

Nursing Approaches for Pain Management in Post-Operative Total Knee Replacement

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Received: 03 March 2022

Accepted: 13 September 2022

Published: 30 November 2022

Abstract

Pain management is very crucial in nursing care. However due to lack of overall understanding, pain management by health professional is scarce. Therefore, knowledge and attitude of nurses towards effective management of pain in care post-operative care is pertinent. The effectiveness of postoperative nursing care is a basic part of a healthcare worker. The type of post-operative management emphasized in this article consists of the pain assessment and pain management by pharmacological and non-pharmacological tools. Post-operative follow-up care is required to alleviate pain and restore knee features and functions. The primary duty of nurses in postoperative care is to acknowledge preparation and implement suitable treatment. This article aims to provide information on increasing nurses' knowledge in managing pain for post-operative care of Total Knee Replacement. Searches were performed by using electronic database for full text article in English language, original article published between 2000 and 2021. The database includes Springer, PubMed, British Medical Journal, Malaysian Orthopaedic Journal, SAGE Pub and ProQuest.

Keywords

Nurses' knowledge, knee replacement, pain management, post-operative.

Introduction

Total knee replacement (TKR) is one of the most common orthopaedic procedures performed. TKR is to replace a knee joint with artificial substance by performing a surgical procedure. This treatment are required to relieve pain and restore knee functionality^[1]. In Malaysia, TKA has been implemented since the late 1970s^[2]. The factors influencing the outcomes after TKR include preoperative parameters, operative methods, and postoperative care ^[3]. Nursing care is crucial and challenging in caring for post-operative patients to achieve a good outcome and fast recovery. The quality of nursing care for post-operative patients is a fundamental responsibility of the nursing profession. The main responsibility of the nurses in caring for postoperative patients is to recognise the appropriate planning and implement adequate treatment. TKR needs intensive bone dissection and manipulation of soft tissue, hence the patient may have severe pain in early postoperative periods and require effective pain management during recovery ^[4]. The responsibility of providing comfort to patients in the post-operative and surgical unit rests in the hands of nurses. Pain assessment knowledge and skills of nurses are fundamental for pain management. As nurses play a pivotal role in post-operative pain assessment and management, it is vital for them to be trained with adequate knowledge and skills regarding pain management. However, researches related to pain management particularly on knowledge and practice in the post-operative care setting are limited ^[5]. This indicates that there is a gap in nursing knowledge on pain management. This article aims to close that gap in nurses' post-operative pain management of Total Knee Replacement.

Role of Nurses Post-Operative Pain Management

Determining the causes of pain during the postoperative period is very crucial for every nurse whether the pain is related to the surgical site, trauma case or medical complication. Post operation, pain should be assessed and evaluated because response to the pain of every patient is different and unique. The following are some of the aspects that the nurse must consider when evaluating postoperative pain that consists of the assessment of the surgical site and functional status, documentation of the pain assessment and the report of pain to the management team^[6].

Monitoring the complications is the priority nursing responsibility for every treatment, especially for the post-operation of TKR. Patients who are receiving pain management must be monitored closely. The activities include assessing the patients' pain ^[7], providing appropriate interventions to relieve the patient's pain ^[8] and reassessing the patient's pain after intervention ^[9].

Pain score assessment

The experience of pain is very subjective. The International Association for the Study of Pain (IASP) developed a series of pain definitions in 1970. The original definition of pain was "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage"^[10]. Postoperative pain management can be effective if well planned, delivered in a consistent, evidence-based manner, and based on patients' assessment of their pain whenever possible ^[11]. The pain can be either short-term, acute, or chronic ^[12]. Acute pain develops when tissues are harmed because of trauma, surgery, or burns. There is only a brief period of pain, and no complex process is needed for healing. On the other hand, chronic pain requires more sophisticated therapy ^[13].

The primary goal of postoperatively treatment is to reduce the patient's pain while they are awakened after anaesthesia. A good pain evaluation is essential for providing effective pain care. The numerical rating scale (NRS), visual analogue scale (VAS), and verbal descriptor scale (VDS) are the three instruments that nurses use to measure pain. The NRS rates pain on a scale of 0 to 10, the VAS assesses pain by allowing patients to freely mark their pain level on an analogue scale, and the VDS offers six options that are verbally described. All three pain rating scales are valid, reliable, and appropriate to use in a clinical setting ^[14]. The pain assessment tool that is recommended for use in Malaysian hospitals by the Ministry of Health is NRS.



