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Erector Spinae Plane vs. Transverse Abdominis Plane Block, and Their Effects on Reduction of Opioid Consumption Post-Operatively: An Educational Module

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Abstract

Background This evidence-based module project aimed to discover a regional anesthetic that can produce better patient outcomes after laparoscopic surgeries, as pain remains an issue for up to 70% of patients because of the addition of visceral pain that is a result of the pneumoperitoneum needed to proceed laparoscopically. Untreated post-op pain leads to prolonged recovery, dissatisfaction, exacerbation of comorbidities, and worse outcomes. Currently, anesthesia providers use opioids or perform a TAP block to combat this pain. A TAP block can be inconsistent in blocking necessary spinal levels and does not contain visceral pain-relieving effects. An ESP block is a novel technique that has been increasingly used across various surgeries with promising results in pain-relieving effects due to its wide coverage of analgesia and visceral pain-relieving effects.

Methods: The researcher reviewed PubMed, Medline, and Embase. Studies included were published within the years of 2017-2023, only RCTs, with participants within the age range of 18-65 years old, written in English, had full-text available, and pertained to the QI topic. The exclusion criteria encompassed studies that did not have an ESP or TAP block as an intervention, surgery routes other than laparoscopic, pediatric patients, elderly patients, or written in another language. 127 articles were initially identified; however, after duplicates were removed and applying the inclusion and exclusion criteria, 15 articles were found and selected. After IRB exemption was obtained, an online educational module was created with the intention to send to selected anesthesia staff at a designated facility. Pre and post qualitative surveys were collected over an 8-week period and aggregate data were analyzed by Qualtrics. The plan is to disseminate at the AANA national conference and to make an evidence-based protocol for clinical practice.

Results: CRNAs and Anesthesiologists of different age groups and years of experience from a level I trauma center were invited to participate in this educational module to assess their knowledge in treating pain postoperatively after laparoscopic surgeries. 56 surveys were sent out, with only 11 participants completing it fully (19.6% response percentage). 11 participants from a level I trauma center consented to the educational module before preceding to complete the demographics, pre-survey, educational video, and post-survey. Pre survey results showed that majority of providers did could not correctly identify how much pain patients feel postop (64%) or the type of pain relief that a TAP block provides (55%). However, most knew what kind of pain was felt post op (64%), blocks to use to treat it (82%), and how an ESP block relieved pain (64%). Post survey showed an increase in knowledge in most of the areas, which proves the success of the educational module.

Discussion: Post-operative pain remains a critical unsolved issue that leaves the patient vulnerable to post-operative complications. IV analgesia has shown inferior patient outcomes post-operatively in patient outcomes when compared to regional anesthetic techniques. Current research concludes that a multimodal approach with the inclusion of an ESP block prior to or immediately after a laparoscopic procedure was found to be the most effective way to treat post-operative pain because of its visceral pain-relieving effects and its ability to provide a wider analgesia coverage. Across the eight articles chosen in the final selection, ESP blocks have shown to decrease opioid consumption, pain scores, PCA pump usage, and receive higher patient satisfaction based on questionaries. Evidence across the remaining seven articles that TAP blocks have also proposed similar results, further proving that regional anesthesia equates to better outcomes. The post survey revealed that some providers would consider using an ESP block in their plan, while others were unlikely too. Limitations included possible low survey participation due to virtual delivery.

Keywords: Laparoscopic Surgery, Post-operative Pain, Erector Spinae Plane (ESP) block, Transversus Abdominis Plane Block (TAP)

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Introduction

As laparoscopy is becoming the surgical procedure of choice for numerous different abdominal-related surgeries, anesthesia providers need to establish a more effective way to minimize the pain in the post-operative area that accompanies the small incisions made during the surgery as up to 70% of patients are experiencing moderate to severe levels of pain and are at risk for post-operative complications.[1] Adults who undergo traditional laparoscopic surgeries are usually expected to go home on the same day; however, inadequately managed pain can delay this and lead to prolonged hospital stay if not addressed promptly.[2] Some providers choose to opt out of any regional technique, even when their facilities allow peripheral blocks, and elect to use opioids to lessen the pain; however, this can lead to worse outcomes and negate the positives that laparoscopic surgery has to offer. Robotic laparoscopic surgeries still experience post-operative pain; though, post-operative analgesic requirements are much less than the traditional laparoscopic technique due to the precision of tissue control and better handling that the robotic hands allow.[3]

As stated, laparoscopic surgeries are the surgical technique of choice since they have shown better surgical outcomes, are minimally invasive, and have been linked to earlier patient recovery.[3] Despite being minimally invasive and the overarching improvements laparoscopic procedures have seen compared to open, patients are still experiencing moderate to severe pain in the post-operative area.[3] Post-operative pain has remained a critical issue, and it is the responsibility of anesthesia providers to treat this pain effectively and efficiently to further add to improvements that laparoscopic surgeries have developed. If post-operative pain remains inadequately managed, patients will experience longer recoveries than intended, dissatisfaction, and worse outcomes. Additionally, if opioids are the sole anesthetic of choice to treat the pain,

the side effects and adverse effects such as nausea and vomiting, constipation, delirium from oversedation, and respiratory depression could further contribute to the negative outcomes.[4] Exacerbation of comorbidities can also occur as well as limited early mobility, which can lead to the formation of blood clots.[4]

Regional anesthesia is gaining popularity in becoming part of the multimodal approach to combat the post-operative pain experienced by many patients; however, many facilities have yet to implement one of the two blocks or have implemented one and lack the knowledge of the other block, such as the ESP block, in its ability to decrease pain more. Lack of coverage based on the area where the surgery was performed is another issue seen with certain TAP blocks. Training, education, and skillset to perform ESP block are needed as this block has shown promising results in its ways of providing adequate analgesia in the right areas for majority of laparoscopic surgeries. Studies show that when regional anesthesia is utilized, whether TAP or ESP, significantly lower post-operative opioid consumption is achieved, decreased pain-rating scales are noted, and superior analgesia is seen than sole use of intravenous pain medications.[5]

The solution to fix the continuing and unresolved issue of post-operative pain after laparoscopic surgery is to determine which regional block approach is most efficient in targeting the different pain mechanisms in addition to the normal multimodal approach of intraoperative nonopioid analgesics or narcotics. This was done by evaluating evidence-based research and comparing the outcome of randomized controlled trials of each block. Though TAP blocks are the most performed block for laparoscopic surgeries, they lack a visceral pain-reliving effect and can be inconsistent in blocking necessary sensory spinal levels needed to lessen the incisional and trocar port site pain felt .[6] However, ESP blocks provide wider coverage of analgesia and show to have the missing visceral aspect that has not been able to be adequately treated.[7]

With the use of randomized-controlled trials of laparoscopic surgeries with each block, this project will gather information to present the best anesthetic plan to anesthesia providers to successfully manage and lessen post-operative pain that patients experience.

Problem Statement

Intense post-operative pain and discomfort are still evident in more than half the patients who undergo laparoscopic procedures.[1] As laparoscopy becomes the standard of care for various surgeries, anesthesia providers play a pivotal role in preventing, managing, and treating pain during the peri-operative experience. Therefore, it is in the hands of anesthesia to develop the most effective technique for optimal patient comfort and analgesia, especially during the post-operative period, to reduce complications and contribute to the benefits of the minimally invasive surgery performed. A successful analgesic regimen is lacking, and provider consensus is inadequate, leading to inconsistent pain management outcomes. Incorporating regional blocks, particularly ESP and TAP, into a multimodal anesthetic plan has shown promising results in decreasing opioid consumption, increasing patient satisfaction, and accelerating recovery time. The question lies about which of the two blocks is superior and more feasible in clinical practice to become the 'gold standard' for this surgical route.

