

12-2021

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<https://doi.org/10.33015/dominican.edu/2021.NURS.ST.19>

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Recommended Citation

Sehic, Halida, "Increased Use of Opioids Perioperatively Leads to Unmanaged Postoperative Pain" (2021). *Nursing | Senior Theses*. 42.
<https://doi.org/10.33015/dominican.edu/2021.NURS.ST.19>

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Increased Use of Opioids Perioperatively Leads to Unmanaged Postoperative Pain

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NURS 4500 Nursing Research and Senior Capstone

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May 03, 2021

Abstract

Background: Total knee and total hip joint arthroplasty are two frequently preformed surgeries, with 5.2 million total knee arthroplasties performed the United States between the year 2000 and 2010 (Williams et al., 2015). Opioids are widely used to manage pain for patients undergoing total joint arthroplasty. However, use of opioids is associated with undesirable adverse effects, such as nausea and respiratory depression, (Johnson et al., 2011). In postoperative patients following total joint replacement, 75 % of the patients complain of inadequately controlled moderate to severe pain (De Luca et al., 2018). Increased use and overprescribing increase tolerance to opioids and can result in poorly controlled acute post-operative pain leading to chronic pain, impaired mobility, and negative long-term outcomes.

Aim: Examine if long term opioid pain management has an impact on early postoperative mobilization, long-term dependence, and overuse of opioid medications after total joint arthroplasty.

Proposal: Increased consumption and long-term use of opioids preoperatively can lead to unmanaged postoperative pain. Use of multimodal analgesia and preemptive analgesia can lead to improved outcomes for patients who are undergoing total joint arthroplasty of the knee and hip. The proposed study aims to examine if use of such modalities can have improved long terms outcomes in patients undergoing total joint arthroplasty.

Methodology: A review of full text literature was performed on March 11, 2021 using PubMed and CINHALL and Google Scholar through the Dominican University Databases. The keyword terms used were “pain management,” “pain control,” “total knee arthroplasty,” “total hip arthroplasty,” and “total joint arthroplasty.” The search generated 180 full text articles of which four were used for this research paper.

Recruitment strategy: Inpatient and outpatient post-operative patients undergoing total knee arthroplasty and total hip arthroplasty with moderate to severe uncontrolled pain.

Measurements: Using the 36-Item Short Form Health Survey to review impact of health on the participants everyday life. Quality and intensity of experienced pain the McGill Pain Questionnaire will be used. Current Opioid Misuse Measure (COMM) assessment tool will be used to evaluate aberrant medication related behavior, while the opioid consumption and the corresponding daily morphine milligram equivalent amount (MME) will be evaluated at the preoperative period and in the immediate postoperative.

Analysis: Participants general demographics will be recorded and means, and standard deviations will be calculated. Proportions will be determined on race, education, and income. A t-test will be used to compare the means of two groups, those who are consuming preoperative opioids and those who are not, to determine whether there is statistical evidence associated with population means and has are significantly different and influences the population of interest.

Increased Use of Opioids Perioperatively Leads to Unmanaged Postoperative Pain

Effective postoperative pain management is an essential part of the care for postoperative recovery in surgical patients after total knee and hip joint arthroplasty. Adverse outcomes, such as chronic pain, impaired function, prolonged opioid use, and poor quality of life can lead to mortality and morbidity that can result from inadequate pain control (Gan, 2017). The surgery may result in the suppression of the immune system, due to anesthetic drugs, and is often in proportion to the invasiveness of the surgery performed (Wang et al., 2019). The factors that lead to increased risk is anesthesia duration, number and size of incision, along with complications during surgery and any underlying medical problems (Zambouri, 2007). Effective postoperative pain control and management can lead to improved patient comfort, earlier mobilization and reduced incidence and risk of deep venous thrombosis by allowing increased mobility, and lead to faster recovery without development of chronic pain (Gan, 2017). However, increased use of opioids and overprescribing can lead to increased tolerance and result in unmanaged acute pain (Hah et al., 2017). When pain is poorly managed in the acute postoperative period, patients can develop chronic pain and have impaired mobility, prolonged recovery, increased risk for complications – such a thrombosis and poor mobility, resulting in poor quality of life.

In order to achieve optimal postoperative pain management, lack of knowledge, reluctance, and false concerns about addiction must be recognized (Al-Mahrezi, 2017). Furthermore, the presence and intensity of acute pain during or after surgery is predictive of the development of chronic pain and can be a source of patient dissatisfaction (Al-Mahrezi, 2017). Prescribing methods for peri-operative analgesic are varied and can lead to inadequate pain control. Improper management of post-surgical pain is associated with delay in healing, increase

in suffering and complication rates, anxiety and sleep-disturbance, and a decrease in quality-of-life post-surgery (Baratta et al., 2014). A study, which included 250 eligible participants, showed that 82% of patients continue to experience acute pain after surgery, with the majority experiencing moderate-to-severe pain (Baratta et al., 2014). Barriers to acute postoperative pain management are related to lack of communication with the patient and fear of opioids with the possibility of addiction post-operatively. Such barriers lead to decreased satisfaction of pain management and furthermore, poor pain control that is associated with an increase in psychological distress, decreased social activities, prolonged rehabilitation, and chronic pain (Sinatra et al., 2002). Often patients lack understanding of the complexity of pain and the need for multimodal pain management (Barrata et al., 2014). Nursing and physician barriers to adequate post-operative pain management are related to inadequate knowledge of pain management regimens, negative attitudes related to opioid use, and poor understanding of complexity of pain and associated side effects (Barrata et al., 2014).

