

Nurses Role in Managing Post-Operative Pain for Pediatric Patients

Systematic Literature Review

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Abstract

Because of children developmental stage ranging from neonate to adolescence, their limited communication skills, and cognitive ability, pediatric patients experience pain differently than adult patients which affects the child's level of comfort, healing rate, and quality of life. For a variety of medical issues, children endure a range of surgical procedures, from a complex tonsillectomy to intricate surgeries. In order to promote a seamless recovery and reduce risks, these young patients require effective post-operative pain treatment. Considering the vulnerability of pediatric populations nurses plays an important role in elevating child's post operative pain. This study aimed at investigating how nurses assess and individualize post-operative pain in pediatric unique needs, preferences and clinicals. Subsequently demonstrating the most effective nurse-led interventions for managing post-operative pain in pediatric patients.

Methodology: Katherine Kolcaba's theory of comfort was used for the theoretical framework. Data collection was that of systematic literature review. The research articles consisted of 14 articles for the systematic literature review.

Results: The critical appraisal of the data set reveal seven major themes; documentation, pain scale and assessment, pharmacological, nonpharmacological, educational program, parents' perception and satisfaction on post-operative pain management and nurses' perception and clinical competencies. Furthermore, several sub-theme links to the research question included cognitive-behavioural techniques, cheer theory, comfort theory, music and distraction strategies for nurse-led effective management of pediatric post-operative pain.

Language: English **Key words:** Assessment tool, Pain assessment, Pain management, Pediatric patients, Post-operative, Nurses' management, Comfort theory, holistic approach.

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1 Introduction

Pain is a natural response of the body to various stimuli, such as injury, illness, or physical strain. It is a complex and subjective experience that can vary in intensity and duration from one individual to another. Pain can be classified into two main categories: acute pain and chronic pain. Acute pain is a sudden onset of pain that usually lasts for a short period, while chronic pain persists for a longer duration. The evolution of pain is a gradual scaling to acute pain involves a complex series of events that occur in the nervous system. When an injury or illness occurs, it triggers the release of chemical messengers called prostaglandins, which are responsible for the sensation of pain. Prostaglandins stimulate the pain receptors in the affected area, sending signals to the spinal cord and the brain (European Pain Federation, 2022).

The management of pain has always been in the forefront for the improvement of the quality-of-care right from the onset. Such desire stem from recent studies and publications that has aimed at shining the light at a pandemic that has led many to psycho-addiction to medication thus reducing the quality of life of those they are affected by it (Upp, 2013). Many scholars continue arguing on what is the best care plane in the management of pain, but one thing is in agreement among all that pain should be prevented as well as treated with the best care plan before it should evolve to a chronic condition and this include cancer patient which are most vulnerable (Max, 1995).

Post-operative pain is a common experience for many patients, and managing this pain effectively is a crucial aspect of their recovery. While medications are often used to manage pain, Nurses play a critical role in the management of post-operative pain, as they are responsible for assessing the patient's pain level, determining the appropriate interventions, and monitoring the patient's response to treatment. Nurse-led interventions can include a variety of approaches, such as patient education, relaxation techniques, and other non-pharmacological interventions (Tocher, 2012). According to the American Nurses Association, the intervention of nurses in post-operative pain management should be timely and effective in pain relief. This therefore means that nurses should prioritize the assessment and management of pain as a vital sign to ensure that patient receive adequate pain relief (ANA, 2016).

When it comes to pediatric patients, post-operative pain management is crucial because it affects the child's level of comfort, healing rate, and quality of life in general. For a variety

of medical issues, children endure a range of surgical procedures, from a complex tonsillectomy to intricate surgeries. In order to promote a seamless recovery and reduce risks, these young patients require effective pain treatment. Because of their developmental stage, limited communication skills, and cognitive ability, pediatric patients experience pain differently than adult patients. For example, young children who are still developing their language skills may only be able to express their distress through weeping, expressions, and gestures. While older children may possess an improved ability to articulate pain, they may still encounter difficulties in precisely describing its location or intensity. The mental state and fear of a child can also affect how they experience pain, which adds another layer of complexity to their evaluation and treatment. Using age-appropriate pain assessment methods and being aware of these differences is critical for healthcare providers to accurately evaluate pain (Twycross, Finley, & Latimer, Pediatric nurses' postoperative pain management practices: an observational study, 2013).

Many researchers have come to prove that inadequate pain management can lead to adverse outcomes, such as prolonged hospital stays, delayed recovery and increase healthcare costs (American Pain Society, 2008). This therefore implies that nurses' intervention in post-operative pain management can improve patient outcomes and reduces the burden on the healthcare system. To achieve such outcome, nurses would need adequate and extensive knowledge and training in the management of pain including pediatric post-operative pain which thus include pharmacological and non-pharmacological techniques in pain relief to achieve effectiveness in due time. The objective of this thesis is to gain a comprehensive understanding of the responsibilities undertaken by nurses during the assessment of post-operative pain, as well as the various approaches employed for pain management in pediatric patients undergoing surgical operations within surgical environments.

2 Background

According to the Finnish medicine agency FIMEA five in every ten Finn use over the counter oral medicine related to pain which do not have any significant difference in adverse effect overall (FIMEA, 2022). Several studies have shown that the increased use of common analgesics for pain especially in Finland has been in a steady increase minus the stricter regulation in the control of narcotic substances. These mostly account to the fact that more and more people are become intolerant to drug effect and thereby increasing the chances of individual for the need for comprehensive care plan for acute pain patient. This problem is not unique to Finland alone but affects a lot of European nation (Boston Scientific , 2017).

Despite extensive research conducted over several decades in the field of pain management, along with notable advancements in pharmacological treatment and technology, numerous studies have consistently found that patients, particularly pediatric children, continue to have inadequate pain management (Van Hulle Vincent & Denyes, 2004). The nurse's ability to effectively communicate with patients, as well as the nurse's knowledge, attitude, and belief regarding pain and pain medications, are just a few of the many aspects that contribute to successful pain management. Providing adequate and timely pain relief to children and their families is a basic human right. A vital nursing activity, the accurate evaluation and effective management of a pediatric patient's pain is one that requires the nurse to possess an accurate theoretical knowledge base of pain and its assessment and management in addition to the proper attitudes. The assessment of the knowledge and attitudes of nurses will bring to light information that can potentially help in the creation of appropriate strategies to address educational needs related to the assessment and management of pediatric pain (McDonald, McNulty, Erickson, & Weiskopf, 2000). While it's always easy to attribute the various causes of pain to injury or illness, one thing is certain, pain turns to exacerbate the healthcare system due to the general progression acute pain can tack to become a chronic problem (Mortada, et al., 2022).

Pain in general has an overwhelming cost to the general healthcare system which is estimated at around €300 billion in Europe. In this regard, with the limited infrastructure system to manage such problem, the burden to healthcare system become far greater with much large ramification in the life of the people themselves especially in pediatric which exacerbate far greater cost and overwhelm families which often lead to depression among family member affected by it (CORDIS EU Research, 2020). The general improvement in the availability of knowledge, training skills and pain management technique becomes vital in the forefront of management pain and post-operative pain in pediatric and limiting children's adverse condition to the progression to becoming chronic. The quick call to action with the use of analgesics as a faster way of treatment to pain, however, becomes a contributing factor to the burden on the healthcare system itself (Keto, Heiskanen, Humanen, Kalliomaki, & Linna, 2022).

Finland among other Nordic nations, have gone a great length in developing better policies that will have positive impact on their population in the area of pain management. Realising the critical importance of pain management to a child's overall health and recovery after surgery, these nations have made significant investments to address the specific difficulties of providing pain relief to pediatric patients. Child-centered care is a cornerstone of the

Nordic countries' and Finland's approach to postoperative pain treatment for children. These countries recognise that children's pain is distinct from that of adults, both in terms of its nature and its expression. Therefore, regulations have been carefully created to guarantee that healthcare providers have access to the information and resources they need to assess and manage pain in pediatric patients. Finland, along with its Nordic counterparts, places a high priority on the implementation of evidence-based practises for the management of postoperative pain in pediatric patients. Constantly progressing knowledge regarding the management of pain in children is the result of rigorous research and clinical studies. By dedicating resources to research, clinical practise is able to incorporate the most recent and efficacious techniques for pain management (Keto, Heiskanen, Humanen, Kalliomaki, & Linna, 2022).

Overall, more data is necessary to expand the area of per view concerning pediatric post-operative pain as it is believed by many researchers that the management of pediatric post-operative pain before its evolution to becoming chronic within children can solve the underlying metadata of chronic pain within pediatric patients which all originate from a poorly managed acute pain. Nurses who are the forefront in the patient's care plan, need an expanded and exhaustive educational career to fully comprehend the risk of unattained post-operative pain symptoms, the risk of different or alternate therapies also available for treatment persistent symptoms of post-operative pain and mostly importantly to understand the patients' needs which collaboratively with the patient will improve the patient quality of life (Keto, et al., 2022)

2.1 Pain factors

From the onset of the first ever published study related to pain in 1988, various organs including the European Pain Federation have seek to define pain as “an emotional experience resulting from unpleasant feeling due to an actual or potential damage to the body tissue”. Many scholars commonly agree that pain is a subjective experience which can be diagnosed independently from its cause (European Pain Federation, 2022). There is multiple facets to pain from the physiological experience to the psychological aspects that all care providers experience within the nursing field. Regardless of one's ethnicity or racial group, there is a universal acceptance that pain is access in accordance with physiological processes, its resulting consequences and therefore effects at different cellular and molecular levels from its complex neurotransmitters, receptors and proteins (Turunen, 2007).

Pain involves various components which include physical sensation of pain, which is transmitted through nerve fibers to the brain. The sensory component of pain can be described in terms of its location, intensity, quality, and duration, the emotional response to pain, which can include feelings of fear, anxiety, depression, or frustration. The emotional component of pain can be influenced by factors such as past experiences, beliefs, and cultural norms. It's important to note that these components are interconnected and can influence each other, which can result in a complex and multidimensional experience of pain (Ylinen, 2010).

The mechanism of pain can be broadly divided into three stages: transduction, transmission, and perception. **Transduction:** This is the first stage of the pain mechanism, in which noxious stimuli (such as heat, pressure, or chemical irritants) are converted into electrical signals by specialized nerve endings called nociceptors. Nociceptors are distributed throughout the body and are sensitive to different types of stimuli. **Transmission:** Once the nociceptors are activated, the electrical signals generated by them are transmitted to the spinal cord and then to the brain through a network of nerves. In the spinal cord, the nociceptive signals are processed and filtered before being transmitted to the brain. Different types of nerve fibers are involved in the transmission of nociceptive signals, and they differ in their speed and the type of information they carry. **Perception:** The perception of pain is the final stage of the pain mechanism, in which the brain receives and interprets the nociceptive signals. The brain integrates the sensory information with emotional and cognitive factors to produce a conscious experience of pain. The perception of pain is also influenced by past experiences, cultural and social factors, and individual differences in pain sensitivity. In summary, the mechanism of pain involves the transduction of noxious stimuli into electrical signals by nociceptors, the transmission of these signals to the brain through a network of nerves, and the perception of pain in the brain. Different individuals turn to have different tolerance levels to pain and while a certain pain factor may be intensive to one, another can differ the same factor as mild or moderate (Turunen, 2007).

Pain in infants is a significant clinical concern that is the subject of extensive research. The challenge associated with communicating with neonates often complicates the identification of pain or causes it to be misinterpreted as non-existent. Disease progression, infections, injuries, diagnostic tests, and surgical procedures are all potential causes of pain and discomfort in neonates and should be treated as such with the assumption that pain is present (Herr, et al., 2006). Researchers in Oxford University conducted a clinical study where MRI were used on infant in an attempt to study infant pain. The overall result was that infants

experience pain the same as adults and even have lower threshold compared to adults (University of Oxford, 2015). Research on new-born pain has demonstrated that neonates are capable of experiencing pain starting from 23 to 24 weeks of gestation. Subsequently, it has been seen that recurrent untreated pain during this developmental stage can have both immediate and long-term effects on behavioural and neurological outcomes. Moreover, same research indicates that healthcare professionals, including nurses, exhibit hesitancy in administering analgesic medications to new-borns due to concerns regarding potential adverse effects, drug tolerance, and dependence. This reluctance is further compounded by the absence of clear dose guidelines and limited pharmacokinetic data on commonly used pharmaceuticals for neonates (Roofthoof, Simons, Anand, Tibboel, & Van Dijk, 2014).

The planning and consideration of pain management should take into account the age and developmental stage of the child who is undergoing pain. Healthcare workers have a moral obligation to ensure the recognition and management of pain in infants and children through the use of observation and inquiry (Solodiuk, 2013).

2.1.1 Post-operative Pain

Post-operative pain is characterized as an intricate reaction to tissue damage that occurs during the surgical procedure, eliciting an aversion response in the central nervous system. Patients have an inherent entitlement to post-operative pain management. As per the pain community centre, the primary objective of post-operative pain management is to provide prompt relief from the patient's discomfort through resuming hydration and nutrition and ensuring that they can regain their footing. It can be successful if meticulously organized. Since numerous factors can contribute to post-operative pain, no two patients who have undergone the exact same procedure will experience identical pain; therefore, routine evaluation is essential. It is critical that healthcare professionals and nurses have a thorough understanding of this. Thus, patients have an increased risk of developing chest infections, hypoxia and cardiac complications, pressure ulcers, deep vein thrombosis, melancholy, anxiety, anorexia, and wound infection rates, among others, if they do not receive adequate postoperative pain management (Kehlet, Jensen, & Woolf, 2006).

Surgical interventions invariably result in tissue damage, which subsequently manifests as discomfort. Delay in mobilisation, associated complications, psychological distress, and anxiety are all consequences that are widely recognised as possible

outcomes of inadequate pain relief. In the current healthcare setting, managing post-operative pain can be difficult. Completion of post-operative pain awareness is impeded by excessive patient volume, insufficient personnel, time constraints, unsuitable attitudes, and insufficient knowledge. By implementing a multimodal treatment approach, consistent and accurate pain assessment, and a focus on meeting the unique requirements of each patient, this may be mitigated by creating an environment where pain management is prioritised. Insufficient pain management can jeopardise the objectives of numerous healthcare systems, which include reducing patient readmission rates and enhancing patient satisfaction (Taylor & Stanbury, 2009).