Problem Identification

Contrary to what some may believe, a laparoscopic technique still has the potential to elicit severe pain post-operative from the trocar port sites, effects of the insufflation aggravating intra-abdominal organs, and tissue manipulation from the laparoscopes.[8] One may wonder how this could be with a minimally invasive approach that entails smaller incisions and is intended to speed the recovery process. However, the pain mechanisms that the laparoscopic route brings forth differ from that of a regular laparotomy. While an open surgical procedure generates

primarily somatic pain from the large incision, the latter causes the patient to experience somatic pain with the addition of visceral pain to varying degrees depending on multiple factors concerning the patient, surgery route, duration of surgery, abdominal insufflation pressure, and anesthesia provided.[8] Incision, suture, and port site entry pain contribute to the somatic pain that patients can experience in a laparoscopic case.[8] This kind of pain can be identified as sharp, stabbing, and easily localized. Visceral pain is a result of the pneumoperitoneum from the distention of diaphragmatic muscle fibers, nerve stretching, stretching of the peritoneum, and triggering of an inflammatory response.[8] Visceral pain, which is often overlooked and disregarded, is described by patients as dull, aching, and more generalized, making it harder to locate and treat as this pain comes from the visceral organs.[9]

Implementing the proper measures to treat the underlying pain mechanisms seen after laparoscopic surgeries is vital to treating it successfully. Currently, as aforementioned, hospitals are inconsistent with pain management regimens after these procedures. Different methods to control pain include local anesthetic infiltration to trocar entry sites, systemic intravenous opioids, lidocaine 5% patches to the abdomen, nonopioid analgesics, and regional blocks.[10,11] Varying success has been demonstrated with these methods as post-operative pain continues to be an issue, though regional anesthesia has by far proved to be the most successful. TAP blocks are a known and popular regional choice for laparoscopic cases; however, as regional anesthesia practice continues to grow with the use of ultrasound, new blocks are formed and have the potential to provide better, more inclusive analgesia. ESP blocks are one of the many up-and-coming blocks, and it is with evidence-based research that it can be determined if this block is more efficacious than a TAP block at treating the visceral and somatic pain that accompanies a laparoscopic surgery.

Background

As minimally invasive procedures have been created through innovation and technological advancements over the past three to four decades, many disciplines have adopted them as they have increased in popularity and are favored due to their improvements in patient outcomes.[12] Laparoscopic surgical technique is one of the first minimally invasive techniques and was first utilized as a diagnostic tool, eventually making its transition to a commonly used surgical approach in the 1960s-1980s.[12,13] A gynecologist performed the first laparoscopic procedure in 1962, while the first published surgery of its kind that revolutionized the procedure was a laparoscopic appendectomy in the early 1980s, marking the beginning of this approach to become the most globally used technique in years to follow. [12] Currently, it is used for various complex and simple surgeries.

Unlike an open route where a large abdominal incision is made, a laparoscopic procedure consists of small, key-hole-like incisions in the umbilicus and different quadrants of the abdomen, depending on the surgery. To facilitate this type of surgery, CO2 insufflation is applied through one of the incisions,, a laparoscope is inserted to visualize within the enclosed abdomen, trocars are placed, and surgical instruments are placed within the trocars to perform the operation.[13] As a result of the small incisions a laparoscopic surgery offers, patients see better cosmetic results, have less tissue damage, experience a faster return to normal activities and work, have higher chance of same-day surgery discharge, experience fewer wound complications, and a chance of lesser somatic pain from the smaller incisions.[11,14] In addition, morbidity and mortality are reduced; therefore, it is a safer approach than open. Although procedure-specific, if performed laparoscopically, as much as a 50% shorter length of hospitalization is seen if the patient has to stay.[15]

Although a laparoscopic approach has the potential for less somatic pain because a large abdominal incision is avoided, post-operative pain is not eradicated by any means. Kunapaisal et al[8] found that in some laparoscopic cases where the surgical procedure lasted longer than three hours and had an abdominal insufflation of ≥ 12 mmHg, the analgesia requirement was higher than in a conventional laparotomy. Furthermore, Gough et al[11] found that the postoperative pain after a laparoscopic ventral hernia repair can be equivalent to an open approach. In fact, it would be a disservice to the patient and hinder the recovery process to believe that post-operative pain would not be an issue because this approach brings forth a different type of pain, as previously mentioned, that laparotomy does not, which is visceral in origin. Visceral pain results from the wound of the intra-abdominal organ, the pneumoperitoneum, and stretching of the peritoneum that is needed to accomplish the minimally invasive technique.[14] Currently, post-operative pain after any laparoscopic surgery is still an issue as it occurs in 50% to 70% of patients, as patients still complain of pain inside the abdomen, hence visceral pain that is not being controlled.[1,7] This counteracts some of the benefits of this type of surgery, such as lesser post-op complications, shorter hospitalization, faster patient recovery, decreased morbidity, and increased patient satisfaction.[1]

A TAP block is the most common and well-known regional technique to treat post-operative pain after laparoscopic surgery. It has managed and treated pain more effectively post-operatively than local infiltration at port sites and systemic intravenous medications through patient-controlled analgesic (PCAs) pumps.[16] The TAP block was first introduced in 2001 and has since found its value for many intrabdominal procedures because of the nerves that are targeted with the injected local anesthetic.[16] The plane between internal oblique and tranversus abdominis muscle is located, with the use of ultrasound or through landmark with the petit

triangle, and is the area of interest where the thoracolumbar nerves can be found.[16] These nerves exit T6-L1 spinal roots and provide sensory sensation through nerves to the anterior-lateral abdominal cavity; therefore, if blocked, analgesia to this area of the abdomen where trocars are inserted is achieved.[16] A TAP block's analgesic effect relieves somatic pain but lacks efficacy on visceral pain.[16] Additionally, TAP blocks can be inconsistent as they do not always block the T7 and T8 dermatomes, which are needed to provide post-operative analgesia after a laparoscopic procedure.[6]

An ESP block is a novel regional technique first described in 2016 and has shown great potential for pain relief after an abdominal-related procedure when performed at the T7 level.[7] Kwon et al[7] found that this block can not only provide more analgesia since it covers more of the abdominal wall, but also is feasible in treating both visceral and somatic pain. This block targets the plane between the erector spinae muscle sheath and the transverse process of the vertebra and has the ability to block multiple spinal levels as the local anesthetic spreads both rostral and caudally.[7] It blocks dorsal rami, ventral rami, and rami communicantes because of its anterior penetration into the paravertebral space, contributing to its potential to block both types of pain experienced in a laparoscopic surgery.[7]

Scope of the Problem

In the United States, over 700,000 laparoscopic cholecystectomies (LC) are performed annually, with increasing amounts every year.[1] Laparoscopic appendectomies are increasing, along with bariatric, colorectal, gynecological, and many other abdominal-related surgeries. This means that over 350,000 patients yearly experience unmanaged post-operative pain after an LC. Moreover, these patients who experience this are at high risk for more severe post-operative complications. Post-op pain stands true for other laparoscopic routes and accounts for one of the

main concerns. In the future, robotic surgeries will gain more popularity as surgeons navigate the technical side of using robotic hands and develop better skills. Artificial intelligence is also up and coming as laparoscopic procedures continue to advance.

With each advancement to improve this approach, the issue still stands that post-operative pain is still of concern because of the different types of pain it creates; though, with these advancements comes more precision in tissue handling, therefore, less somatic pain could be seen. Mangalath et al[3] compared the analgesic requirements of patients undergoing traditional laparoscopic cases versus robotic and was able to further prove that robotics did cause less incisional pain; however, did not eradicate post-operative pain entirely. Therefore, even with technological advances, post-operative pain will continue to affect more patients going for this type of surgery, and it is still an issue for anesthesia to determine what multimodal anesthetic plan with the inclusion of regional anesthesia shows the best, most consistent results. Currently, there are randomized controlled trials being done and have been conducted comparing different anesthetics or seeing the effects of using one versus not. This allows anesthesia providers to collect the research and determine what works and what does not work.

Consequences of the Problem

Patient recovery in the post anesthesia care unit (PACU) is a valuable time that will dictate how the patient will heal and regain normalcy. An important independent predictor of a patient's recovery is pain, which is still an unresolved issue after laparoscopic surgeries. Despite being minimally invasive, if post-operative pain is left unrelieved and inadequately treated, many consequences will be seen as the patients recover with high pain levels. However, treating the pain felt with opioids can further cause and exacerbate issues, such as respiratory depression, nausea and vomiting, constipation, increased time to first ambulation, and delayed discharge.

Improperly managed pain can lead to the activation of the patient's stress response, which contributes to the retention of water and sodium and a higher metabolic rate.[11] Gastrointestinal, respiratory, thromboembolic, psychological, and cardiovascular issues can also arise.[11] These events that all stem from the post-operative pain will increase the hospital cost for the patient, especially if the patient has to be admitted for such complications. Another issue that can arise is provider lack of awareness of the pain that the patient is feeling due to the assumption that laparoscopic surgery is minimally invasive and supposed to cause less pain. Since pain is subjective and there is no test to pinpoint the amount of pain someone is truly in, this issue can happen easily depending on the patient's way of handling pain based on their culture, gender, and age. In this event, a patient is discharged normally without pain treatment and is at high risk for readmission. This can lead to patients developing mistrust amongst healthcare personnel and avoiding care in the future from the fear of experiencing the same issue. In addition, prolonged use of opioids and the development of chronic pain can occur from the acute pain.[17]

Knowledge Gaps

Understanding that laparoscopic surgery still experiences pain needs to be instilled in the minds of anesthesia providers and PACU nurses to properly prevent or identify it post-operatively. As mentioned, this approach results in different origins of pain, including visceral, incisional, referred, and peritoneal.[8] This caused some confusion at first with applying different methods to treat the pain and decrease opioid consumption, yet still experiencing pain, for example, with NSAIDs, gabapenoids, and local anesthetics. The knowledge gap is starting to be filled with the decision that this pain should be treated with a multimodal approach with the inclusion of regional anesthesia to target different pain pathways. Discovering what block treats visceral pain takes time with completing trials. Although studies have been conducted

confirming the visceral pain-relieving effect of ESP blocks, more studies need to be completed to validate further. On top of this, many anesthesia providers do not know how to perform an ESP block as this is a newer interfascial block. As ESP block continues to gain popularity for numerous surgeries, educational workshops and training sessions on the block needs to be implemented in order to fully incorporate this block into anesthetic plans.

