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Leighton School of Nursing

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Does an Online Educational Workshop for Certified Registered Nurse Anesthetists Reduce the Perceived Clinical Barriers and Promote Willingness to Change Practice to the Use of Spinal Anesthesia for Patients Undergoing Total Hip Arthroplasty?

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Abstract

Total Hip Arthroplasty (THA) is a commonly performed procedure in the operating room and often the patient population undergoing this procedure are elderly with multiple comorbidities. Despite new research on spinal anesthesia (SA) many hospital facilities continue to utilize general anesthesia (GA). One of the most important adverse outcomes noted with GA is the activation of the neuroendocrine stress response. The neuroendocrine stress response is responsible for increased mortality and morbidity and is activated through pain under general anesthesia. The utilization of spinal anesthesia prevents the activation of the neuroendocrine stress response as pain signals are blocked along the ascending nerve fibers. The purpose of this DNP project was to educate certified registered nurse anesthetist (CRNAs) at an acute care hospital in an urban city in the Midwest via an online educational workshop and identify the perceived barriers that prevent CRNAs from utilizing SA technique in practice for THA patients. This was measured through an online power point presentation module along with a pre-and post-survey. The surveys were designed by using Likert-based questions focusing on the impact of SA and GA on patients presenting for THA, barriers to the use of SA, and their confidence in use of SA in this patient population after participating in the power-point presentation. The results of the survey showed a statistical significance in their confidence in the use of SA of $p < .05$, demonstrating the impact of the educational module in the post-survey results. Some limitations notable in this study were small study sample, lack of compliance and incentive for participating in this project, technical issues, and lack of in-person training.

Keywords: general anesthesia, spinal anesthesia, neuraxial anesthesia, regional anesthesia, total hip arthroplasty, total hip replacements, post anesthesia recovery unit, hemodynamic complications, comorbidities, CRNAs, barriers, and facilitators.

Does An Online Educational Workshop for Certified Registered Nurse Anesthetists Reduce the Perceived Clinical Barriers to the Use of Spinal Anesthesia for Patients Undergoing Total Hip Arthroplasty?

Total Hip Arthroplasty is one of the most common procedures done to replace all of the hip joint to reestablish joint function and mobility, with more than 400,000 THAs being conducted yearly in the United States (Campbell clinic, 2019). The overall incidence of joint replacements in the United States is monumental, with over 1 million total hip and total knee replacements conducted yearly (Maradit Kremers et al., 2015). The average age of these patients is 65 years and they often accompany multiple comorbidities (Nagelhout & Elisha, 2018). Maradit Kremers et al. (2015) notes a higher prevalence of total joint pathologies and chronic diseases such as strokes and myocardial infarctions. Traditionally, GA has been the most common technique for providing anesthesia. Yet as new anesthesia techniques evolve, practitioners continue to utilize GA in their practice, despite a growing body of evidence that support the superior outcomes of SA in THA (Basques et al., 2015). SA offers the benefits of reduced length of hospital stay, decreased transfusion requirements, decreased postoperative nausea and vomiting (PONV), decreased risk of deep venous thrombosis (DVT), hemodynamic stability, and decreased health care costs (Pu & Sun, 2019). Basques et al. (2015) report adverse effects noted with the use of GA, such as an increase in surgical time and postoperative recovery, transfusion requirements, ventilatory dependence, cardiac events, and readmission rates. The unfavorable effects of GA range from mild consequences to long lasting postoperative disabilities that includes cardiovascular, respiratory, and acute renal failure (Harris & Chung, 2013).

SA on the other hand provides anesthesia providers the ability of quick administration of an anesthetic agent, with ease (Calderon-Ochoa et al., 2019). However, this requires consistency

in practicing the techniques of administering SA and continuous educational training for providers (Calderon-Ochoa et al., 2019). Adequate training and continuous education can increase provider comfort and offer healthier outcomes in patients even those with considerable amount of comorbidities (Matsen Ko & Chen, 2015). The purpose of this DNP project was to educate certified registered nurse anesthetist (CRNAs) at an acute care hospital in an urban city in the Midwest via an online educational workshop and identify the perceived barriers that prevent CRNAs from utilizing SA technique in practice for THA patients, and assess the participants willingness to change practice after participating in an online educational module.

Background

THAs can be performed under GA or through SA to provide relaxation to the large group of muscles separated during the procedure (Nagelhout & Elisha, 2018). Spinal or Neuraxial anesthesia is defined by localization of the nerves of the peripheral nervous system with a local anesthetic to reduce pain modulation during the course of a surgical procedure (Nagelhout & Elisha, 2018). Despite the noted benefits of SA, 60.9% of THAs are being performed under GA, and 39.1% are conducted under SA (Matsen Ko & Chen, 2015). A growing number of studies reveal the use of SA being limited to high volume large specialty centers (Parvizi & Rasouli, 2015). Regardless of the numerous benefits of SA, specific barriers such as patient refusal, patient anxiety, provider unfamiliarity and discomfort, fear of litigation, surgeon preference, hospital policy, and hospital culture can pose a significant challenge to utilizing this technique. According to Duale et al. (2015) the most common barrier identified by providers is risks and time consumption associated with performing SA. Calderon-Ochoa et al. (2019) emphasize the safety of SA; however, errors in administration of this technique can lead to pain at the puncture

site, post-dural puncture headache (PDPH), and compromise in heart rate due to a higher level of block.

Comorbidities

The goal of THA is to provide pain relief to promote mobility and a restored quality of life. The majority of the patients presenting for a THA often suffer from multiple comorbidities such as cardiopulmonary, renal, and cerebrovascular diseases, and approximately 50% are obese (Nagelhout & Elisha, 2018). The most common cause of disability experienced by patients undergoing THA is some form of degenerative joint disease stemming from arthritic inflammatory changes associated with aging and disease pathologies (Nagelhout & Elisha, 2018). Common risk factors for the development of osteoarthritis are age, obesity, gender, and trauma (Haebich et al., 2020). Obesity gives rise to the increasing number of joint arthroplasty surgeries and simultaneously increasing morbidity and mortality due to comorbidities that exist with obesity (Haebich et al., 2020). Obesity is strongly linked with cardiovascular disease, diabetes, strokes, cancer, kidney failure, and osteoarthritis, which most commonly affects the joints of the hip, knee, foot, and hand (Nagelhout & Elisha, 2018). A meta-analysis conducted by Pozzobon et al. (2018) supports the link between increasing body mass index and a sedentary lifestyle with osteoarthritis. The management of hip joint replacements does not end at surgery and requires clinicians to implement appropriate techniques during surgery that considers the recovery aspect as well. Patients undergo several months of physical therapy and frequent follow-ups for imaging and routine checkups (Maradit Kremers et al., 2015). Therefore, utilizing an anesthetic technique that decreases postoperative complications and revisions is even more critical to prevent further hindrances in recovery (Maradit Kremers et al., 2015).

Spinal versus General Anesthesia

There has been extensive recent research which has further distinguished the benefits of SA compared to GA in the intra and postoperative settings of THA patients. For example, Parvizi & Rasouli (2015) analyzed a study establishing reduced 90-day mortality, reduced 30day mortality, and reduced postoperative complications using the SA technique. The likelihood of decreased morbidity and mortality associated with the neuraxial approach is due to the minimized risks of fatal cardiac events, onset of circulatory clots and reduced risks of significant blood loss (Parvizi & Rasouli, 2015).

Although more frequently used, GA is associated with increased surgical site infections (SSI) and intraoperative hemodynamic instability which can pose significant harm to the patient (Parvizi & Rasouli, 2015). Furthermore, GA often leads to impaired cognitive function and delirium in the elderly population, along with higher use of opioid requirements post-operatively (Parvizi & Rasouli, 2015). Patients who received SA have found to have decreased opioid requirements, postoperative pain, and an overall appropriate cognitive function profile (Parvizi & Rasouli, 2015). Overall, it is established that GA has an increased ability to cause in hospital unfavorable outcomes. Nagelhout & Elisha (2018) noted patients undergoing THA who receive GA have an overall increased risk of death, respiratory failure, and intensive care admissions.