Aim

Does increased pre-operative opioid use and overprescribing lead to poor post-surgical outcomes in patients undergoing total knee and total hip arthroplasty?

Literature Review

The full text research articles were found using databases through the Dominican University of California library and included CINAHL, PubMed, and Google Scholar. The search terms used were “pain management,” “pain control,” “total knee arthroplasty,” “total hip arthroplasty,” “total joint arthroplasty,” and “preoperative opioid use.” The search generated 180 full text articles of which four were used for this research paper and are included in this literature review.

The review of relevant literature has been divided into two categories, articles discussing the use of multimodal analgesia and its effect on opioid consumption and articles that demonstrate how increased use of opioids and overprescribing negatively impacts patient recovery and patient satisfaction after total joint arthroplasty of the knee and hip.

Use of Multimodal Analgesia and its Effect on Opioid Consumption

Thomazeau, et al. (2015) sought to examine how post-operative pain was reflected when patients were not exercised with physical therapy. The study of 109 patients undergoing total knee arthroplasty recorded patient characteristics, preoperative pain intensity, anxiety and depression levels, sensitivity and pain thresholds in response to an electrical stimulus. The goal of the study was aimed at improving consequences related to “nociceptive stimulation post-operatively” and prevent adverse consequences of increased opioid consumption. The study found that opioid requirements vary significantly and are dependent on duration of pain experienced, anxiety levels and are influenced by both pharmacokinetic and pharmacodynamic factors (Thomazeau et al., 2015). Of the 109 patients observed in the study, more than 50 percent suffered from knee pain for longer than five years. Further, the study showed that the mean post-operative pain intensity for patients receiving opioids preoperatively was higher than in those receiving pregabalin and celecoxib post-operatively (4.0 ± 2.0 vs. $3.0 \pm$ ($p < 0.001$)) (Thomazeau et al., 2015). Additionally, the mean postoperative requirement for opioids was higher for patients who were physically inactive at the time of surgery and in those who consumed opioids for pain management prior to surgery (Thomazeau et al., 2015). The study found that anxiety in patients preoperatively would negatively impact pain control post-operatively (Thomazeau et al., 2015).

This suggests that anxiety is predictive for “post-operative pain intensity” and a decrease in use of opioids and multimodal analgesia must be considered when treating patients

undergoing total knee arthroplasty; however, the long-term use of opioids and potential tolerance which could prove problematic for effective pain management postoperatively was not sufficiently addressed in the study. The study did determine that the use of COX-2-selective inhibitors and pregabalin significantly reduced pain intensity and requirement for opioids in the post-operative period; however, due to a low percentage (3 percent) of patients who expressed dissatisfaction with post-operative pain management the study demonstrated that the use of multimodal analgesia in addition to opioids is significantly more effective in treatment of post-operative pain after total knee arthroplasty (Thomazeau et al., 2015).

Jing-wen et al., 2019), determined that 60 percent of the total knee arthroplasty patients experience severe postoperative pain, while 30 percent of postoperative total knee arthroplasty patients experience moderate pain. The study aimed to examine the benefit of multimodal anesthesia and improved postoperative recovery (Jing-wen et al., 2019). Controlling moderate to severe pain postoperatively in total knee arthroplasty patients is imperative in order to promote ambulation and range of motion to decrease prolonged immobility and subsequent complications. The study found that optimally a combination of preemptive analgesia, cyclooxygenase-2 inhibitors, nerve blocks and adequate post-operative analgesia in addition to opioids should be considered in order to relieve severe post-operative pain and decrease long-term dependence on opioids (Jing-wen et al., 2019). Furthermore, the study discovered that mechanisms related to post-operative pain are related to both peripheral and central mechanisms and the use of monotherapy is suboptimal to adequate pain management thus use of multimodal analgesia not only reduces the pain both preoperatively and postoperatively, but decreases opioid dependence and decreases the risk of associated adverse effects resulting in improved patient satisfaction (Jing-wen et al., 2019). Additionally, Jing-wen et al., (2019) discovered that use of

preemptive analgesia reduces the risk of hypersensitivity and aids in pain reeducation postoperatively. Most importantly, chronic use of opioids in the pre-operative period results in tolerance and leads to decreased pain relief postoperatively and subsequently an increased requirement for opioids (Jing-wen et al., 2019). The study also found that the use of local infiltration anesthesia with liposomal bupivacaine decreased pain post-operatively (19.7 mg vs 84.9 mg, $P = 0.0048$) reduced opioid consumption in the post-op period and prolonged time to rescue opioids without adverse effects (Jing-wen et al., 2019).