Proposed Solution

The solution to fix the continuing and unresolved issue of post-operative pain after laparoscopic surgery is to determine which regional block approach is most efficient in targeting the different pain mechanisms in addition to the normal multimodal approach of intraoperative nonopioid analgesics or narcotics. This will be done by evaluating evidence-based research and comparing the outcome of randomized controlled trials of each block. Though TAP blocks are the most performed block for laparoscopic surgeries, they lack a visceral pain-reliving effect and can be inconsistent in blocking necessary sensory spinal levels needed to lessen the incisional and trocar port site pain felt .[6] However, ESP blocks provide wider coverage of analgesia and show to have the missing visceral aspect that has not been able to be adequately treated.[7]

PICO Question

In adults undergoing laparoscopic surgeries, which regional anesthetic technique, erector spinae plane (ESP) or transversus abdominis plane block (TAP), is more efficient in decreasing opioid consumption?

Population (P): Adults undergoing laparoscopic surgeries.

Intervention (I): Erector spinae plane (ESP)

Comparison (C): Transversus abdominis plane block (TAP)

Outcome (O): Reduction in opioid administration post-operatively.

Literature Review

Literature Search Process

The three databases selected to perform a systemic literature review were PubMed, Medline, and Embase. These were chosen due to their reputable reputation, and scholarly articles with evidence-based research were discovered that is apply to the PICO question presented. Relevant studies were identified using the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA). In the search in these databases, the keywords utilized included: (“Laparoscopic” AND “anesthe*” OR “anesthesia” AND “regional”), (“Laparoscopic” AND “ESP”), (“Laparoscopic” AND “TAP”), (“Lap” OR “surgery” AND “ESP” OR “TAP”), (“Transversus abdominis plane” AND “laparoscop*”), (“Erector spinae plane” AND “laparoscop*). Restrictions that were placed included: within the past five years, randomized controlled trial, full text, English, and age from 18-65 years old. Studies discovered were analyzed and appraised to determine the eligibility to be used for the research project.

Inclusion and Exclusion Criteria

Studies that were included in the literature review contained ones that were published within the years of 2017-2023, level II evidence such as a randomized controlled trial, contained participants within the age range of 18-65 years old, written in English, had full-text accessibility, and pertained to the topic of interest. The exclusion criteria encompassed studies that did not have an ESP or TAP block as an intervention, surgery routes other than laparoscopic, pediatric patients, elderly patients, systematic reviews or meta-analyses, reviews, no access to the full text, or written in another language. No restrictions were placed on the geographic location of where the research took place. 127 articles were initially identified; however, after duplicates

were removed and applying the inclusion and exclusion criteria, 15 articles were found and selected to use in the literature review to answer the PICO question.

Literature Appraisal and Literature Matrix

The literature review matrix completed includes 15 articles of Level II evidence-based research according to Polit-Beck's evidence of hierarchy. Each study is a randomized controlled trial that administers either an ESP block or a TAP to determine the analgesic efficacy post-operatively after a laparoscopic procedure. Different laparoscopic abdominal-related procedures are seen through the selection of articles to show a variety of cases and the use of regional anesthesia for each. For example, studies were chosen that included laparoscopic cholecystectomies, laparoscopic inguinal hernia repair, laparoscopic colorectal surgery, laparoscopic gastric sleeve resection, laparoscopic nephrectomy, and laparoscopic hepatectomy. Although these procedures involve different organs, incisions are made in the abdomen area for each to access the targeted area; therefore, the regional anesthetic that could ameliorate the pain felt in these cases is similar. For each study, the design, methods, setting, variables, data analysis, findings, results, and limitations were noted, and the pertinent parts were extracted to provide a quick overview.

Characteristics of the Included Studies

Atiparmak et al[18] aimed to determine how effective an ultrasound-guided ESP block can be after a laparoscopic cholecystectomy (LC) in decreasing post-operative opioid consumption.[18] This study was level II evidence since a randomized controlled trial was performed. Post-operative pain after an LC remains a critical issue, and TAP blocks have been used to combat it with varied success. As ESP blocks have gained popularity, this study's purpose was to assess if this block showed superior analgesic results post-operatively. To accomplish this, 41 patients

were divided into two groups at an academic university hospital. Before induction, the intervention group received a bilateral ESP block at the level of T7 with 40 ml (20 ml for each side) of 0.25% bupivacaine, and the control group received the same block at the level; however, a total of 40 ml of saline was used instead of bupivacaine.[18] After block administration, the patient underwent general anesthesia, and the laparoscopic surgery proceeded.

Numerical pain rating scale (NRS) scores were gathered at specific periods in the post-operative period to determine the effect of the ESP block. Patients were then assessed using the 11-point NRS at 15 minutes, 30 minutes, 1 hour, 12 hours, and 24 hours after surgery.[18] A p-value less than 0.05 showed statistical significance. This study used the Mauchly's test and the Greenhouse- Geisser correction for statistical analysis. NRS scores at different periods showed considerably lower scores in the ESP group than in the control group ($p < 0.05$).[18] Additionally, the PCA pump was utilized less by the patients with the block than those without further supporting the efficacy of ESP block ($p = 0.022$).[18] Also, 10 patients without the block needed more doses of IV morphine, and this group required an average of 43 mg of tramadol more than the ESP group to manage the pain ($p < 0.001$).[18] It is evident from the results displayed in this study that ESP block administration prior to a LC contributes to a vast reduction in tramadol consumption post-operatively, in NRS scores at each time frame post-surgery, and in rescue doses of opioid analgesics.[18] The authors came to a conclusion that an ESP block is the answer to pain relief after a LC. The study's strengths included a placebo group, completely randomized, and double-blind. Limitations of this study included a small sample size and using tramadol as the opioid of choice for the PCA.

Altinsoy et al[2] investigated the outcomes seen post-operatively during periods of rest and movement with the administration of a unilateral ESP block for a laparoscopic hernia surgery

(LHS). A randomized controlled trial was done, making it level II evidence, at a research hospital in Turkey. The study analyzed the block's ability to reduce opioid consumption post-operatively, ultimately contributing to the positives that a laparoscopic surgery intends to offer. To determine its efficacy, 60 patients scheduled for a LHS were divided into two groups, where one received a unilateral ESP block of 20 ml's of 0.25% bupivacaine after intubation in a lateral position at the T7 vertebral level and the other group did not.[2] Post-operative pain was assessed with NRS scores and consumption of tramadol was noted. Furthermore, the patients were given a questionnaire to evaluate their recovery.[2] NRS (interval data) was used post-operatively to assess pain at 1, 4, 6, 12, and 24 hours.[2] PCA pump for 24 hours (20 mg of tramadol with 20-minute lockout period) was used to determine the need of opioids in the post-op period. The Shapiro-Wilk test was utilized to check for normality, while variables and their distributions were tested with student's test-test and Mann-Whitney U tests.[2] The Chi-square tests were utilized for categorial variables.[2]

The ESP block proved to provide better pain management than no regional block at all when examining the NRS scores, opioid consumption, and QoR scores the study offers. NRS scores are much lower at different hours in the group that received the ESP block.[2] Patients who got the regional block also saw a decrease in the need for opioids within that 24-hour time frame after surgery (60 mg of tramadol for the ESP group vs. 80 mg in the control group with a p value of < 0.001) and achieved better QoR scores than the control group ($p < 0.05$).[2] The QoR scores showed that the ESP group felt independent faster, more physically comfortable, and felt emotionally better.[2] The study reveals that a unilateral ESP block for a patient undergoing a inguinal herniorrhaphy effectively decreases analgesic requirements and improves post-operative pain levels.[2] Therefore, it is recommended that this block should be used as part of the

multimodal approach in combating post-operative pain after these surgical procedures. A strength of the study is that it is level II evidence and randomized. Limitations included no follow-up after 24 hours and a small sample size.