Effective assessment, management, and documenting of pain are essential components of a health team's collaborative efforts in managing post-operative pain. Pain assessment and management following surgery are critical components of post-operative patient care. A meticulously structured healthcare system ought to underpin post-operative pain management, with meticulous documentation of the treatment outcome for every individual patient being an absolute necessity. Around fifty percent of post-operative patients have received insufficient pain management (Abdalrahim, Majali, & Bergbom, 2008).

2.1.2 Types and Classification of Pain

There is different classification of pain which are often are based different factor such as physiology, intensity, types of tissue affected and syndrome. Studies conducted in the University of Wisconsin differentiated various characteristics and types of pain as illustrated in figure 1 below.

Pain physiology	Inflammatory, Neuropathic and Nociceptive
Intensity	Mild-Moderate-Severe; 0-10 numeric pain rating scale
Time Course	Acute, Chronic
Types of Tissue involved	Skin, Muscles, Viscera, Joints, Tendons, Bone.
Syndromes	Cancer, Fibromyalgia, Migraine, Other procedure.

Figure 1 Pain Classification (University of Wisconsin 2010)

Acute pain is a sudden, intense pain that is usually caused by tissue damage due to injury, surgery, or disease. This type of pain is generally short-term and lasts less than three months. Acute pain serves as a warning signal that something is wrong in the body and prompts the individual to seek medical attention. Although acute pain is usually temporary, it can be debilitating and affect an individual's quality of life (Schug, 2015). Acute pain can be caused by various factors, including injury, surgery, and illness. One of the most common causes of acute pain is injury, such as fractures, sprains, and cuts. Surgical procedures can also lead to acute pain, especially in cases where invasive procedures are involved. Acute pain can also be caused by illnesses such as appendicitis, pancreatitis, or infections. Acute pain can have various effects on an individual's quality of life. The immediate effect of acute pain is discomfort and distress, which can affect an individual's mood and ability to perform daily activities. Acute pain can also lead to sleep disturbances, fatigue, and irritability. If not properly managed, acute pain can lead to chronic pain, which can have long-lasting effects on an individual's physical and emotional well-being. (American Pain Society, 2008).

Acute pain is a common type of pain that can have various causes and effects. The management of acute pain requires a multidisciplinary approach that includes pharmacological and non-pharmacological interventions. Healthcare professionals should strive to manage acute pain effectively to prevent the development of chronic pain, which can have long-lasting effects on an individual's quality of life. The management of acute pain depends on the cause and severity of the pain. Painkillers such as nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids can be used to manage acute pain. However, the use of opioids should be monitored carefully to avoid addiction and other adverse effects. Non-pharmacological interventions such as physiotherapy, massage, and acupuncture can also be used to manage acute pain (Chou R, 2009).

Acute pain often give rise to chronic pain which disguises a range of emotional symptoms with a prolong time to appear, thus resulting in a change in behavioural and verbal signs that often are difficult to detect. Chronic pain in children and adolescent is a well-documented medical problem which has a farther ramification in patient's life including biological, psychological and social system.

2.1.3 Perceptions about post-operative Pain

Patients who experience post-operative pain due to surgery may have different perceptions of their pain based on their unique experiences and circumstances. One of the most common perceptions of pain among pediatric patients is that it is intense. Post-operative pain is often described as a sharp, severe, and intense sensation that can be overwhelming and difficult to manage. According to a study published in the *Journal of Pain Research*, post-operative pain is often acute pain, and it is typically rated higher in intensity than chronic pain, and patients tend to report higher levels of distress associated with acute pain (Sullivan, 2018).

Patients with post-operative pain may also experience emotional distress, such as anxiety, fear, and depression. The psychological impact of acute pain can be significant, and patients may struggle to cope with the stress and uncertainty of their illness or injury. A study published in the *Journal of Pain and Symptom Management* found that patients with post-operative or acute pain had higher levels of anxiety and depression than patients with chronic pain. Inability to cope is another perception of pain that acute patients may experience. Acute pain can interfere with a patient's ability to perform daily activities, leading to feelings of helplessness and frustration. This can be particularly challenging for patients who are already dealing with the physical and emotional stress of their illness or injury (Merskey, 2017).

Post-operative pain is often perceived as urgent by patients, who may feel a need to have their pain treated immediately. Patients may fear that their pain will worsen if it is not addressed promptly, and they may become distressed if they perceive that their pain is not being taken seriously by healthcare providers. Fear of addiction is another perception of pain that post-operative pain patients may experience. Patients may worry that taking pain medication will lead to addiction, and they may avoid taking medication that could help manage their pain. This fear can be particularly strong among patients who have a history of substance abuse or who have family members with addiction issues (Bair, M. J., Robinson, R. L., Katon, W., Kroenke, K., 2003). Finally, patients with post-operative pain may need empathy and support from healthcare providers and loved ones to help them cope with their pain. A study published in the *Journal of Pain and Symptom Management* found that patients who felt supported by their healthcare providers reported less pain and distress (Merskey, 2017).

Pediatric post-operative pain management is an essential component of healthcare, given its direct impact on the comfort, recuperation, and general welfare of children subsequent to surgical procedures. Despite this, several widespread misunderstandings and falsehoods

exist regarding this subject. To guarantee that children are provided with suitable and efficacious pain management, it is vital to acknowledge and debunk these fallacies (Kozier, Sharon, & Morgan-Samuel, 2012).

Perception	Facts
Severe pain is exclusively reported by patients who have undergone significant surgery	Extreme pain can persist even in the aftermath of minor surgical procedures
The nurse or other healthcare professionals possess the utmost knowledge regarding the patient's existence	Pain is only ascertainable in its existence and characteristics by the individual experiencing it
Addiction to analgesics prescribed for pain management is improbable.	Patients are not likely to develop an addiction to analgesics prescribed for pain management.
There exists a clear correlation between the extent of tissue damage and the level of pain experienced.	Anguish is a subjective sensation, and both the intensity and duration of pain can significantly differ between people.
Pain can be confirmed through the observation of observable physiological or behavioural indicators.	Behaviour and physiological adaptations are possible despite periods of severe discomfort.

Figure 2 Common perception about pain Kozier et al., 2012 pp. 746

2.2 Post-operative pain Assessment Tool

Pain among other vital sign, is considered to be fifth in the vital signs scale and therefore requires a constant and progressive monitoring to ensure the best quality of care and treatment to related pain symptoms (Hong, 2016). It becomes necessary for nurses and other care professional to not only understand the previous pain assessment tools at their disposal but to also have the required training and knowledge to use. It is often said among care professionals that it is better to prevent pain than to heal them. The primary objective of evaluation is to accurately ascertain and convey pertinent information regarding the location, intensity, and impact of pain on the infant's overall functioning. The primary means of

assessing pain is often through patients' self-reporting of their pain experiences (Crellin, Harrison, Santamaria, & Babl, 2015). The four prevailing behavioural pain measurement instruments that are dependent on the nurse's direct observation of the child are as follows: The Face, Legs, Activity, Cry, and Consolability (FLACC), the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS), behavioural pain Assessment scale, the Toddler-Pre-Schooler Post-operative Pain Scale (TPPPS) and the Parent's Post-operative Pain Rating Scale (PPPRS) (Twycross, Alison, 2013).

The FLACC scale is an invaluable tool that has been purposefully developed to assess the intensity of acute pain in pediatric patients, with a particular emphasis on the post-operative phase. The aforementioned evaluation instrument serves a pivotal function in the field of pediatric healthcare by facilitating communication during instances where young patients are incapable of accurately self-reporting their pain. Healthcare providers can effectively evaluate and manage pain in this vulnerable population until the child reaches the age of self-report pain scale proficiency, with the assistance of the FLACC scale's structured and systematic approach. Furthermore, it exhibits robust validity and reliability, establishing it a dependable option for evaluating post-operative pain. (Twycross, Alison, 2013). Particularly for the evaluation of pain in pediatric patients undergoing recovery from surgery, the CHEOPS scale is a universally validated and esteemed instrument. It is significant in that it was not developed independently; on the contrary, seasoned recovery room nurses participated in a collaborative effort that led to its creation. Due to their considerable practical expertise in post-operative childcare, these nurses were in a unique position to impart insightful observations regarding the symptoms and behaviours they encountered most frequently in order to ascertain whether a child was experiencing pain. In order to develop an instrument that is not only clinically sound but also pragmatic and attuned to the intricacies of assessing pain in pediatric patients, the collaboration with these seasoned recovery room nurses was indispensable (Hockenberry & Wilson , 2014). For evaluating post-operative pain in children aged one to five years, the TPPPS scale has been devised as a specialised and valuable observational instrument. Assessing pain in this particular age group presents distinct challenges as a result of their restricted cognitive development and limited communication capabilities. The purpose of developing the TPPPS was to address this lack of communication and offer medical professionals a systematic framework for efficiently evaluating and controlling pain. Vocal pain expression, facial pain expression, and bodily pain expressions comprise the three discrete pain behaviour categories that the

TPPPS measures. Each of these categories plays a crucial part in constructing a full depiction of a young child's experience of pain. (Twycross, Alison, 2013)

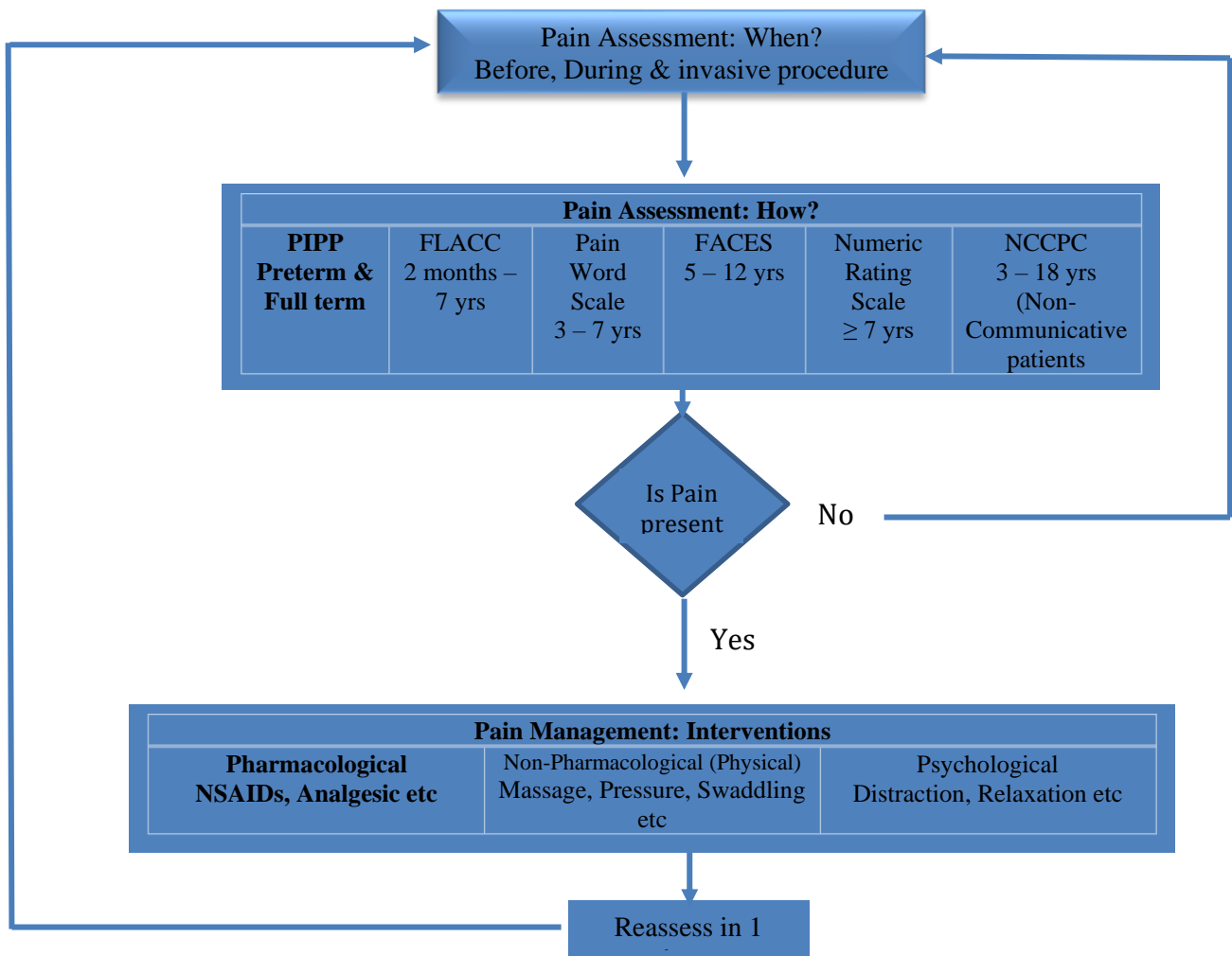


Figure 3 Twycross, 2013 Managing Pain in Children

Lastly, in the measurement of pain, it is important to document or have a record of each patient's pain record as they provide valuable information to the care and helps in the determinant of best course of care plan in regard to pain treatment. The pain diaries become the convenient tool to serve such purpose, where patients themselves record their pain levels at different intervals providing also various activities or interventions that affect their pain. Pain is always subjective and as such nurses have to understand that no single tool can provide a complete picture of a patient's pain experience. It is therefore recommended to use multiple tools and methods to assess and manage pain in acute pain after surgery (Herr, et al., 2006)

2.3 Nursing role in care for Pediatric post-operative pain patient

The aim of any care is and has always been that of improving a patient's quality of life, this include a well care plan for infants or children who are recovering from surgery. It is always challenging in alleviating a patient's post-operative acute pain especially with children which often can progress to a chronic situation. In has been argued in one study that though patient receive medication aimed at alleviating their pain, sometimes the medication does achieve its objective (Hong, 2016)

Therefore, nurses resolve in implementing different set of methods and interventional strategies for pain management which often include pharmacological as well as non-pharmacological intervention as a form of holistic approach to achieve their goal. Whatever approach is found to be effective; nurses have the ethical obligation to present these options to the patients and obtain consent before implementation through thorough discussion and adverse effects.