Spinal Anesthesia

The primary purpose of SA as stated by Nagelhout & Elisha (2018) is to prevent the transmission of pain signals from the surgical site to the spinal cord and higher centers in the brain, known as the somatosensory areas of the cortex and amygdala, where pain signals are perceived. SA utilizes local anesthetic with or without opioids, which is deposited into the

subarachnoid space outside of the spinal cord into the CSF, anesthetizing the spinal cords nerve roots to block transmission of pain signals along a nerve fiber and suppressing ascending pain signals. Pain can be a significant source of morbidity and mortality due to the activation of the stress response and its effect on multiple organ systems. Sympathetic nervous system activation (SNS) ensues from surgical pain and stress that causes the release of catecholamines, cortisol, and hormones that have compensatory and potentially adverse effects on heart rate, peripheral, systemic vascular resistance, increased blood pressure, which increase myocardial demand and oxygen consumption. The use of SA prevents the physiological stress response to surgery and pain and provides superior surgical analgesia. Additional documented benefits of the SA technique are decreased postoperative ileus and improved cardiopulmonary profiles in high risk patients. This significant intraoperative profile is substantial due to the fact that a large majority of THA patients have underlying cardiac pathology and are incapable of tolerating the adverse effects caused by surgical pain. SA allows the patients to remain awake for the procedure and avoiding the possible ill effects of an endotracheal tube such as dental damage, aspiration, vocal cord damage, nerve injury, and ventilatory dependence (Nagelhout & Elisha, 2018).

Possible Complications of Spinal Anesthesia

Nagelhout & Elisha (2018) discussed potential side effects of SA such as significant hypotension and bradycardia. Once the local anesthetic is deposited in the subarachnoid space, it can spread towards nerve fibers of the autonomic nervous system (ANS). The ANS controls the sympathetic nerve fibers of the heart, known as the cardiac accelerators that can become anesthetized by the local anesthetic, leading to substantial drops in blood pressure due to unabated vasodilation. Additionally, bradycardia can occur as the vagal fibers in the heart are affected which cause slowing of the heart's conduction frequency which further compromises

blood pressure. This phenomenon of bradycardia and hypotension can be combated by administering adequate crystalloids and colloid solutions to provide ample preload to the heart prior to the administration of SA. An alternative approach to preventing hypotension and bradycardia is through the use of 5HT3 antagonist, Ondansetron, prior to administrating spinal anesthesia. Other modalities such as pelvic tilting and administering ephedrine, a mixed alpha and beta-agonist, and phenylephrine, a pure alpha-agonist, are effective in treating bradycardia and hypotension. Postoperative nausea and vomiting (PONV) is an accompanying side effect on spinal anesthesia; however, it is less common (Nagelhout & Elisha, 2018). Another possible complication of spinal anesthesia is PDPH that occurs due to a decrease in the cerebrospinal fluid in the subarachnoid space due to a leak through the dura mater (Nagelhout & Elisha, 2018). Several causes that attribute to this occurrence are large cutting needles, female gender, age, and cerebrovasodilation (Nagelhout & Elisha, 2018). Nagelhout & Elisha (2018) also notes a 70% increase in PDPH with the use of a 16-guge Toughy needle (cutting needle bevel) and recommends only a non-cutting needle (blunt tip) be utilized. The risk of PDPH can be minimized or avoided by using an appropriate needle, and vasodilation can be combated through the administration of vasoconstrictor drugs such as caffeine and theophylline. Nagelhout & Elisha (2018) also emphasize an important point that not all headaches after SA is caused by the anesthetic technique itself, rather there are diverse causes such as anxiety, lack of sleep, dehydration prior to surgery, hypoglycemia, and simply due to the lack of caffeine intake the morning of surgery.

Possible Complications of General Anesthesia

The goal of GA is to alter neuronal activity, thereby providing immobility, amnesia, and a state of unconsciousness (Nagelhout & Elisha, 2018). The most common receptors targeted to achieve this goal are enhancing GABA and antagonizing NMDA receptors either through IV or inhaled agents (Nagelhout & Elisha, 2018). GA in patients with pre-existing comorbidities can be significantly compromised due to surgical stimulation and subsequent SNS activation (Nagelhout & Elisha, 2018). For example, the SNS stimulation can activate the coagulation pathway, increasing the likelihood of a thromboembolic event (Harris & Chung, 2013).

Other considerations can be highlighted by the fact that a multitude of anesthetic drugs which are utilized to promote unconsciousness can cause a decrease in systemic vascular resistance leading to hypotension (Nagelhout & Elisha, 2018). Studies reveal the risk of myocardial infarction in elective non-cardiac surgery is up to 5% with GA (Harris & Chung, 2013). Heart failure can occur in up to 6% of patients with pre-existing cardiovascular disease (Harris & Chung, 2013). The utilization of mechanical ventilation during GA can cause numerous respiratory complications such as aspiration, atelectasis, bronchospasm, laryngospasm, and worsening of pre-existing lung pathologies. About 70% of patients experience atelectasis, the most common cause of postoperative hypoxemia. Unidentified atelectasis can increase risks for the development of acute lung injury and pneumonia (Harris & Chung, 2013). PONV can occur in 20% to 30% of patients and 70% to 80% in patients who are high risk (Harris & Chung, 2013). Other complications commonly occur with GA are sore throat, dental impairment, postoperative cognitive decline, and possible drug-related anaphylaxis (Harris & Chung, 2013).

Summary

The selection of an anesthetic for any patient is multifactorial, encompassing the patient's age, gender, comorbidities, operative times, type of surgery, blood loss associated with the procedure, cost of the kind of anesthetic, and the surgeon and patient preference. A wide range of ill effects from GA should alert an anesthesia provider to seek other methods of anesthesia that are proven to be superior in patients presenting for a THA (Parvizi & Rasouli, 2015).

Problem Statement

The consequential effects that accompany the use of GA in patients undergoing THA are well understood by anesthesia providers. GA significantly impacts patient recovery and overall rehabilitation, post-surgery. Anesthesia providers may not always have full control of which anesthetic type to utilize, but full reasons for the underutilization of SA are still unclear. The goal was to deliver a power-point educational presentation to CRNAs in an urban hospital in the Midwest and help identify current barriers as to the underutilization of SA.

Needs Assessment & Gap Analysis

Current literature suggests that THA cases are expected to rise by four million by 2030. A leading cause of degenerative joint disease is obesity (Nagelhout & Elisha, 2018). As per the World Health Organization, approximately 13% of adults across the nation are classified as obese, with an expected rise in the rate of obesity in the future (Haebich et al., 2020). Evidence supports patients undergoing THA are high-risk patients due to their multiple comorbidities and the use of GA has shown to produce adverse outcomes in THA candidates. Due to the higher obesity rates in our nation, it is necessary to implement an anesthetic technique that decreases morbidity and mortality and promotes improved patient outcomes throughout the peri-operative period.

The project site for this DNP project currently employs GA and peripheral nerve block (PNB) as its choice of anesthesia for patients requiring THA. There is no current set protocol that limits the project site to GA and PNB; however, there is no set protocol in place that recommends SA for patients undergoing THA. Various anesthesia providers have varying degrees of opinions for the utilization of SA. A myriad of evidence supports the use of SA to prevent the adverse outcomes associated with GA in this patient population. Further research was conducted to identify existing barriers that limit CRNAs from employing SA as their chosen mode of providing anesthesia to patients undergoing THA to improve morbidity and mortality.

