
Intensity	Mild-Moderate-Severe; 0-10 numeric pain rating scale
Time course	Acute, Chronic
Type of tissue involved	Skin, Muscles, Viscera, Joints, Tendons, Bones
Syndromes	Cancer, Fibromyalgia, Migraine, Others procedure.

Acute pain can have defined as the alertness of harmful signalling originating from recently damaged tissue, complicated by sensitization in the periphery and within the central nervous system (CNS). Its depth changes with inflammatory processes, tissue healing, and movement as well. Pain by description is subjective in nature, while acute pain signals tissue trauma. Sensitization inhibits normal behaviour in a protective manner to minimize risk and eventually promote tissue healing, even though it is unpleasant. There are three commonly known categories of pain and these include; acute, chronic (non-malignant), and cancer related pain (Smeltzer & Bare 2004).

In controlled medical settings such as recovery from surgery or during procedures, acute pain rarely serves a useful purpose and can prove harmful too. Examples of acute pain include post-operative pain, trauma, burns, or other injuries and conditions that require emergency department visits, strains, and oral mucositis in cancer patients who undergo head and neck irradiation, chemotherapy-induced peripheral neuropathy in cancer patients, diagnostic procedures such as biopsies, acute headaches. Uncontrolled acute pain leads to more than just discomfort. Clinically, these are some of the impacts of uncontrolled acute pain. They include delayed wound healing, increased risk of pulmonary morbidity that includes pneumonia due to pain-impaired breathing, increased risk of thrombosis and increased mortality risk. About to patients the impacts are usually suf-

fering, increased costs of care, poor sleep, urinary retention, limited mobility or breathing and low patient autonomy, fear and anxiety, slower recovery of normal function and lifestyle, reduced quality of life during recovery and increased risk of chronic pain development (IASP 2010).

Chronic pain is the kind of pain with continual pattern of the pain. This pain lasts longer than 6 months; it relates to a prolonged disease. Both types *can affect and be affected by a person's state of mind* (WebMD 2017). Chronic pain in childhood however is a common medical problem with many potential damaging effects. As time goes by, chronic pain influences and can be influenced by biological, psychological and social systems which usually interact with one another (Nassau, JH 2015). Chronic pain always begins with an acute initial phase. The acute pain gives rise to a host of emotional signs which with prolonged time appear very quickly, changing behavioural and verbal signs that are more subtle and difficult to detect (Smail-Faugeron 2013). "*Chronic pain is one of the most underestimated health care problems in the world today, causing major consequences for the quality of life of the sufferer and a major burden on the health care system in the Western world,*" said Professor Harald Breivik, President of EFIC. He continues to say "*We believe chronic pain is a disease in its own right.* (WHO 2004)

2.1.2 Myths, misconceptions and evidence of pain

Pain management can be affected by several myths, misconceptions and biases. These most of the time may involve attitudes of nurses, patients and parents 'ignorance. Patients react to pain based on personal experiences and the understanding of pain to them. Patients and family members may lack knowledge of the result of pain and the use of analgesia. Notwithstanding, the most common general misconceptions about pain are as seen in table 2.

Table 2: Common misconceptions about pain (Kozier et al., 2012 pp.746)

Misconception	Correction
Patients experience severe pain only when they had major surgery	Even after minor surgery, patients can experience intense pain
The nurse or other healthcare professionals are the authorities on the patient's life	The person who experiences pain is the only authority on its existence and nature
Administering analgesia regularly for pain will lead to addiction	Patients are unlikely to become addicted to analgesia provided to treat pain.
The amount of tissue damage is directly related to amount of pain	Pain is subjective experience and the intensity and duration of pain vary considerably among individuals
Visible physiological or behavioral signs accompany pain and can be used to verify its existence.	Even with severe pain periods, physiologic and behavioral adaptation can occur.

In addition to the above most common misconceptions, earlier research also showed several misconceptions that were corrected and are as follows:

Infants and children experience much less pain as compared to the adults. The fact is that younger children may perceive a greater intensity of pain than older children do

which calls for their management. Infants are incapable of experiencing pain due to immaturity of their central nervous system. Neonates exhibit behavioural, physiological and hormonal responses to pain. Children cannot describe and or locate their pain. Children as young as 3 years have used self-report tools and can locate their pain and where it hurts the most for the clinicians. Children do not want to be involved in their pain management. It is showed that a level of autonomy increased a child's feeling of control. The use of opioids causes respiratory depression and addiction in children when used for pain management. This is not true because the risk of respiratory depression is no greater risk in children than in adults provided the dose is appropriate to the treatment of an acute condition. There are no incidences of addiction in post-operative children for acute conditions. Fear of creating opioid addiction should never be a reason for withholding opioid analgesics from anyone who needs them for their pain alleviation. Children will be truthful about their pain. Children will often withdraw when coping with pain and may not admit to their pain, this is so due to the fear of what will happen next hence preventing them from disclosing the truth. An injection not hurting is a common misconception told to children and infants. Children described the injection as the 'worst hurt'. Children fear injections more than anything else in hospital (Burr, et al., 1989, p. 587). Each of these myths has now got strong evidence to refute them and the myth that the nurse/health professional being accurate assessor of the child's pain is also refuted (Alder, 1990). The children will always be the experts about their own pain experience even if there are problems in communicating the richness, intensity and quality of that experience.

2.2 Post-operative pain

Post-operative pain relates to psychological and physiological distress that may obstruct post-operative recovery and lead to increased depression and development of chronic post-surgical pain (Nielsen et al, 2007). Post-operative pain is a best example of an acute pain and normally it is limited to a couple of days after the surgery (Messerer et al., 2010).

Surgical procedures almost always cause tissue damage which develops into pain. The impact of insufficient pain relief is well known and can result into delayed mobilisation

and related complications as well as psychological distress and anxiety. Managing post-operative pain in the present healthcare environment can be challenging. Busy hospital wards, low staff numbers, limited time, inappropriate attitudes, and inadequate knowledge all hinder complete post-operative pain alertness. This may be alleviated by producing an environment where pain management is considered a priority by introducing regular and accurate pain assessment, a multimodal treatment approach and a focus on responding to individual patient's needs. Many healthcare systems are also under pressure to shorten the length of stay and improve patient satisfaction, both of which will be compromised if pain management is not adequate (Taylor & Stanbury 2009).

Good post-operative pain (POP) management requires health team cooperative efforts in proper assessment, management, and documentation of pain. Pain assessment and management after surgery are the fundamentals to the care of post-operative patients. Post-operative pain management should be based on a well-organized health care system that gives high priority to documentation of the management outcome for each individual patient. Approximately 50% of post-operative patients have been inadequately treated for pain (Abdalrahim et al., 2008).