2.3.1 Pharmacological Therapy

Pharmacological therapy always comes as a safer option as a form of pain management plan in other to alleviate a children's post-operative acute pain, however, in recent findings, it has been observed that children's who undergoes pharmacological therapy as for of pain relief method often have their persistent due to inefficiency of the medication and prolong pain which often can becomes a chronic condition. In most European countries, over the counter drugs are the most common assessable form of drugs which are non-addictive and non-steroidal anti-inflammatory drugs (NSAIDs), often are common prescriptive form of drugs. In most situation after surgery, patients have spinal cord stimulation therapy which aim at alleviating pain directly. In this situation, such form of therapy is under the guidance and supervision of a physician. (Hong, 2016)

Nurses are at the forefront to all this treatment through constant monitoring of children's various responses to treatment, provide reliable information to the child's physician on the improvement or failure of the medications and possible recommendations to alternative form of pain management therapy. This also is the opportunity for nurses to identify adverse effects and possible various patient's experiences with pain where there is no improvement in relation to the therapies. Nurse's knowledge of pharma-kinetic and pharmaco-dynamic becomes useful and such understanding helps in the improvement of altered treatment to patient's pain management plan. (American Pain Society, 2008)

2.3.2 Non-pharmacological method to care for post-operative.

In the advent of the opioid crisis in the US, many patients have become adamant in their refusal in the use of pharmacological drugs (Sullivan, 2018). Non-pharmacological and alternative methods for management of pain is essential in the relief of pain without the use of any pharmacological product. Such alternative methods often include relaxation, mindfulness and meditation, distraction and acupuncture, yoga and music. Non-pharmacological methods can also be effective in reducing pain and improving patient outcomes. Nurses play a critical role in implementing non-pharmacological pain management strategies, and there are several methods they can use to provide effective care for patients with post-operative pain even in pediatrics (American Pain Society, 2008).

One effective non-pharmacological method for managing pain after surgery is distraction. Distraction can involve providing patients with activities that take their mind off their pain, such as reading, watching TV, or listening to music. Distraction techniques can be particularly effective for infant's patients who are experiencing mild to moderate pain. Another non-pharmacological method for managing pain after surgery is relaxation techniques. These techniques can include deep breathing, progressive muscle relaxation, guided imagery, and mindfulness meditation. Relaxation techniques can help patients to reduce muscle tension and promote a sense of calm, which can in turn reduce pain levels (JCI , 2001)

In addition, nurses can use heat or cold therapy to manage pain after surgery, however, this technique is not recommended for neonate. Heat therapy can be applied through the use of warm compresses or heating pads, while cold therapy can be applied through the use of ice packs. Both heat and cold therapy can help to reduce inflammation and promote healing, which can in turn reduce pain levels. Acupuncture is another non-pharmacological method that has been found to be effective in managing pain after surgery though such method in children is under strict guidance and supervision. Acupuncture involves the insertion of fine needles into specific points on the body, which can help to stimulate the release of endorphins and reduce pain levels. While this method may not be suitable for all patients, it can be an effective option for some (NCCIH, 2019)

Finally, nurses can use patient education as a non-pharmacological method for managing acute pain after surgery. By educating older pediatric patients about their pain and pain management strategies, nurses can empower patients to take an active role in managing their pain. This can include providing information about pain medications, non-pharmacological

pain management techniques, and the importance of reporting pain to healthcare providers. By using a combination of these methods and working closely with other healthcare professionals, nurses can provide effective pain management strategies that can help to improve patient outcomes and promote a faster recovery (JCI , 2001).

2.4 Self-care management plan in post-operative surgery

Post-operative pain can be a challenging experience for patients especially for children, but a self-care management plan for children older enough to be educated about self-care pain management and to parents can help to reduce pain levels and promote a faster recovery. A self-care management plan is a personalized plan that is developed and adapted to patient in collaboration with healthcare professionals, and it outlines specific strategies for managing pain and promoting healing (Ausili, Masotto, Dall'Ora, Salvini, & Di Mauro, 2014).

While it may be tempting to avoid physical activity when experiencing pain, exercise can actually be an effective way to reduce pain levels and promote healing. Low-impact exercises such as walking, swimming, and stretching can help to improve circulation, reduce inflammation, and release endorphins, which are natural painkillers. Such technique is specific tailored to children older than 12 years, who can walk on their own around their homes, hospital corridors under the surveillance of their parents and nurses. Parents should consult with their healthcare provider to determine what types of exercise are appropriate for their children in every individual situation. Relaxation techniques such as deep breathing, guided imagery, and meditation can help to reduce muscle tension, promote relaxation, and reduce pain levels. Parents and guardians can learn these techniques from healthcare professionals or through self-directed resources such as books or online tutorials (CDC, 2021)

Heat therapy, such as warm compresses or heating pads, can help to reduce muscle tension and promote relaxation, while cold therapy, such as ice packs, can help to reduce inflammation and pain levels. Parents again should always consult with their healthcare provider to determine which type of therapy is appropriate for their children's individual situation. A healthy diet can promote healing and reduce inflammation, which can in turn reduce pain levels. Parents and guardians should always aim to eat a balanced diet that includes plenty of fruits and vegetables, whole grains, and lean protein sources. Consultation with a healthcare provider helps to determine if there are any specific dietary recommendations for their individual situation (CDC, 2021).

Getting enough sleep is important for promoting healing and reducing pain levels. Patients should aim to get 7-9 hours of sleep each night and should work with their healthcare provider to manage any sleep disturbances that may be contributing to their pain. Having a strong support network can be helpful for managing pain and promoting healing. Patients can reach out to family, friends, or support groups to get emotional support and practical assistance with daily tasks (CDC, 2021).

A self-care management plan can be an effective way for patients with acute pain to manage their pain levels and promote healing. By incorporating strategies such as exercise, relaxation techniques, heat or cold therapy, nutrition, sleep, and support, patients can take an active role in managing their pain and promoting a faster recovery.

3 Aim of the Study and problem definition

The aim of this study is to enhance nurses' knowledge in the effectiveness of nurse-led interventions in managing post-operative pain in pediatric surgical patient through the provision of new information in regard to pain management as well as patient awareness of post-operative pain. In this regard, the following research question help in the process to reach the objective of this research:

- How do nurses assess and individualize post-operative pain management plans in pediatrics unique needs, preferences, and clinical conditions?
- What is the most effective nurse-led interventions for managing post-operative pain in pediatric surgical patients?

4 Theoretical Framework

The Comfort Theory by Katharine Kolcaba is a nursing theorist that emphasizes on the significance of comfort as a comprehensive and crucial element of patient care. In nursing practice, this theory has become a fundamental framework that offers a holistic approach to patient care. This is especially true for post-operative pain surgery patients, for whom managing physical, emotional, and psychosocial comfort is essential for fostering recovery and improving general well-being. The theory highlights how comfort has multiple dimensions, including physical, psycho-spiritual, environmental, and socio-cultural ones. The use of efficient pain management strategies is crucial in order to mitigate discomfort, mitigate the risk of complications, and facilitate the process of healing. Nevertheless, the

inclusion of Comfort Theory introduces an additional dimension to the provision of care by acknowledging that the concept of comfort goes beyond just alleviation of physical pain. Instead, it encompasses the provision of emotional support, the promotion of psychological well-being, and the fostering of a sense of connectivity (Kolcaba K. , 2003)

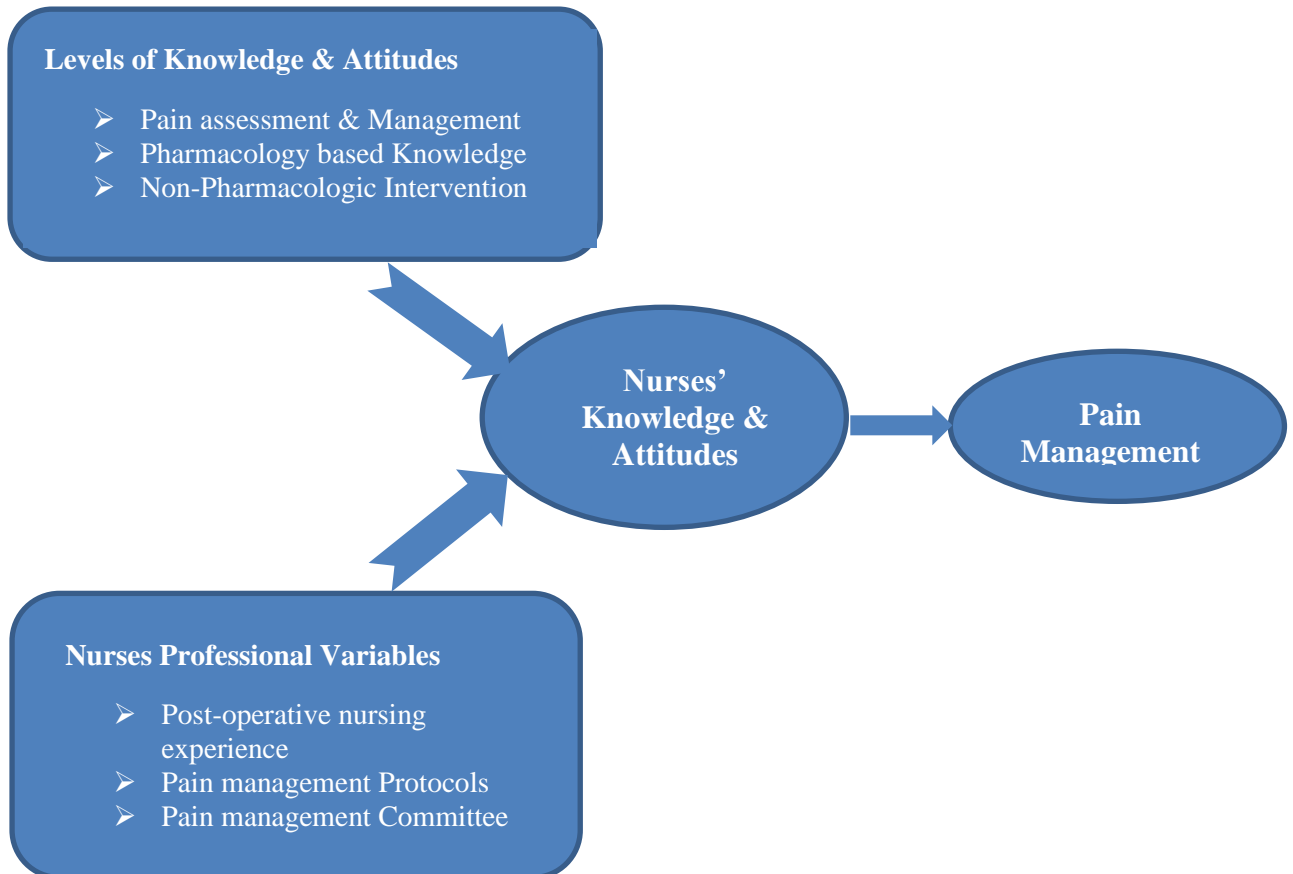


Figure 4 Conceptual Framework for Comfort theory (Kolcaba et al., 2006)

4.1 Physical Comfort

The Comfort Theory places a strong emphasis on the value of physical comfort in fostering overall well-being. In order to deal with physical discomfort, it emphasizes pain management, posture, and physical care. Utilizing pain assessment tools and non-pharmacological approaches, pain management entails locating and resolving the origins of pain. Giving patients their basic requirements, such as ensuring hygienic conditions and a healthy diet, is known as physical care. Comfort Theory emphasizes individualized care, professional collaboration, good communication, prevention, and early intervention. Additionally, it places a strong emphasis on observation and evaluation to guarantee that comfort measures are still effective during the healing process. The Comfort Theory encourages a more comfortable and healthier environment for patients by treating physical

discomfort and offering suitable pain management techniques (Kolcaba, Katherine; Tilton, Collete; Drouin, Carol., 2006)

4.2 Psycho-Spiritual Comfort

The Comfort Theory, a cornerstone of healthcare, emphasises the significance of patients' psycho-spiritual comfort. It emphasises the necessity for nurses to support patients emotionally, lessen worry, encourage coping mechanisms, and respect their spiritual views. Nurses are essential in providing patients who are experiencing emotional distress as a result of pain, disease, or medical procedures with compassionate presence, active listening, and empathy. As surgical patients frequently suffer worry and fear connected to the treatment, the healing process, and possible results, anxiety reduction is a crucial component of psycho-spiritual comfort. Interventions to lessen anxiety, such as mindfulness practises, relaxation techniques, and therapeutic dialogue, are crucial. Creating a safe environment for patients to communicate their worries, fears, and feelings through therapeutic dialogue is essential to addressing psycho-spiritual comfort. Nurses do this by communicating effectively and empathically. Another essential component of psycho-spiritual comfort is patient education, which aids patients in understanding their disease, available treatments, and the healing process. In order to support their psycho-spiritual wellbeing, nurses help patients identify appropriate coping mechanisms, such as taking up a hobby, practising meditation, or consulting a spiritual advisor. Another part of psycho-spiritual comfort is the promotion of hope. Nurses encourage and uplift patients so they can remain hopeful in the face of suffering or misfortune. Psycho-spiritual comfort also includes addressing psychological discomfort, which can be done by using strategies like guided imagery, distraction, and mindfulness exercises. The Comfort Theory emphasises the value of addressing a patient's emotional, psychological, and spiritual well-being in their care, to sum up. Nurses aid in the psycho-spiritual comfort of their patients by offering emotional support, lowering anxiety, promoting coping mechanisms, and honouring their spiritual beliefs. (Kolcaba, K., 1992)

4.3 Environmental Comfort

The Comfort Theory emphasises the significance of environmental comfort in patient treatment. Nurses play an important role in developing a therapeutic environment that supports the general well-being of patients. Lighting, noise levels, cleanliness, privacy, personalisation, and cultural sensitivity are all important considerations. Nurses reduce noise levels, ensure enough illumination, maintain cleanliness, respect patients' privacy, and

involve them in decision-making. They also take cultural preferences into account and accommodate their individual identities. This method is consistent with Comfort Theory's holistic approach, which takes into account how the physical environment interacts with other dimensions of comfort. Comfortable settings promote rest and recuperation by promoting sleep, relaxation, and overall well-being. The environment is integrated with care interventions, increasing the efficacy of other therapies targeted at improving patient comfort. The comfort and effectiveness of the patient experience depend on this all-encompassing approach to healthcare. (Kolcaba & Wilson, 2002)

4.4 Sociocultural Comfort

When providing care, the Comfort Theory, a cornerstone of healthcare, emphasizes the value of recognizing and respecting patients' cultural backgrounds, social identities, and personal preferences. This factor plays a key role in ensuring that nurses deliver high-quality treatment that respects and promotes their distinctive sociocultural identities. Cultural sensitivity, individual identity, effective communication, inclusive care, cultural traditions, honouring preferences, fostering trust, developing cultural competency, working with families, and patient-centered care are key components of sociocultural comfort according to Comfort Theory. Nurses must be culturally aware, recognizing and respecting their patients' cultural beliefs, practices, and values, and tailoring their care to meet their patients' specific cultural preferences. Achieving cultural competence requires constant study and self-evaluation so that healthcare providers can cater to a wide range of patients. Care plans for patients should take into account their cultural and social backgrounds, which is why nurses and families should work together. Finally, in Katharine Kolcaba's Comfort Theory, the component of sociocultural comfort emphasizes the importance of recognizing and addressing patients' cultural and social identities. By customizing care plans to correspond with the cultural beliefs, tastes, and backgrounds of patients, nurses are able to improve the overall comfort and well-being of individuals under their care. When paired with other aspects of comfort, this dimension creates a comprehensive approach that accords with the theory's holistic view of patient care. (Kolcaba K. , 2003)

Finally, Katharine Kolcaba's Comfort Theory's holistic approach ensures that post-operative pain is managed comprehensively and individually. Nurses provide care that not only eliminates pain but also enhances patients' total comfort and well-being by taking physical, emotional, psychological, spiritual, and social factors into account. This method enhances patient outcomes and satisfaction while adhering to the guiding principles of the theory.