Figure 1: Numerical rating scale (NRS) and verbal analogue scale (VAS)

Figure 1 is an example of a numerical rating scale (NRS) and verbal analog scale (VAS), and this scale is assessed by asking the patient the level of pain experienced. The scale has several rates from 0 to 10 that show the rating of pain score. This tool is used by inquiring about the patient's feelings and indicating the score level based on the numerical and verbal rating scales. The pain score is interpreted as 0: no pain, 1 to 3: mild pain, 4 to 6: moderate pain, and 7 to 10: severe pain ^[15]. If the patient reports a pain score of less than 4, the patient may be uncomfortable or is experiencing moderate pain, however, if the patient reports a pain score of more than 4, the patient is experiencing distress and is in discomfort ^[10]. However, nurses do not solely rely on pain scores when measuring pain; they also consider vital signs and other signs and symptoms indicating the patient may be experiencing pain, such as anxiety, restlessness, and a rapid heart rate. The consequences of unrelieved post-operative pain can affect the patient physiologically and psychologically. The physiological effects of unrelieved post-operative pain include increased heart rate and/or respiratory rate and increased arterial blood pressure and oxygen consumption ^[16].

Pharmacological management

NSAIDS

Inadequate treatment for post-operative pain can diminish the quality of life and raise the risk of postoperative complications ^[17]. Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly used in postoperative surgery in mild or moderate pain ^[18]. NSAIDs are a likely safe and effective alternative to opioids for postoperative pain management in a majority of patients ^[19] and should be given to all postoperative surgical patients unless contraindicated ^[20]. NSAIDs are a type of heterogeneous drug with analgesic, anti-inflammatory, and antipyretic effects to be utilized for acute and chronic pain and are available in the parenteral, topical, intramuscular, and rectal forms ^[18]. NSAIDs are sometimes mixed with opioids to improve efficacy and are recommended after the first day of postoperative ^[20]. Most of the NSAIDs are available as oral tablets, namely Ibuprofen 200mg/ tablet, and Naproxen Sodium 220mg/tablet.

However, NSAIDs contribute complications to the post-surgical treatment including the effect of bleeding and necrotizing soft tissue infection (NSTI). NSTI is one of the complications of NSAIDs users and it is classified as a type of infection that causes necrosis of the skin, subcutaneous fat, superficial/deep fascia, and muscle ^[21]. NSTI is a rare case and the studying between NSAIDs and NSTI is still up for dispute. The consumption of NSAIDs also contributes to prolonging bleeding and coagulation by inhibiting COX-1 enzymes and decreasing thromboxane A2 (TXA2) which may reduce vasoconstriction and platelet aggregation. Those who had hip arthroplasty experienced higher post-operative bleeding issues than the patient who did not take NSAIDs in the peri-operative interval ^[22]. As a recommendation, the nurses should be aware of the risk for NSTI and prolong bleeding by assessing the wound for every shift. Moreover, for the client who consumes long-term NSAID medication while on post-surgery, an extra cautious history of the past bleeding problem is required.

Opioids

Total Knee Replacement (TKR) is one of the most painful orthopaedic surgical procedures [23] and numerous analgesic innovations have been used to decrease the level of pain postoperative [24]. In pharmacological treatment, opioids are frequently prescribed for acute postoperative pain by orthopaedic physicians [25]. The major side effects of using opioids during the preoperative are drowsiness and sedation, meanwhile, during postoperative, the side effects are nausea and gastrointestinal tract symptoms, and respiratory distress. Long-term use of this analgesic can lead to addiction and will affect rehabilitation [26]. Opioids control the action of the nociceptors via attaching to receptors in the peripheral and central nervous systems. They can be given orally, topically, parenterally, neuraxial, and recto routes. For postoperative pain, morphine, hydromorphone (dilaudid), and fentanyl are the most often utilised intravenous opioids [27]. Fentanyl and opioids were the most used for pain management in Malaysia [28]. Opioids are typically prescribed with morphine, which is a common drug, and it starts working quickly and reaches its greatest effect in one to two hours.

The most relevant side effect of all opioids is respiratory distress, which can cause hypoxia and respiratory arrest. All opioids have serious side effects. Therefore, it's crucial for patients who were given opioids postoperatively to have their breathing and oxygen saturation closely monitored [27]. Sedation, nausea, and vomiting are the common side effects that are worsened at the beginning of therapy or when the dose is increased, but tolerance to these side effects develops quickly. Nurses are responsible for administering the medication ordered by a doctor and following the 10 'R's, which comprise the right patient, right medication, right dosage, right route, right time, right documentation, the right education, right to refuse, right assessment and right evaluation to prevent the medication error and monitor the side effect of a drug such as drowsiness, confusion, nausea, and slow breathing.