These studies demonstrate that long-term opioid use increased the potential for tolerance which can lead to unmanaged preoperative and postoperative pain in patients that are undergoing total joint arthroplasty of the hip or knee. Using preemptive analgesia can help reduce the risk of increased opioid use in patients scheduled to undergo total joint arthroplasty. Additionally, utilization of cox-2 inhibitors can reduce the use of opioids. Utilization of multimodal analgesia postoperatively can aid in better postoperative pain management that can reduce the risk of uncontrolled pain and result in better patient outcomes postoperatively.

Increased Use of Opioids and Overprescribing Negatively Affects Patient Recovery and Satisfaction Post-Operatively

Ruddell et al., aimed to examine if larger opioid prescriptions after total joint arthroplasty are associated with an increased risk of dependence. The study found that total hip arthroplasty patients had higher opioid tolerance than those who underwent total knee arthroplasty (25.3 % vs. 14.6 %, $p = 0.004$); however, the total knee arthroplasty patients showed a prolonged opioid use in the post-operative period (37.9% vs 17.2, $p < 0.001$). The initial outpatient dose prescribed postoperatively was related to prolonged use of opioids (OR 1.286, 95% CI, 1.002 to 1.654; $p = 0.049$) for a 1 standard deviation increase of 332.0 in the initial MMEs for total hip arthroplasty

patients, and for the total knee arthroplasty patient group (OR 1.248, 95% CI, 1.001 to 1.558; $p = 0.049$) for a one standard deviation increase of 292.5 in initial MMEs (Ruddell et al., 2021).

The study also revealed increased odds of prolonged opioid use associated with quantity of opioids administered during the inpatient period (OR 1.523, 95% CI, 1.183 to 1.961; $p = 0.001$) for one standard deviation increase of 105.9 inpatient MMEs for total hip arthroplasty and (OR 1.466, 95% CI, 1.165 to 1.845; $p = 0.001$) for a 1 standard deviation increase of 96.3 inpatient MMEs for TKA (Ruddell et al., 2021). It was also discovered that there is a dose dependent correlation between the initial prescription of opioids and the total opioid quantity filled by patients in the prolonged and chronic postoperative period (Ruddell et al., 2021).

Schlosser et al., (2020) in the retrospective metanalyses aimed to examine the relationship between opioid use and post-operative length of stay and the readmission rates for patients who have undergone hip and knee arthroplasty. Furthermore, the aim was to examine the enhanced surgical recovery protocols that include multimodal pain management as a key process (Schlosser et al., 2020). The study found that the patients receiving treatment with lower doses of opioids had shorter median length of stay ($p < 0.001$) and that this earlier discharge had no negative impact on readmission rates. Patients that were discharged on day one and received a lower (MME) per day than those who were not discharged (32.5 [IQR: 19.0–50.0] versus 45.0 [26.7–71.2], $p < 0.001$) (Schlosser et al., 2020). The study found that patients discharged on day two had similar results (43.5 [26.0–67.0] versus 48.0 [27.5–77.0], $p < 0.001$), but not for those discharged on day three (Schlosser et al., 2020). The number of opioids used following joint arthroplasty is associated with discharge date and with lower amounts of opioid used and are linked to the probability of earlier discharge for both days one and two (Schlosser et al., 2020).

According to the study, the amount of opioid dose per day is found to be the strongest predictor of earlier discharge date (Schlosser et al., 2020).

In conclusion, the study discovered that the probability of an earlier discharge following joint arthroplasty and a decreased chance of readmission is associated with use of lower amounts of opioids following surgery (Schlosser et al., 2020).

Larger doses of opioid and prolonged use have been shown to be associated with increased pain and tolerance postoperatively in patients that are undergoing total joint arthroplasty of the hip or the knee. Additionally, prolonged use of opioids is associated with quantity of opioids prescribed and administered during the hospitalization period. Patients who consumed lower doses have been found to be discharge home sooner than those who consume larger doses. Increased doses were not only found to be associated with longer hospital admissions, but also higher readmission rates.