5 Research methodology

This is a qualitative study that is conducted by means of a systematic literature review, and it will use the usage of both an inclusive and exclusive method to acquire the necessary data. To make an attempt to respond to the research questions, a content analysis will be used.

To understand, analyse, and explain the social phenomena of people's encounters, behavioural actions, and emotions, qualitative research is a method of social analysis that tries to understand these things (Holloway & Kathleen, 2016).

5.1 A systematic Literature Review

A systematic literature review is a methodical approach to analysing and synthesizing existing research on a specific topic. Its objective is to deliver an account that is both exhaustive and objective of the current state of knowledge within a certain domain. A systematic review seeks to minimise bias and subjectivity, unlike traditional literature reviews, which may be impacted by the reviewer's subjective ideas. As a result, a systematic review is an essential tool for evidence-based practise since it attempts to eliminate subjectivity and prejudice (Coughlan & Cronin , 2017). This is achieved through a rigorous research strategy aimed at identifying all relevant studies pertinent to the research topic. Numerous databases are explored to minimise the risk of missing pertinent information. The retrieve studies, therefore, undergo a systematic screening process based on predetermined inclusion and exclusion criteria which ensure that the inclusion of studies meet specific quality and relevance standards. A crucial stage in the process is the synthesis of the findings. The outcomes of the studies that are included are analysed and compared by the researchers so that they may identify patterns, trends, and contradictions between the relevant articles (Coughlan & Cronin , 2017). In the end, the findings are interpreted by placing them within the framework of the research topic. The evaluation comes to a close with a detailed overview of the evidence and an analysis of its implications for clinical practise.

The aim of the systematic review is to provide substantial answers to the research questions through gathering of evidence, this therefore denote that every first-hand research which is linked to research questions is identified, critically reviewed and the findings analysed. The overall, is the birth of new findings as a result of the combination of various evidence and its analysis (Coughlan & Cronin, 2017). Subsequently, systematic review identifies the various lack in knowledge which often than not can be applied in future studies.

5.1.1 Qualitative Research

This is research that involves the collection and analysis of non-numerical data. Such data are often texts, videos or audios. Qualitative research, in contrast to quantitative research, seeks to gather information that is more open to interpretation and personal experience. Such information subject to interpretation are concepts related to and or opinions based on experience. Thus, qualitative research helps in giving understanding complex and in-depth research topics. This is the most widely used method in nurse which helps in the identification of motivations and passion driven research in nursing, especially in real life situations. Interviews with study participants are the first step in most qualitative research projects. Since qualitative research aims to comprehend human experiences and viewpoints, this strategy is fundamental to the field. Data collecting, data analysis, and data sampling are all part of this. Qualitative researchers have an open mind and are willing to pivot in response to participant feedback and new information at any point throughout these phases. When studying topics that revolve around human experiences, beliefs, and behaviours, this method is very useful for getting a thorough and nuanced grasp of the subject at hand (Polit & Beck, *Essentials of nursing research : appraising evidence for nursing practice*, 2022).

An essential component of any research endeavour, even qualitative ones, is a rigorous literature review. It is useful for building the research's theoretical foundations. It sheds light on the prior research in the field by outlining the major theories and concepts. In order to find unexplored or underexplored topics, researchers must first conduct comprehensive literature reviews. This is useful for zeroing in on the new study's primary questions. (Polit & Beck, *Essentials of nursing research: Appraising evidence for nursing practice*, 2018).

An exhaustive, detailed, and nuanced investigation of the thesis subject is possible through the integration of qualitative research methods with a systematic literature review. It gives them the freedom to think creatively, analyse previous works, and add to the field's body of knowledge. This thesis is based on a rigorous literature review. The research methodology employed is qualitative. This kind of expansive thinking was the author's choice while composing the thesis.

5.1.2 Data Collection

CINAHL, EBSCO, PUBMED, BioMed Central Journal, Google Scholar and Novia FINNA E-book are the databases used as access and primary sources for the articles needed. Keyword used in the search engine included, “Pain”, “Post-operative”, “Pediatric surgery

pain patient”, “Nurses role”, “Pain management”, “Patient education” and “Nurses Knowledge”. The prisma flow chart below is seen in figure 5 show the overall result in the various database search.

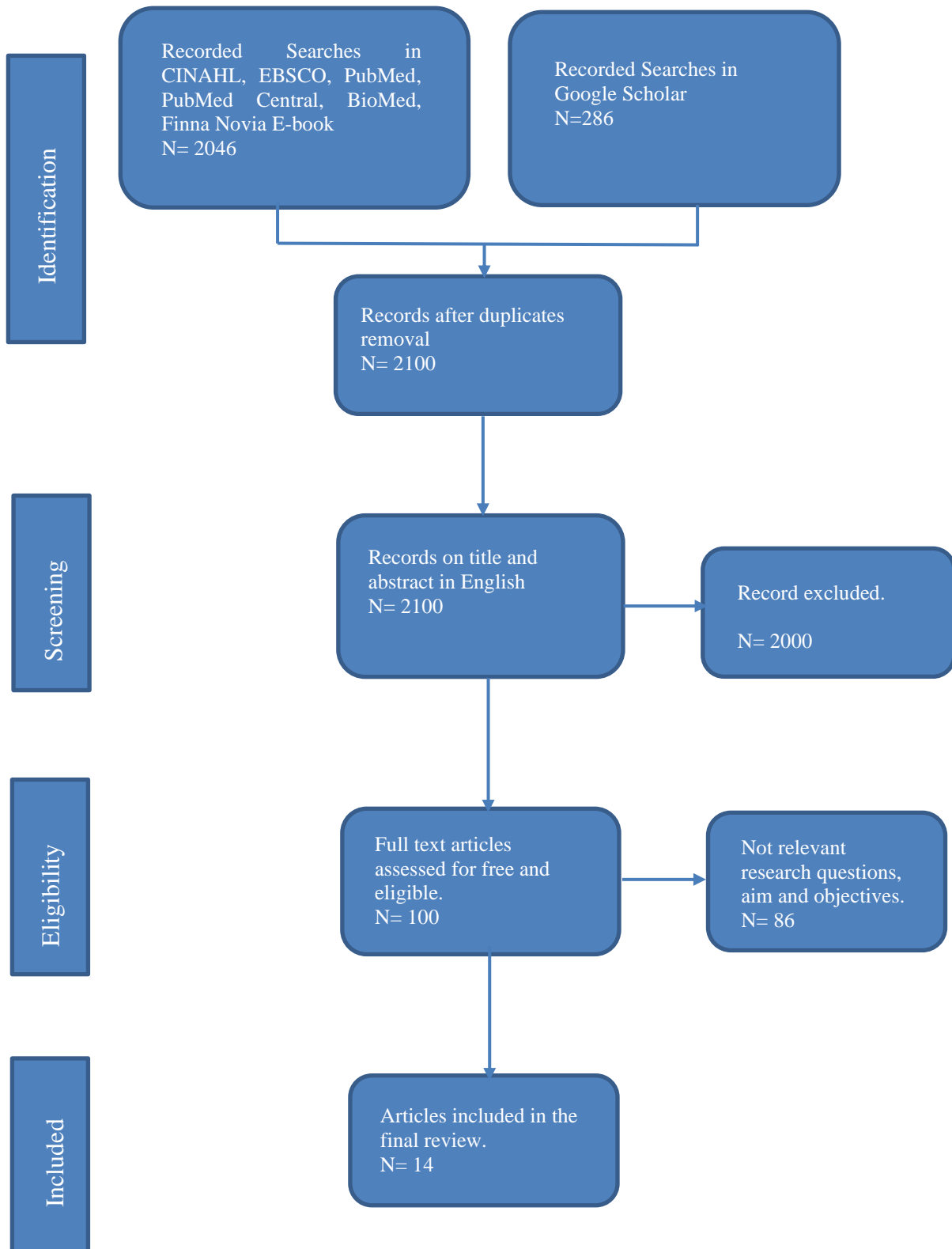


Figure 5 Prisma Flow chart

5.2 Inclusion and Exclusion Criteria

When designing a study, it is helpful to have well defined inclusion and exclusion criteria. This helps to ensure that all the necessary information is gathered and that the study does not stray too far from the parameters of the study topic. The criteria for selection need to serve as a guide for concentrating on publications that are pertinent to the research questions and subject matter (Coughlan & Cronin , 2017).

The inclusion of criteria needed for this study were: The article's relevance should align with both the research question and the study topic that is post-operative pain patient or nurse's role in the management of post-operative pain surgery patient. The articles should be a qualitative study, peer or scientific reviewed, written in English, written within the last ten years and full text published with a free access.

The exclusion criteria employed in this study for the selection of articles to determine their irrelevance included quantitative study, any secondary sources, non-academically written, not in English and published before 2013.

5.3 Content Analysis

The research methodology employed in this study is qualitative content analysis. This approach involves the examination and interpretation of the existing data, with a focus on identifying prominent themes and patterns. Visualisation tools, such as charts and graphs, are utilised to aid in this process. Data can be made more cohesive through the use of themes, which function to identify and give meaning to the data. The researcher, after reading the articles, generated sections that helped in categorising the information through editing and analytical style. The researcher then provided an interpretation of the study. The researcher did delve into the ideas by examining sentence by sentence and paragraph by paragraph to highlight parallels and dissimilarities. The next step, after articles have been analysed, is to identify themes and establish classifications for them (Polit & Beck, Essentials of nursing research : appraising evidence for nursing practice, 2022). To achieve this, the researcher used colour coding as seen in figure 6. Each article was read at least 3 times, the first time was to establish the relevance of the study to the research, the second time was to establish the main research theme in the study with the colour RED such pain assessment or pain management or assessment tools in pediatric post-operative pain. Sub-themes were then group in wordings of occurrence with the colour code yellow and lastly the researcher

determine what each group seeks to demonstrate such as documentation or pharmacological treatment with the colour code white.

The purpose of every research done is always to provide value added information pertinent to field in which the research is conducted. Likewise, the aim of this research is to provide evidence-base information and resources to nurses so that they would be better prepared to give care to pediatric post-operative patients who are experiencing pain by using individualised pain management strategies. This research utilises content data analysis to evaluate the information that has been gathered. This section will estimate the appropriateness of the study based on five primary criteria as a part of a qualitative research project. These criteria are dependability, credibility, transferability, trustworthiness, and confirmability. According to Polit and Beck (2018), dependability in qualitative research refers to an investigation that is reliable in that its methodological framework is accurate and consistent. The reliability of the findings of the research is a major factor in determining a researcher's credibility (Polit & Beck, 2018). According to Darawsheh (2014), credible research has a close association between the procedure of doing content analysis and the interpretations of the researcher (Darawsheh, 2014). In this particular investigation, both credibility and reliability were verified. In this study, peer-reviewed publications were collected using several databases, including CINAHL, EBSCO, PubMed, BioMed, Google Scholar, and searches from Novia FINNA. The researchers used severe "inclusion and exclusion criteria" to make their selections. The credibility of the research was ensured by the use of data representativeness (Polit & Beck, 2018). The study used inductive content analysis as its primary method for interpreting and contextually situating the data it gathered. In addition, in order to understand the findings of the study, the researchers used Kolcaba's Theory of Comfort, which is a valid and practical theory.

The findings of qualitative investigations are said to be transferable, when it can be used efficiently in a variety of contexts. According to Darawsheh (2014), confirmability refers to the degree to which the conclusions of a study are consistent with the findings of studies conducted by other researchers. This helps to guarantee that the data being relied upon is accurate. The validity of the findings can be established through their congruence with the research that were included for the literature review.

The conclusions of this study were compared to those of other investigations, and it was found that they produce results that are comparable. In addition, the criteria for selection guaranteed that the various articles collected were pertinent to the topic at hand and

comparable to one another. The piece of writing contains an adequate amount of trustworthiness and authenticity. The research is objective, and it offers genuine information that is a testament to the review that was carried out. Furthermore, the findings of the study can be applied to enhance nursing practise. The credibility of the data has been preserved by the application of the methods of content analysis that have been specifically outlined. This indicates that precise definitions have been provided for frequent emerging ideas in an effort to reduce researcher bias. Making this point absolutely clear is helpful to the study in that it allows the researchers to include it in their list of suggestions.

5.4 Ethical Consideration

The terms "ethics" and "ethical" relate to a collection of guiding principles, values, and rules that control moral behaviour and decision-making. The process entails determining whether a given action or set of options is morally acceptable or objectionable based on the standards of the surrounding community. Ethics provides a framework that enables individuals and communities to negotiate complex situations, make ethical decisions, and retain integrity in their dealings with others (Manuel, et al., 2021). Since ethics guarantees that patients' dignity and well-being are upheld and maintained, it is crucial in the fields of health and social care. When ethical considerations are considered, the guidelines that are in place to safeguard the research process are able to maintain a delicate equilibrium. The purpose of ethics is to investigate and comprehend the norms, values, principles, and ideals that govern research (Holloway & Kathleen, 2016).