Vrsajkov et al[5] aimed to assess the effects of a subcostal transversus abdominis plane block as a pain-relieving approach in the post-operative area after an LC. This study was performed in the clinical centre of Vojvodina, Novi Sad, Serbia. Two groups of 38 patients each were randomly assigned as either the group receiving the bilateral TAP block of 20 ml's of 0.33% bupivacaine before incision or standard post-operative analgesia consisting of tramadol.[5] Student t-test was used to analyze differences between the groups with normal distribution of data and the Mann-Whitney U test was used for data without a normal distribution.[5] A chi-square test was used for nonparametric data.[5]Information was recorded using NRS scores at certain time periods after surgery, which were at 10 minutes, 30 minutes, 2h, 4h, 8h, 12h, 16h.[5] At each time stamp that an NRS score was recorded, the TAP group clearly showed significantly reduced pain scores post-operatively (p values ranging from 0.000-0.004).[5]

In addition, it was unsurprising that the patients who received a TAP block needed less administration of tramadol.[5] The average tramadol consumption for the TAP block group was 24 mg vs 270 mg in the control group ($p = 0.000$).[5] To achieve increased patient satisfaction, reduce side effects, and prevent a prolonged hospital stay, a subcostal TAP block before a LC is the route to go as anesthesia providers.[5] It is more efficacious than standard analgesia in decreasing opioid consumption and improving overall pain management. A strength of the study was that it was level II evidence and randomized. Limitations included a small sample size and the exclusion of patients who received port-side infiltration further contributing to a smaller sample size.

Sørenstua et al[19] aimed to investigate the analgesic effectiveness post-operatively in two blocks, TAP versus an anterior quadratus lumborum block (QLB), after a laparoscopic inguinal hernia repair.[19] Two equal groups, consisting of 60 patients combined, were divided, and pre-operatively, one group received the TAP block, and the other received the anterior QLB.[19] Each block contained 20 ml's of 0.75% ropivacaine. Opioid consumption and pain scores were tracked post-operatively to determine if one block proved to provide superior analgesic results than the other. Mann-Whitney test were used to assess non-normally data while t-test were used to assess normality.[19] Both groups showed similar results when comparing the mean oral morphine equivalent (OME) (10.3 mg in the TAP group vs 10.85 mg in the QLB group with p value = 7.13), and there were no differences noted in pain scores at the 7-day post-op period.[19] Overall, the NRS at rest and coughing at the different time intervals showed similar results, and it could not be concluded if one is better than the other. When deciding between a TAP or an anterior QLB block for pain management purposes for a laparoscopic inguinal hernia repair, no block was identified to reduce opioid consumption better than the other.[19] The authors decided that to choose between the two blocks, anesthesia personnel should factor in other aspects to determine the best block, such as potential risks, providers' skills, and practicalities.[19] Strengths of the study included randomized controlled travel performed at a county hospital and both blocks performed by same anesthesiologist Limitations included a small sample size and lack of use of a PCA pump that could have provided objective information.[19]

Zhao et al[20] completed a randomizied controlled trials in an affiliated hospital of North Sichuan Medical College. This study wanted to assess if a post-op bilateral posterior TAP block could reduce a patient's opioid requirement compared with the placebo in those undergoing a laparoscopic colorectal cancer surgery.[20] Two groups of 46 patients were randomly divided and

received either a bilateral U/S guided, posterior TAP block with 20 ml of 0.5% ropivacaine or normal saline. One group received the block with local anesthetic before extubation, while the other received the block also at extubation; however, with normal saline.[20] The log-rank test was utilized to compare when the need for the first rescue tramadol dose was needed between each group.[20] For continuous variables, the Student's t-test and Mann-Whitney U test was used.[20] Lastly, to compare qualitative data differences, the Chi-squared test was used.[20]

The group given the TAP block showed better results than the control group regarding the total rescue tramadol consumption and needed less of it (0 mg vs. 100 mg with a p value < 0.001).[20] For example, the TAP block group's first time to rescue dose was 24 hours, while the control group's first time was 50 minutes.[20] NRS pain scores at different time periods, patient satisfaction, and need for rescue dosing. NRS scale scores were recorded at 2, 4, 6, 12, 24, 48, and 72 hours.[20] Although some areas showed no differences between the two groups, such as at 2 and 3 days post-op with the NRS pain scores and patient satisfaction, it is evident that a TAP block is efficacious in decreasing post-operative opioid consumption ($p < 0.001$).[20] As moderate post-operative pain is associated with laparoscopic colorectal cancer surgery, a posterior TAP block shows success in decreasing analgesic requirements more than no regional anesthetic technique.[20]A strength of the study was that it was level II evidence and randomized. The study had two limitations: it did not measure plasma concentration of ropivacaine for toxic dose for each patient and adjust accordingly and did not assess sensory of the TAP block.[20]

Li et al[21] goal was to evaluate the quality and efficacy of an ultrasound-guided bilateral ESP block in improving post-operative pain management and recovery after a laparoscopic surgery for colon cancer. 53 patients were divided into the control and intervention groups at a local hospital. Preoperatively, an ESP block was performed for both groups, though only the

intervention group received 20 ml of 0.25% ropivacaine on each side, while the control group received normal saline.[21] The X^2 test was used to compare baseline clinical characteristics of both groups, while the t-test was used to calculate the mean values and standard deviation.[21] Data was recorded with visual analog scale (VAS) scores and time to opioid consumption.[21] VAS scores (interval) at 2, 6, and 24 hours after surgery were recorded.[21] The average VAS score and opioid consumption were significantly lower in those of the ESP group (p=0.000). The average analgesic consumption for the control group was 52 mg, which was 28 mg more than the ESP group ($p < 0.05$).[21] ESP block for a laparoscopic colon cancer surgery is a promising addition to the multimodal approach to producing better results for patients post-operatively. It is a regional technique that should be included to improve quality of care. Limitations of the study included a small sample size and no follow-up on pain after 24 hours.

Mittal et al[22] performed a randomized controlled trial in Sir Ganga Ram Hospital. The objective of this study was to determine the efficacy of a TAP block when included in the anesthetic technique for patients undergoing a laparoscopic gastric sleeve resection.[22] To accomplish this, two groups of 60 patients total were created, with one group receiving the TAP block with 20 ml per side of 0.375% of ropivacaine along with systemic IV analgesia and another group receiving only systemic IV analgesia.[22] Postoperatively, the VAS and a satisfaction score were used to make conclusions.[22] The t-test, Mann-Whitney U test, chi-square, and fisher's exact test were all used for statistical analysis in this study. VAS scores (interval) were recorded at rest and with movement at 30 min, 3 hr, 6 hr, 12 hr, 24 hr, 48 hr.[22] The average VAS score were higher in the non-TAP group than in the TAP group ($p < 0.001$). In addition, the mean patient satisfaction score was better in the TAP group, 8.20 vs. 7.07 ($p < 0.001$), and the mean number of rescue medications was higher in the non-TAP group. The results indicate that

the U/S-guided TAP block successfully minimizes post-operative pain and increases patient satisfaction for patients undergoing bariatric procedures. It is a minimally invasive and effective regional anesthetic technique that should be added to an anesthetic plan. However, a limitation was that the sample size was small; therefore, a larger sample should be conducted in the future to prove the results further.

Mostafa et al[23] evaluates the effects of a U/S guided bilateral ESP block before induction of anesthesia on the pain-relieving results it brings. One group of 30 will receive the bilateral ESP block ultrasound-guided with 20 ml's per side of 0.25% bupivacaine, while the other group of 30 will receive a placebo of 20 ml's of normal saline. VAS scores and median total post-op morphine consumption are both recorded to proceed to a conclusion.[23] For the statistical analysis section, the Shapiro-Wilk test, t-test, Mann-Whitney, and Fisher exact test were all used to help gather data accurately. VAS scores were taken at 30 min, 1 hr, 2 hr, 4 hr, 6 hr, 8 hr , 12 hr, 18 hr, and 24 hours.[23] The first 8 hours that VAS scores were assessed, significant differences were noted between the ESP and control groups ($p < 0.001$); however, at 12, 18 and 24 hours, although VAS scores were lower in the ESP group, they were nonsignificant.[23] Mean morphine consumption for the ESP group was lower than the control group within the first 24 hours.[23] The time to first morphine dose for the ESP block group was 420 minutes vs 27.5 minutes from the control group ($p. < 0.001$).[23] It is evident from the results that in patients undergoing laparoscopic bariatric surgery, incorporating a bilateral U/S guided ESP block into the analgesic regimen effectively reduces opioid consumption and pain post-operatively that is commonly seen after this specific surgery.[23] The strength of this study includes being an RCT, while limitations include being a small sample size and lack of documentation of sensory loss after the block was administered.