Literature Review

Methods

A comprehensive review was conducted for articles published in the last ten years comparing SA and GA. Additionally, articles were reviewed which assessed barriers to the utilization of SA. Two databases were searched in January 2022 using Google Scholar and PubMed. Boolean phrases used "AND" and "OR" that utilized the keywords *general anesthesia, spinal anesthesia, neuraxial anesthesia, regional anesthesia, total hip arthroplasty, total hip replacements, post anesthesia recovery unit, hemodynamic complications, comorbidities, CRNAs, barriers, and facilitators.* The inclusion criteria for articles included a patient population undergoing THA, published in English, hip and knee arthroplasties studies, studies involving regional or neuraxial anesthesia, human participants only, and patients older than age 18. Exclusion criteria for articles were those younger than 18 years of age, not written in the English language, published over ten years ago, and animal research studies. As a result, 1,122 articles were identified, and 735 articles were eliminated due to the exclusion criteria listed above. After

735 articles were eliminated, 387 articles were assessed for eligibility, and 375 articles were excluded, with only 12 articles meeting the inclusion criteria.

General Anesthesia versus Spinal Anesthesia

In a randomized control trial conducted by Zhang et al. (2021) the effects of GA was examined on 110 patients from January 2019 to December 2020. The observation group was given SA and the control group was given GA. The primary outcome measured were the excellent anesthesia rate allocating the anesthesia effect into three grades: excellent, good, and poor. The secondary outcomes measured were blood pressure, heart rate, postoperative complications, length of hospitalization, and time in the recovery room. Data was evaluated using SPSS 22.0 software and a value of $P<0.05$ was noted to be significant. SA was noted with excellent anesthesia rate superior to GA. In regards to hemodynamic, values for blood pressure and heart rate were considerably lower in the observational group ($P<0.05$). SA provided a stable hemodynamic profile in the observation group. The overall length of hospital stay and recovery period were significantly shorter for the observation group ($P<0.5$). The safety and superiority of SA was confirmed through this study due to the local effects of SA versus the systemic effects created by GA that produces a profound effect on the patients overall hemodynamic status (Zhang et al., 2021).

In a retrospective study conducted by Memtsoudis et al. (2014) the authors aimed to estimate the consequences of anesthesia type on postoperative outcomes. The study measured the following variables: cardiopulmonary complications, length of hospital stay (LOS), and ICU admissions and the impact of general anesthesia on these variables. The interest of this cohort study stems from a growing body of research that is continuously evaluating the impact of anesthetic agents on intraoperative outcomes. Data was obtained from 494 hospitals in the United States and 872, 416 charts were reviewed. About 60% of the patients in the study were

noted to have received GA. Some of the comorbidities noted in the study sample were, obesity, sleep apnea, and cardiopulmonary disease. The Deyo index was employed to denote the comorbidity burden which was defined by the value of 0.74 (1.06). The Deyo index was 1.77 (1.15) in patients with cardiopulmonary complications who were administered GA. The ICU admission rates were higher in groups of patients who received general anesthesia with cardiopulmonary disease and were of advanced age. When comparing SA and GA using confidence intervals (CI) in relation to pulmonary (0.7-0.94), cardiac (0.88-1.06), and combined complications (0.83-0.95), the outcomes were noted not significant ($P<0.0001$). Although when comparing SA and GA, SA was linked with a 11% decrease in complications overall. Therefore, an overall decrease in cardiac and respiratory complications was associated with SA especially in the elder population. SA was concluded as the choice of anesthetic for those who are of advanced age with comorbidities (Memtsoudis et al., 2014).

A retrospective study undertaken by Haughom et al. (2015) notes an increase in the number of transfusions and blood loss associated with the procedure. Due to the head of the femur at the hip joint being very vascular and the inability to use a tourniquet to minimize blood loss, blood transfusions are a possible requirement especially in the elderly population. Haughom et al. (2015) studied the role of SA and GA in minimizing blood loss and transfusion requirements. Historically, SA has been associated with decreased estimated blood loss during orthopedic surgeries. Their study evaluated 28,857 patients undergoing THAs, and 11,317 of these patients received SA and 17,540 patients received GA. SA compared to GA proved to require lower number of blood transfusions (14.23% vs 17.51%). Operative times were shorter for those patients who received SA (88.94 vs 100.97 minutes). The study compared spinal versus general in regards to examining other complications such as pneumonia (0.23% vs 0.36%; $P= 0.046$), ventilator dependency greater than 48hours (0.04% vs. 0.12%; $P= 0.045$), stroke

occurrences (0.07% vs 0.19%; P= 0.01), infection rates (0.22% vs 0.34%; P= 0.066), and death (0.12% vs 0.21%; P= 0.089). SA proved to decrease the risk of blood transfusion by 18% when compared to GA. Studies as such are crucial to understanding the impact of blood loss during surgery and offer evidence based research to guide practice to decrease mortality and morbidity associated with blood transfusions (Haughom et al., 2015).

A similar retrospective chart review study conducted by Kelly et al. (2021) demonstrated lower estimated blood loss of 328.3ml with SA vs 393ml with GA. Six percent of patients were discharged the same day with SA and 0.8% with GA. Administration of intrathecal fentanyl along with the local anesthetic in the subarachnoid space was noted to decrease pain scores in the post-anesthesia care unit (PACU); whereas, those who received GA had higher pain scores requiring increased doses of narcotics in the PACU (Kelly et al., (2021).

Perlas et al. (2016) conducted a retrospective cohort study of 10,868 patients who underwent THA and total knee arthroplasty (TKA), and among those patients 8,553 patients received SA. The study confirmed a total reduction in the number of death within 30 days of elective THA and 58% risk reduction in total. Similar to other studies in this literature review, SA decreased the amount of blood loss during surgery, prompted shorter operating room time, and shorter LOS (Perlas et al., 2016).

Basques et al. (2015) conducted a retrospective study comparing GA and SA for total hip arthroplasty. The goal of this study was to note the LOS, readmission following elective THA, and adverse events. The proposition of this study was that there would be significance in the data from patients who underwent GA. In this study 20,936 patients underwent elective THA and 12, 752 patients (60.9%) received GA and 8,184 patients (39.1%) received SA. Interestingly, patients who received GA were relatively healthy, younger, with decreased comorbidity burden, and had higher BMIs in comparison to those who received SA. Patients in the GA cohort were

1.31 times more likely to have an adverse event, 5.81 times more likely to require ventilator support, 2.17 times likely to have an unplanned intubation, 2.51 time likely to have a stroke, 5.04 times likely to have cardiac arrest, and 1.34 times likely to require blood transfusion (Basquest et al., 2015).

Impact of Spinal Anesthesia

As previously noted, exaggerated SNS responses can have serious effects on high risk patients throughout the peri-operative period. Das et al. (2015) evaluates the effects of SA and GA on hemodynamics through neuroendocrine stress response elicited during laparoscopic surgery. Some of the variables measured were heart rate (HR), mean arterial pressure (MAP), serum cortisol, oxygen saturation (Spo2), and end-tidal carbon dioxide (EtCO2). Patients were divided into two groups of 15, and group A received general anesthesia and group B received SA. To measure cortisol levels, venous blood samples were collected prior to the initiation of anesthesia and 30 minutes after the creation of a pneumoperitoneum for the visualization of contents within the abdominal cavity. Continuous intraoperative vital sign monitoring would demonstrate any changes in HR, MAP, SPo2, EtCO2, and electrocardiogram changes. Statistical Package for Social Sciences (SPSS) was utilized to analyze data obtained from the two groups. HR was noted to decrease in both groups, but more so in group B than A. Group B was also noted with a lower but healthy MAP in comparison to group A. Cortisol levels were found to be higher before and after the creation of a pneumoperitoneum in group A and a decrease noted for group B. There were no occurrences in SPo2 and EtCO2 in either group. In patients who received GA, hypertension and tachycardia (increased HR) were prominent, which are general neuroendocrine stress responses often elicited from surgical stress. These effects were not present in group B due to the vasodilation and sympathetic blockade of the vagal fibers in the heart. The authors of this study agree that SA attenuates the stress response associated with

surgery, as distinguished by the decrease in cortisol levels and MAP. They also note a decrease in pulmonary complications since patients do not have to be intubated or extubated under SA and are able to ambulate sooner (Das et al., 2015).