The Finnish advisory Board on Research and Integrity (TENK) has issuing guidelines in regard to research done by researchers within universities and applied science universities. These rules and guidelines are followed according to the latest guideline issued by the Advisory Board on Research which involve both medically related research and nonmedical research within two specific domains. This includes research undertaken on human behaviour and science, whereas another on the guidelines for ethical research or review on human sciences. Within Finnish research community, when research is done involving human participants, they must be done within ethical norms to avoid any biases, harm and research integrity (TENK, 2019)

This research project followed TENK guidelines on research and integrity through several steps to achieve the desired research outcomes. First, the supervising mentor of Novia University of Applied Science approved the start of the research project upon submission of

the research plan. While the research was undertaken, sources, publication, authors and references have been cited according to Novia writing guidelines to avoid any plagiarism. Upon the collection of data necessary for this research, no harm has been done toward any individual. In the absence of human participant, the need of informed consent wasn't necessary, if so the right of privacy, human dignity and confidentiality has been observed as per Law within Finnish Constitution section 6-23 (TENK, 2019).

6 Result

The literature review findings indicate a consensus that the effective management of pediatric post-operative pain necessitates the involvement of nursing healthcare professionals who possess responsibility, accountability, and expertise, and who adhere to the established standards of care for infants or children who underwent surgery. As described in the methodology section, a total of twelve peer-reviewed qualitative scientific research papers were consulted for this study. Various research papers presented relevant data to ascertain the outcomes of this study, with most of them offering overlaying information that pertained to the distinct themes uncovered in this research. As depicted in Figure 6, the research papers included in this study are categorised based on their individual findings pertaining to the involvement of nurses in the management of post-operative pain in pediatric patients. Based on the data obtained, this study categorises the outcomes into seven primary classifications, specifically: documentation, pharmaceutical, non-pharmacological, educational intervention, parents' perception, nurses' knowledge, and pain scale. Subsequent finding into the main themes reveal sub-themes under each main finding with greater links to the research question: how do nurses assess and individualize post-operative pain management plans in pediatric unique needs, preferences, and clinical conditions?

A further critical analysis into the sub-theme reveals that through nurse-led interventions in pediatric post-operative patients like adequate empathy, positive motivation and encouragement, cognitive-behavioural therapy, cheer therapy, music therapy, adequate and adaptive distraction methods and proper timely pharmacological treatment, can address a multifaceted needs of pediatric post-operative patients under which such findings has a greater link to the research question: What is the most effective nurse-led interventions for managing post-operative pain in pediatric surgical patients?

These themes are in close proximity to Katherine Kolcaba's theory of comfort, which emphasizes on taking a holistic approach, which is essential for the emotional,

psychospiritual, environment and sociocultural health of young patients as they recover, in addition to helping with physical symptoms of pain. Because children react differently to hospitalisation and medical treatments than adults do, it is crucial to provide them with this all-encompassing care in paediatric settings.

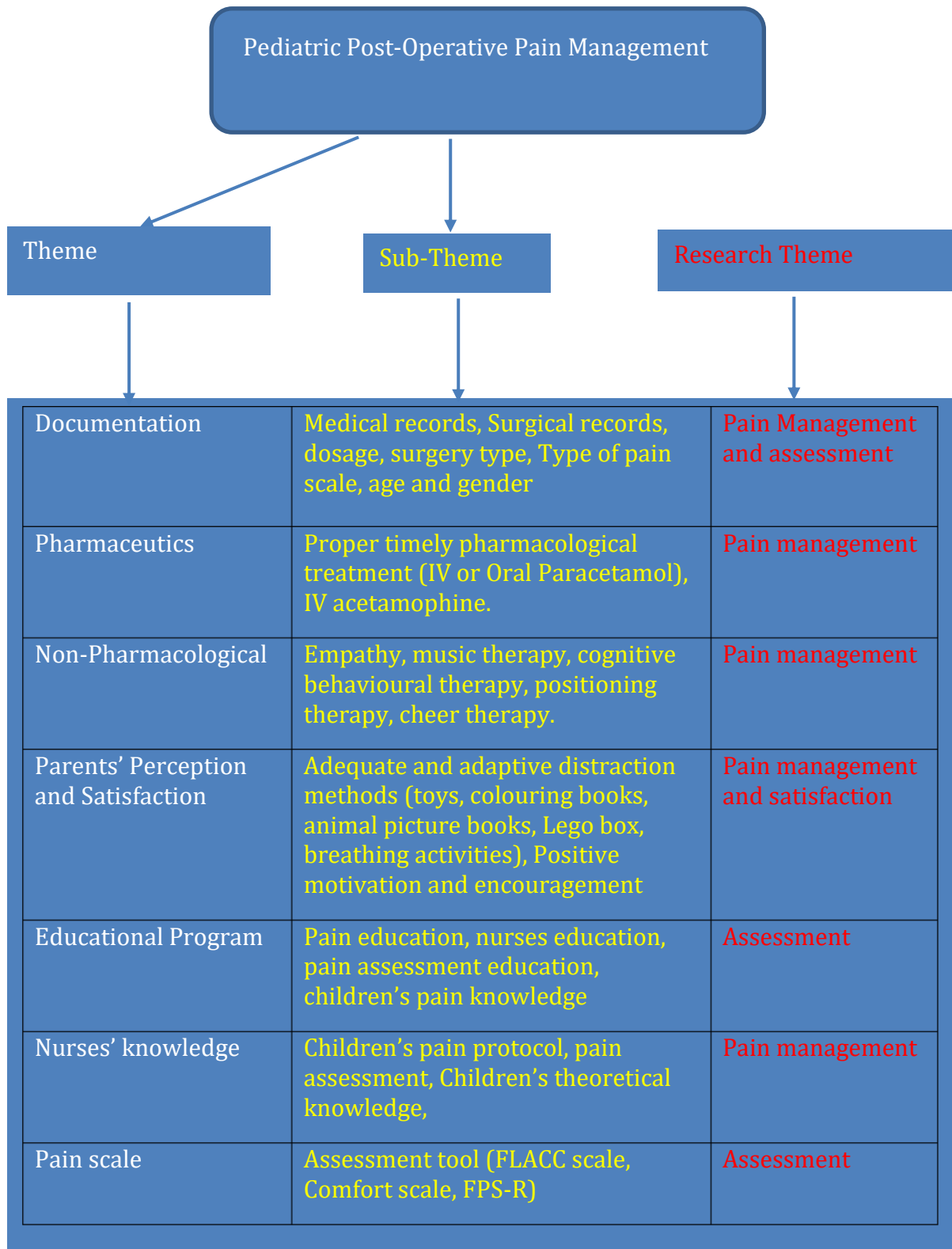


Figure 6 Theme and Sub-theme flow chart

Of the 14 articles reviewed, two had data about post-operative pharmacological use as a method of pain management after surgery in pediatric patients (n = 2), three reported data on post-operative pain management based on the type of pediatric surgery (n = 3), one reported data that provided insights into the importance of educational programs tailored to post-operative pain management in pediatric patient (n = 1). Included in this data on education program as well is parents' satisfaction and parents' perception on infant's pain management (n = 3). Subsequently, among the remaining articles, is found two data on the use of holistic post-operative pain management as a form of pain strategy in pediatric patient (n = 2). Lastly, three provided an in-depth analysis about nurse's practices in the management of pediatric post-operative pain management (n = 3). As illustrated in figure 6, the research papers are categorised according to the results they present regarding the responsibilities of nurses in the management of post-operative pain in pediatric patients. Based on the data obtained, this research systematically categorises the findings into seven overarching themes. The aforementioned themes are closely linked to Kolcaba's Theory of Comfort, which places emphasis on the role of nurses in delivering educational and supportive care for post-operative pain in pediatric patients. Additionally, it highlights the involvement of older children in actively engaging in self-management for post-operative pain management.

6.1 Documentation

According to Khin Hla, et al., (2014) the commencement of any pediatric pain management starts with documentation of the necessary data related to the patients and is considered the most important component of pain evaluation (Khin Hla, et al 2014). During the evaluation process of pediatric patients' pain, the nurse diagnoses the patients' pain through the acquisition of information and documenting them connected to the patient's pain. All pertinent details extracted from the patient's medical record are documented. These included the patient's age at the time of surgery, gender, the nature of the surgery (minimally or non-invasive and invasive), the type of surgical intervention performed, methods of pain management use to manage pain, length of hospital stay, pain score, parental satisfaction and clinical recommendation, date, dosage, route of administration, and prescription for pain medication both after the procedure and upon discharge. Furthermore, the duration and nature of the pain scale evaluation prior to and following the administration of pain medication are documented. Documentation is maintained at the patient, substance administration, and surgical procedure level (Dorkham, Chalkiadis, Ungern Sternberg,

Davidson, & Lonnqvist, 2014). In another study, the documentation and assessment of pain, it encompassed various aspects, such as determining the location, providing a detailed description, evaluating the duration and intensity of the pain, and identifying factors that either alleviate or exacerbate the pain. The evaluation of the impact of pain on sleep, mobility, and social contacts was crucial in determining the comprehensive influence on a child's functioning. The evaluation of pain in pediatric patients based on the specific surgery involved several methods, such as observing the child's behaviours, conducting a physical examination, obtaining reports from parents, and monitoring physiological indicators. The presence of distress behaviours, such as restlessness and irritability, which may or may not have a direct correlation with the experience of pain (Merkel, Danaher, & Williams, 2015).

6.2 Pain Scale and Assessment.

The suitability of the pain scales was evaluated on each patient, and the results were examined by applying the standards that were established for each individual pain scale. These recommendations were always dependent on the child's age and the degree of development that they were at (Shamim, Ullah, & Khan, 2015). In a study carried out by Dorkhan, et al., a small percentage of individuals report using the pain scale. This is due to diverse misunderstandings regarding child suffering. This considers not only the parental element, but also the system factor and the children factor. The parental element was analysed as a mixed of misconception and misadministration of children's post-operative pain scale report where the end result was fewer administration of post-operative pain analgesics. Children's factor was seen as children who failed to report self-pain due to fear of receiving medication they do not like or which to take. And lastly, system factor here was referred to hospital system that uses improper pain assessment tool in the pain scale measure of infant which resulted in improper post-operative pain management. A significant cultural discrepancy exists regarding the assessment of pain in pediatric patients undergoing surgery, according to one study; consequently, this discrepancy may be attributed to cultural, ethnic, and religious affiliations, all of which influence the pain scale measurement in infants following surgical procedures (Dorkham, Chalkiadis, Ungern Sternberg, Davidson, & Lonnqvist, 2014).

When evaluating the level of pain experienced by pediatric patients following surgery, a battery of instruments was utilised. Shamim et al., (2015) study, Self-reports were regarded as the primary means of gathering data regarding the severity of pain. It was observed that the utilisation of self-report methods in assessing pain in younger pediatric children has been

seen to encounter some challenges. This was mostly due to the requirement of sufficient cognitive and communication abilities for effective application. In cases when a kid is unable to self-rate their pain, alternative evaluators such as parents, nurses, or physicians might assume the responsibility of assessing and quantifying the pain experienced. The study placed significant emphasis on the evaluation of instruments across diverse cultural contexts, recognising that pain perception might be altered by socio-cultural factors (Shamim et al., 2015).

The utility and reliability of facial expressions as an indicator of pain in infants is contingent upon the gestational age of the newborn. The FLACC Scale evaluation tool was developed primarily for the purpose of evaluating post-operative pain in children aged 0 to 7 years. This measure has demonstrated strong efficacy in assessing pain in young children. This statement acknowledges the validity and reliability of the FLACC scale as a measure of pain until the individual can self-report their discomfort (Shamim et al., 2015). The COMFORT Behaviour Scale (COMFORT-B), a modified iteration of the COMFORT scale, primarily evaluates pain severity and the distress experienced in relation to pain. It has been validated for the assessment of sedation levels and post-operative pain in paediatric patients. The numeric rating scale and the Faces Pain Scale-Revised (FPS-R) were utilised predominantly by nurses for the purpose of evaluating pain in children. However, it was observed that the FPS-R was occasionally employed for assessing pain in younger children. It was observed that there was inconsistent documentation of pain assessments and pain scores. While informal approaches were employed by certain nurses for pain assessment ((Abou Elella, et al., 2015)

6.3 Pharmacological

The pharmacological analysis on the effectiveness of the use of medicine as a method to manage pediatric pain has been widely discuss and document and it is considered the most common use as a form of pain management among researchers (Merkel, Danaher, & Williams, 2015). This focused on evaluating the appropriateness of the medicine dosage delivered and prescribed at discharge, based on established standards. Furthermore, the time and route of delivery are utilised to determine whether pain is adequately reviewed after drug administration in accordance with established criteria. It is recommended that pain reassessment be conducted within a one-hour timeframe after the administration of medication. The temporal and spatial parameters of delivery are employed as determinants to ascertain the accuracy of pain reassessment subsequent to medication administration.

Proper reassessment of drug administration should involve evaluating the patient's pain levels within a timeframe of five-ten minutes following medication administration and/or five-ten minutes prior to the subsequent dose ((Dorkham, Chalkiadis, Ungern Sternberg, Davidson, & Lonnqvist, 2014).

According to Dorkham et al., (2014), it is commonly observed that analgesics are typically delivered in accordance with the specified dosage, although their administration may be delayed until the child reports experiencing pain. These medications are consistently provided as frequently as possible and are commonly recommended on an as-needed basis. Based on the aforementioned findings, it was observed that a significant proportion exceeding fifty percent of the pediatric population who were administered pro re nata analgesics following surgical procedures do not receive the recommended dosage (Dorkham, Chalkiadis, Ungern Sternberg, Davidson, & Lonnqvist, 2014). To corroborate such findings, Shay, et al., (2014), discussed that though the use of nonopioid and opioid are done at optimal point, the administration of such drugs is such that it is either less than needed and over more than needed based the knowledgeable nature of the care giver following fears of addictive nature of the medication (Shay, Kattail, Morad, & Yaster, 2014).