Patient controlled analgesic

Patient-controlled analgesia (PCA) is commonly used for pain management post-TKR to support simple, fast, and satisfactory pain relief [29], and a patient can control the medication based on the severity of pain by pressing the button when needed. Generally, opioids used in PCA include morphine, fentanyl, oxycodone, and hydromorphone [30]. PCA is safe and efficient for treating moderate to severe pain and has been increasingly popular for use in a patient undergoing TKR and opioids drug are frequently administered by PCA [29]. According to Neelima et al [31], the most widely used analgesic method recommended to patients at Hospital Kuala Lumpur (HKL) is PCA after post-surgery and there is a minimal occurrence of side effects and difficulties. Even though PCA give high effectiveness to the patient on post pain management but it also gives some negative effects such as nausea, vomiting, respiratory depression, and urinary retention [32]. PCA is significantly effective in post-operative pain management, but future study needs to be explored controlling the side effects of the opioid. This is supported by Nakagawa et al. (2019) [33], who stated that alternative treatment options (opioids) must be reviewed especially in elderly patients over the age of 80, who are more likely to experience opioid-related side effects. The nurse plays a vital role in monitoring regularly for pain, excessive sedation, alterations in mental and respiratory status and hypotension at least every 4 hours. Besides, nurses also must chart the pump setting, numbers of bolus given, number of attempts, the total amount of drug given, patient education and response to treatment.

Non-pharmacological Management

Cool treatment & Cryotherapy

Following invasive surgery, pain control is imperative for a patient's cure, recovery, and satisfaction. Cooling treatments as non-pharmacological interventions are prevalent, immediately available, and easy to use. Local cooling of the skin induces physiological responses by reduction of the skin surface and subjacent tissue temperature [34]. This leads to a significant decline in nerve conduction velocity to vasoconstriction [35]. Furthermore, local cooling influences how painful patients perceive their recovery from reconstructive surgery [36].

Nowadays, there are many types of cooling methods used. Different modes exist depending on the

frequency, duration, or degree of cooling. Cooled water significantly reduces amount of blood flow and conductivity, which also lowers the level of muscle soreness [37] and can be treated as heat-induced hyperthermia. The temperature of the tissues rapidly drops during ice cooling. Through the 20 minutes of ice pack usage, the muscle temperature will decrease from 7 to 17 degrees, respectively. The cool package includes a frozen gel, and this just take a few minutes are spent applying an ice pack to the damaged tissue. Due for a similar effect with ice, direct skin contact should avoid and protection with cover should be used to protect against skin injury.

Cryotherapy is known as an alternative cool treatment device and is commonly used in treating a patient post TKR. This implies the application of cold to the skin around inflammatory soft tissues and joints such as ice. The physiology of this application is by limiting local blood flow by vasoconstriction, resulting in a regional inflammatory reaction, swelling, and heat sensation, as well as impeding nerve signal transmission, potentially lowering pain transmission [38]. In the early rehabilitation, the cryotherapy group had significantly better knee flexibility and decreased oedema [39]. In 86 patients after TKA, cryotherapy resulted in considerably better pain management and client comfort than epidural anaesthesia [40]. For further study, the researcher can make a comparison on the affective of pain management between cool treatments and cryotherapy.

Diversional therapy

A nurse makes a significant role in managing pain control by recommending a variety combination of pharmacological and non-pharmacological measures of pain management. Non-pharmacological or alternative therapies are employed because they are more congruent with the values and beliefs of the patient toward health and life. Among all non-pharmacological measures for pain relief, diversional therapy such as music has attracted the attention and interest of patients [41]. Music therapy, when repeatedly administered gradually creates a diversion, which in turn relaxes the mind and changes the mood. It reduces pain intensity, and length of hospital stays and improves the quality of life [42].

The study by Allred et al [43] was conducted to determine if listening to music or resting can reduce the pain on postoperative day 21, and the study found there is a significant decrease in pain. This result provides evidence to support that music, or a quiet rest period decreases pain. A systematic literature review was performed by Economidou et al (2012) [44] to identify the impact of music on postoperative pain and found that music reduces postoperative pain as measured with a visual analog scale (VAS). Therefore, it was concluded that music is an effective non-invasive, non-pharmacological, and relatively cheap intervention for postoperative pain management.