Iwasaki et al. (2015) illustrates the ill effects of the surgical stress response as hyperglycemia from excess cortisol, immunosuppressive effects, catecholamine release form the adrenal medulla spilling norepinephrine responsible for tachycardia and hypertension, fat and protein catabolism, and inflammatory changes throughout the body. An overview of reports note patients receiving SA did not demonstrate many of the known stress responses to surgical stimuli; whereas, GA has shown to exaggerate many of the surgical stress responses (Iwasaki et al., 2015).

Barriers to spinal anesthesia use

The field of healthcare is ever evolving and advances in knowledge and technology are shaping the field of medicine. Diseases pathologies and patient profiles in the modern world can often be quiet complex requiring continuous development of ones knowledge in education and research. In a retrospective review conducted by Williams et al. (2015) 49 articles were analyzed to understand barriers to organizational advancement towards improved knowledge and practice. The five barriers discovered by the authors of this article were, workload, non-supportive staff/management, shortage of resources, lack of authority to implement change, and workplace culture. As per the authors, it is imperative to eliminate even one of these barriers prior to proceeding forth with changes in patient care (Williams et al., 2015).

There are increasing number of hip replacement surgeries taking place daily and are often taking place in ambulatory settings to expedite discharge from hospitals. SA and GA both have characteristics to offer to expedite the discharge process. According to Capdevila et al. (2020), GA offers a faster onset and offset of anesthesia; whereas, SA is linked to less postoperative

complications, early discharge, and overall 90% rate of success. Through this observational study the authors were able study 592 patients undergoing orthopedic, urogenital, varicose vein stripping, and gastroenterological procedures. Fifty nine percent of patients received SA and 73% of patients received GA. The aim was to identify factors that impact choosing which anesthetic type to be used for the designated surgery. The results were based on responses from a pre-surgery self-reported questionnaire (surgery, surgeon, patient's medical status, and choice of anesthesia), and a questionnaire administered seven days after surgery to collect data on patient's pain and overall satisfaction. The authors of this study discovered that patient's fears, level of anxiety, and stress significantly impact the providers decision in choosing a type of anesthetic (Capdevila et al., (2020).

A cross-sectional ancillary study conducted by Duale et al. (2015), explored barriers faced by anesthesia provider in regards to conducting regional anesthesia for patients presenting for thoracotomy or thoracoscopy. A 9-item questionnaire was disseminated and responses from 84 anesthesiologist was statistically analyzed using XLStat. The questionnaire in specific analyzed barriers to the use of epidural block (EDB) and continuous paravertebral block (PVB) for thoracic procedures. The results displayed technical barriers as the most common reason mentioned by the participants. Technical barriers include the risk of placing an epidural or paravertebral block, time consumption, and financial cost. The next common reasons listed were nursing barriers followed by reluctance of colleagues (surgeons and nurse managers) (Duale et al., 2015).

Multivariable Analysis

Podmore et al., 2019 aimed to identify gaps in research on patient outcomes based on their comorbidities at the time of surgery. Their findings did reveal increased LOS and mortality in those identified with overall 11 comorbidities. Ultimately surgeries have to be conducted on

sick patients to provide them pain relief and functional joint abilities; however, health care providers need to understand the complexity of these patients with increased number of comorbidities and design a plan to mitigate physical and mental postoperative challenges (Podmore et al., 2019). Articles in this literature review agree upon SA providing superior outcomes to GA through various studies on varying patient types (Warren et al., 2020; Tirumala et al., 202; Wilson et al., 2020). SA offers desirable patient outcomes and produces less intraoperative adverse events. These articles validate the importance of choosing and tailoring anesthetic agents to offset potential complications and delay in recovery. Despite validating the desirable effects of SA, it continues to remain an underutilized technique due to fear, confidence level in skill, hospital culture, and fears expressed by patients.

Theoretical Framework

The theoretical framework or model used to guide this project is the Change Theory of Nursing constructed by Kurt Lewin (Nursing Theory, 2020). The Change Theory is appropriate to help guide this quality improvement project because it fosters change in professional practice in a world of healthcare that is constantly evolving. It is a three-stage model of change defined as the unfreezing-change-refreeze model, emphasizing old knowledge and habits being replaced by new knowledge and improved practices (Nursing Theory, 2020).

The first stage is unfreezing, which emphasizes the importance of abandoning old practices and cultural attachment to practices and beliefs that conforms individuals to a set of ideas and groups. As a result, individuals or groups will have to re-direct themselves in the opposite direction of their current beliefs. The second stage is change or movement in one's beliefs and practices towards a practice more consistent with the present. Lastly, the refreezing stage emphasizes locking in the shift in behaviors and ideas as the new standard of practice

(Nursing Theory, 2020). For a model depiction of The Change Theory, please see Appendix A.

Collaboration of The Change Theory and The Quality Improvement Project

Step 1: Unfreezing

The CRNAs have commonly adopted the practice at this critical care hospital in Indiana to use general anesthesia for all patients undergoing THA. Therefore, the online educational workshop will provoke some introspection among the CRNAs regarding their past views and practices and learn to let go.

Step 2: Change

Through the online educational workshop, the CRNAs will be educated on the patient population requiring THAs, the consequences of general anesthesia in this patient population, and the benefits of spinal anesthesia. The aim is to promote change in practice, based on evidence-based findings.

Step 3: Refreeze

In this stage, the idea is to ensure that new knowledge and practices are retained as the new standard by which anesthesia is provided to ensure the best clinical outcomes.

Project Aims and Objectives

This quality improvement project aimed to provide a power-point educational presentation to disseminate knowledge and literature supporting the benefits of SA and to identify current clinical barriers to its use. The goal of the power-point academic presentation was to inform the CRNAs of the varying degree of comorbidities among patients requiring THA and how GA adversely affects the health outcomes in these patients. The modules will also educate the participants on the perceived barriers discovered through evidence-based literature that was conducted by the PI. Before the online learning module, the CRNAs completed a pre-survey questionnaire to evaluate the participant's current knowledge of using SA for THA and

identify perceived barriers. The post-survey questionnaire will assess the participant's willingness to change practice and utilize SA after participating in the online educational module.

Project Design / Population and Setting

This DNP project utilized a quasi-experiential design surveying CRNAs practicing in an acute care urban hospital in the Midwest and evaluated current trends in practice. It assessed barriers to the utilization of SA for THA. A sample of CRNAs actively practicing and with relevant experience performing anesthesia for THA surgeries was used. The project took place through online sources and email. CRNAs in this facility were chosen for this study due to the high volume of orthopedic cases being conducted under GA. Participants in the survey were invited to join a power-point educational presentation which consisted of a pre-and-post study. The academic module was created using power-point, a course system for online teaching and learning. The surveys were made available through Qualtrics. The Primary Investigator (PI) sent an email link to the clinical nurse specialist at this hospital for the power-point presentation and the surveys. The clinical nurse specialist sent out the weblinks provided by the PI to the CRNAs, along with the consent and the purpose of this study. The participants were given one month to complete the module and the pre-and post-survey at their own pace. The recruitment period for this project took place between July 2022 and August 2022. The data was analyzed using Microsoft Excel.

Data collection/Measurement

To measure the CRNAs knowledge of SA for THA and identify perceived barriers, a 9item demographic questionnaire and a 14-item questionnaire survey devised using a 5-point Likert scale were developed by the PI (Appendix D). These questionnaires collected nonidentifiable data relating to demographics, experience, knowledge about GA, SA, their

effects on THA patients, and perceived barriers to using SA. After participating in the educational workshop, a 14-item post-survey was then utilized to assess their willingness to change practice.