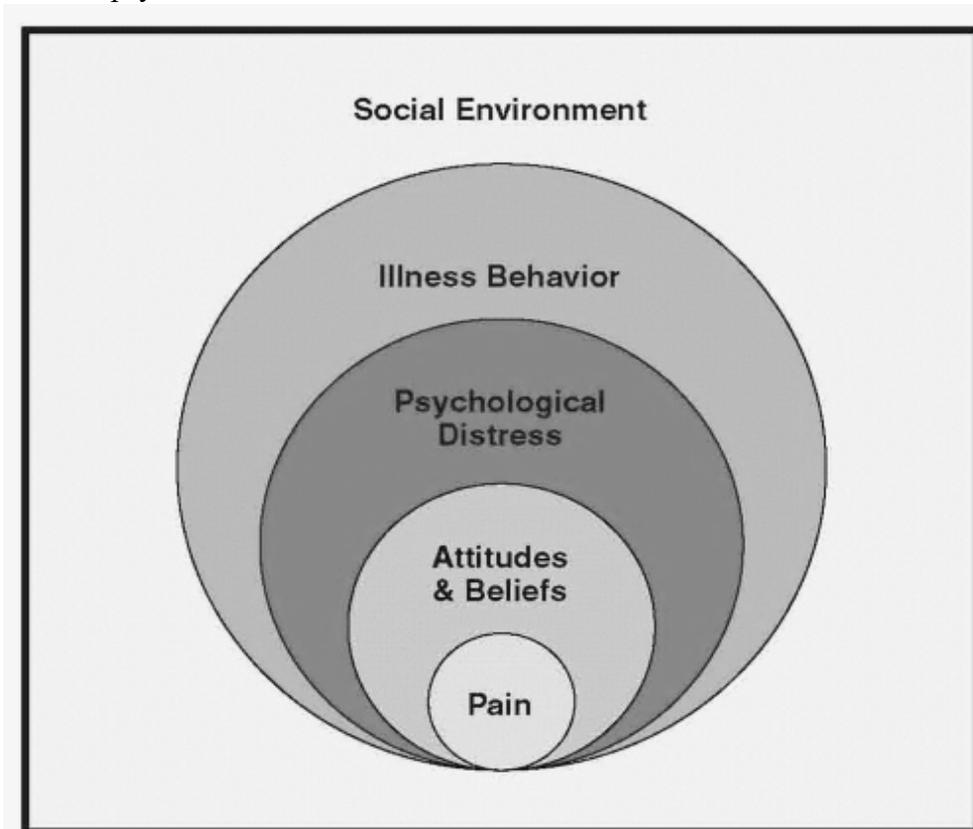
Theoretical Framework

The aim of the proposed study is to examine if opioid pain management has an impact on early postoperative mobilization, long-term dependence and overuse of narcotic medications after total joint arthroplasty. To address this gap the biopsychosocial model is used to address the underlying pain perception. This model allows for optimal foundation that is comprehensive and tailored for specific patient needs. Chronic pain is a debilitating and widespread condition that affects millions of individuals worldwide. In 2015, more than 25 million Americans reported experiencing chronic and consistent pain daily (Nahin, 2015). The differences in how patients experience and communicate the experience can result in varying treatment due to physician interpretation of the patient experience report (Beavers et al., 2016). The difficulties in treatment and assessment of pain has led to overprescribing of opioids that does not result in treatment of

the underlying causes of pain. Opioids, which are highly addictive and present associated negative outcomes such as misuse and overuse.

The experience of chronic pain encompasses unpleasant experiences, both physical and emotional, associated with actual or potential damage. In acute conditions, the pain is resolved when the problem is addressed and treated; however, chronic pain requires continuous monitoring and treatment with multiple approaches (Beavers, 2015). The biopsychosocial model focuses on treating the individual as a whole and integrates both the mind and the body and acknowledges the biological, psychological, and social components that are associated with the pain experience. It also places an emphasis on illness and how one lives with or responds to the condition and related symptoms (Beavers et al., 2016). Figure 1 gives a brief overview of the biopsychosocial mode (Liebson et al., 2020).

Figure 1: The Biopsychosocial Model



This theory posits that pain is not simply a neuropsychological phenomenon, but rather depends on both social and psychological factors such as culture, family, nociceptive stimuli and environment which influence pain perception leading to an impact on an individual's response to pain and associated behaviors (Dekkers et al., 2018). Johnson et al., (2013), defines acute pain management as a complex process involving activation of nociceptors, chemical mediators and inflammation (Johnson et al., 2013). The study further explains that pain medication is used to target each of the key elements within the pain pathway and eliminate or reduce the sensation of pain (Johnson et al., 2013). The authors explain that pain management should begin prior to the trauma or injury of the tissues, when possible, and continue throughout the perioperative period in order to appropriately manage pain and improve both clinical outcomes and satisfaction for the patient (Johnson et al., 2013). However, some research suggests that early use of opioids for pain management leads to impaired post-operative function and long-term pain (Goplen et al., 2019).

Design

Methodology

Prospective cohort study to examine long term opioid use preoperatively and associated negative effects of pain control in the postoperative period of patients undergoing total joint replacement of the hip or knee. Using quantitative data, the study will examine self-reported preoperative opioid consumption, actual post-operative opioid consumption, and self-reported pain. Patient-reported outcome measures will be assessed at in the immediate post-operative period and at three, six, and twelve months postoperatively. The patient pain experience will also be examined.

Site and Sample

I will target a sample of 500 post-operative total hip and knee joint replacement patients, ten participants per variable (Independent Variable, Dependent Variable, covariates) per stratified group (those that use and those that do not use pre-operative opioids) by using the California Joint Replacement Registry (The Joint Commission, 2020). Patients will be given a survey during the immediate postoperative period to examine preoperative opioid consumption and the corresponding daily morphine equivalent amount and postoperatively at three months, six months, and twelve months.