2.2.1 Assessment tools of post-operative pain

Pain measurement amongst infants and children has always been a very difficult task mainly because children can hardly express or explain the pain intensity level, therefore making it hard for nurses to assist appropriately. It is important to know the cause of pain since this may help in deciding on the best tool and required management. While making a diagnosis due to changed comfort or pain the nurse has a role to mainly gather physiological and behavioural signs that are related to the pain (Craft & Denehy 1990). The main goal of assessment is to highly provide the most authentic information about the location, intensity of the pain and the effects it is causing to the infant's functioning. Self-reporting of pain by patients is commonly identified as the primary source of information for the assessment of pain (Crellin et al. 2015). However, while dealing with infants--nonverbal children (excluding those with cognitive impairments), "*it is obvious that there is no way infants can tell their experience of pain and it is difficult to infer pain from mere observation*" (University of Oxford 2015).

The four most commonly used behavioural pain measurement tools which rely on the nurse's observation of the child include: The Face, Legs, Activity, Cry and Consolability (FLACC), behavioural pain Assessment scale, the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS), the Toddler-Pre-schooler Post-operative Pain Scale (TPPPS), and the Parent's Post-operative Pain Rating Scale (PPPRS) (Hockenberry & Wilson 2014). FLACC scale is designed to measure acute pain amongst infants and children following a surgery. This can be used until the child is able to self-report the pain with the help of another pain scale. It has the validity and reliability for evaluating of post-operative pain (Hockenberry & Wilson 2014, Ball et al. 2016). CHEOPS was developed in collaboration with experienced recovery room nurses who were queried as to what behaviours they most frequently observed to determine whether a child is in pain (Hockenberry & Wilson 2014). TPPPS is an observational scale that was developed for measuring post-operative pain in children ages 1 to 5 years. This includes three pain behaviour categories; vocal pain expression, facial pain expression and bodily pain expressions. PPPRS is a scale that parents may use to rate their children's pain by noting the changes in the frequency of several behaviours (Hockenberry & Wilson 2014).

According to Herr et al. (2006) no single behavioural scale has been shown to be superior to others and healthcare professionals should select a scale that is appropriate to the patient and type of pain on which it has been tested. Also emphasizes that behavioural pain tools should be used for initial and ongoing assessments (Herr et al. 2006). Table 2 also gives details of the use of behavioural pain assessment tools, age bracket tested, department and type of pain tested.

Table 3 Title: Use of Behavioural Pain Assessment Tools (Herr et al. 2006)

Scale	Age bracket tested	Type of pain tested
FLACC	2 months to 7 years	Post Anesthesia Care, intensive care, acute care settings, surgical pain and acute pain
CHEOPS	1 to 5 years	Post Anesthesia Care Unit, surgical pain
TPPPS	1 to 5 years	Post Anesthesia Care,
CHIPPS	0 to 5 years	clinic and acute care setting; surgical pain
COMFORT Behavior Scale	neonate to 3 years	intensive care setting, surgical pain
CRIS	neonates	neonatal and pediatric intensive care setting, procedural and surgical pain
RIPS:	newborn to 3 years	acute care setting; surgical pain
UWCH	less than 3 years	acute care setting, surgical and procedural pain

The body outline tool used with adults also has potential for use with children as young as 6 years. The reliability of a body outline has been evaluated to assist hospitalised children 8 to 17 years old to communicate the location of their pain. For infants, behavioural indications such as tagging or rubbing apart maybe the only indication of where the pain is felt (Craft & Denehy 1990). Thereafter, intensity of the pain whether mild, moderate, severe or unbearable is sought. Knowing that intensity of pain is subjective, a variety of assessment tools are used for instance the visual analogue.

While assessing post-operative pain, nurses ask such questions as seen in table 4

Table 4: Suggested Elements of Post-operative Pain Assessment (Chou et al. 2016)

ELEMENT	QUESTIONS USED FOR ASSESSMENT
1. Onset and pattern	When did the pain start? How often does it occur? Has its intensity changed?
2. Location	Where is the pain? Is it local to the incisional site, referred, or elsewhere?
3. Quality of pain	What does the pain feel like?
4. Intensity	How severe is the pain?
5. Aggravating and relieving factors	What makes the pain better or worse?
6. Previous treatment	What types of treatment have been effective or ineffective in the past to relieve the pain?
7. Effect	How does the pain affect physical function, emotional distress, and sleep?
8. Barriers to pain assessment	What factors might affect accuracy or reliability of pain assessments (e.g. cultural or language barriers, cognitive barriers, misconceptions about interventions)?

2.2.2 Pain management strategies of post-operative pain

Knowing that, more than 80% of patients who undergo surgical procedures experience acute post-operative pain. Approximately 75% of those with post-operative pain, report the severity as moderate, severe, or extreme. Many preoperative, intra-operative, and post-operative interventions and management strategies are available and continue to evolve for reducing and managing post-operative pain (Chou et al., 2016). There exist various aspects of post-operative pain management, including preoperative education, peri-operative pain management planning, and the use of different pharmacological and non-pharmacological modalities. Preoperative education in pain management is a well recommended strategy. This strategy is valuable in combating factors that hinder effective post-operative pain management. Factors are usually classified as follows as parental, for instance:

Parental factors can be the ability to recognize and assess their child's pain, and misconceptions about analgesics, child factors, such as refusal to take medication, medication factors, such as ineffective medication or inadequate formulation or dose of analgesics, system factors, such as poor discharge instructions, difficulty in obtaining medication and lack of information provision (Dorkham et al., 2014).

2.2.3 Pharmacological intervention

Unrelieved pain causes discomfort to the patient or the person having pain. Nurses in practice need to become more aware of the adequacy of their analgesic administration, the value of children's self-report of pain, and the limitations of relying on children's behavioural manifestations to judge pain intensity (Vincent 2005). The revelation that some nurses still under treat pain, by either not giving pain medication on a fixed schedule around the clock as ordered by the physicians or giving less than 40% medication ordered Vincent (2001) is a call for concern. Non-opioid analgesics are drugs for the treatment of pain, that are available over the counter and some are to be gotten by prescription such as; acetaminophen (paracetamol), ibuprofen, naproxen, diclofenac, and ketorolac. When they are used alone, they are adequate to treat mild pain although they need to be combined with other agents for treating moderate to severe pain. These drugs have a ceiling effect and are best used in combination with opioids to decrease the dose of the opioids and thus their side effects (Verghese & Hannallah 2010).