Ashoor et al[24] aims to compare the quality of post-operative pain management within 24 hours between ESP block and QLB block with patients undergoing laparoscopic sleeve gastrectomy. Three groups are divided into 40 patients each to receive different interventions such as ESPB, QLBB, and standard IV analgesia as the control group.[24] The patients in the ESPB and QLBB group received 30 ml's per side of 0.25% bupivacaine. Different data points are tracked to determine which block is more efficacious.[24] These data points include VAS scores and PCA pump usage. Normality was tested using the Shapiro-Wilk test.[24] Chi square and Fisher's exact test were both used to assist with small expected numbers.[24] VAS scores (interval) were recorded at 30 mins, 2 hr, 4 hr, 6 hr, 8 hr, 12 hr, and 24 hr.[24] VAS scores were significantly higher in the control group, with the QLB having slightly lower scores ($p < 0.001$).[24] Average total nalbuphine consumption within 24 hours for ESPB (64.4 mg) was lower than the control group (77.5 mg) but higher than the QLB block (57.1) ($p < 0.001$).[24] Additionally, rescue doses were needed quicker in the control group (0.7 minutes) than in the block groups (22 minutes) ($p < 0.001$). Ultimately, it is evident that regional anesthesia is the way to proceed when wanting to reduce analgesic requirements and increase the quality of recovery. The difference between a QLB and ESP block is insignificant, and both have ability to provide efficient post-op analgesia in patients undergoing a laparoscopic gastric sleeve.[24] No follow-up was undertaken for the patients in this study after 24 hours, which served as a limitation. A strength was that the sample size was adequate.

Arık et al[25] performed a randomized controlled trial of 72 patients at a university hospital. This study's purpose was to compare the analgesic efficacy of local anesthetic infiltration at port sites with unilateral subcostal TAP block in patients scheduled for a LC. [25] Groups were divided into three, consisting of the TAP group with 20 ml's of 0.25% bupivacaine, LA infiltration

group, and control group. Analgesia control was monitored for each group post-operatively through use of NRS scores, Likert-type scales, and total tramadol consumption within 24 hours. Shapiro-Wilks test was used to assess normality, while the Levene's test was utilized to assess homogeneity of variances.[25]ANOVA was used to compare study groups.[25] At each time frame the NRS score was noted, the TAP group showed lower scores than the local infiltration and control group ($p= 0.007$ and $p= 0.016$). The average tramadol consumption was significantly lower in the TAP group (229 mg) compared to the two other groups (335 mg in the LA infiltration group vs. 358 mg in the control group ($p < 0.001$).[25] Local anesthetic infiltration and regular IV analgesia were inferior to unilateral subcostal TAP block in decreasing opioid consumption post-operatively.[25] Including a unilateral subcostal TAP block in the anesthetic plan for patients undergoing a LC is recommended. A strength of this study is that it is randomized. Limitations include no follow-up after 24 hours, and a sensory block was not evaluated to assess the block's success.

Vrsajkov et al[26] set out to determine the influence an ESP block has on a patient's post-operative pain undergoing a LC at the Clinical Centre of Vojvodina, Novi Sad, Serbia.[26] Groups were divided into two of 30 patients each; one group received the ESP block with 20 ml's per side of 0.25% levobupivacaine and decadron 2 mg, while the other group received standard multi-modal analgesia of 100 mg of tramadol at the end of the procedure.[26] Data was then measured post-operatively using NRS scores and keeping track of the total tramadol consumed. The student t-test, Mann-Whitney U-test, and chi-square test were used for the statistical analysis of the study.The average NRS scores and tramadol consumption for the ESP group were lower than the control group ($p < 0.007$), with the ESP group having an average tramadol consumption of 25.02 mg and the control group having 208.3 mg ($p < 0.001$).[26] With this information, an ESP

block for a LC can provide more pain-controlling qualities than regular IV systemic analgesia. Total opioid administration and need are decreased with an ESP block; therefore, its use for these surgeries is effective. Limitations included: no follow-up after 24 hours, only recorded pain at rest, no placebo, and lack of PCA usage.

Park et al[27] purpose of the study completed was to determine if including a TAP block, consisting of 40 ml of 0.375% ropivacaine, in the anesthetic plan for a patient undergoing a laparoscopic nephrectomy can improve the post-operative quality of recovery and prevent pain-related negative outcomes. 60 patients divided into two groups were randomized into the intervention group (TAP block) and control group.[27] Post-operative PCA pump usage and a 40 questionnaire (QoR-40) were collected to conclude the TAP block's efficacy.[27] The X^2 test and independent t-test were used for statistical analysis. The TAP group had a higher QoR-40 score ($p= 0.006$), fewer PCA boluses to manage the pain, and showed an increased total usage of the PCA pump ($p= 0.30$). The average score for the QoR-40 was 171.0 in the TAP block group vs 151.9 in the control group.[27] To improve surgical outcomes and decrease morbidity rates for patients undergoing a laparoscopic nephrectomy, an ultrasound-guided TAP block is a excellent addition to the anesthetic technique and has shown its effectiveness through this study.[27] A limitation of this study was the small sample size.

Huang et al[28] aims to assess if U/S guided ESP block can improve post-operative analgesia in patients under laparoscopic hepatectomy at West China Hospital.[28] Two groups were created from a total of 50 patients, one of which would receive an ESP block with 15 ml of 0.5% ropivacaine per side, and the other would receive standard IV analgesia. VAS scores at different time intervals and rescue doses were recorded to assess the difference between the groups. For statistical analysis, the Shapiro-Wilk test, student's t-test, Pearson x^2 and fisher exact

test were used to gather data. ESPB group showed lower VAS scores ($p < 0.001$) and less rescue analgesia consumption than the control group, with the average rescue analgesia consumption for ESPB group being 9 mg vs 20.3 mg in the control group ($p < 0.001$).[28]. ESPB improved post-operative analgesia and accelerated patient recovery by decreasing opioid consumption and VAS scores in patients undergoing laparoscopic heptectomy.[28] Two strengths of the study are level II evidence, and similar characteristics of the subjects. However, the sample size was small and there was no placebo.

Breazu et al[29] had the goal to assess what analgesic technique is most efficient in controlling post-operative pain after a LC. Three groups of 79 patients total would consist of: an oblique subcostal TAP block (OSTAP), local anesthetic infiltration (LAI) of port sites, and classic multimodal IV opioid analgesia.[29] The OSTAP group would receive 20 ml per side 0.25% of bupivacaine, while the local anesthetic infiltration of port sites group would receive 5 ml 0.25% of bupivacaine. Additionally the IV opioid analgesic group, the control group, would receive solely fentanyl. VAS scores at different time intervals showed superior results in the TAP group than in both other groups. For statistical analysis, the Tukey-Kramer HSD test, ANOVA test, Kruskal-Wallis test, and Shapiro-Wilk test were all used. The average VAS score at the 6-hour mark for the OSTAP group was 0.7 vs. 4 for the local infiltration group and 4.5 for the control group ($p < 0.001$).[29] The TAP group also had a lower average pethidine consumption, showing better pain-controlling management (30 mg for the TAP group, 60 mg for the LAI, and 90 mg for the control group) ($p < 0.006$ and $p < 0.001$).[29] The study has shown that the implementing an OSTAP block can reduce pain scores and opioid consumption post-operatively compared to LAI and standard IV analgesia.[29] Limitations of this study include small sample

size, no assessment of sensory block, pain score only evaluated during rest, no pain assessment 0-6 hours, and lower volume of LA for the port infiltration than the TAP block.[29]

Canitez et al[4] wanted to determine if the postoperative quality of recovery can be improved by incorporating an ESP block into the anesthetic plan for a patient undergoing a LC.[4] This study was a randomized controlled trial that took place at University of Health Science, Konya Education and Research Hospital. In order to assess, two groups were created of 85 patients, with one that would receive the ESP block and one that would receive a standard analgesic regimen.[4] For statistical analysis, the Kolmogorov-Smirnov test, student t-test, Mann-Whiteney test, and Pearson's x^2 test were used. QoR-40 scores were higher in the ESPB group than the control group, indicating better patient satisfaction. The average QoR-40 scores in the ESPB group was 181 vs. 167 in control group ($p < 0.01$).[4] Pain scores and total tramadol consumption were lower in the ESPB group ($p < 0.01$). The study recommends the inclusion of an ESPB in patients undergoing a LC to see improvements in patients' pain and recovery post-operatively.[4]