Inclusion Criteria

The inclusion criteria for this study will be patients who scheduled to undergo primary total hip or total knee arthroplasty. Additionally, patients who are prescribed preoperative opioids for pain management of end-stage osteoarthritis and compared with those that were not prescribed opioids preoperatively for end-stage osteoarthritis will be included. Patients who are scheduled for a total joint replacement of the hip or of the knee due to end-stage osteoarthritis will also be included in this study. And finally, patients who are between the ages of 55 and 85 years old and scheduled for total joint arthroplasty of the knee or hip for treatment of end-stage osteoarthritis will fall in the inclusion criteria.

Exclusion Criteria:

The exclusion criteria for this study will include Rheumatoid Arthritis, which has an increased risk of complications. These include increased risk for infection due to compromise to the systemic immune system, impaired wound healing resulting from impaired skin integrity or frail skin, and peroneal nerve injury caused by overcorrection of severely deformed knees. Postoperative stiffness is more common due to generalized muscular weakness and disability (Goodman, 2014). Additionally, patient scheduled for Revision total joint arthroplasty of the hip

or the knee as such procedures are associated with higher rate of infection and complications (Badarudeen et al., 2017). Patients with significant cognitive impairment such that they cannot self-report or consent and those with significant clinical anxiety disorder will also be excluded from this study.

Protocol

The access to the total joint registry will be obtained through the Joint Commission and American Academy of Orthopedic Surgeons. A chart review of patient clinical information will be performed. Potential subjects will be contacted, and an invitation will be sent with a response card. Thirty days will be allowed for response and follow-up with a second invitation with a response card will be sent if a response has not been received. After a third invitation, 30 days will be permitted for a response. If no response, the potential subject will be removed from list. The subject will be screened for clinical appropriateness for participation in study. All subjects must meet inclusion. Any subjects that fall within the exclusion criteria will be removed. Subjects who meet the inclusion criteria will be enrolled and the consent will be reviewed with the subjects. We will ensure that subjects understand that participation is voluntary. The measurement survey tools will be administered to the subjects, data will be obtained, and recorded. Recruitment is 500 participants, and the study is estimated to complete enrollment within six months from the initiation. If enrollment of 500 participants is not met the study will adjust participation of subjects accordingly.

What will you do to preserve privacy?

Participants will sign informed consent and can end participation at any point during the study. Records will be secured using secure password protected files. Only members of the research team will be permitted access to the passwords. Encryption will be used when

information is sent and communicated over the internet and through email. Participants will be assigned alpha numeric codes and names will not be used. Physical files and information will be kept in locked cabinets to which only members of the research team are granted access.

Measurement/Tools

Demographic survey will be administered for age, gender, education, income, race and ethnicity, history of employment, and chronic conditions (such as diabetes, heart conditions, or lung disease). The 36-Item Short Form Health Survey (SF-36), developed by the Boston Health Research Institute (1991), will be used to assess impact of health and quality of participants lives. The SF-36 questionnaire Cronbach alpha exceeds 0.70 for internal consistency and reliability, a *P*-value of < 0.05 , and correlation coefficient ($r > 0.50$), meeting the recommended level (Zhang, 2012).

The McGill Pain Questionnaire (1975) ($r: 0.43-0.88, P < 0.001$) will be used to assess pain severity, quality, and intensity of experienced pain which produces ($K=0.97$) validity statistic, Cronbach's alpha of 0.88 and 0.90 and interclass correlation class coefficient 0.73 to 0.90 (Kachooei, 2015). Using the Current Opioid Misuse Measure (COMM), a 17-item questionnaire designed to identify patients who may be misusing their prescription opioids. The questionnaire will be designed to identify the likelihood of aberrant drug-related behaviors with higher scores representing increased risk (PLR, 2.77 [95% CI, 2.06 to 3.72), while lower scores on the COMM are consistent with decreased likelihood of abuse (NLR, 0.35, 95% CI, 0.24 to 0.52]) (Chou et al., 2009). The quantity of daily opioids used will be assessed by converting the daily dosage of opioids consumed to Milligram Morphine Equivalent (MME), which is the value that will be assigned to opioids to represent the relative potency. The outcome of interest is post-operative pain, which will be measured using The McGill Pain questionnaire. The independent (exposure)

variable is the use of pre-operative opioids, measured using Milligram Morphine Equivalent. Covariates of interest examined will be history of smoking, use of daily simple analgesics (NSAIDs), body mass index (BMI) and duration of wait for surgery. Smoking leads to greater loss of cartilage and can result in more pain (Amin, 2007). High BMI poses a significant risk for osteoarthritis (Zheng, 2015). All participants will respond to a demographic survey that will determine age, meeting the requirement of research study, gender, income, race, and ethnicity. Pre-operative opioid use (independent variable) will be determined by converting current cumulative intake of any medication in the opioid class over a twenty-four-hour period and converting to MME, which is an equivalency factor to measure a dose of morphine that is equivalent to the ordered opioid, (95% confidence interval, -13.96 – 14.56) (Heins, 2020). The post-operative analgesia and type of analgesia (dependent variable) will be recorded by reviewing the electronic medication administration record and converting any medication administered in the opioid class to MME.