The PI developed the surveys and validated them by the members of this DNP project.

Data Collection Procedure

Intervention

The project with the educational module and surveys were sent to 23 CRNAs, and six CRNAs participated in this project. The clinical nurse specialist sent weekly email reminders to promote compliance. This data collection process began with the CRNAs reading an informed consent available in the pre-survey through Qualtrics. Once consent was obtained, the participants generated a random number through a link that would serve as their identification for the project. They would also use that number to participate in the post-survey. Once the presurvey was completed, the CRNAs then participated in the power-point presentation, which provided insight into anesthetic techniques and their impact on patients undergoing THA. The pre-survey aimed to measure clinical barriers, provider knowledge, and confidence and skill level in SA. The pre-survey also attained information regarding participants' demographics, gender, age, educational background, and years in clinical practice.

Post-Intervention

After the power-point presentation, participants then participated in a post-educational survey. Once data collection was completed, results from Qualtrics were obtained, and data analysis was conducted using Microsoft Excel. The data was analyzed through paired t-tests. Significance was reviewed utilizing a P value of $< .05$.

Ethical Consideration

Approval for this DNP project was granted by Marian's Institutional Review Board (IRB) and the IRB committee of the hospital before the commencement of the project. Participation in this study was voluntary, and participants were free to join the study or opt-out at any point. The participants of this study could not be identified through any of the data collected, and the participants were made aware of their anonymity. The participants were informed about the purpose of this study and why they were chosen to participate in it. All collected data will be stored in a password-protected computer in the PI's home and deleted upon completing this project. Minimal harm to the participants was presented in this project as it did not involve sensitive questions or social, psychological, physical, or legal liability. Informed consent, along with the purpose of this study, was presented on the first page before the pre-survey. There was no patient or patient-related health information used to conduct this project.

Data Analysis and Results

The 9-Item questionnaire revealed 50% (3) female and 50% (3) male participants. 83.33% of participants were in the age group of 25-35, and 16.67% were in the age group of 36-45. Of the six participants, 72.22% had a DNAP degree, and 27.78% had either a master's or DNP degree. All six participants had between one-five years of experience in providing anesthesia care.

Pre-Survey Analysis

The pre-survey results focused on evaluating the participant's baseline understanding of the impact of GA and SA, the pros and cons of each anesthetic modality on patients with multiple comorbidities, and baseline understanding of patient-related factors, work culture, and surgeon preferences impacting the anesthesia providers decision in choosing between GA and

SA. 66.67% of participants said they agree with wanting to know more about the impact of GA and SA and 11.11% strongly agreed. 77.78% of participants expressed being knowledgeable about the pros and cons of GA and SA and the effects of each anesthetic type on patients with multiple comorbidities. 33.33% of participants agree that SA is safer for comorbid patients presenting for THA, 22.22% strongly agreed that SA is safer, whereas 44.44% of participants expressed neither. 44.44% of participants agree on being hesitant to perform SA due to OR production pressure. 33.33% agreed, and 11.11% strongly agreed to patient fears impacting their decision to perform a SA. 55.56% agree, and 33.33% strongly agree on utilizing SA if the surgeons did not have any preferences. 55.56% of participants agreed, and 11.11% strongly agreed in feeling confident in managing patients under SA and adverse events. Lastly, 44.44% strongly agree and consent that their work culture impacts their decision to choose SA for their patients undergoing THA.

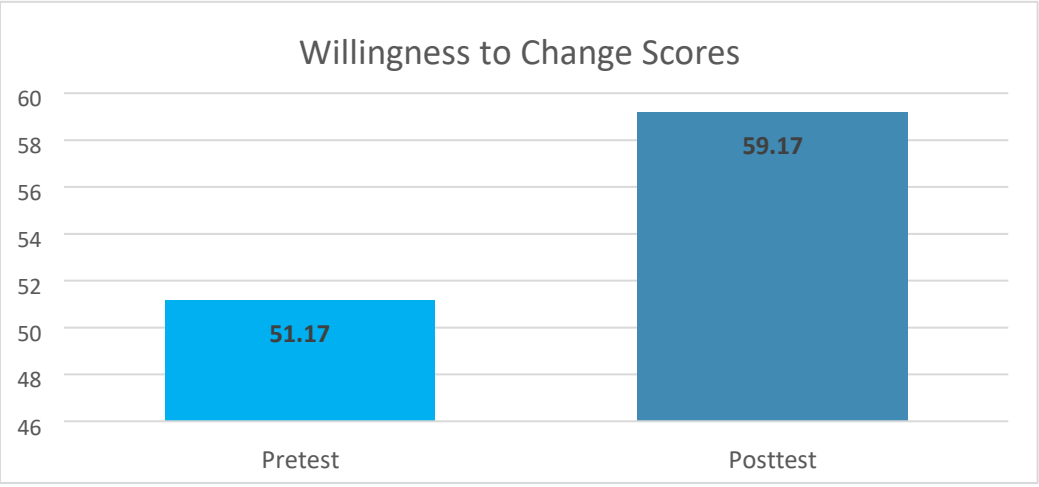
The goal of the post-education survey was to analyze the transition in knowledge, confidence, and the participant's willingness to change to practice after participating in the educational module. 83.33% of participants strongly agreed, and 16.67% agreed that an online academic module increased their knowledge of SA vs GA and its impact on patients with comorbidities. 83.33% also strongly agreed that after partaking in the online educational module, their understanding of the pros and cons of GA on patients undergoing THA with multiple comorbidities has increased. 66.67% agreed, and 33.33% of participants strongly agree that they are confident in managing patients under SA and adverse events; this is a 22.22% increase in confidence level from the pre-educational survey.

Some areas of statistical significance were seen in the paired t-tests after the participants received the educational workshop. In all, there were three areas of significance (p-value < .05**).** Questions with significant paired t-tests included: question 1. impact of GA vs SA in THA (p-value= 0.042), question 2. knowledge on the pros and cons of SA and GA and its impact on THA patients with comorbidities (p-value= 0.025), and question 3. the participants level of preparedness to care for patients undergoing THA with multiple comorbidities (p-value= 0.012).

Question 1 had statistical significance between the pre-survey scores (M= 4, SD= 0.632) and post-education scores were (M= 4.83 , SD= 0.408). Question 2 had statistical significance between the pre-survey scores (M= 4.16, SD= 0.408) and post-education scores were (M= 4.83 , SD=0.408). Question 3 had statistical significance between the pre-survey scores (M= 2, SD= 1.095) and post-education scores were (M= 3.833 , SD= 1.169).

Many areas were noted with improvement in post-educational scores through an agreement between participants; however, with a lack of any statistical significance. One of the questions that did not show statistical significance was regarding confidence in managing patients under SA and adverse events (0.235). Two other questions that met this criterion were their confidence levels in performing SA vs GA (0.530) and participant belief that SA is safer for THA patients with multiple comorbidities (0.741). Questions regarding the patient, OR, and surgeon factors impacting the CRNAs decisions to choose an anesthetic modality did not show any statistical significance, nor any significant changes noted in scores post-educational module. This DNP project compared pre-test and post-test of participants to change practice after participating in an educational module. The average pre-test score was 51.17, the average posttest score was 59.17. This project had an increase in the participants willingness to change practice which was not statistically significant (P-value > 0.05).