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Altiparmak et al,[18] 2019	Design: Randomized, Double-Blinded, Placebo- Controlled Trial This randomized controlled trial aimed to determine how effective an ESP block can be after laparoscopic cholecystectomy (LC) to decrease post-operative opioid consumption.[18] To accomplish this, 41 patients were divided into two groups. Before induction, the intervention group received a bilateral ESP block at the level of T7 with 40 ml (20 ml for each side) of 0.25% bupivacaine, and the control group received the same block at the level; however, a total of 40 ml of saline was used instead of bupivacaine.[18] After block administration, patient underwent general anesthesia and the laparoscopic surgery proceeded. Numerical pain rating scale (NRS) scores were gathered at certain time periods in the post-operative period to determine the effect of the ESP block.	41 patients, 18-70 year old's, ASA I-II.[18] • Intervention group: 21 patients • Control group: 20 patients Characteristics of participants: average age: 48, average weight 70 kg, average height 166 cm, average BMI 26, average surgical time 42 minutes.[18] Attrition rate: 11% • 5 were excluded due to mechanical failure in PCA upon follow-up.[18] The study was conducted to determine if ESP blocks successfully decreased opioid consumption due to the moderate to severe pain that patients feel after a laparoscopic procedure.[18] It was conducted in an academic university hospital in an operating room (OR) setting.[18] The study followed the standards outlined in the Declaration of Helsinki.[18]	IV= ESP block at the level of T7 with 40 ml (20 ml for each side) of 0.25% bupivacaine CV= ESP block at the level of T7 with 40 ml (20 ml for each side) of saline DV= NRS score at different time points DV= usage of PCA DV= rescue dose of 4 mg IV morphine	As patient was brought to the PACU, the Modified Observer's Assessment of Alertness/Sedation scale (OAAS) was used to monitor the patients every 5 minutes until the score reached a 5.[18] An OAAS score of 5 meant that the patient could normally respond to their name.[18] Patients were then assessed using the 11 point NRS at 15 minutes, 30 minutes, 1 hour, 12 hours, and 24 hours after surgery.[18] If the NRS score was 4 or above, a rescues dose of IV morphine 4 mg was given.[18] After they were deemed eligible, they were sent to the surgical floor and received an IV Patient Controlled Analgesia (PCA) for 24 hours, which contained solely a 20 mg bolus of tramadol with 15 minute lockout period, that allowed technology to see how often patient required a bolus.[18] Level of NRS: interval data Info Reliability: Mauchly's test then Greenhouse- Geisser correction	A statistically significant difference was noted between the IV group and CV group in the mean post-operative tramadol consumption (100 ± 19.2 mg and 143 ± 18.6 mg, respectively; $p < 0.001$).[18] NRS scores at the 15 and 30 minute marks were statistically significant as the IV group was much lower ($p < 0.001$).[18] Also, at 12 and 24 hour mark, NRS scores were lower in the IV group when compared to the CV. Over all the times assessed, significant differences were shown in NRS scores between the IV and CV group, with the IV group showing lower scores (F [1, 39] = 24.061, $p < 0.0005$).[18] 10 more patients in the CV group required rescue doses of morphine post-operatively in the first 24 hours; therefore, IV needed less ($p = 0.001$).[18]	The NRS scores at 15, 30, and 60 minutes, and 12 and 24 hours showed considerably lower scores in the IV group than the CV group.[18] Additionally, the PCA pump was utilized less by the patients with the block than those without further supporting the efficacy of ESP block.[18] Also, patients without the block needed more doses of IV morphine in order to treat pain.[18] Mean tramadol consumption for IV group was 100 mg vs 143 mg for the CV group.[18]	It is evident from the results displayed in this study that ESP block administration prior to a LC contributes to a vast reduction in tramadol consumption post-operatively, in NRS scores at each time frame post-surgery, and in rescue doses of opioid analgesics.[18] An ESP block is the answer to pain relief after a LC.	Strengths: presence of a placebo group, completely randomized, double-blind Limitations: small sample size, using tramadol as the opioid of choice for the PCA Feasibility of use in practice/ confidence to act: As laparoscopic surgeries continue become the surgical procedure of choice, the use of ESP block in practice is very feasible and would show superior analgesia results post-operatively. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Altinsoy et al,[2] 2022	Design: Randomized Controlled Trial This study investigates the outcomes that are seen post-operatively during periods of rest and movement with administration of a unilateral ESP block for a laparoscopic hernia surgery (LHS). It analyzes the block's ability to reduce opioid consumption post-operatively, and ultimately contribute to the positives that a laparoscopic surgery intends to offer. To determine its efficacy, patients scheduled for a LHS were divided in to two groups, where one received the block after intubation in a lateral position at the T7 vertebral level and the other group did not.[2] Post-operative pain was assessed with NRS scores and consumption of tramadol was noted. Furthermore, the patients were given a questionnaire to evaluate their recovery.[2]	Total of 60 patients, 18-70 year old's, ASA I-III.[2] • Intervention group: 30 patients • Control group: 30 patients Characteristics of participants: average age: 61, average BMI 28, average duration of surgery 71 minutes. Attrition rate: 15% • 10 were excluded for either conversion to open surgery or reoperations within 24 hours.[2] Setting: OR room at research hospital in Turkey.	IV: 20 ml 0.25% bupivacaine unilateral ESP block at T7 CV: no intervention, however, each patient received a sterile bandage cover to ensure blinding.[2] DV: usage of PCA period and overall tramadol consumption DV: NRS scores at different time periods (1,4,6,12,24 hours) DV: rescue dose of 50 mg NSAID called dexketoprofen trometamol	Aldrete score: used to determine when patient was ready to be assessed with NRS (score of >9 was the study's indication of readiness).[2] NRS (interval data) was used post-operatively to assess pain at 1, 4, 6, 12, and 24 hours.[2] Quality of recovery-40 questionnaire (QoR-40) (nominal) was used to assess the patients quality of functional recovery.[2] PCA pump for 24 hours (20 mg of tramadol with 20 minute lockout period) was used to determine need of opioids in the post-op period. Shapiro-Wilk test: utilized to check for normality.[2] Continuous variables with a normal distribution was tested with student's test-test, while continuous variables without normal distribution was tested with Mann-Whitney U tests.[2] Chi-square tests were utilized for categorical variables.[2]	NRS scores at movement and rest in the CV group 4.870 ((95% CI: 2.267–10.458) and 5.250 (95% CI: 2.327–11.839) times increased than compared to IV group.[2] PCA usage of total tramadol administration is significantly lower in IV group than CV group ($p < 0.001$).[2] Higher scores were noted in the QoR-40 at hour 6 in the IV group ($p < 0.05$).[2]	Unilateral ESP block proves to provide better pain management then no regional block at all when examining the NRS scores, opioid consumption and QoR scores the study provides. NRS scores are much less at hours 1, 4, 6, 12, and 24 in the group that received the ESP block.[2] Patients who got the regional block also saw a decrease in the need of opioids within that 24 hour time frame after surgery and achieved better QoR scores than the control group.[2] The QoR scores showed that the IV group felt independent faster, more physically comfortable, and felt emotionally better.[2] Total average tramadol consumption for intervention group is 60 mg vs 80 mg for the control group.[2]	Performing a unilateral ESP block for a patient undergoing a inguinal herniorrhaphy is effective in decreasing analgesic requirements and improving postoperative pain levels.[2] This block should be used as part of the multimodal approach in combating post-operative pain after these surgical procedures.	Strengths: randomized Limitations: no follow-up after 24 hours, small sample size Feasibility of use in practice/ confidence to act: high feasibility due to increasing incidence of inguinal hernias and performing them laparoscopically. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Vrsajkov et al,[5] 2018	Design: randomized controlled trial This study aims to assess the effects of a subcostal transversus abdominis plane block as a pain-relieving approach in the post-operative area after an LC. Two groups will be randomly assigned as either the group that receives the TAP block before incision or receives standard post-operative analgesia such as IV pain medication.[5] Otherwise, both groups will receive the same medications throughout the perioperative experience. Information will be recorded using NRS scores at certain time periods after surgery.[5]	76 patients, 18-75 year old's, ASA I-III.[5] • Intervention group: 38 patients • Control group: 38 patients Characteristics of participants: average age: 51, average weight 81 kg, average duration of surgery 70 minutes.[5] Attrition rate: 0 Setting: Clinical Centre of Vojvodina, Novi Sad, Serbia.[5]	IV: Bilateral subcostal ultrasound-guided TAP block with 20 ml of 0.33% bupivacaine per side CV: Standard IV pain medication post-operatively – tramadol 1 mg/kg Q6 hours DV: NRS score DV: Tramadol consumption post-operatively	NRS score (interval) at 10 minutes, 30 minutes, 2h, 4h, 8h, 12h, 16h.