Non-steroidal anti-inflammatory drugs (NSAIDs) inhibit the enzyme cyclooxygenase (COX), that reduces the production of prostaglandins at the site of tissue injury, and diminish the inflammatory cascade. Optimal post-operative analgesia is possible if the drug is given early, immediately following induction, since the onset of pain relief is 20 to 30 minutes following its administration. The analgesic and opioid-sparing effects of ketorolac, which may reduce the incidence of opioid-related adverse effects such as respiratory depression, nausea and vomiting, have been demonstrated by numerous studies in children (Verghese & Hannallah 2010).

Opioids, the word "opium" is derived from the Greek word meaning juice and refers to the juice of the poppy plant. Opioids exert their effects similarly to the endogenous opioid peptides met-enkephalin, beta-endorphin, and dynorphin which act at specific

opioid receptors. These opioid receptors are found in the presynaptic and postsynaptic sites in the brain, spinal cord, and peripheral nerve cells. However, children are so fearful of intramuscular (IM) injections that they often will deny pain to avoid the therapeutic and equally painful injection. Other novel routes of administration like the nasal administration of fentanyl has been shown to result in an analgesic blood level comparable to that following intravenous (IV) use, making it useful in children who do not have, or have lost, their IV access. It is very important to exercise caution when opioids are used in neonates and young infants. Younger children develop a tolerance to opioids and benzodiazepines more rapidly than older children. The management of tolerance and withdrawal has now become a nearly universal consequence of prolonged administration of these medications to critically ill neonates, infants, and children (Verghese & Hannallah 2010).

2.2.4 Non-pharmacological interventions

As for most patients with pain, clinicians would acknowledge that non-drug methods should not be used instead of, but in addition to, common methods of pain management (McCaffery 2002). Non-pharmacological pain management involves many physical and cognitive-behavioural pain management strategies. Physical interventions include cutaneous stimulation, immobilisation, transcutaneous electrical nerve stimulation (TENS) and acupuncture, mind body or cognitive behavioural interventions including distraction activities, relaxation methods, imagery, meditation, hypnosis and therapeutic touch (Kozier et al., 2012. pp 753). To have a successful treatment of pain, different pharmacological and non-pharmacological methods should be combined. Non-pharmacological methods mainly aim at treating cognitive, behavioural and socio-cultural dimensions of pain.

The most commonly used non-pharmacological strategies to alleviate pain are, such as distraction, imagery, and massage. Hospitalized patients may as well also use techniques that have previously worked for them in the past. Before suggesting or instructing patients to use non-drug techniques, nurses need to be aware of the methods used effectively and preferably by the patient. Applying the wrong technique like instructing patients to use a specific technique, such as imagery, may reduce their confidence in the techniques they typically use to control pain. Nurses and healthcare professionals have

used non-drug techniques for years to help patients manage pain. These techniques have been labelled differently by the years. Non-invasive, non-pharmacological, non-drug, and complementary therapies have been used interchangeably to reflect non-medical therapies. These factors enable patients to obtain a sense of control, in a way reducing the pain and hence promoting pain alleviation. Distraction or focusing attention away from the pain may be one of the primary mechanisms resulting in pain relief. Relaxation and music are included in this cognitive category. Physical techniques focus on altering physiological processes that may reduce pain. Massage and the application of heat and cold are included in this category. One possible mechanism of action for massage and heat/cold therapy is the stimulation of the large diameter fibers, which are hypothesized to reduce central pain transmission. Reducing muscle tension, which may contribute to pain transmission, is another possible mechanism of action (Wells et al., 2008).

3 THEORETICAL FRAMEWORK

This chapter discusses the theoretical framework in relation to the topic of pain. The general purpose of a theory is to make research results meaningful and easily interpreted. The theories give researchers opportunity to join facts and observations to an orderly system (Dunn 2004). A theory is not guesswork or a belief. It is based on experimental evidence found through scientific research that has been thoroughly controlled and approved to avoid bias. The theoretical framework is used to provide a background for exploring a problem and then give answers to the problem at hand. The nursing theory chosen to support the research to the problem is the comfort theory of Katharine Kolcaba.

3.1 Kolcaba's Theory of Comfort

Kolcaba describes comfort as an outcome of care that's holistic in nature. She has done an extensive review of literature about comfort. Webster defines comfort as *a state of easy, to soothe in distress or sorrow, to give strength and hope*. She argues that this definition provided a brilliant justification for nurses to give comfort to patients so that the patient will feel better and the nurse will feel satisfied too. Kolcaba (2010) described comfort as seen in three forms: relief, ease, and transcendence. When exact comfort needs of a patient are met, the patient experiences comfort in the sense of relief.

“For example, a patient who receives pain medication in post-operative care is receiving relief comfort. Ease addresses comfort in a state of contentment. For example, the patient's anxieties are calmed. Transcendence is described as a state of comfort in which patients are able to rise above their challenges.”

She uses three nursing theorists to derive three types of comfort: Relief which was derived from the work of Orlando 1961, Ease was derived from the work of Henderson 1966 who described 13 basic functions of human beings to provide care and the third one is Transcendence that she derived from Zderad (1975) who said that patients could rise above their problems by being assisted by nurses.

Kolcaba (2003) shows contexts in which the patient's comfort occurs which are; Physical: these include bodily sensations. Psycho-spiritual: the inner awareness of oneself. Environmental: these include orderliness, quiet, safety etc. Socio-cultural: are the patients' needs culturally assurance, support, positive body language and care.

According to Kolcaba (2003), comfort has three interventions, and these are; Standard comfort interventions focus on sustaining homeostasis and the controlling of pain. Coaching, here there is providing of teaching for a paediatric patient and involving of the family, relieving of anxiety, give hope, listen and plan for their recovery. Comfort food for the soul, doing of extra small things by nurses to make the children/ families feel cared for and strengthened too, these may be imagery to do away with things that could enhance physical discomfort.