Figure 1



Discussion

The primary purpose of this DNP project was to identify perceived clinical barriers and promote the utilization of SA for patients having THA. The study had both strengths and weaknesses that impacted the results of this study. Some strengths of this project were familiarity with the site, ease of access to modules, and surveys through email. The participants did not have to go to a class session physically; instead, the modules were accessible from anywhere through the participant's email. The project was self-paced over a month, with educational material organized to review evidence-based research and pathophysiology. Several limitations impacted the overall outcomes and results of this research project. The internal weaknesses of this project were that this was an asynchronous online learning module that lacked in-person instructions on performing spinal anesthesia. In addition, the online module could not answer questions and concerns regarding the educational material. The PI's inexperience with creating online educational modules and self-created surveys can be considered a weakness, as the validity of these tools can be questioned. Some other limitations included a small sample size, biases of participants, setting, time, limitations in the data collection process set forth by the hospital, lack of compliance and incentive for participating in this project, and technical issues. 23 CRNAs were invited to participate in this research project; however, there were only six participants since this was a voluntary research project. Larger sample size would provide precise data as well. Having participants from multiple hospital settings would provide distinct data. For future research, it is recommended to include a larger sample size, conduct research, and collect data over a more extended period with participants from multiple hospitals.

The inclusive results reveal an increased knowledge of SA and GA and their impact on THA patients, a deeper understanding of the pros and cons of each anesthetic modality, and better preparedness to care for patients with multiple comorbidities under SA. In addition, it was confirmed that many barriers to performing SA were due to patient-related factors, OR production pressures, and surgeon preferences.

Conclusion

THAs cases continue to be among the most common orthopedic procedures conducted in the nation successfully. They aim at restoring mobility and reducing pain associated with arthritis. However, it is more essential than ever to be cautious in the type of anesthetic chosen for patients due to the rising number of hip replacements cases stemming from hip pathologies and hip fractures and the increasing concern regarding accompanying cardiopulmonary and cerebrovascular diseases that exist among these patients. The growing age of patients, preexisting conditions, and cement prostheses are risks that promote complications. Numerous data demonstrate the impact of anesthesia on the patient's overall well-being in combination with the previously mentioned factors (Perlas et al., 2016). Numerous articles support the benefits of SA in attenuating the ill effects of the surgical stress response noted in patients with a THA. By modifying our practice and providing continuous education on a regular basis, the health of the surgical patient can significantly improve, and mortality and morbidity can be reduced. This DNP project facilitated education for CRNAs on understanding the effects of SA and GA on surgical patients presenting for THA, identified barriers to the limited use of SA, and evaluated willingness to change practice. Data analysis revealed a greater depth of understanding by the CRNAs of SA and GA, the impact on this patient population, and increased confidence level in SA. Ultimately, practice change can be elicited by further continuous education.

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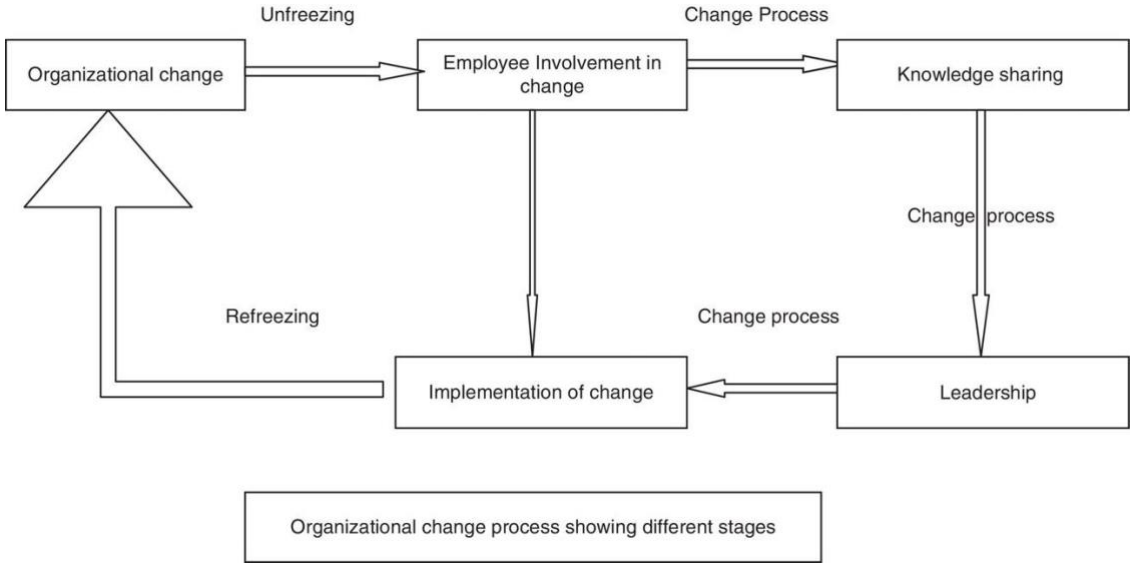
Appendix A

Theoretical Framework: Kurt Lewin's Change Theory



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Appendix B

IRB Approval

MARIAN UNIVERSITY
Indianapolis ®

Institutional Review Board

DATE:	4-18-2022
TO:	Harjyot Sensi & Dr. Sara Franco
FROM:	Institutional Review Board
RE:	B22.125
TITLE:	Total Hip Arthroplasty & Anesthetic Technique
SUBMISSION TYPE:	New Project
ACTION:	Determination of EXEMPT Status
DECISION DATE:	4-16-2022

The Institutional Review Board at Marian University has reviewed your protocol and has determined the procedures proposed are appropriate for exemption under the federal regulations. As such, there will be no further review of your protocol and you are cleared to proceed with your project. The protocol will remain on file with the Marian University IRB as a matter of record. Please be mindful of the importance of reporting only de-identified, HIPPA-compliant information about the patient in any exhibit or publication.

Although researchers for exempt studies are not required to complete online CITI training for research involving human subjects, the IRB **recommends** that they do so, particularly as a learning exercise in the case of student researchers. Information on CITI training can be found on the IRB's website: http://www.marian.edu/academics/institutional-review-board.

It is the responsibility of the PI (and, if applicable, the faculty supervisor) to inform the IRB if the procedures presented in this protocol are to be modified of if problems related to human research participants arise in connection with this project. Any procedural modifications must be evaluated by the IRB before being implemented, as some modifications may change the review status of this project. Please contact me if you are unsure whether your proposed modification requires review. Proposed modifications should be addressed in writing to the IRB. **Please reference the above IRB protocol number in any communication to the IRB regarding this project.**

Dr. Trisha Staab on behalf of Amanda C. Egan, Ph.D.
Chair, Marian University Institutional Review Board

Appendix C- IRB Approval

UNION HOSPITAL
A Union Health partner

April 1, 2022

Harjyot Sensi (hsensi780@marian.edu)

Dear Harjyot Sensi:

RE: Study #2204RP01 **at:** Union Hospital

Study Title: Total Hip Arthroplasty and Anesthetic Technique

Start Date: Upon conditions being met **End Date**: September 30, 2022

Thank you for submitting a Research Authorization Application (RAA) and supporting documentation, you are **conditionally approved** to conduct your research project at the location and during the time frame listed above, pending IRB Approval.

The following area(s) have been identified as not meeting the standards as set forth by Union Hospital.

Your study cannot begin until the following condition(s) have been satisfied:
Requirement – Marian University IRB Review and Approval.
Recommendation – Include Union Hospital Contact in the consent statement
Recommendation – Send link of survey to Ms. Annette Smith who will distribute to CRNAs

We wish you success with your research project. Please do not hesitate to contact our office if we can be of assistance.

Sincerely,

Hicham Rahmouni, MBA
Research Review & Compliance
Union Hospital, Inc.

Appendix D

9 Item-Demographic Questionnaire

Please choose your answers as it appropriately fits.