[5] Student t-test was used to analyze differences between the groups with normal distribution of data and the Mann-Whitney U test was used for data without a normal distribution.[5] A chi-square test was used for nonparametric data.[5]	In the TAP block group (24.29±47.54g), tramadol consumption was vastly lower than consumption in the standard IV analgesia group (270.2±81.9g) (p = 0.000).[5] NRS scores at 10 min, 30 min, 2h, 4h, 8h, 12h, and 16h were significantly lower in the TAP group than the traditional opioid analgesia group (p values ranging from 0.000-0.004).[5]	At each time stamp that an NRS score was recorded, the TAP group clearly showed significantly reduced pain scores post-operatively.[5] In addition, it was without surprise that the patients who received a TAP block needed less tramadol administration.[5] Average NRS score for TAP vs CV.[5] • 10 min: 2.97 vs 5.20 • 30 min: 3.11 vs 4.97 • 2 hr: 3 vs 4.32 • 4 hr: 2.48 vs 3.85 • 8 hr: 1.91 vs 3.11 • 12 hr: 1.48 vs 2.45 • 16 hr: 1.17 vs 2.14 Avereage tramadol consumption for TAP was 24 mg vs CV it was 270 mg.[5]	To achieve increased patient satisfaction, reduce side effects, and prevent a prolonged hospital stay, a subcostal TAP block before a LC is the route to go as anesthesia providers.[5] It is more efficacious than standard analgesia in decreasing opioid consumption and improving overall pain management.	Strengths: randomized Limitations: small sample size, exclusion of patients who received port-side infiltration further contributing to smaller sample size Feasibility of use in practice/ confidence to act: Subcostal TAP has shown great potential for its use in practice and would be a great adjunct to add to a patients anesthesia care. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Sorenstua et al,[19] 2022	Design: double-blinded, randomized controlled trial This study aims to investigate the analgesic effectiveness post-operatively in two blocks, TAP versus an anterior quadratus lumborum block (QLB), after a laparoscopic inguinal hernia repair.[19] Two equal groups were divided and, pre-operatively, one group received the TAP block and the other received the anterior QLB.[19] Opioid consumption and pain scores were tracked post-operatively to determine if one block proved to provide superior analgesic results than the other.	60 patients, > 18 years old, ASA I-III.[19] • Intervention group: 30 patients • Control group: 30 patients Characteristics of participants: average age 57, average weight 84 kg, average BMI 25, average duration of surgery 45 minutes.[19] Attrition rate: 12% • 7 lost due to conversion to open Setting: county hospital	IV: TAP block with 0.75% of ropivacaine for a total of 20 ml's IV: anterior QLB block with 0.75% of ropivacaine for a total of 20 ml's DV: Consumption of oral morphine equivalent (OME) at different times DV: Pain scores	OME (interval) consumption at 4 hours than at 24h, 48 h, and 7 days.[19] Pain scores (interval) when coughing and at rest at 1 hr, 2 hr, 3 hr, 24 hr, 48 hr, and 7 days post-op.[19] Mann-Whitney test were used to assess non-normally data while t-test were used to assess normality.[19]	No statistical difference in consumption of OME at the 4 hour post-op mark between the TAP group (10.3 ± 7.85 mg) and the QLB group (10.9 ± 10.85 mg) (p = .713).[19] Pain scores between both blocks showed no difference at 7 day period; however, at 1 hour when coughing, the pain score was higher in the TAP group than the anterior QLB (p = 0.025).[19]	Both groups showed similar results when comparing the mean OME and there were no differences noted in pain scores at the 7 day post-op period.[19] OME consumption for TAP and QLM at 4-48 hours is 10 mg, Overall, the NRS at rest and coughing at the different time intervals showed similar results and it could not be concluded if one is better than the other.	When deciding between a TAP or an anterior QLB block for pain management purposes for a laparoscopic inguinal hernia repair, no block was identified to reduce opioid consumption better than the other.[19]	Strengths: randomized, both blocks performed by same anesthesiologist. Limitations: small sample size, lack of use of a PCA pump that could have provided objective information.[19] Feasibility of use in practice/ confidence to act: Either block can be used in practice as both show results in reducing pain; however, not one block is superior than the other. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Zhao et al,[20] 2021	Design: randomized, double blinded, controlled trial This study wanted to assess if a post-op bilateral posterior TAP block could reduce a patients opioid requirement compared with the placebo in those who will undergo a laparoscopic colorectal cancer surgery.[20] Two groups were randomly divided and received different interventions. One group received with block with local anesthetic before extubation while the other received the block but with normal saline.[20]	92 patients, 18-65 years old, ASA I-III.[20] • Intervention group: 46 patients • Control group: 46 patients Characteristics of participants: average age 51, average BMI 23, average duration of surgery 163 minutes. Attrition rate: 11% • 10 patients were converted to open Setting: in affiliated hospital of North Sichuan Medical College.[20]	IV: post-operative bilateral, U/S guided, posterior TAP block with 20 ml of 0.5% ropivacaine on each side.[20] CV: post-operative bilateral, U/S guided, posterior TAP block with normal saline. DV: total rescue tramadol consumption within 24 hrs. DV: NRS at different hour periods: 2, 4, 6, 12, 24, 48, and 72 hr.[20] DV: patient satisfaction in regards to their pain management post-op DV: time to the first request made by the patient for rescue tramadol.[20]	Total tramadol consumption NRS scale (interval) at 2, 4, 6, 12, 24, 48, and 72 hours.[20] Patient satisfaction (1-5 of very unsatisfied- very satisfied) (interval) at 24, 48, and 72 hours.[20] The log-rank test was utilized to compare when the need for the first rescue tramadol dose was needed between each group.[20] For continuous variables, the Student's t-test and Mann-Whitney U test was used.[20] Lastly, to compare qualitative data differences, the Chi-squared test was used.[20]	The total rescue tramadol consumption within the first 24 hours is was reduced in the TAP group than in the control group ($p < 0.001$).[20] The TAP group showed favorable NRS pain scores at the time periods between 2-24 hours ($p < 0.001$); however, similar NRS scores were recorded at 48 and 72 hours.[20] Patient satisfaction was were higher in the TAP group on the first day ($p = 0.002$), but were similar to the control group for days 2 ($p= 0.702$) and 3 ($p= 0.551$) (TAP blocked received 4's, while control received 3's.[20] Less patients who received the TAP block needed rescue tramadol for pain (o < 0.001).[20]	The group that was given the TAP block showed better results than the control group regarding the total rescue tramadol consumption (average opioid mg within 24 hrs for TAP= 0, control= 100 mg) (time to first rescue dose for TAP= 24 hrs, control= 50 minutes)..[20] NRS pain scores at different time periods, patient satisfaction, and need for rescue dosing. Although some areas showed no differences between the two groups, such as at 2 and 3 days post-op with the NRS pain scores and patient satisfaction, it is evident that a TAP block is efficacious in decreasing post-operative opioid consumption.[20]	As moderate post-operative pain is associated with laparoscopic colorectal cancer surgery, a posterior TAP block proves to show success in decreasing analgesic requirements more than no regional anesthetic technique.[20]	Strengths: randomized. Limitations: did not measure plasma concentration of ropivacaine for toxic dose for each patient and adjust accordingly, did not assess sensory of the TAP block.[20] Feasibility of use in practice/ confidence to act: highly feasible to decrease post-operative pain in this particular surgery Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Li et al,[21] 2022	Design: randomized control trial This study's goal is to evaluate the quality and efficacy of an ultrasound-guided bilateral ESP block in improving post-operative pain management and recovery after a laparoscopic surgery for colon cancer.[21] 53 patients were divided into the control and intervention group. Preoperatively, an ESP block was performed for both groups; though only the intervention group received local anesthetic while the control group received normal saline.[21] Data was recorded with visual analog scale (VAS) scores and time to opioid consumption.[21]	53 patients, 18-75 years old, ASA I-II.[21] • Intervention group: 26 patients • Control group: 27 patients Characteristics of participants: average age 65, average BMI 20.[21] Attrition rate: 6 % • Lost because of withdrawal, excluded 2 to make it even. Setting: = local hospital	IV: bilateral ESP block with 20 ml of 0.25% ropivacaine on each side.[21] IV: bilateral ESP block with 20 ml of normal saline each side.[21] DV: VAS scores DV: total post-op analgesia consumption DV: rescue analgesic if VAS score >5	VAS scores (interval) at 2, 6, and 24 hours after surgery.[21] Total post-op consumption tracking The X^2 test was used to compare baseline clinical characteristics of both groups, while the t-test was used to calculate the mean values and standard deviation.	VAS scores at 2, 6, and 24 hours post-op were lower in the ESP block group than those in the normal saline group (p=0.000). In the ESP group, consumption of ketorolac tromethamine was more half lower than the control group ($p < 0.05$).