3.1.1 Conceptual framework for comfort theory

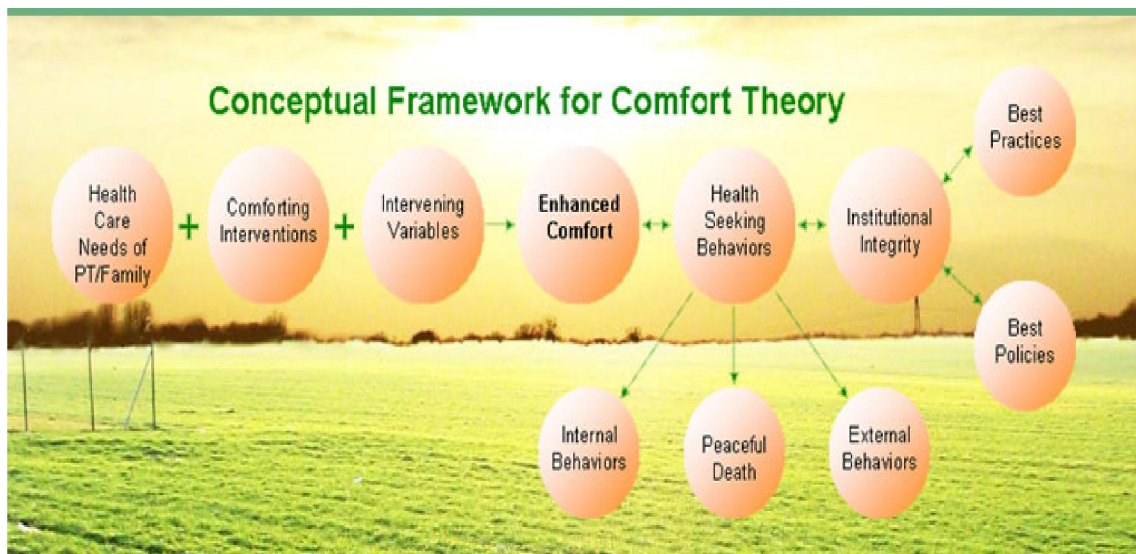


Figure 1: Framework for comfort theory (Kolcaba 2010)

The major concepts in the theory are defined below that connect with the diagram as seen above. Health care needs are the things identified by the patient or family member in the given setting. Intervention variables are factors that cannot likely change, and providers have less or no control over, such as, financial status, social support or prog-

nosis. Comfort is the immediate desirable outcome of nursing care as described by the comfort theory. Health seeking behaviours is the behaviour of seeking help. Institutional integrity is defined as the values, financial stability and wholeness of healthcare organization. Best policies are protocols and procedures created by an institution to be used after collecting of evidence. Best practices are those procedures created by an institution for specific patient/family applications (or types of patients) after collecting evidence.

Webster (1990) defined comfort in several ways: (1) to soothe in distress or sorrow; (2) relief from distress; (3) a person or thing that comforts; (4) a state of ease and quiet enjoyment, free from worry; (5) anything that makes life easy; and (6) the lessening of misery or grief by cheering, calming, or inspiring with hope(Webster 1990). By the very difference of these definitions, we tend to see that comfort is a holistic, complicated term. Comfort also is used in several forms such as comfortable, in comfort, comforting, and comforter. Comfort is also a process (“The nurse comforted me”) and a product (“The child felt comforted”). And, the state of comfort is more than the absence of discomfort (Kolcaba & Dimarco 2005).

The author believes comfort is a basic patient need in the nursing care process. The comfort theory is applicable to many groups including such as surgical or post anaesthesia nursing, paediatrics nursing and many others. Improved comfort strengthens patients to engage in behaviours that move them toward a state of wellbeing. Basically, comfort theory includes the process of comforting actions performed by a nurse for a patient that is in pain. Comforting measures can provide pain relief, help ease distress or help support the patient to go through the experience or condition. Comfort is such a useful concept, it is important for patients working to return to former functional levels as before. The author believes the practice of this theory, comfort and care are the essence of nursing and it guides nursing decisions regarding the patient, and creates a tangible picture of the interventions needed to achieve comfort for the patient.

4 AIM AND RESEARCH QUESTION

The aim of this thesis is to obtain and describe information from current and older literature that helps to determine how a nurse can assess and manage pain in paediatrics. This will also increase the nurses' knowledge on the importance of the assessment and management of pain as well as those reading this thesis, especially the healthcare professionals. Nurses need to know pain and recognize that pain management is vital in the recovery of paediatric patients. Therefore, the purpose of this study is to give a clear view regarding post-operative pain in paediatrics in contrast to adults. The importance of the study is to narrow the gap in knowledge the paediatric nurses may be having.

To reach the aims of this thesis the following research two in one question was posed.

1. How do nurses assess and intervene in post-operative pain management in paediatrics?

5 METHODOLOGY

The method of research chosen by the author is a Literature review. ‘Literature’ refers to a collection of academic scholarly writings which are scientific articles, conference proceedings, and dissertations. A good literature review is built, and then expanded, on already existing previous research and studies on a similar topic or area of interest. Knowledge cannot be advanced without reviewing existing knowledge. According to Wilkinson (2000), the definition of a literature review consists of six conceptions and these are list, survey, search, knowledge enhancer, a report and a supporting or directing tool (Aveyard 2010).

5.1 Data collection

The data was collected using several search engines, such as *Arcada FINNA*, *CINAHL (EBSCO)*, *ScienceDirect*, *MedlinePlus*, *PubMed*, *google*, *Google Scholar* and *Sage*. The articles were searched using keywords management of post-operative pain amongst infants and paediatrics. The keywords used to search the articles selected for the literature review included: pain, post-operative pain, infants, paediatrics, nurse role, assessment, intervention, nurse knowledge. The use of inclusion and exclusion criteria was included to narrow down the search. The article selected should provide answers to the given research questions. The author used the inclusion and exclusion criteria whereby the inclusion criteria were that:

Table 5: Inclusion and exclusion criteria

INCLUSION	EXCLUSION
The articles should be PDF full text.	Articles that are not in full text.
Scholarly reviewed articles	Non-academic databases were excluded.
Publication between 2007-2017	Articles before 2007 were excluded.
Articles should be written in English.	Articles in other languages excluded
Free of charge articles	None funded therefore payment were excluded
Articles relevant to the topic, paediatrics who underwent any kind of surgery	Irrelevant articles and specific gender articles not considered.

5.2 Articles used in the findings

The following were the articles chosen by the author from the search process; this is so because they were found with the most common used keywords and information that was related to the research question posed.