1. What gender do you identify as?
    a. Female
    b. Male
    c. Other
    d. I prefer not to answer

2. What is your age?
    a. < 25
    b. 25-35
    c. 36-45
    d. 46-55
    e. 56-65
    f. > 66
3. What is your level of education?
    a. Masters
    b. DNP
    c. DNAP
    d. Other

4. How many years of practice as a CRNA do you have?
    a. <1
    b. 1-5 years
    c. 6-10 years
    d. 11-15 years
    e. 16-20 years
    f. > 20 years

5. Does your facility perform total hip arthroplasties?
    a. Yes
    b. No

6. How many total hip arthroplasties are performed in a month?
    a. < 1
    b. 1-5
    c. 6-10
    d. 11-15
    e. 16-20
    f. > 20

7. Do you provide anesthesia services for patients presenting for total hip arthroplasties? a. Yes
    b. No

8. Does your organization commonly use spinal anesthesia for total hip arthroplasties? a. Yes
    b. No

9. Do CRNAs in the main operating room (OR) or ambulatory room perform epidural/spinal/caudal anesthesia commonly for any type of procedures?
    a. Yes
    b. No

On a scale of 1-5, how strongly do you agree with the following statements

	1. Strongly agree	2. Agree	3. Neither agree or disagree; undecided	4. Disagree	5. Strongly disagree
I want to know more about the impact of general anesthesia vs spinal.					
I am knowledgeable on the pros and cons of general anesthesia and spinal anesthesia and its effect on patients with multiple comorbidities					
I am unsure of how to care for patients with multiple comorbidities under spinal anesthesia.					
I believe spinal anesthesia is safer for comorbid patients presenting for total hip arthroplasty.					
I am confident conducting a spinal vs general anesthetic					
I would be hesitant to perform a spinal anesthetic due to OR production pressures.					
Spinal anesthesia increases my workload in comparison to general anesthesia					
Patient concerns or fears impacts my decision in choosing spinal anesthesia					
I have enough resources and support to perform a spinal anesthetic					
I am confident in performing a spinal anesthetic					

I would feel more confident if I had more experience in managing adverse					
events occurring from spinal anesthesia					
I would utilize spinal anesthesia if the surgeons did not have any preferences					
My work culture impacts my decision to choose spinal anesthesia for patients undergoing total hip arthroplasty					
My workplace would be hesitant to amending current practice.					

Post Test:

On a scale of 1-5, how strongly do you agree with the following statements

	1. Strongly agree	2. Agree	3. Neither agree or disagree; undecided	4. Disagree	5. Strongly disagree
An online educational module increased my knowledge of spinal vs general anesthetic and it's impact on patients with comorbidities					
An online educational module increased my knowledge on the pros and cons of general anesthesia and spinal anesthesia and its effect on patients with multiple comorbidities					
I am better prepared to care for patients with multiple comorbidities under spinal anesthesia.					

I believe spinal anesthesia is safer for comorbid patients presenting for total hip arthroplasty.					
I am confident conducting a spinal vs general anesthetic					
I would be hesitant to perform a spinal anesthetic due to OR production pressures.					
Spinal anesthesia increases my workload in comparison to general anesthesia					
Patient concerns or fears impacts my decision in choosing spinal anesthesia					
I have enough resources and support to perform a spinal anesthetic					
I am confident in performing a spinal anesthetic					
I would feel more confident if I had more experience in managing adverse events occurring from spinal anesthesia					
I would utilize spinal anesthesia if the surgeons did not have any preferences					
My work culture impacts my decision to choose spinal anesthesia for patient undergoing total hip arthroplasty					
My workplace would be hesitant to amending current practice.					

Appendix E
Literature Review Matrix

Citation	Research Design & Level of Evidence	Population / Sample size n=x	Major Variables	Instruments / Data collection	Results
Basques, B. A., Toy, J. O., Bohl, D. D., Golinvaux, N. S., & Grauer, J. N. (2015). General compared with spinal anesthesia for total hip arthroplasty. *The Journal of bone and joint surgery. American volume*, *97*(6), 455–461. https://doi.org/10.2106/JBJS.N.00662	Retrospective cohort study, Level :3	n= 12,752 patients	Operating room times and length of stay Adverse Events and Readmission	Charlson Comorbidity Index-Instrument for measuring comorbidities ACS-NSQIP- for data collection	General Anesthesia (GA) had increased operative time, +12 minutes compared to spinal anesthesia (SA). P< 0.001 GA postoperative time was an additional +5 minutes compared to SA. P< 0.001. Patient who underwent GA were 1.31 times likely to have an occurrence of an adverse event, 5.81 times likely to have prolonged ventilatory use, 2.17 times likely to have an unplanned, 2.51 likely to have a stroke, 5.04 times likely to have a cardiac arrest, and 1.34 times likely to require a blood transfusion The rate of readmission was noted without any significance.

Capdevila, X., Aveline, C., Delaunay, L., Bouaziz, H., Zetlaoui, P., Choquet, O., Jouffroy, L., Herman-Demars, H., & Bonnet, F. (2020). Factors Determining the Choice of Spinal Versus General Anesthesia in Patients Undergoing Ambulatory Surgery: Results of a Multicenter Observational Study. *Advances in therapy*, *37*(1), 527–540. https://doi.org/10.1007/s12325-019-01171-6	Observational, Cohort study Level: 4	n= 592 patients	Postoperative recovery Factors associated with use of the anesthetic technique Comparison between spinal chloroprocaine, prilocaine, and bupivacaine Efficacy of spinal and general anesthesia Features of spinal anesthesia according to the local anesthetic agent	Data collection- A preanesthetic selfadministered questionnaire and a 7day post-surgery selfadministered questionnaire. Instruments: SAS 9.1 version software, The Mann-Whitney test, Krustal-Wallis test, Student t Test and chisquared test.	Average time between local anesthetic (LA) and onset of surgery was 20 mins and motor blockade of the lower extremity was 9 minutes. The use of additional pain modalities with SA was in 26% of cases, and the use of GA due to failed SA only occurred in 4.5% of patients. The attainment rate of SA was 91.6% of time. The median onset between induction of anesthesia and the onset of surgery was 15 minutes with delays due to extubation averaging 60 mins. Patients fear of the type of anesthesia was 30.2% for GA and 14% for spinal anesthesia, and stress and anxiety caused by GA was 24.6% and 14.3% for SA.

Das, W., Bhattacharya, S., Ghosh, S., Saha, S., Mallik, S., & Pal, S. (2015). Comparison between general anesthesia and spinal anesthesia in attenuation of stress response in laparoscopic cholecystectomy: A randomized prospective trial. *Saudi journal of anaesthesia*, *9*(2), 184–188. https://doi.org/10.4103/1658-354X.152881	A Randomized trial Level: 2	n=30 patients Group A: 15 patients Group B:15	Cortisol BP HR EtCO2 SPO2	Instrument: SPSS (t-test and Chi-square). Data collection: Microsoft excel sheet	GROUP B Cortisol levels 30 minutes post- P=0.004 Pre pneumoperitoneum cortisol level- GA: 18.37g/dl, SA: 19.65 g/dl Postpneumoperitoneum cortisol level- GA: 21.15g/dl, SA: 13.24g/dl MAP difference b/w group A and B: P= 0.01

Dualé, C., Gayraud, G., Taheri, H., Bastien, O., & Schoeffler, P. (2015). A French Nationwide Survey on Anesthesiologist-Perceived Barriers to the Use of Epidural and Paravertebral Block in Thoracic Surgery. *Journal of cardiothoracic and vascular anesthesia*, *29*(4), 942–949. https://doi.org/10.1053/j.jvca.2014.11.006	Cross sectional ancillary study Level: 4	n=84 anesthesiologist	Perceived barriers Activity per center Team size Activity per physician Technical barriers Risk Complexity Time consumption Cost Nursing barriers Supervision Training Reluctance of colleagues Surgeons Nurse Manaer	Data Collection: 9-Item electronic questionnaire, Instruments: Microsoft office, Excel 2003, Redmond WA	Multivariate descriptive analysis: Epidural Block for Analagesia: F1 + F2: 47.4% of the variance. Paravertebral block for analgesia: F1+F2: 51.8% of the variance Activity per center: P= 0.037 Complexity: P=0.008 Time consumption: P= 0.028 Surgeons: P= 0.001 Nurse Manager: P= 0.003 Hospital Manager: P= 0.001 Cost: P= 0.085