Analysis

A correlational design will be used to determine a relationship between use of opioids preoperatively and determine the possible negative outcome on long-term opioid dependence and chronic pain. Additionally, if use of multimodal analgesia and short-term opioid use has a positive outcome on postoperative patient recovery after total joint arthroplasty of the hip and knee in relation to early mobility, decreased incidence of venous thromboembolism, decreased pain and patient postoperative satisfaction and quality of life after surgery.

Means and standard deviations will be calculated on age and years of education. Proportions will be determined on race, education, and income. A t-test will be used to compare the means of two groups, those who are consuming preoperative opioids and those who are not,

in order to determine whether there is statistical evidence associated with population means are significantly different and has an effect on the population of interest. The t-test will allow to make comparison between the two independent groups, those that are consuming preoperative opioids and those who are not allowing for determination to be made regarding which variable levels have the most significant impact on the association (Fain, 2017). A p-value of less than 0.05 will be considered statistically significant. A t-value of 0.95 for a confidence interval will be used (Fain, 2017).

A demographic survey will be administered for age (years) where a mean will be determined, gender (female; male; transgender female; transgender male; prefer not to answer), education where a mean years of schooling will be determined (12th grade or less; graduated high school or equivalent; some college, no degree; associate degree; bachelor's degree; post-graduate degree), median income (\$20,000 or less; \$20,000 to \$34,999; \$35,000 to \$49,999; \$50,000 to \$74,999; \$75,000 to \$99,999; \$100,000 and over), race and ethnicity (Hispanic/Latino; Hawaiian/Pacific Islander; White; Black/African-American; Asian; Native American/Alaska Native, and employment (employed full-time; employed part-time; seeking opportunities; retired; prefer not to say).

The 36-Item Short Form Health Survey (SF-36). The SF-36 questionnaire Cronbach alpha exceeds 0.70 for internal consistency and reliability, a *P*-value of < 0.05, and correlation coefficient ($r > 0.50$) (Zhang, 2012).

Pre-operative opioid use (independent variable) will be determined by converting current cumulative intake of any medication in the opioid class over a twenty-four-hour period and converting the amount to MMEs (95% confidence interval, -13.96 – 1 4.56) (Heins, 2020).

The post-operative analgesia (dependent variable) and type of analgesia will be recorded by reviewing the electronic medication administration record and converting any medication administered in the opioid class to MMEs 95% confidence interval, -13.96 – 1 4.56) (Heins, 2020).

Chronic conditions, such as diabetes, heart conditions, or lung disease will be used as covariates to improve the accuracy of the model and may significantly affect the final analysis results as the participants of different demographics and populations may have different outcomes.

Pain intensity will be measured using the McGill Pain Questionnaire (1975) (r: 0.43-0.88, $P < 0.001$) which will be used to assess pain intensity of (K=0.97) validity statistic, Cronbach's alpha of 0.88 and 0.90 and interclass correlation class coefficient 0.73 to 0.90 (Kachooei, 2015).

Pain quality will be measured using the McGill Pain Questionnaire (1975) (r: 0.43-0.88, $P < 0.001$) to assess pain quality of experienced pain which produces (K=0.97) validity statistic, Cronbach's alpha of 0.88 and 0.90 and interclass correlation class coefficient 0.73 to 0.90 (Kachooei, 2015).

The (COMM) will be used to identify opioid prescription misuse behavior. The likelihood of aberrant drug-related behaviors with higher scores representing increased risk (PLR, 2.77 [95% CI, 2.06 to 3.72]), while lower scores on the COMM are consistent with decreased likelihood of abuse (NLR, 0.35 [95% CI, 0.24 to 0.52]) (Chou et al., 2009).

A correlational design will be used to determine a relationship between use of opioids preoperatively and determine the possible negative outcome on long-term opioid dependence and chronic pain. Additionally, if use of multimodal analgesia and short-term opioid use has a

positive outcome on postoperative patient recovery after total joint arthroplasty of the hip and knee in relation to early mobility, decreased incidence of venous thromboembolism, decreased pain and patient postoperative satisfaction and quality of life after surgery.

Human subject protection

Application to the IRB to ensure that the rights and welfare of study subjects are protected. Ethical considerations will need to be made to ensure patient safety in the postoperative period and to keep patient information confidential and anonymous. Using assigned laptops that only permits access to the researchers and ensure password security is enabled. No data collection will occur until the study and research is approved by the Dominican Internal Review Board. The participants will be informed that they may cease participation at any time and that submission of the survey will constitute informed consent.

Limitations

This study has limitations, including the prospective design which will require a long-term follow-up with study subjects. Additional limitations are related to potential for insufficient data relating to patient's actual consumption of opioids prescribed in the preoperative period, inability to evaluate all protocols and policies regarding opioid prescribing, and largely varied protocols and policies related to preoperative counseling and education for patients suffering from end-stage osteoarthritis and total joint arthroplasty of the hip and knee.