- i. Bai, J, & Hsu, L 2013, Pain status and sedation level in Chinese children after cardiac surgery: an observational study, *Journal of Clinical Nursing*, CINAHL, EBSCOhost, viewed 24 March 2017.
- ii. Baley, K, Michalov, K, Kossick, M, & McDowell, M 2014, Intravenous Acetaminophen and Intravenous Ketorolac for Management of Paediatric Surgical Pain: A Literature Review, *AANA Journal*, 82, 1, pp. 53-64, CINAHL, EBSCOhost, viewed 24 March 2017.
- iii. Hatfield, L.A. and Ely, E.A., 2015. Measurement of acute pain in infants: A review of behavioural and physiological variables. *Biological research for nursing*, 17(1), pp.100-111.
- iv. He, H, Jahja, R, Lee, T, Ang, E, Sinnappan, R, Vehviläinen-Julkunen, K, & Chan, M 2010, Nurses' use of non-pharmacological methods in children's post-operative pain management: educational intervention study, *Journal of Advanced Nursing*, 66, 11, pp. 2398-2409, CINAHL, EBSCOhost, viewed 24 March 2017.
- v. Kankkunen, P, Vehviläinen-Julkunen, K, Pietilä, A, Korhonen, A, Nyysönen, S, Lehtikoinen, N, & Kokki, H 2009, Promoting children's pharmacological post-operative pain alleviation at home, *Paediatric Nursing*, 35, 5, pp. 298-303, CINAHL, EBSCOhost, viewed 24 March 2017.
- vi. Lippert, W, Miller, M, Lippert, A, & Mehlman, C 2012, Documentation of post-operative pain in the neonatal brachial plexus palsy population, *Journal of Clinical Nursing*, 21, 9/10, pp. 1263-1273, CINAHL, EBSCOhost, viewed 24 March 2017.
- vii. Merkel, S.I., Danaher, J.A. and Williams, J., 2015. Pain management in the post-operative paediatric urologic patient. *Urologic nursing*, 35(2), pp.75-83. viewed

24 March 2017

- viii. Shamim, F., Ullah, H. and Khan, F.A., 2015. Post-operative pain assessment using four behavioural scales in Pakistani children undergoing elective surgery. *Saudi journal of anaesthesia*, 9(2), p.174.
- ix. Twycross, A, Finley, G, & Latimer, M 2013, Paediatric nurses' post-operative pain management practices: An observational study, *Journal for Specialists in Paediatric Nursing*, 18, 3, pp. 189-201, CINAHL, EBSCOhost, viewed 24 March 2017.
- x. Weiner, C., Penrose, S., Manias, E., Cranswick, N., Rosenfeld, E., Newall, F., Williams, A., Borrott, N. and Kinney, S., 2016. Difficulties with assessment and management of an infant's distress in the post-operative period: Optimising opportunities for interdisciplinary information-sharing. *SAGE Open Medical Case Reports*, 4, p.2050313X16683628.

5.3 Data analysis

Content analysis is defined as a research technique which is used for objective, systematic and quantitative description of documentary evidence (Lo-Biondo-Wood & Haber 2006). It was found to be appropriate for the study because it can be used either qualitatively or quantitatively as deductive or inductive way for the study. However, the study is qualitative. In this literature review the main findings of the review of scientific research articles were analysed using inductive content analysis.

Inductive analysis starts with the details of the aspect of interest towards a more general picture (Speziale & Carpenter 2007). Hence, grouping and classifying information. An inductive method attempts to understand the data at hand (Elo & Kyngäs 2008). This was the approach of choice used to grant the authors the ability to associate the findings and determine persistent themes. Ten articles were identified for critical review by reading them thoroughly; data was analysed to find necessary information. A summary of the important ones was recorded. The author always begun by reading and identifying codes, coding was based on the keywords. The author then analysed the textual material

in the articles, this was through several articles that consisted of similar keywords that were related with the research is what content analysis was based on. While reading, the author made notes and highlighted points of relevance to the topic. Important ideas that answered the research question were then divided into categories. The categories were; documentation, pain scale selection, pharmacological/drug administration, non-pharmacological methods and educational intervention of post-operative pain. And then subcategories were structured in relation to the categories and questions as seen in table 6 below.

Table 6: Results of the literature search

<u>Sub categories</u>	<u>Main categories</u>	<u>Research question category</u>
Diagnosis of pain, medical record e.g. age, gender, surgical intervention, type of surgery, time, date, dosage, type of pain scale and assessment.	Documentation	Assessment and management
Self-reports, FLACC, COMFORT -B, numeric scale, FPS-R, POP, CHIPPS, PIPP, CRIES, Parents	Pain scale selection	Assessment tools
Opioids, analgesics, IV acetaminophen, non-opioid analgesics	Pharmacological	Pain management
Relaxation, breathing techniques, helping with daily activities, imagery, positive reinforcement, thermoregulation, massage and positioning.	Non-pharmacological	Pain management
Pain education, educational programmes	Educational intervention	Pain management and assessment

5.4 Ethical considerations

The Arcada guidelines about good scientific practices were thoroughly read and well understood. While conducting this study, the required academic research ethics that are an essential part of the integrity of this study were also engaged. Nursing practice must be based on reliable evidence. This depends on the ability of authors to identify that a moral issue exists in each situation and knowing how to take appropriate ethical action when required, and on personal commitment and a genuine to desire to achieve moral outcomes (Fry, S et al. 2002). This thesis was conducted through systematic literature review hence no interviews, questionnaires or observations were applied as part of methodology. To avoid unlawful recovery of data, the author only accessed to official databases such as EBSCO, PubMed and ScienceDirect from Arcada library to.

6 FINDINGS

In this chapter, the findings of the study in relation to the literature review of the 10 articles are presented. The research question answered in this chapter following the main categories that emerged from the study.

Assessment and interventions of post-operative pain in infants and paediatrics

In answering the question which is two in one; “How do nurses assess and intervene in post-operative pain management in paediatrics?” five categories in steps emerged as a process of how nurses assess and intervene in post-operative pain in paediatrics and these are: Documentation, pain scale selection, pharmacological/drug administration methods, non-pharmacological methods and educational intervention. Assessment and measurement of pain is a continuous process that precedes and follows intervention to alleviate pain.

Documentation

According to Lippert et al., (2012) documentation was noted as the first step and an essential part of pain assessment. During assessment, nurses make a diagnosis of pain by gathering and recording information that is related to the pain. Every bit of information from the patient’s medical record and/or history; such as age at the time of surgery, gender, impairment and type of surgical intervention to treat the impairment, the time, date, dosage, route of delivery and prescription of pain medication post-operatively and on discharge was recorded. In addition, the type of pain scale and time of pain scale assessment is noted for pre-and post-pain medication administration. Documentation is done on a patient level, drug administration level and by the surgery type (Lippert et al. 2012).

Pain scale selection

The second step seen is pain scale selection. Suitability of the pain scales was conducted on every patient and was analysed using the guidelines for each respective pain scale which was always based on the child’s age and the developmental level. In Lippert et al.’s study, a low percentage of the proper usage of pain scales was reported. Because of unsatisfactory pain relief, under dosage due to wrong prescription and ineffective pain management, the wrong use of pain scales was also attributed to the longer stay of pa-

tients in hospitals (Lippert et al. 2012). Several measurement tools were used for assessment of post-operative pain in amongst paediatric patients. Self-reports were considered the basic source of information on the intensity of the pain. It was noted that self-report methods had obstruction goals in younger children because it can be well applied to those with adequate cognitive and communication abilities and if the child is unable to rate their pain then parent; nurse or physician can stand in to assess and measure. Emphasis was made on tools being tested in different cultures as pain can be influenced by socio-cultural factors (Shamim et al. 2015).