In combination with the pharmacological treatment of pediatric pain patients, multiple studies have indicated that the use of a multimodal approach as a form of pain treatment turn to effective than if use pharmacologically alone (Shay, Kattail, Morad, & Yaster, 2014; Merkel, Danaher, & Williams, 2015). Acetaminophen i.e., Paracetamol if administered in its intravenous form is highly tolerated among new-borns and young children, even those in the early weeks' gestation. Pain control is a crucial element and corner stone of the anaesthetic plan, most often accomplished through the injection of opioids. Furthermore, paracetamol, can serve as valuable adjuncts in enhancing post-operative pain management, these drugs may provide benefits when administered to pediatric patients (Shay et al., 2014). In addition, investigation on the impact of paracetamol and combination of other drugs such lidocaine on post-operative pain problems, specifically sedation and post-operative nausea and vomiting, though not very conclusive but worthy of mention as it provides great insights on nurses' knowledgeable skill in the management of pain and monitoring pharmacokinetics. Opioids exhibit a notable efficacy as analgesics, significantly mitigating post-operative discomfort subsequent to comparable procedures and concurrently diminishing the elevated likelihood of subsequent inflammation and haemorrhaging (Abduallah, Al-Ahwal, & Ahmed, 2022). It is imperative to ensure the active participation of healthcare professionals in the management of pain, including in the pediatric population, as per the specified

guidelines. Of the thirteen articles analysed in this research, only ten (10) explicitly examined the population of pediatric patients, whose ages ranged from 6 months to 16 years as well as gender demographic whereas, the remaining three focus parents without mentioning the patients age nor gender.

Many researchers constantly attempt to prove alternative to the quick use of analgesics, non-opioids and opioids to manage pain in pediatric patients. Abdullah et al., studies such alternative where the use of erector spinae plane block prove to be efficient in mitigating the quick use of analgesics, limit intraoperative fentanyl consumption and decrease post-operative morphine usage. The overall result of such effectiveness therefore improves the overall score of post-operative pain score in pediatric patients. However, though significant, this is worthy to consider that such effectiveness of the use of erector spinae plane block was proven to be efficiently implemented only within hip surgery for the patients. (Abdullah, et al., 2022)

According to Merkel et al. (2015), it is recommended to administer analgesics continuously throughout the immediate post-operative period. In the context of opioids, it is recommended to complement a continuous dosing regimen with an oral or intravenous as necessary prescription for breakthrough pain. In cases where patients are unable to consume oral fluids and drugs, they may be administered an analgesic pump, which offers patient-controlled analgesia (PCA) or nurse-controlled analgesia (NCA) as an alternative. In cases when the patient lacks the cognitive capacity to comprehend and give appropriate doses, the hospital policy designates either the nurse or parent as the authorised agent responsible for activating the analgesia pump button when the patient requires pain medicine. To provide a consistent level of pain relief, a prescription is given for a low-dosage rate, along with a supplementary dose to be administered as needed for instances of breakthrough pain. In the initial post-operative period, it is imperative for the nurse to diligently observe the patient's pain level, sedation status, and breathing rate and effort. This monitoring should be conducted irrespective of the precise route of medication administration, or the combination of medications used (Merkel, Danaher, & Williams, 2015).

6.4 Non-Pharmacological

Non-pharmacological interventions have demonstrated efficacy in pain management. However, nurses encounter many challenges that hinder their use of these strategies during the pain alleviation process. A plethora of research exists that supports the efficacy of non-

pharmacological interventions in alleviating pain experienced by children. Non-pharmacological interventions are recognised as viable approaches employed either as standalone ways for minor pain or as supplementary measures to pain medication for moderate and severe pain, in order to get sufficient pain relief. The utilisation of non-pharmacological approaches has been observed to effectively decrease the consumption of opioids and mitigate adverse physiological and psychological reactions associated with pain (Celebioglu, et al., 2015). According to Celebioglu et al. (2015), several research that examine pain management practises generally exhibit a tendency to concentrate on a single aspect of treatment, such as pain assessment, or analgesic administration, or non-pharmacological interventions, which therefore, a comprehensive understanding of pain management is not achieved.

In one study, revealed that perioperative cognitive-behavioural methods in pain treatments were associated with a favourable outcome in pediatric surgery patients. The results indicated that the inclusion of verbal encouragement, encouragement reward method, music etc in the preoperative, intraoperative, or postoperative phases of surgery yielded positive outcomes in relation to several aspects of the surgical process. One noteworthy discovery entailed a decrease in anxiety levels observed in pediatric patients who had perioperative music therapy. Research has demonstrated that physical methods such as massage therapy has the potential to mitigate preoperative anxiety, a prevalent condition observed in pediatric patients undergoing surgical procedures. The same study proved that the use of emotional support interventions yielded favourable outcomes in the realm of pain management in instances where the inclusion of such treatment method in the perioperative treatment of pediatric patients was found to be associated with reduced levels of pain and discomfort, as reported by the patients themselves. The findings indicated that nonpharmacological treatments have the potential to decrease the need for anaesthesia in surgical procedures. The discovery of this phenomenon may have significant consequences for reducing the administration of anaesthesia in pediatric populations. The implementation of music therapies was found to be correlated with enhanced recovery results. The study found that children who were exposed to music demonstrated faster healing periods and experienced decreased levels of postoperative distress. The study's findings were based on evidence that demonstrated a high overall quality of evidence from the randomised controlled trials that were analysed. This adds weight to the notion that perioperative nonpharmacological therapies have positive effects (Celebioglu et al., 2015).

Nursing personnel who have received appropriate training in the application of non-pharmacological pain management strategies possess a vital skillset that enables them to autonomously integrate these techniques into their caring practises, without relying on prescriptions from physicians. The increasing autonomy affords nurses the opportunity to develop a comprehensive and cohesive approach to nursing care, wherein the effective management of pain is effortlessly integrated with their wider range of responsibilities. Relaxation techniques, controlled breathing exercises, and active support in daily activities were identified as the most commonly utilised non-pharmacological interventions by nurses in the observed context. The significant popularity of these strategies highlights their applicability and effectiveness in the nursing field. Furthermore, it is imperative to emphasise that there was a statistically significant increase observed in the utilisation of non-pharmacological interventions by nurses, particularly in the realm of alleviating post-operative pain in pediatric patients. The increasing trend seen indicates the rising acknowledgment among nursing professionals of the concrete advantages linked to these strategies, encompassing their efficacy and ability to improve the overall quality of patient care. As a result, the increased utilisation of non-pharmacological approaches not only highlights the changing nature of nursing practise but also has the potential to provide favourable results for pediatric patients in terms of pain control and general welfare (Dorkham, Chalkiadis, Ungern Sternberg, Davidson, & Lonnqvist, 2014).

The primary obstacles that impede nurses' effective implementation of pain treatment strategies are commonly attributed to the demanding nature of their profession and the difficulties associated with pediatric patients' degrees of cooperation. Several significant barriers hinder the implementation of non-pharmacological pain relief strategies after an intervention. These obstacles include high workloads and time constraints, limited access to necessary resources, inadequate experience in utilising non-pharmacological methods, a lack of comprehensive pain management policies that promote and facilitate the adoption of non-pharmacological approaches, and a noticeable lack of knowledge about these alternative techniques. It is noteworthy to add that a discernible pattern has arisen, wherein a growing number of nurses are recognising that the limitations stated above have considerably hindered their ability to properly utilise non-pharmacological pain treatment approaches (Weiner et al., 2016).

6.5 Educational Program

Emphasising the importance of educational interventions within the realm of pediatric post-operative pain treatment is crucial. The use of pain education has shown great potential in bringing about beneficial transformations in the field of nursing. Although there is significant potential, it is important to acknowledge that only a restricted number of authors have conducted thorough examinations on the efficacy of educational interventions designed specifically for nurses and other healthcare professionals in the context of mitigating post-operative pain in children. These educational initiatives are considered a crucial area of focus for improving the standard of care delivered to pediatric patients undergoing surgical operations. The programme provides a systematic and focused method for educating healthcare practitioners, including nurses, on the essential knowledge, abilities, and perspectives required to effectively manage post-surgical pain in pediatric patients. By placing emphasis on the importance of pain education, it becomes feasible to bridge gaps in knowledge, cultivate a more profound comprehension of the complexities surrounding pediatric pain, and promote evidence-based approaches that prioritise the comfort and welfare of juvenile patients. However, it is evident that additional investigation and inquiry are required in this domain in order to fully use the capabilities of educational interventions. It is imperative to conduct further comprehensive research and foster a wider agreement among the academic and healthcare sectors in order to establish the most effective methods, enhance educational curricula, and ultimately guarantee that nurses and healthcare professionals are adequately equipped to deliver proficient pain management and empathetic care to pediatric patients' post-surgery. By implementing this approach, efforts can be made to reduce the level of distress encountered by pediatric patients and improve the overall standard of their recovery following surgical procedures (Dorkham, Chalkiadis, Ungern Sternberg, Davidson, & Lonnqvist, 2014).

Several studies included data on the importance of parents' education on both the pharmacological and non-pharmacological method of pediatric post-operative pain. Parental involvement is seen as the key to effective and accurate pain assessment and management of children's post-operative pain (Dagg et al., 2020). Having a kid hospitalised can cause a wide range of emotions in parents, including worry, dread, helplessness, anxiety, despair, and frustration. There is a need for information to help parents effectively participate in controlling their child's post-operative pain because they also have communication challenges and knowledge gaps. It is critical for parents and other carers to be well-informed so that they can offer optimal care while also safeguarding their own health. In the same

study by Saigh et al., 2023, they showed that it is beneficial for both the child's recovery and the carers' capacity to deal and handle the situation successfully to educate parents about post-operative pain management (Saigh, & Saigh, 2023).

6.6 Parents perception and satisfaction on post-operative pain management.

The study of Mathias, et al., (2022), the utilisation of distraction tools as a component of pain management strategies resulted in significantly greater parental satisfaction across several age groups, spanning from 2 to 7 years old. The distraction tools, which were specifically designed to align with the developmental stages and interests of the children, shown notable efficacy in mitigating discomfort associated with pain. In the context of youngsters between the ages of 2 and 4, the utilisation of visually stimulating and fascinating diversions, such as vivid toys, engaging anime literature, fundamental building blocks, and interactive push-and-pull toys, has been identified as the preferred approaches. The implementation of age-appropriate diversions successfully redirected the focus of the young patients, hence enhancing the tolerability of the pain management procedure by alleviating discomfort. Furthermore, the inclusion of relaxation techniques involving controlled breathing in the intervention for this particular age cohort introduced an additional element of relaxation and diversion, so augmenting the overall efficacy of the methodology. Distraction strategies have undergone adaptations to align with the progressing cognitive and social development of children between the ages of 5 and 7. Role-playing game cards, matching card games, creative colouring books, and interactive programmes on electronic devices have emerged as the favoured tools. The aforementioned distractions effectively stimulated the developing imaginations and cognitive capacities of the children, hence enhancing the overall immersive and pleasurable nature of the postoperative time. The integration of age-appropriate distraction tactics was found to have a positive impact on the satisfaction levels of mothers and carers, resulting in a pleasing conclusion. The significance of customising pain management strategies for pediatric patients at various developmental stages is emphasised by the positive link shown between the utilisation of distraction tools and heightened satisfaction. In conclusion, this methodology not only facilitates the more efficient management of pain but also enhances the overall experience for both pediatric patients and their families throughout the arduous postoperative period (Mathias, Pai, Kumar, Guddattu, & Bramhagen, 2022).

Researchers Khin Hla et al. (2014) sought to understand how parents felt about the quality of pain evaluation after surgery. They discovered that although participants did experience moderate to severe pain, they were generally satisfied with the treatment they received. Reasons for this contentment may include the notion that nurses will make every effort to alleviate pain and the realisation that a certain level of discomfort is to be expected following surgery. Given the possible short- and long-term effects, the study emphasised the significance of post-operative pain management for patients experiencing moderate to severe levels (Khin Hla, et al., (2014)

After their children underwent surgery, Erogan and Celik (2020) looked at how well parents understood and dealt with pain, how satisfied they were with their children's postoperative pain management, and how knowledgeable they were about pain evaluation in general. Overall, parents reported being content with how their child's postoperative pain was managed, and they exhibited moderate levels of understanding and usage of pain management approaches. The results of the study highlight the importance of healthcare providers educating parents on how to best manage their children's suffering (Erogan & Celik, 2020).

6.7 Nurses Perception and Clinical Competencies

The identification and evaluation of pain in pediatric patients are complex procedures that are greatly impacted by the behavioural cues exhibited by children. These cues, in turn, play a crucial role in shaping nurses' judgements regarding the intensity of pain experienced by the child. Research by Erogan & Celik, (2020) carried out within this field has provided insight into a fascinating phenomenon in which the actions of children, specifically in relation to vocalisation, in conjunction with parental involvement, significantly influenced the administration of pain relief drugs. The findings of this study indicate that children who exhibited more audible and overt signs of discomfort were more likely to be administered pain medications at a greater frequency in comparison to their more subdued peers. The nurses interpreted the vocalisations, which frequently presented as sobbing or expressing vocal anguish, as signs of increased pain intensity, leading to a more lenient use of pain management treatments. Additionally, a significant link was observed between the frequency of parental intervention and the utilisation of pain drugs. Children whose parents took an active role in advocating for their pain relief requirements and regularly communicated with nursing staff regarding their child's distress were administered a higher dosage of pain medication. The active engagement of parents in the care of their child was

seen as a significant means of obtaining information and confirming the kid's experience of pain. This, in turn, influenced nurses to adopt a more assertive approach to managing pain (Erogan, & Celik, 2020).

There is a significant body of evidence indicating that nurses frequently hold preconceived views and expectations regarding the appropriate ways in which children should manifest their suffering. The notion of anticipated conduct might give rise to a potentially problematic situation when children who deviate from these norms are unjustly stigmatised as "misbehaved" or "ill-mannered." A specific study by Khin Hla, et al., (2014), investigated this phenomenon, providing insights into the intricacies of how nurses evaluate and classify pediatric patients according to their pain-related behaviours. This study revealed that nurses frequently regarded children who refrained from vocalising or expressing pain as "well-behaved" children. The misinterpretation of the lack of explicit displays of suffering was mistakenly perceived as an indication of fortitude or stoicism when confronted with pain. As a result, nurses exhibited a tendency to disregard or underestimate the degree of discomfort encountered by these pediatric patients, which could potentially result in inadequate pain control. On the other hand, children who displayed heightened and conspicuous behaviours in reaction to pain were susceptible to being unjustly stigmatised with unfavourable labels such as "hysterical," "whining," or "miserable." Nurses may potentially perceive the vocalisations or overt behaviours of these children as excessive or melodramatic, rather than realistic indicators of their pain intensity, due to their preconceived notions regarding suppressed pain expression (Khin Hla, et al., 2014).