Conclusion

With total knee and total hip arthroplasty being the two of the most common surgeries performed for patients suffering from end-stage osteoarthritis, the perioperative management of patient's pain is extremely important in order to improve rehabilitation, increase patient mobility, and improve both patient satisfaction and postoperative outcomes. Increased pre-operative opioid

use and overprescribing could potentially lead to poor post-surgical outcomes in patients undergoing total knee and total hip arthroplasty.

Despite the use of multimodal analgesia, opioids will continue to be required for management of postoperative pain in patients who have undergone total joint arthroplasty of the hip or the knee. When planning treatment and surgical intervention for patients with end-stage osteoarthritis, the pain management perioperatively must be considered for each patient and tailored to preoperative and postoperative needs individually. The length of symptoms experienced preoperatively, and advancement of condition will play a role in treatment for each patient's pain management regimen.

Use of different analgesia regimens can aid in decreased use of opioids preoperatively and potentially reduce the risk of opioid related adverse effects while improving post-operative satisfaction and recovery for patients. The proposed study will aid in evaluating perioperative opioid use in treatment of pain associated with end stage osteoarthritis. Additionally, it will evaluate use of multimodal analgesia, such as cox-2 inhibitors in addition to opioid prescribing patterns perioperatively to aid in pain management associated with end-stage osteoarthritis and improve postoperative outcomes and satisfaction for patients undergoing total joint arthroplasty of the hip and knee.

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Literature Critique Table

Citation	Design/ Question/ Hypothesis	Sample/ Setting	Independent Variable Covariates	Dependent Variable	Significant Findings	Notes
Schlosser, M. J., Korwek, K. M., Dunn, R., & Poland, R. E. (2020). Reduced post-operative opioid use decreases length of stay and readmission rates in patients undergoing hip and knee joint arthroplasty. <i>Journal of Orthopaedics</i> , 21, 88–93. https://doi-org.dominican.idm.oclc.org/10.1016/j.jor.2020.03.003	Retrospective analysis The study aimed to determine if decreased post-operative opioid use impacts length of admission and readmission rates in patients that are scheduled to undergo total hip and knee joint arthroplasty. Further the study examined if surgical recovery protocols that are geared towards use of multimodal pain management have a positive impact on acute pain management and re-admission rates in patients who undergo total joint	98 affiliated medical centers across the United States where data collected included is from adult patient encounters classified as hip or knee joint arthroplasty procedures with discharge dates between June 1, 2016 and March 24, 2019	The variable manipulated is the mode and dose of anesthesia used.	Moderate to severe pain	When lower doses of opioids is prescribed to patients following total hip and knee arthroplasty it positively impacts discharge and readmission rates. Patients who are prescribed lower amounts of opioids and take opioids for a shorter duration pre-operatively are associated with earlier discharge and lower readmission rates post-operatively.	Opioids lead to increased length of stay and complications. The increased use of opioids can impact treatment of acute pain and can lead to discharge to extended care facilities due to prolonged admission for acute pain management . Decreased use of opioids preoperatively can have a positive impact on post-operative acute pain management along with the use of multimodal analgesic regimen.

<p>De Luca, M. L., Ciccarello, M., Martorana, M., Infantino, D., Letizia Mauro, G., Bonarelli, S., & Benedetti, M. G. (2018). Pain monitoring and management in a rehabilitation setting after total joint replacement. <i>Medicine</i>, 97(40), e12484. https://doi.org/10.1097/MD.00000000000012484</p>	<p>arthroplasty. Observational retrospective cohort-study. The study was aimed at monitoring pain during the postoperative rehabilitation period in relation to the protocols used post-operatively. The aim of the study is to present results of a perioperative anesthetic protocol, and a pain treatment protocol in use in the patients undergoing TKA and THA.</p>	<p>50 patients who underwent THR and 50 TKR hospitalized within the Intensive Rehabilitation Unit from January 2017 to December 2017 were retrospectively evaluated, and included in the study.</p>	<p>NRS pain score</p>	<p>The use of rescue pain protocols in addition to multimodal analgesic protocols</p>	<p>Preoperative pain intensity (NRS) was found to be a significant predictor of high pain (at rest and during movement) following TKR, and an independent risk indicator for poor function at 6 months after surgery, slowing rehabilitation in the immediate postoperative period. Results of this retrospective study on a cohort of patients who underwent uncomplicated THR and TKR demonstrated well-controlled pain both in the early postoperative period and in the</p>	<p>High preoperative NRS scores that evaluate pain level are an indicator for high pain intensity postoperatively for patients following TKA and THA. Use of multimodal analgesic protocols helps control the pain intensity and leads to enhanced recovery and improved function postoperatively</p>
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<p>Li, J. W., Ma, Y. S., & Xiao, L. K. (2019). Postoperative Pain Management in Total Knee Arthroplasty. <i>Orthopedic surgery</i>, 11(5), 755–761. https://doi.org/10.1111/os.12535</p>	<p>Meta-analysis which aimed to discuss the current postoperative pain management regimens for TKA. The study objective was to demonstrate that use of multimodal analgesia could improve perioperative pain control and patient satisfaction through the</p>	<p>Study on THA and TKA</p>	<p>Multimodal anesthesia and opioid use</p>	<p>Pain intensity</p>	<p>intensive rehabilitation phase. Preoperative pain intensity (NRS) was found to be a significant predictor of high pain. The study reports a very good control of pain with the perioperative anesthetic protocols, and pain treatment protocols. TKA patients used opioids within 3 months prior to surgery¹². Compared with total hip arthroplasty patients, TKA patients were twice as likely to require refill opioid prescriptions and were prescribed a greater total morphine equivalent</p>	<p>Limiting opioid use preoperatively can have a positive outcome on recovery. Patients must be evaluated individually to establish best perioperative pain management protocol. Use of multimodal analgesia can result in optimal pain management</p>
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			combination of several analgesic regimens while also reducing opioid consumption and opioid-related adverse effects.		dose for a longer period of time postoperatively. Preoperative chronic use of opioids reduces the effect of pain relief post operation, and increases postoperative opioid consumption in TKA patients. Preoperative opioid use is associated with early revision, postoperative complication, worse clinical outcomes due to developed tolerance, and hyperalgesia, which can complicate recovery and rehabilitation.	and increase patient satisfaction postoperatively. Multimodal analgesic protocols will require more investigation and study in order to be beneficially implemented.
Thomazeau, J., Rouquette, A., Martinez, V., Rabuel,	Observational prospective study. Aimed to	109 patients.	Analgesia used. Duration of analgesia use	Analgesia used. Multimodal analgesia.	Clinicians could use the pre-operative	Level of anxiety is predictive for measure