Use of facial expressions as a valid and reliable sign for infant pain is dependent on their gestational age of the infant. Term infants are more likely to show facial expressions than preterm infants. Hatfield & Ely (2015), The FLACC Scale assessment tool was established mainly to assess post-operative pain in 0–7-year-old children which has shown good compatibility in pain assessment for young children. This acknowledges the idea of FLACC being valid and reliable until self-report of pain is possible. The COMFORT Behaviour Scale (COMFORT-B) Scale which is an adapted version of the COMFORT scale was seen to mainly measure pain intensity and distress associated with pain, and approved to assess sedation level and post-operative pain in children (Bai & Hsu 2013). The numeric rating scale and the Faces Pain Scale-Revised (FPS-R) was also used by nurses mostly to assess children's pain; however, FPS-R was being occasionally used on younger children. It was noted that pain assessments and pain scores were not always constantly documented as they should have been. Although some nurses used informal methods to assess pain (Twycross et al., 2013).

There are four combined POP pain scales which are CHIPPS; crying, oxygen requirement, increased vital signs, and facial expression, sleep (CRIES); COMFORT; and the Premature Infant Pain Profile (PIPP) in full-term for infants used in the first 48 post-operative hours. The five physiological indices that were measured included heart rate, mean arterial blood pressure (MAP), HF-HRV, and urinary and plasma cortisol. They found that the COMFORT score and HF-HRV were inversely connected with opioid dose and plasma levels, suggesting that HF-HRV is the best-correlated measure in relation to opioid dose and plasma morphine levels in the first 48 hr after the surgery (Hatfield & Ely 2015). Parents were noted to play an important role in/while assessing and communicating their child's pain to the health care team as they were seen to know their

children better, how the pain manifests, the cause of pain and thereby assisted in the selection of the best or more effective intervention method to be used i.e. pharmacological or non-pharmacological (Merkel et al. 2015). However, parents could not assess the child's pain with the verbal pain scale as well as by using the PPPM (Kankkunen et al., 2009).

Pharmacological / Drug administration

The third step is pharmacological method. The adequacy of the dosage of medication administered and ordered at discharge was analysed using recommendations. In addition, the time and route of delivery were used to conclude whether pain was properly reassessed following drug administration based on guidelines; the reassessment for pain should be within one hour following medication administration. The time and route of delivery were used to decide if pain was correctly reassessed following drug administration. Drug administration would be considered properly reassessed if the patient's pain is reassessed 5 minutes after giving the medication and/or 5 minutes before the next dose. In Lippert et al., study, a large percentage of patients were found under dosed at least once during their hospital visit or stay whereas a smaller percentage were overdosed however with no complications recorded (Lippert et al., 2012). Infants that are receiving deep anaesthesia and associated opioid analgesics after surgery showed lower incidence of post-operative sepsis and poor neurological outcomes, and fewer post-operative deaths (Twycross et al., 2013). Twycross still adds that analgesics are usually administered at the prescribed dose though they may not be given until that child reports pain. They are always administered as often as they could be and are often prescribed on a pro re nata (PRN) basis. In one study, more than half of the children that were prescribed PRN analgesics post-operatively did not receive any as they should. Kankkunen et al., (2009) also added that the administration of analgesics was at an optimal level.

Numerous studies found that IV acetaminophen is well tolerated amongst infants and small children as young as 28 weeks' gestation. Pain management, is such an essential component of the anaesthetic plan, which is most frequently achieved via administration of opioids. The non-opioid analgesics such as ketorolac and acetaminophen are useful complements that may help to improve post-operative pain control. In relation to paediatric patients these medications may be beneficial. Furthermore, the effect of ketorolac and acetaminophen on post-operative complications such as sedation and post-operative

nausea and vomiting (PONV) was examined by studies. Nine of the studies focused specifically on paediatric patients ranging in age from 6 months to 16 years (Baley et al., 2014). Opioids are such an effective analgesic that highly reduce post-operative pain following similar procedures and reduces the high risk of additional swelling and bleeding. They should be involved for the treatment of pain even with paediatrics as prescribed (Weiner et al, 2016).

According to Merkel et al., (2015) analgesics are best given around the clock (ATC) during the immediate post-operative period. In the case of opioids, an ATC schedule should be supplemented by an oral or IV as needed (PRN) dose order for breakthrough pain. Patients unable to take oral fluids and medications may be placed on an analgesic pump which provides patient-controlled analgesia (PCA) or nurse-controlled analgesia (NCA). If the patient is too young to understand and administer doses appropriately, the nurse or parent (per hospital policy) is designated as the authorized agent to push the analgesia pump button when the patient needs the pain medication. To provide continuous analgesia, a low-dose rate is ordered, as well as a demand dose to be used for breakthrough pain. The nurse should carefully monitor the patient's level of pain, sedation, and respiratory rate and effort in the immediate post-operative period, without taking in account the specific route of delivery or combination of medications given.

Kankkunen study noted that parents can control the child's post-operative pain while at home appropriately if provided with information, instructions about timing and dosing of analgesia on discharge. For that reason, it is highly essential that parents are provided with sufficient information, support, and tools to assess and manage their child's pain while at home. Dosing of analgesics is well known for not being at an optimal level at home and that all children do not receive pain medication even after being assessed by parents that they have pain post-operatively. The main reasons for poor pain relief of children at home are inadequate prescription of medication and insufficient administration of the prescribed medication. Earlier studies reported that several parental factors have hindered children's effective pain relief at home after surgery such as parents may expect the child to have pain after surgery and fathers have highlighted the need to tolerate pain among boys, fear of side effects, consider analgesics as addictive, parents' attitudes, parents' own experiences of surgery and thought of the less often children receive analgesia, the better it worked. These negative attitudes about children's pain and

analgesics describe inadequate use of analgesics in children's post-operative pain management while at home (Kankkunen et al., 2009).

Non-pharmacological methods

Non-pharmacological method which is the fourth step has been shown to be effective in relieving pain however with many barriers limiting nurses' use of the methods, while in process of alleviating the pain. There is a wide range of evidence of the effectiveness of non-pharmacological methods for relieving children's pain. Non-pharmacological methods are accepted methods used independently with mild pain or as a complement to pain medication for moderate and severe pain to ensure adequate relief. The uses of non-pharmacological methods have also been noted to help reduce opioid intake and potentially harmful physiological and psychological responses towards pain (He et al., 2010). However, according to Twycross et al., (2013) there was limited use of non-pharmacological methods of pain relief although nurses saw the use of non-pharmacological methods as a role of the parents. Twycross et al., (2013) adds that several studies that are analysing pain management practices often tend to focus on mainly one element of care like pain assessment, the administration of analgesics, or non-pharmacological methods. Thus, a complete picture of pain care is not obtained.