The varied nature of the phenomena lies in the impact of a nurse's years of experience on their approach to delivering analgesia and their level of confidence in making decisions pertaining to the necessity of administering analgesics. On one side, it is apparent that nurses who possess a greater number of years of experience demonstrate an increased propensity to provide analgesics to pediatric patients. The aforementioned tendency can be ascribed to the gradual acquisition of clinical knowledge and expertise, enabling these experienced practitioners to acknowledge the significance of pain management in the context of pediatric healthcare and take proactive measures to address the pain requirements of children. Moreover, it has been observed that nurses who possess extensive expertise in the field of pediatric nursing often demonstrate elevated degrees of self-assurance when it comes to their capacity to evaluate and ascertain the necessity of administering analgesic treatment to a kid. The increased level of confidence can be attributed to an extensive period of exposure to a wide range of clinical circumstances, which has allowed individuals to cultivate a heightened

clinical acumen and a more sophisticated comprehension of pain evaluation (Smeland, et al., 2018)

7 Discussion

This study confirms Katherine Kolcaba's theory of comfort which aimed at prioritizing the holistic approach of care in pediatric post-operative patient through their various comfort needs be it environmental, physical, psycho-spiritual, and socio-cultural. In conjunction to the theory, the aim of this study was to increase nurses' knowledge in the assessment and management of pediatric post-operative pain tailored to each patient, subsequently bringing about the evidence-based practice of efficient nurse-led interventions for managing pediatric post-operative pain, thus Kolcaba's theory contributed significantly in responding to the aim of this study. This discussion part investigates the discussion of the results and secondly, investigates the discussion of the methods used in this study.

7.1 Discussion of Results

This study provides empirical evidence supporting Kolcaba's Comfort hypothesis, which underscores the significance of prioritising comfort as a means to enhance the holistic health of patients. The findings have revealed the essential role that nurses play in the provision of comfort to pediatric patients experiencing post-operative pain, as well as in creating a secure healing environment. This is achieved through the nurses' identification and classification of the distinct comfort requirements of pediatric patients following surgery. The individuals possess the ability to differentiate between relief comfort, ease comfort, and transcendence comfort. Relief comfort pertains to the alleviation of physical pain, while ease comfort involves the establishment of a soothing environment. Lastly, transcendence comfort involves aiding the child in discovering purpose and hope throughout the process of rehabilitation. Kolcaba's philosophy of Comfort focuses on the interaction between the inclusion of families in the care plan and the collaboration between nurses and families. This collaboration aims to effectively address the requirements of patients, particularly children with intellectual impairments. Nurses bear the role of offering educational and supportive opportunities to pediatric patients and their families, facilitating the acquisition of self-care

skills necessary for independent performance of daily routines and work activities throughout the recuperation period at home following surgery. The attainment of optimal self-care necessitates the provision of exceptional nursing services and a secure atmosphere for both infant parents and older children, thereby facilitating their recuperation, preservation of health, and enhancement of overall well-being. The literature study reveals the noteworthy contribution of nurses in actively participating in therapeutic communication with pediatric patients. This involves effectively conveying information about the healing process in a manner that is suitable for their age and encouraging them to openly express their emotions and apprehensions. In the realm of pediatric post-operative pain management, nurses can enhance their ability to deliver culturally sensitive care by acquiring knowledge about cultural beliefs and practises pertaining to pain and healing. Finally, the literature review emphasises that nurses have the capacity to formulate a comprehensive care plan by doing an assessment of the individual's comfort requirements. This may encompass pharmacological measures aimed at alleviating pain, such as the administration of analgesics and the management of associated side effects. Additionally, non-pharmacological interventions, such as distraction tactics, therapeutic touch, or relaxation exercises, may be employed to augment comfort and promote a state of transcendence (Smeland, et al., 2018; Kolcaba, 2003).

Pediatric patients are regarded as a vulnerable population due to their distinct healthcare requirements. The maintenance of their well-being is not solely crucial for their present state of health, but it also possesses the potential to exert a lasting influence on their subsequent physical and psychological maturation. In close links to Kolcaba's theory of psycho-spiritual comfort, is the necessity for nurses to provide an emotional supportive environment for pediatric post-operative patients to heal. In the realm of healthcare, it is vital from a moral and ethical standpoint to prioritize the comfort and well-being of individuals. The experience of pain is a widespread and powerful factor that motivates pediatric patients to seek medical help. Pain is encountered by children due to a range of factors, encompassing injuries, illnesses, and medical interventions. The expeditious and efficient management of pain is an essential obligation of healthcare professionals. Insufficient management of post-operative pain in pediatric patients can lead to significant physiological consequences. The occurrence of heightened stress reactions, including elevated heart rate and blood pressure, has the potential to impede the process of healing and may give rise to problems. The presence of unmanaged post-operative pain might lead to notable psychological anguish in pediatric patients. Exposure to certain stimuli has the potential to elicit emotional responses such as

worry, terror, and manifestations akin to post-traumatic stress disorder. The enduring psychological consequences of these effects can have a profound and lasting influence on the child's overall well-being (Abou Elella, et al., 2015).

Smeland et al. (2018) state that underestimating pain is a major feature of pediatric postoperative care. Due to time constraints, a lack of expertise in pediatric pain assessment, or misconceptions regarding children's pain tolerance, healthcare practitioners may not always accurately measure the pain levels experienced by children. Many kids may experience unrecognised and neglected suffering because of this. Underestimation is a major problem, but so is poor pain documentation. Medical staff that treat children may fail to properly capture important details about the child's discomfort, such as its severity, location, and potential causes. When a child's pain history isn't properly documented, it might be difficult to create effective management strategies. As a result, under-medication is more likely when pain is not properly evaluated and recorded. If doctors don't have a good idea of how much pain a child is in, they might not provide him or her the right treatment. This can cause children to receive insufficient pain treatment, which in turn can lengthen their suffering, heighten their misery, and complicate their recovery (Smeland, Twycross, Lundeberg, & Rustøen, 2018). Weiner, et al., (2016) suggest that healthcare providers must make the assessment, recording, and management of pediatric pain a top priority in order to solve these problems. Fostering a culture of empathy and patient-centered care requires giving adequate training to healthcare personnel, deploying standardised pain assessment techniques adapted for different age groups, and so on. By acknowledging and rectifying the inadequate evaluation and documentation of pain, healthcare systems have the potential to enhance the standard of care delivered to children, mitigate their distress, and advance their holistic welfare throughout medical interventions or illnesses. This is in close association with Kolcaba's theory of comfort which offers tailored centered holistic care for pediatric patients encompassing the documentation and assessment process of care (Weiner, et al., 2016).

In the physical comfort standpoint of Kolcaba's theory of comfort, since newborns, babies, and children may not be able to verbally convey their discomfort, Shamim et al. (2015) suggested that pain evaluation is an essential part of treatment. Healthcare providers frequently use a variety of pain measures to quantify and communicate pain levels in this population. To ensure the most precise pain evaluation possible, numerous pain assessment scales have been developed to address the unique needs of people at various ages and stages of development. The Neonatal Infant Pain Scale (NIPS) for newborns, the Faces Pain Scale-

Revised (FPS-R) for children, and the Wong-Baker FACES® Pain Rating Scale, which uses facial expressions to assess pain in both children and adults, are just a few examples of such scales suggested by Dorkham et al., 2014. Tools like this consider a child's expressive capacity to aid in the assessment and management of pain. To better understand and assess pediatric patients' pain, several scales have been designed, validated, and published. It is important to note, however, that various pain scales may not be extensively used or even available in some healthcare facilities. Despite the existence of these helpful pain scales, there is no assurance that they will be consistently used within healthcare facilities. Their availability and utilisation may be impacted by factors such as institutional procedure variances, healthcare personnel' expertise with the scales, and a lack of resources in some healthcare settings (Weiner et al., 2016; Smeland et al., 2018). Due to these limitations, nurses may have to rely on less objective techniques of pain assessment. Integrating validated pain scales into everyday practise is a top priority for healthcare systems to enable complete and standardised pain evaluation for pediatric patients. Making these scales easily accessible is only half the battle; nurses also need to be taught how to use them correctly. Institutional pain management procedures that require regular use of these scales have been shown to increase the reliability of pain assessment and the standard of treatment for newborns, babies, and children. As a result, pediatric patients will have improved overall healthcare experiences and results as nurses are better able to treat and alleviate their suffering (Smeland, Twycross, Lundeberg, & Rustøen, 2018).

The socio-cultural comfort care of pediatric patient lies in nurses educational background that seeks to provide an in-depth understand of the cultural and spiritual believes of pediatric patients. In 2014, Dorkham et al. conducted research that lent weight to the idea that effective therapies for diverse health disorders comprise a holistic strategy that makes use of both pharmacological and nonpharmacological methods. Medical disorders can be managed and treated with the help of drugs and other pharmaceutical agents through pharmacological interventions. In addition to alleviating symptoms and slowing the development of disease, these therapies can also address the physiologic causes of the problem. Factors such as the patient's diagnosis, medical history, and reaction to treatment all play a role in determining which medication is best. Analgesics and antibiotics are two examples of pharmacological interventions used to treat acute and chronic pain and infection, respectively (Dorkham, et al., 2014). Non-pharmacological methods, on the other hand, cover a broad spectrum of treatments that don't rely on pharmaceuticals. Health in all its forms (mental, bodily, and behavioural) is addressed by these methods. Behavioural therapy, physical therapy, dietary modifications, stress management strategies, exercise programmes, and alternative therapies

like acupuncture and meditation are all good examples. Improvements in the patient's quality of life, coping skills, and long-term health are often only possible through non-pharmacological therapies (Dorkham et al., 2014; Celebioglu, et al. 2015; Abou Elella et al., 2015).

The importance of healthcare providers' education and experience in pediatric pain management is shown by the study by Dagg et al., (2020). Problems with identifying and appropriately treating pediatric pain have been linked to insufficient training and a lack of expertise. Inaccurate pain assessments and inappropriate treatment may result if healthcare personnel aren't well-versed in pediatric pain management. The study also brought attention to the problem of pediatric patients having low expectations for pain alleviation after surgery (Dagg, et al., 2020). The common belief that children are less sensitive to pain or more resilient than adults may result in ineffective pain relief measures. Eliminating this misunderstanding is critical for providing the pain medication that young patients need to maximise comfort and speed recovery. Another study Merkel et a., (2015), concludes that routine use of pain medication is essential, especially in the postoperative period. This preventative method is used to lessen the likelihood that pain will become chronic. Adequate pain control and general comfort are best achieved and maintained with the regular prescription of pain medications based on the child's age and weight. A combination of treatments is often necessary for successful pain management. This includes the use of both pharmaceutical methods (such as physical therapy, relaxation exercises, and distraction tactics) and non-pharmacological methods (such as opioids and non-opioids) to alleviate pain. Healthcare practitioners can get the best possible pain treatment with the fewest possible adverse effects by approaching the problem from several different perspectives (Merkel et al., 2015).

Taking into account the results, it is clear that the selected theoretical framework is appropriate for the investigation. The patient is at the centre of nursing care according to Katharine Kolcaba's Theory of Comfort. According to this notion, nurses play a crucial role in ensuring and improving patients' well-being by providing holistic comfort care. By developing this idea further, we can see how Kolcaba's argument radically alters the nursing profession by encouraging a more empathetic and person-centered focus on healthcare. Kolcaba's thesis rests on the idea that a nurse's primary responsibility is to make the patient feel at ease. When nurses prioritise their patients' comfort and well-being, they go beyond only treating the illness or relieving symptoms to provide holistic care that addresses the patient's physical, psychological, spiritual, and social needs. Each patient's requirements and

preferences are considered as part of this patient-centered approach to healthcare. In addition to ensuring that their patients are physically comfortable, nurses are also responsible for seeing to their mental and emotional health. This all-encompassing method acknowledges that a patient's emotional and spiritual well-being as well as their sense of cultural belonging are crucial to his or her recovery from illness or injury. According to Kolcaba's view, it is crucial to often check in with the patient to see how they are feeling. Nurses routinely assess patients' reactions to treatment and make adjustments to care accordingly. The patient's well-being and ease of care are continuously assessed and improved through this cycle. Kolcaba's theory suggests that positive patient outcomes can be achieved through nurses' provision of comfort-centered care, including but not limited to better pain management, reduced anxiety, improved well-being, and higher levels of patient satisfaction.

7.2 Discussion of Method

Systematic literature review has been the sole method used in this study as per the guidelines related to any systematic literature review. This follows a qualitative design methodology of systematic literature review. Fourteen scientific articles chosen for this study of which holds concurrence focus on post-operative pain in pediatric patients. These articles address the issue related to post-operative pain in paediatric patients through the various lenses aimed at it, mainly; four articles focus on the assessment methods and tools use in pediatric post-operative pain management, three focus on how pediatric post-operative pain can be managed based on the type of surgery, two looked at the use of pharmacological analgesics to manage pediatric post-operative pain, three focus on parents involvement and parents management of pediatric post-operative pain at home or in hospitalization, and lastly, two articles focus on the type of nonpharmacological technique efficient in pediatric post-operative pain. All fourteen scientific articles were conducted in different countries such as Turkey, Saudi Arabia, Canada, Australia, Egypt, India, Pakistan, and USA. All ethical consideration were observed in the course of this study.

The results of qualitative studies are considered to have transferability when they may be applied successfully in different settings. Darawsheh (2014) states that confirmability is defined as the extent to which one study's results are in line with those of other studies. The reliability of the data being used can be better ensured with this. When the results match up with the studies that were part of the literature review, it shows that the findings are valid. It is widely acknowledged that registered nurses have a responsibility to educate parents on how to perceive and manage their children's post-operative pain, whether it be with over-

the-counter medications or in-patient hospitalisation, and to provide the necessary care to children so that they can achieve better health outcomes (Polit & Beck, 2022).