<p>C., Prince, N., Laplanche, J., Nizard, R., Bergmann, J., Perrot, S. and Lloret-Linares, C. (2016), Acute pain Factors predictive of post-operative pain and opioid requirement in multimodal analgesia following knee replacement. <i>Eur J Pain</i>, 20: 822-832. https://doi.org.dominican.idm.oclc.org/10.1002/ejp.808</p>	<p>identify the determinants of post-operative pain intensity and post-operative opioid requirement. Recorded patient characteristics, pre-operative pain intensity. Multivariate linear regression models were used to identify predictors of post-operative pain at rest and opioid requirement.</p>	<p>preoperatively.</p>	<p>Duration of analgesia use preoperatively. Mean intensity of pain at rest for the total 5-day period.</p>	<p>pain profile, in terms of anxiety levels, neuropathic pain symptoms, and chronic pre-operative pain intensity, to improve the efficacy of pain management after knee surgery. Relationship between pre-operative opioid consumption and MED identified in univariate analysis disappeared in multivariate analysis, following adjustment for mean post-operative pain intensity at rest. This suggests that higher levels of opioid consumption before surgery mostly</p>	<p>of pain post-operatively. Opioid use prior to surgery increases risk for increased pain experienced post-operatively. Presence of neuropathic pain is linked to sensitization and risk for chronic pain persistent pain. Patients that were treated with opioids prior to surgery experienced higher level of pain post-operatively and required more opioids. Use of multimodal analgesia decreases the risk for patient dissatisfaction post-operatively.</p>
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resect the intensity of chronic musculoskeletal pain. High pain intensity and a need for opioids before surgery thus suggest that any delay in surgery would probably be associated with a poorer outcome and more difficult recovery.

<p>Ruddell, J. H., Reid, D., Shah, K. N., Shapiro, B. H., Akelman, E., Cohen, E. M., & Daniels, A. H. (2021). Larger Initial Opioid Prescriptions Following Total Joint Arthroplasty Are Associated with Greater Risk of Prolonged Use. <i>The Journal of bone and joint surgery</i>.</p>	<p>Cohort study. A statistical analysis. Study aimed to evaluate the association of inpatient perioperative opioid dosing and initial opioid prescription dosing in this patient population with the risk of prolonged opioid use and the quantity of opioids used in extended</p>	<p>507 patients undergoing THA or TKA between 1/01/2016 and 6/30/2016.</p>	<p>Pain level.</p>	<p>Opioid use.</p>	<p>Increased preoperative use of opioids significantly increases the risk for prolonged opioid use. Larger initial doses filled post operatively result in increase in total opioids filled Preoperative opioid use within 30 days of the surgical procedure</p>	<p>The effects of increased opioid dosages on long-term well-being of patients is underestimate. By limiting preoperative opioid prescriptions patients are at lower risk for opioid misuse and abuse. Minimizing initial opioid use, for both inpatients and</p>
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<p><i>American volume, 103(2)</i>, 106–114. https://doi.org/10.2106/JBJS.20.00732</p>	<p>postoperative periods.</p>	<p>was strongly associated with an increased OR of chronic opioid use. Patients who underwent TJA and were administered higher cumulative inpatient opioid dosages following the surgical procedure were at a significantly increased risk for utilizing opioids for up to 150 days, regardless of the initial outpatient postoperative opioid prescription dose, preoperative use of controlled substances, sex, procedure, anesthesia type, or use of a peripheral nerve block.</p>	<p>outpatients, without compromising pain control efforts. Patients are likely to have better outcomes after THA and TKA.</p>
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