Nursing staff that are trained in using non-pharmacological methods may use these methods independently as part of pain management, and in so doing they are not restricted by physicians' prescriptions and may develop an integrative approach to nursing care. Relaxation, breathing techniques and helping with daily activities were the most common methods reported and there was a statistically significant increase in nurses' use of five non-pharmacological methods for children's post-operative pain relief. These were: imagery, positive reinforcement, thermoregulation, massage and positioning. These partially confirm their hypothesis that educational intervention increases nurses' use of non-pharmacological pain relief methods (He et al., 2010). Evidence recommends that the use of the Parents' Post-operative Pain Measure (PPPM) promotes 1 to 6- year-old children's non-pharmacological pain alleviation at home after surgery. Parents given the PPPM used several non-pharmacological pain alleviation methods more than those in the control group. The PPPM was used as an intervention to promote children's pain alleviation. Several studies show that children have significant post-

operative pain at home and that there is a need to improve children's pain management. (Kankkunen et al., 2009)

The most commonly reported reasons that limited nurses' application of the pain relief methods which were heavy workload/lack of time and child's inability to cooperate. There are barriers/limitations to the use of non-pharmacological methods after the intervention process; heavy workload/lack of time, lack of resources, lack of experience in using non-pharmacological methods, lack of pain management policy to support and encourage the use of non-pharmacological methods and lack of knowledge about non-pharmacological methods. There was an increase in the number of nurses who agreed that the other barriers had limited their use of the methods (He et al., 2010).

Educational Intervention

Lastly, educational intervention, that pain education is generally such a promising strategy for changing nursing practice, although just a few authors have considered the effectiveness of educational interventions for nurses or healthcare professionals to help relieve children's post-operative pain. The lack of knowledge about pain and its management is a common barrier that contributes to the inadequacy of pain management. Therefore, improvement of nurses' knowledge through education is of such great importance for enhancing pain management. Educational programmes should be provided for nurses with up-to-date information, equip them with better understanding and skills for managing children's pain effectively and thereby improve the overall quality of care. Other factors such as attitudes, beliefs of patients and nurses and the organization, administration and environment, can influence the results of education and act as barriers against optimizing practice although education alone is not sufficient to change nursing practice. Furthermore, it has been revealed that although staff had access to regular in-service education about pain management, attendance at these sessions was extremely low. There is need for innovative teaching strategies and clinical approaches to increase awareness (He et al., 2010).

He et al., (2010) found that educational intervention had a positive effect on nurses' use of non-pharmacological methods. However, education alone was not sufficient to optimize nurses' use of these methods, as they were limited by various barriers in practice. Several researchers investigated nurses' perceptions of barriers to achieving optimal post-operative pain alleviation such as powerlessness, policies and rules of organizations, physicians' taking the lead in practice, time constraints, limited communication and interruption of activities relating to pain management while barriers connected to nurses' use of non-pharmacological pain-relief methods include shortage of nurses/heavy workload, lack of knowledge about pain management, nurses' insecurity, beliefs about parental roles/the child's ability to express their pain. However, none of them have examined nurses' views about the barriers following a pain educational programme (He et al.2010).

7 DISCUSSIONS

Findings indicate that to get effective alleviation of post-operative pain, there is a process of 5 steps taken and followed in a certain order which plays an outstanding role in management of pain and eventually promoting of comfort if done well. These are: Documentation, Pain scale selection, pharmacological/drug administration methods, non-pharmacological methods and educational intervention respectively.

Wellbeing of patient is such an essential aspect of life for children. According to WHO (2004), it was considered that pain relief is so essential in the process of achieving good level of physical and mental health for patients. However, this illustrated the high need of acting towards pain management since it is such a very common reason for pediatrics seeking health care attention. In relation to post-operative pain if not well treated can be harmful with severe consequences that are physiological and psychological on pediatrics. Poor management increases discomfort, longer stay in hospitals, and wrong use of pain scales even with ease of use.

Messerer et al., (2010) as well supported that several studies revealed that pain is under-assessed and poorly documented which is resulting into children being under-medicated and/or their pain being poorly managed by the healthcare professionals. Lundeberg & Lönnqvist (2004) revealed that post-operative pain management in paediatric patients should always begin preoperatively with age specific information about the surgical procedure that is to be done, the pain that might be expected after the procedure, pain assessment and pain treatment as well. They also added that the child and parents need to be informed sincerely, about the following: pain is common after surgical procedures, it is important to treat post-operative pain, pain is an individual and subjective experience, pain intensity varies during the day and night, pain decreases with time. Messerer et al., (2010) added that in contrast, without having regular recording and documentation of pain, pain is to a certain extent undertreated or over-treated, which eventually causes side effects to the children.

According to Messerer et al., (2010), the most common way to quantify and tell pain is using different pain scales. Several scales were validated and published to measuring pain in neonates, infants and children. However, it is important to always remember that

not all these are present for healthcare professionals to make use of them. The presence of many tools shows that pain assessment continues to be a challenge to healthcare providers. To be most effective, pain measurement tools must be effortless, practical and useful without putting a large burden on caregivers' while they measure pain at large. Khin Hla, et al., (2014) supported that self-reporting of pain remains the main standard of pain measurement wherever possible for children and adults. For those children who are unable to self-report their pain, the assessments that are normally made parents, caretakers are often used as an alternative of measurement. Parents know their children better than the health care providers hence their responsibility in assessment after discharge. Many researchers have found that pain rating scores made by parents linked well with their child's scores whereas others have found that parents may tend to overestimate the severity of their child's pain. Pain scale of self-report has been generally seen as the main way of assessing pain and this is mainly because of its subjective nature. However, in this literature review and finding, it was revealed that there are disadvantages that come along with self-reporting method regarding pain assessment in paediatric patients and their nursing. Self-report is not such an appropriate way of assessing post-operative pain in all paediatric patients mainly because it is relative. The method is mainly based on cognitive and communication skills even with infants who are nonverbal hence inaccurate reporting of pain with the self-report method. It is being noted that no specific pain assessment tool or method is perfect for validating pain in children; each has its strengths and limitations. Hence, making effective post-operative pain assessment in paediatric patients is possible with the combination of many pain assessment methods to get the best assessment, to provide best management. Advantages and disadvantages of each method should also become known to the nurses working in paediatric and surgical settings.