After comparing the findings of this study to those of other investigations, it was discovered that they yield similar outcomes. Furthermore, the selection criteria ensured that all of the papers were comparable and relevant to the subject. A sufficient level of credibility and originality is there in the written work. The research is unbiased and provides real data that supports the review's findings. In addition, nurses can improve their practise by implementing the study's findings. By following the specified procedures of content analysis, the data's reliability has been maintained. This shows that in an attempt to lessen the influence of bias in research, common developing concepts have been defined precisely. Researchers will be able to include this in their list of recommendations if you make this point crystal clear.

8 Limitation

Cost has been the very first limitation in this study. The selection of the articles was based on their free access which limited the researcher on number of possible access articles, thereby leading to possible miss articles that could be included in the study. Furthermore, the entire systematic review was done by single researcher, contrary to the possibility that if the research was done by two or more persons, the reliability and well based structure presentation of the findings is guaranteed. Thus, bias view is reduced and can be conclusively used in other evidence-based practices (Polit & Beck, 2022)

9 Conclusion.

Several methodologies and scales have been established in the field of pediatric post-operative pain assessment and treatment to ensure that children receive the care they need to reduce pain and promote healing. Procedural pain in babies and children is best managed with a mix of pharmaceutical and non-pharmacological therapies. Self-reporting remains an effective tool for assessing children's suffering in circumstances when they are developmentally capable of self-expression. The COMFORT Behavior Scale is commonly used to evaluate pain and discomfort in children, particularly those who are unable to provide such information themselves. The assessment scale is used in a variety of contexts, including numerical rating scales, the FLACC scale, the CRIES scale, behavioral observation, and physiological methods. Administering pain medications such opioids, non-steroidal anti-

inflammatory drugs (NSAIDs), and local anaesthetics are examples of pharmacological therapies used to manage post-operative pain in pediatric patients. These drugs are designed to alleviate suffering by addressing the underlying physiological causes of it. Pediatric pain management relies heavily on non-pharmacological techniques, which can be employed alone or in tandem with pharmaceutical approaches. Distraction, visualization, deep breathing, muscle relaxation, music therapy, and physical activity are all examples. These techniques aim to alleviate both the physical and mental suffering that accompany pain. Integrating pharmaceutical and non-pharmacological therapies into pain management for pediatric patients has been proved to be effective time and time again in scientific literature. This multimodal strategy not only reduces the patient's reliance on opioids, but also improves patient safety and fosters a more holistic approach to treatment.

The appraisal of pain is essential to effective pain control, and many factors affect it. The aforementioned considerations include the child's unique traits, their medical diagnosis, and the nurses who perform the evaluations. A thorough and exact pain assessment process is the foundation for effective pain management. Understanding the unique traits of pediatric patients is essential for accurate and effective pain assessment. Nurses must adjust their evaluation methods to account for age-related cognitive and communicative differences in children. Infant pain evaluation requires a different procedure than school-aged or adolescent pain evaluation. Developmental stage, culture, and pain expression all affect appraisal. By taking into account these particular qualities of children, nurses can perform more accurate and age-appropriate pain assessments. Medical diagnosis and health state can substantially influence a child's pain evaluation and management. Some diseases or therapies might exacerbate pediatric patients' pain, while others can impede their ability to express it. Nurses must comprehend the pain implications of various conditions. This information is critical for choosing the best pain assessment and treatment options. Nurses' traits affect pain ratings. Nurses need expertise, empathy, communication, and cultural understanding to work with children and their families. Building trust with the child and their carers improves pain reporting and pain evaluation. Nurses must constantly learn and improve their pain assessment and management skills. This requires staying updated on pediatric pain research, assessment tools, and evidence-based therapies. Nurses understand pain's physiological, psychological, and cultural aspects and how it affects children.

In conclusion, improving pediatric post-operative pain management requires cooperation between healthcare professionals and parents, careful planning and documentation, effective routines, comprehensive pain management education and its implications, and an

understanding of pediatric pain behavior. To get trustworthy and successful post-operative pain therapy, use the best methods and instruments based on patient needs. Proper surgical pain management reduces discomfort and shortens hospital stays. This decreases healthcare facility strain and speeds recovery. Pediatric patients are vulnerable, so post-operative pain treatment should be a focus. This therapy can reduce the short- and long-term effects of untreated pain, improving patient outcomes and well-being. Collaboration, pain management optimization, and individualized interventions can help pediatric patients recover faster and more comfortably after surgery.

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Appendix A Summary of systematic review articles

Author and Title	Aim	Method	Results
(Erogan & Celik, 2020) Assessment of Post-Operative Pain by the Parent, Nurse and an Independent Observer Among 1–7-Year-Old Children	The purpose of this study was to identify variances in the evaluation of post-operative pain experienced by children aged 1 to 7 years, as assessed by parents, nurses, and an impartial observer.	Qualitative Study	The assessment of postoperative pain levels in paediatric patients was conducted by several individuals, including parents, nurses, and independent observers, employing distinct methodologies. The findings of the study are as follows: According to the Numeric Pain Rating Scale utilised in the study, it was observed that upon the initial admission of the child who underwent surgery to the service, the pain rating scores provided by the parent, nurse, and independent observer were determined to be incongruent, with an intraclass correlation coefficient of 0.676 ($p < 0.05$).
(Khin Hla, et al., Perception of pediatric pain: a comparison of postoperative pain assessments	The objective of this study is to examine the variations in the evaluation of pain	Qualitative Study	There were no significant differences in scores reported by verbal children and their parents. The median scores, along with their inter-quartile ranges (IQR), reported by

<p>between child, parent, nurse, and independent observer, 2014)</p>	<p>experienced by paediatric patients in the immediate postoperative period, as assessed by children themselves, their parents, nurses, and independent observers.</p>		<p>children, parents, nurses, and independent observers were as follows: children - 2.0 (0-4.0), parents - 2.0 (1.0-4.0), nurses - 0.0 (0-2.0), and independent observers - 1.0 (0-2.0). In nonverbal children, the median scores reported by parents, nurses, and independent observers were 1.0 (0-3.0), 0 (0-1.0), and 0 (0-2.0), respectively. The agreement between the different scorers was found to be statistically significant.</p>
<p>(Saigh & Saigh, 2023)</p> <p>Mothers' Involvement in Pediatric Postoperative Pain Care in a Tertiary Healthcare Setting in Saudi Arabia</p>	<p>Identify ways to improve management and participation activities by investigating mothers' involvement in postoperative pain treatment and their children's management during hospitalisation and after discharge.</p>	<p>Qualitative Study</p>	<p>The data was used to generate the following primary and secondary themes: (i) the availability of pain information (such as the expected type, frequency, and duration of pain after surgery, as well as pain intensity scores, medication for pain relief, and methods for managing pain), (ii) difficulties in communicating due to language barriers or breakdowns in communication between health professionals, (iii) social and cultural factors (such as patriarchal society, religious beliefs, and work status), and (v) hospital amenities, services, and programmes (such as entertainment, follow-up</p>

			programmes, education courses on pain management for nurses, and materials). and
(Mathias, Pai, Kumar, Guddattu, & Bramhagen, 2022) Mothers' satisfaction with distraction as a post-operative pain management intervention for their child: An interventional study.	Aimed to investigate mothers' levels of satisfaction with distraction as a post-operative pain management intervention for their child	Qualitative Study	This study indicated that experimental mothers were happier than control mothers. In the intervention group, mothers were happier with their child's pain management than in the control group. The postoperative diversion strategy for kids made women happier.
(Merkel, Danaher, & Williams, 2015) Pain Management in the Post-Operative Pediatric Urologic Patient	The purpose of this study was to describe the types of pain experienced by paediatric post-operative urologic patients, list the pain assessment tools nurses can use to assess their pain coping skills, identify the components of a multimodal pain management plan, and	Qualitative Study	Nurses may have specific obstacles in managing pain in paediatric urologic surgery patients. Knowing general pain management, paediatric urology patient specifics, and multimodal pain management will equip nurses to safely and effectively manage patient pain.

	describe the benefits of effective pain management in this population.		
(Dagg, Forgeron, Macartney, & Chartrand, 2020) Parents' Management of adolescent patients' Post-Operative pain after discharge	This study aimed to explore parents' experiences caring for their child's postoperative pain at home through interpretative phenomenology analysis.	Qualitative Study	Coming home alone, dealing with serious suffering at home, and changes in the parent-child connection were the themes that were identified. Nurses optimising educational interventions, transitional pain teams providing continuing care, and return-to-school planning assistance could all be helpful for parents.
(Shay, Kattail, Morad, & Yaster, 2014) The post-operative management of pain from intracranial surgery in pediatric neurosurgical patients	The primary aim of the study was to evaluate, analyse, and optimize the strategies for managing pain following intracranial surgery in pediatric patients.	Qualitative Study	Opioids, widely administered for moderate-to-severe pain after neurosurgery, have been limited in their use due to concerns about detrimental effects on postoperative outcomes and neurologic evaluation. The study has identified medicines and medication families utilised in multimodal pain management to reduce opioid-induced side effects. To reduce opioid-induced side effects, this method combines smaller opioid doses with nonopioid analgesics like NSAIDs, local anaesthetics, NMDA antagonists, α_2 -adrenergic

			agonists, and anticonvulsants (gabapentin and pregabalin).
(Abou Elella, et al., 2015) The Efficacy of the COMFORT score and pain Management protocol in ventilation pediatric patients following cardiac surgery	In order to find out how well analgesics work in paediatric intensive care, there needs to be a better way to score pain. Here, we examine the impact of pain and sedative regimens on the results of the COMFORT scale in children who were ventilated after surgery.	Qualitative Study	When evaluating pain in paediatric patients on mechanical ventilation following surgery, the COMFORT scale is an excellent and trustworthy tool. A pain and sedative strategy was put into place, and the duration of mechanical ventilation, the incidence of withdrawal, and hospital and intensive care unit stays were all reduced.
(Abduallah, Al-Ahwal, & Ahmed, 2022) Effect of Erector Spinae Plane Block on Post-Operative Analgesia after pediatric hip Surgery	In this study, we set out to examine how ultrasound guided ESPB affected postoperative analgesia following hip surgery in children.	Qualitative Study	The use of ESPB considerably increased the time it took for the first request of rescue analgesia from 170.50 ± 44.066 to 256.50 ± 66.434 minutes ($p < 0.0001$), decreased the intraoperative fentanyl consumption from 1.025 ± 0.379 to 0.775 ± 0.343 $\mu\text{g}/\text{kg}$ ($p = 0.035$), and decreased the postoperative morphine consumption from 0.105 ± 0.036 to 0.065 ± 0.023 mg/kg ($p =$

			0.0002). In addition, the postoperative CHEOPS and OPS scores were found to be considerably lower 2, 4, and 6 hours after the surgery ($p < 0.05$), whereas there was no significant difference between the two groups at any other time period ($p \wedge 0.05$).
(Shamim, Ullah, & Khan, 2015) Post-Operative Pain Assessment Using Four Behavioural Scales in Pakistani Children Undergoing Elective Surgery	The objective was to assess the inter-rater agreement on four different behavioural pain assessment scales in our local population.	Qualitative Study	At 15 min, sensitivity and specificity were >60% for doctors and nurses on FLACC, OPS, and CHEOPS scales and for FLACC and CHEOPS scale for the parents. Parents showed poor agreement on OPS and TPPS. At 60 min, sensitivity was poor on the OPS scale by all three observers. Nurses showed a lower specificity on FLACC tool. Parents had poor specificity on CHEOPS and rate of false negatives was high with TPPS
(Weiner, et al., Difficulties with assessment and management of an infant's distress in the postoperative period: Optimising	The importance of accurate pediatric patient assessment is well established but under-utilised in managing	Qualitative Study	In the postoperative period, pain management was challenging, and there was an oversedation episode that required the use of naloxone to reverse the effects of the opiates. His oxygen saturation was also dropping, and he was having to fight harder to breathe. He was started

opportunities for interdisciplinary information-sharing, 2016)	postoperative medication regimens.		on antibiotics after an X-ray revealed alterations that could be caused by aspiration or atelectasis. A member of the medical emergency team had to intervene since the patient was having trouble breathing.
(Çelebioğlu, Küçükoğlu, & Odabaşoğlu, 2015) Turkish Nurses' Use of Nonpharmacological Methods for Relieving Children's Post-Operative Pain	The research was conducted to investigate and analyse Turkish nurses' use of nonpharmacological methods to relieve post-operative pain in children.	Qualitative Study	Undergoing surgery is generally a painful experience for children. Nurses most commonly use cognitive-behavioural methods in the postoperative care of their pediatric patients after surgery.
(Dorkham, Chalkiadis, Ungern Sternberg, Davidson, & Lonnqvist, 2014) Effective Post-Operative Pain Management in Children after Ambulatory Surgery, with a focus on tonsillectomy: barriers and Possible Solutions	The primary aim of this study was to identify the barriers to effective post-operative pain management in children undergoing ambulatory (or outpatient) surgery, with a particular focus on tonsillectomy	Qualitative Study	Interventions to overcome these hurdles include educational strategies, better information, pharmaceutical regimens, and aids for parents to manage their children's discomfort. Overall, slight gains in pain outcomes suggest a need for a more holistic approach that recognizes the complexity of home pain care.

<p>(Smeland, Twycross, Lundeberg, & Rustøen, 2018)</p> <p>Nurses' Knowledge, Attitudes and Clinical Practice in Pediatric Post-Operative Pain Management</p>	<p>To identify nurses' knowledge and clinical practice of pediatric postoperative pain management and whether there is a link between knowledge and practice.</p>	<p>Qualitative Study</p>	<p>There were 193 nurses who took the PNKAS-N and 138 who were observed providing postoperative care to 266 children, for a total of 416 hours (70 hours per unit). A total of 29 out of 40 PNKAS-N points were averaged (standard deviation = 4.2). Our findings highlight gaps in understanding, particularly regarding pharmacologic treatment, including areas like respiratory depression and addiction risk. In 19% of the children, we discovered that validated instruments were used to assess pain; however, this percentage dropped to 9% for children younger than 5 years old. A dosage of morphine that was insufficient was administered to over 66% of the children following surgery.</p>
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