Haughom, B. D., Schairer, W. W., Nwachukwu, B. U., Hellman, M. D., & Levine, B. R. (2015). Does Neuraxial Anesthesia Decrease Transfusion Rates Following Total Hip Arthroplasty?. *The Journal of arthroplasty*, *30*(9 Suppl), 116–120. https://doi.org/10.1016/j.arth.2015.01.058	Nonrandomized observational cohort Level: 4	n= 28,857 General anesthesia group: n= 17,540 Neuraxial Anesthesia: n=11,317	Operative Time Length of Stay Post-operative Transfusion Complication Surgical Complication Superficial infection Deep infection Organ Space Infection Wound dehiscence Reoperation Unplanned readmission Medical complication Pneumonia Unplanned intubation DVT , PE	Data collection: NSQIP database Instruments: t-tests and Chi-squared tests.	Patient group who received neuraxial anesthesia displayed shorter operative time P<0.001 and lower transfusion rates 14.23% vs 17.51% Overall complications 4.62% vs. 5.23% P= 0.019 And lower medical complication rates 2.63% vs 3.42%; P< 0.001 Pneumonia: P= 0.046 Unplanned intubation: P=0.018 Vent use > 48 hrs P= 0.045 Stroke: P=0.01 Deep Infection: P= 0.066 Death: P=0.089

Kelly, M. E., Turcotte, J. J., Aja, J. M., MacDonald, J. H., & King, P. J. (2021). General vs Neuraxial Anesthesia in Direct Anterior Approach Total Hip Arthroplasty: Effect on Length of Stay and Early Pain Control. *The Journal of arthroplasty*, *36*(3), 1013–1017. https://doi.org/10.1016/j.arth.2020.09.050	A retrospective chart review. Level : 3	n= 500 n= 376 Neuraxial anesthesia n= 124 General anesthesia	Fluid Estimated Blood loss Preoperative hematocrit Postoperative day 1 hematocrit Change in hematocrit PACU MME PACU pain PACU Nausea Same day discharge LOS Hour Readmission	Data collection: Administrative database Chesapeake Regional Informational System for patient demographics Instruments: t-tests and Chi-test, SPSS 25.0	Neuraxial anesthesia patient: EBL: 328.3ml vs GA 393.1ml Patients in the NA group experienced shorter procedural time NA: 50.2 vs GA: 54 Patients in the NA group consumed less MME in PACU NA: 10.2mg vs GA: 15.6mg Length of hospital stay under GA: 32.7 hours vs GA: 38.1 hours. Approximately 61% of patients were discharged the same day in the NA group .

Memtsoudis, S. G., Rasul, R., Suzuki, S., Poeran, J., Danninger, T., Wu, C., Mazumdar, M., & Vougioukas, V. (2014). Does the impact of the type of anesthesia on outcomes differ by patient age and comorbidity burden?. *Regional anesthesia and pain medicine*, *39*(2), 112–119. https://doi.org/10.1097/AAP.0000000000000055	Retrospective Cohort Study Level : 3	n= 872, 416 patient records	Combined outcomes Cardiac complications Pulmonary complications Prolonged Length of stay ICU Utilization.	Data collection: Administrative data from premier perspective database Deyo Index Instrument: KruskalWallis Test	Patients who received general anesthesia were 0.91 time likely to experience major complications, 0.88 times likely to experience pulmonary complications, 1.02 times likely to have an ICU admission and 0.87 times likely to have an increased LOS.
Perlas, A., Chan, V. W., & Beattie, S. (2016). Anesthesia Technique and Mortality after Total Hip or Knee Arthroplasty: A Retrospective, Propensity Scorematched Cohort Study. *Anesthesiology*, *125*(4), 724–731. https://doi.org/10.1097/ALN.0000000000001248	A Retrospective Cohort Study Level: 3	n= 10,868 n= 8,553 Spinal Anesthesia n=2,315 general anesthesia	Death MI MACE PE Blood transfusion	Data Collection: University Health Network Electronic Data Warehouse Instrument: Mann-Whitney U Test, Chisquare test, and Fisher exact test Charlson Risk score	30 day mortality= 0.19% in spinal anesthesia group and 0.8% in the general anesthesia group, risk ration= 0.42; 95% CI, 0.21 to 0.83; P=0.0045 Spinal anesthesia was noted with a shorter length of stay 5.7 vs 6.6 days.

Podmore, B., Hutchings, A., Skinner, J. A., MacGregor, A. J., & van der Meulen, J. (2021). Impact of comorbidities on the safety and effectiveness of hip and knee arthroplasty surgery. *The bone & joint journal*, *103-B*(1), 56–64. https://doi.org/10.1302/0301-620X.103B1.BJJ-2020-0859.R1	An Observational study Level: 6	n= 640,832 patients	Length of hospital stay Emergency readmissions Improvement in severity of joint problems.	Data Collection: Oxford Hip or Knee Scores (OHS/OKS), health-related quality of life (HRQoL) Hospital Episode Statistic dataset (HES)	Patients who had heart diseases have 1.2 days longer LOS and readmission rate was 1.5% and mortality 0.2% higher. In patients with heart disease, differences in improvement of OHS was -0.4 and -0.6 for OKS.
Williams, B., Perillo, S., & Brown, T. (2015). What are the factors of organisational culture in health care settings that act as barriers to the implementation of evidence-based practice? A scoping review. *Nurse education today*, *35*(2), e34–e41. https://doi.org/10.1016/j.nedt.2014.11.012	A Scoping Review: Level 6	n= 49 articles	Perceived barriers Workload Other staff/management not supportive Lack of resources Lack of authority to change practice Workplace culture resistant to change.	Instrument: Charting the data, a descriptive analytical method Data Collection: Multiple databases were conducted using Medline, EMBASE, EBM Reviews, Google Scholar, The Cochrane Library.	Barriers to: Workload: 38 Other Staff/Management not supportive of research: 37 Lack of resources: 28 Lack of authority to change practice: 22 Workplace/professional culture resistant to change: 14

Tirumala, V., Bounajem, G., Klemt, C., Maier, S. P., Padmanabha, A., & Kwon, Y. M. (2021). Outcome of Spinal Versus General Anesthesia in Revision Total Hip Arthroplasty: A Propensity Score-Matched Cohort Analysis. *The Journal of the American Academy of Orthopaedic Surgeons*, *29*(13), e656–e666. https://doi.org/10.5435/JAAOS-D-20-00797	A Retrospective study Level: 3	n= 2,656 patients	Indication for revison THA Implant Revised Implant Fixation TXA use Surgeons Mean Operational time Blood loss and transfusions Post-operative complications Length of stay	Data collection: Charlson comorbidity Index (CCI) American College of Surgeons-National Surgical Improvement (ACS-NSQIP) database Instrument: SPSS 25 IBM	Pt's undergoing GA had a significantly longer procedure time (174 versus 161, P< 0.01); higher intraoperative time (402 versus 305, P<0.01); extended length of time of surgery (odd ration 2.45)
Zhang, T., Ma, Y., Liu, L., Wang, J., Jia, X., Zhang, Y., & Dong, Y. (2021). Comparison of clinical effects of general anesthesia and intraspinal anesthesia on total hip arthroplasty. *American journal of transational research, 13*(7), 8241–8246.	A Prospective Study Level: 6	n= 110 patients	Anesthesia effect Blood pressure Heart Rate Post-operative recovery room and total hospitalization time	Data collection: Excellent anesthesia rate Observation in the OR Instrument: SPSS 22.0 statistical analysis software	Excellent anesthesia rate in the control group: P<0.05 MAP and HR P< 0.05 Postoperative recovery time and in hospitalization time P< 0.05