The study of Lundeberg & Lönnqvist (2004) noted that assessment of pain is such an important aspect to make the treatment of post-operative pain successful. It was noted that pain ought to be assessed on a regular basis with appropriate tools for the paediatrics. There are countless different scales that can be used in different age groups while assessing pain. They emphasised the importance of using a scale that is sufficient in the clinical setting. The aim of pain measurement is to explain the phenomenon and factors that influence it, diagnose and predict the need for intervention and evaluate the effec-

tiveness of treatment. According to Walther-Larson et al., (2016) the intensity of pain of children while at home, assessment was done by parents with the help of the PPPM scale, numeric scale for children 0-12years as indicated by several studies.

The study of Lundeberg & Lönnqvist (2004) supported that intervention includes both pharmacological and non-pharmacological techniques whenever possible and work together to give positive results. Non-pharmacological techniques include distraction, physical therapy, TENS, acupuncture, etc. Pharmacological interventions include non-opioids [e.g. paracetamol, Non-steroidal anti-inflammatory drugs (NSAIDs), clonidine], opioids (e.g. morphine, meperidine, and hydromorphone), local anaesthetics and adjuvant drugs. Song et al., (2016) revealed that factors contributing to inadequate pain relief in paediatric patients are lack of training and experience, difficulties in quantifying pain, low expectations with respect to post-operative analgesia. Pain following surgery is best managed by providing medication on a regular basis, preventing the pain from recurring.

Messerer et al., (2010) supported that healthcare professionals require suitable levels of education about pain and they also need sufficient training in using of the pain assessment tools according to exact age groups. Effective communication with the child, their family or caregivers and the professionals in the team is additionally essential in attaining sufficient management. Nurses have a task of using their knowledge on pain and apply it to alleviate the child's pain.

Considering the findings, we can see that the choice of theoretical framework supports the study. Kolcaba's theory of comfort mainly focuses on what nursing does to the patient who is the main center and the nurse being the most essential person because they provide the care which aims at increasing the comfort. The main goal of nursing is providing comfort to the patient which is seen in findings with the steps being taken all focusing on the achieving of comfort. In relation to Kolcaba, she utilizes the four metaparadigm concepts which are nursing, patient, environment and health. When looking at nursing there is an assessment of comfort needs, activities to promote the patient comfort and reassess the comfort levels of the patient. It is important to note that process of assessment and reassessment is either subjective or objective in nature. As for the patient, it can either be an individual or their family however in relation to my findings it

the individual that's seen as the patient. The environment is seen to be any part of the patient's surroundings that can us as nurses can command so as to increase the patients comfort while relating to my findings, the use of the Parents' Post-operative Pain Measure (PPPM) done at home showed to have created a good environment for the patient because they were in their comfort zone and reduced on the anxiousness it creates while in hospital settings hence the role the environment plays as comfort or discomfort being found in the patients environment. Finally, health is the best possible functioning of the patient, family, healthcare giver with the main interest of giving the comfort needs that are needed. Here in the findings it's seen where there is a process of five steps that aim at seeing the pain is alleviated and optimum health is attained. I believe with all this together creation of comfort will be attained and eventually increase in patient's health finally.

8 CONCLUSION

The major/most common methods and scales of assessing post-operative pain in paediatric patients are; self-reporting, COMFORT Behaviour Scale, numeric rating scale, FLACC Scale, CRIES, behavioural observation, and the physiological methods while the main interventions are pharmacological methods and non-pharmacological methods; which have shown to be effective for procedural pain management in infants and children, and are most effective when used in combination.

There are many factors which influence pain assessment, which is the key to management, and include; child characteristics, medical diagnosis, and the nurse characteristics. Appropriate pain assessment practice is the basis for successful pain management. Healthcare professionals can ensure the quality of pain assessment by increasing their awareness in this crucial area which in turn can bring about the decrease in an untreated pain in paediatric patients. Through becoming knowledgeable about general aspects of pain and pain management, and the practice of multimodal pain management, the nurses are well equipped to take on these challenges and to safely and effectively manage the paediatric patient's pain.

In conclusion, management of post-operative pain in paediatric patients could also be improved through the help of increased cooperation among healthcare professionals and parents, good planning, documentation, good routines, education about pain management and its consequences and paediatrics pain behaviour might as well improve the nurse's ability to manage the pain patients. Although post-operative pain care methods and tools are available to be used, not all methods apply to every patient, therefore should be well selected to get reliable results. General proper surgical pain management is important to surgical patients not only because it eases the pain but also shortens their admission to the hospital. Post-operative pain management should be always put as a priority especially for paediatrics to decrease the short term and long-term consequences that may come along with it.

8.1 Strengths, limitations and recommendations

The study used articles for the literature review from studies about post-operative pain management in paediatric patients conducted in several countries such as United Kingdom, United States, China, Pakistani, Sweden, Finland etc. This gave the study a broader viewpoint from different areas of the world. This also shows that post-operative pain is not limited to specific countries or continents or age or sex but rather all. Most of the articles used in the study are recent studies that are conducted at least within the last six years which is beneficial for this study. Consistency is seen in this study because most of the articles had the same keywords and results in relation to assessment and intervention towards post-operative pain in paediatrics.

During this whole thesis, it was depending on *Kolcaba's Comfort theory*. When looking at this the theory though does not clearly bring out comfort hence making it a bit difficult to relate to and thus the need to be elaborated for/to those who do not come to understand it. The comfort theory by Katherine Kolcaba is a middle-range theory applicable to various healthcare settings. The theory is narrow in nature and mainly targets patients and their families, hence the need for expansion. The theory also puts less focus on medication and treatment of patients. To patients, medication reduces anxiety which when neglected leads to lower comfort levels implying poor management by the healthcare professionals.

The study faced a few limitations. In addition, the literature review was limited by the number of research articles used as data sources to conduct the review generally. Some of the scientific articles that seemed good and relevant to the study were not accessible or could not be found from Arcada database, hence making their omission. In, search some articles were written based on a certain country hence the inapplicability of the idea of generalizing i.e. "*Pain status and sedation level in Chinese children after cardiac surgery: an observational study, Journal of Clinical Nursing*"; which aimed at exploring Chinese children after cardiac surgery. Furthermore, although the author tried to make much more effort to extract only top-quality references, the English language inclusion criteria limited in a way that studies conducted in other languages which were not considered could have presented extra facts during this study.

In general, recommendations are mainly aimed at healthcare professionals. The author recommends that future researchers put together guidelines in relation to the management of pain in infants and paediatric patients and that more extensive research be conducted to further the studies by doing more research on pain management of surgical patients after discharge because it is very important to patients' continuation of care and wellbeing. The author also recommends that research focusing on finding out whether post-operative pain is really being managed is highly encouraged.

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