In Malaysia, music therapy is not widely used as a non-pharmacological intervention, although it is projected to become more prevalent in the future. The majority of the population of Malaysians are Muslims. Reading the Quran and reciting the Dzikir can be an effective intervention or method to treat post-operative pain after TKR. The research about spiritual therapy must be discovered in-depth to determine its efficiency in the management of post-operative pain management. As a recommendation, the nurses should consider advising Muslim patients by encouraging the patients on employing the spiritual aspects as a diversional method to reduce pain sensitivity.

Transcutaneous Electrical Nerve Stimulation

Transcutaneous Electrical Nerve Stimulation (TENS) is a common device applied to the patient following TKR and it is classified as an alternative treatment, non-invasive procedure, and cheap and safe analgesic technique based on the gate-control theory of pain [45]. Furthermore, TENS also aids in the improvement of quadriceps muscle function following total knee arthroplasty and also aids in the client's initial reconstruction [46]. This device process entails both the peripheral and central nervous systems by stimulating endogenous inhibitory mechanisms of opioid receptors in the central nervous system, as well as lowering central neural sensitization including primary and secondary mechanical hyperalgesia [47], [48].

The recommendation period for TENS is by applying it onto the skin for every exercise session within 20 minutes to reach the optimum peak.

A randomized control trial performed by Sahni et al. (2021)^[46] found that using TENS with exercises during the first few days of rehabilitation provides better results and accelerates the recovery process. Moreover, it also promotes the quadriceps muscle's condition after total knee replacement and assists in the patient's initial recovery. The effectiveness and safe transcutaneous electrical nerve stimulation (TENS) for pain relief after TKR and this device has the potential to drastically relieve pain and opioid use^[49].

Acupuncture

Acupuncture has been a widely accepted supplementary and option treatment. Acupuncture activates specific acupuncture points with very fine needles, and this is a nontoxic technique with an outstanding safety profile when conducted properly by professional practitioners^[50],^[51]. This alternative treatment of Traditional Chinese Medicine, which is a much bigger method of treatment and frequently employed in the treatment of pain. The indication of this method is commonly used for the treatment of a patient that suffered from low back pain (LBP)^[52] and dysmenorrhea^[53]. For post-surgery, this treatment is suggested for managing pain relief such as post-haemorrhoidectomy^[54] and arthroplasty surgery within 48 hours post-operative^[55]. The mechanism of this device proposed that needle stimulating of small-diameter nerve fibres might stimulate the central nervous system at the spinal level and higher brain centre, resulting in the production and releasing of endogenous opioids and neurotransmitters^[56].

The study of the effectiveness of acupuncture related to pain management of TKR is significantly effective and reduces pain. Acupuncture is a reliable device to alleviate the pain among patients who suffered after total knee replacement^[57]. Acupuncture paired with routine treatment resulted in considerably higher alleviating pain at 8, 12, 24, and 48 hours, respectively, following Total Knee Replacement when compared to routine treatment only^[55]. Although acupuncture is an alternative treatment that is recommended for reducing pain, healthcare providers in Malaysia are still not familiar with this treatment. A study needs to approve the significance of acupuncture as an alternative treatment in managing pain. However, this study is still lacking in several respects, especially in nursing roles^[58]. There is also uncertainty as to which treatment situations acupuncture might be most effectively used, there are no clear and consistent guidelines as to what the role of nurses might be in this procedure.

Conclusion

Postoperative pain management is essential for nurses since they deal with pain management daily. Patients expect medical professionals, especially nurses, to closely monitor their condition and treat pain with pharmaceutical, non-pharmacological, and complementary therapies. Attitudes of nurses relate to pain, the assessment of pain, and decisions regarding pain management are important, given the understanding that lacking pain assessment results in inadequate pain management. If postoperative pain is insufficiently treated it can lead to a lack of rest, sleep deprivation, delayed wound healing, patient dissatisfaction, longer hospitalization, and an increase in the cost. The objective of this article is to improve nurses' knowledge of pain management and nursing care for post-operative Total Knee Replacement (TKR) patients. The Ministry of Health should be providing more opportunities and support the health care provider through Medical and Nursing Education continuously on pain management in various methods. Desired indirect outcomes of improving patient care by continuing to enhance and reinforce current practice through the knowledge practice, especially among nurses. Hopefully, with this article, the healthcare provider can give optimum treatment for the patient post TKR in managing pain.

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