[21]	The average VAS score at 2, 6, and 24 hours for the intervention group was: 2.12, 2.72, and 2.76.[21] The average VAS score at 2, 6, and 24 hours for the control group was: 2.32, 3.68, and 3.32.[21] The average analgesic consumption for the intervention group was 24 mg, while for the control group it was 52 mg.[21]	ESP block for a laparoscopic colon cancer surgery is a promising addition to the multimodal approach to produce better results for patients post-operatively. It is a regional technique that should be included to improve quality of care.	Strengths: randomized Limitations: small sample size, no follow up on pain after 24 hours Feasibility of use in practice/ confidence to act: safe and beneficial to implement into practice Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Mittal et al,[22] 2018	Design: randomized, double-blinded, controlled trial The objective of this study was to determine the efficacy of a TAP block when included in the anesthetic technique for patients undergoing a laparoscopic gastric sleeve resection.[22] To accomplish, two groups were create with one group that received the TAP block along with systemic IV analgesia and another group that would receive only systemic IV analgesia.[22] Postoperatively, the VAS and a satisfaction score were used to make conclusions.[22]	60 patients, 18-60 years old, ASA I-III.[22] • Intervention group: 30 patients • Control group: 30 patients Characteristics of participants: average BMI 45, average weight 119 kg.[22] Attrition rate: 0 Setting: = Sir Ganga Ram Hospital	IV: TAP block with 20 ml per side of 0.375% of ropivacaine.[22] CV: systemic IV analgesia DV: VAS scores DV: 'Capuzzo' satisfaction score DV: rescue medication	VAS scores (interval) at rest and with movement at 30 min, 3 hr, 6 hr, 12 hr, 24 hr, 48 hr.[22] 'Capuzzo' satisfaction score (interval), the higher the score the more satisfied the patient is. Rescue medication doses to breakthrough pain was higher in non-TAP vs TAP group ($p < 0.001$).[22]	The VAS scores differ significantly between the TAP group and non-TAP group at each time period ($p < 0.001$).[22] The Capuzzo satisfaction score was higher in the TAP group than the control ($p < 0.001$).[22]	Average VAS scores between the TAP and non-TAP group.[22] • 30 min- 6.53 vs 7.47 • 3 hr- 7.07 vs 6.00 • 6 hr- 6.27 vs 5.20 • 12 hr- 5.60 vs 4.13 • 24 hr- 4.00 vs 2.93 • 48 hr- 3.07 vs 2.00 Mean patient satisfaction score for the Non-TAP group is 7.07, while it is 8.20 for the TAP group.[22] Mean number of rescue medications of Non-Tap is 2.60 vs 1.27 in TAP group.[22]	U/S- guided TAP block to minimize post-operative pain and increase patient satisfaction for patients undergoing bariatric procedures is a minimally invasive and an effective regional anesthetic technique that should be added to an anesthetic plan.	Strengths: randomized, Limitations: small sample size Feasibility of use in practice/ confidence to act: Administration of U/S guided TAP block is feasible to use in practice for bariatric surgery to decrease the pain that is usually seen from such surgeries Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Mostafa et al,[23] 2021	Design: randomized, double-blinded, controlled trial This study evaluates the effects of a U/S guided bilateral ESP block before induction of anesthesia on the pain-relieving results it brings. One group will receive the block, while the other will receive a placebo. VAS scores and median total post-op morphine consumption are both recorded to proceed to a conclusion.[23]	60 patients, 18-65 years old, ASA III.[23] • Intervention group: 30 patients • Control group: 30 patients Characteristics of participants: average age 39, BMI > 40, average duration of surgery 160 minute,.[23] Attrition rate: 0 Setting: = hospital OR	IV: bilateral ESP block ultrasound-guided 20 ml per side of 0.25% bupivacaine CV: bilateral ESP block ultrasound-guided 20 ml per side of normal saline DV: VAS scores DV: total median post-operative morphine consumption DV: mean time to first morphine dose	VAS scores (interval) at 30 min, 1 hr, 2 hr, 4 hr, 6 hr, 8 hr , 12 hr, 18 hr, and 24 hours.[23] 24-hour post-operative mean cumulative morphine consumption Mean time to first morphine dose was vastly longer in the ESP group than in the control group ($p < 0.001$).[23]	The VAS score was lower at every time assessed in the ESP group ($p < 0.001$.[23] The 24-hour post-operative mean cumulative morphine consumption was lower in the ESP group than the control group $p < 0.001$).[23]	The first 8 hours VAS scores were assessed, significant differences were noted between the ESP group and control group; however, at 12, 18 and 24 hours, although VAS scores were lower in the ESP group, they were nonsignificant.[23] Mean morphine consumption for the ESP group was 8.0 mg vs 21 mg in the control group within the first 24 hours.[23] The time to first morphine dose for the ESP block group was 420 minutes vs 27.5 minutes from the control group.[23]	In patients undergoing laparoscopic bariatric surgery, incorporating a bilateral U/S guided ESP block into the analgesic regimen is effective in reducing opioid consumption and pain post-operatively that is commonly seen after this specific surgery.[23]	Strengths: randomized Limitations: small sample size, did not documentation sensory loss of block Feasibility of use in practice/ confidence to act: ESP blocks should be incorporated in the anesthetic plan of a patient undergoing this procedure. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Ashoor et al,[24] 2023	Design: randomized, prospective, double-blind, single-center study.[24] This study aims to compare the quality of post-operative pain management within 24 hours between ESP block and QLB block with patients undergoing laparoscopic sleeve gastrectomy. Three groups are divided to receive different interventions such as ESPB, QLBB, and standard IV analgesia as the control group.[24] Different data points are tracked to determine which block is more efficacious.[24]	120 patients, 21-60 years old.[24] • ESP group: 40 patients • QLB group: 40 • Control group: 40 patients Characteristics of participants: average age 34, average BMI > 45, average duration of surgery 104 minute,.[23] Attrition rate: 16% • Lost due to block failure, conversion to open, reoperation within 24 hours, and allergic reaction to block.[24] Setting: = Ain-Shams University Hospital	IV: ESPB 30 ml per side of 0.25% bupivacaine.[24] IV: posterior QLBB 30 ml per side of 0.25% bupivacaine.[24] CV: IV analgesia DV: VAS at rest and during movement DV: total nalbuphine consumption from PCA pump DV: total ketorolac rescue analgesia	VAS scores (interval) at 30 mins, 2 hr, 4 hr, 6 hr, 8 hr, 12 hr, and 24 hr.[24] PCA pump to assess how much nalbuphine is needed in first 24 hours. Normality was tested using the Shapiro-Wilk test.[24] Chi square and Fisher's exact test were both used to assist with small expected numbers.[24]	VAS scores at rest and movement were higher in the control group than both block groups ($p < 0.001$).[24] First rescue analgesia time was noted to be significantly lower in the control group than both block groups ($p < 0.001$).[24] Between both blocks, similar results were produced. Compared to both block groups, the control group had a higher nalbuphine consumption, total rescue analgesia dose, and frequency of rescue analgesia ($p < 0.001$).[24]	VAS scores were significantly higher in the control group, with the QLB having slightly lower scores.[24] Average total nalbuphine consumption within 24 hours for ESPB is 64.4 mg, QLB is 57.1 mg, and control group is 77.5.[24] Time to first rescue dose of analgesia for ESPB group was 21.4 minutes, QLB is 22.2 minutes, and control is 0.7 minutes.[24]	It is evident that regional anesthesia is the way to proceed when wanting to reduce analgesic requirements and increase quality of recovery. The difference between a QLB and ESP block is insignificant, and both have ability to provide efficient post-op analgesia in patients undergoing a laparoscopic gastric sleeve.[24]	Strengths: randomized, good sample size Limitations: no follow up after 24 hours Feasibility of use in practice/ confidence to act: feasible in decreasing post-operative pain and can be performed safely in patients Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Arik et al,[25] 2020	Design: randomized, double-blinded, controlled trial. This study's purpose was the compare the analgesia efficacy of local anesthetic infiltration at port sites with unilateral subcostal TAP block in patients scheduled for a LC. [25] Groups were divided into three, consisting of the TAP group, LA infiltration group, and control group. Analgesia control was monitored for each group post-operatively.	72 patients,18- 80 years old, ASA I- III.[24] • TAP group: 24 patients • Control group: 24 patients • LA infiltration: 24 patients Characteristics of participants: average age 44.1, average BMI 29.4, average duration of surgery 69.1 minutes.[25] Attrition rate: 0 Setting: University hospital	IV: Unilateral subcostal TAP block with 20 ml of 0.25% bupivacaine.[25] IV: local anesthetic infiltration at port sites with 20 ml of 0.25% bupivacaine.[25] CV: regular IV analgesia DV: PCA usage of tramadol (total tramadol consumption) DV: NRS score during rest and cough DV: Likert-type scale of patient satisfaction	NRS score (interval) during rest and cough at 1 hr, 3 hr, 6 hr, 12 hr, 24 hr. Total tramadol consumption was measured for each group Patient satisfaction with Likert-type scale (interval) Shapiro-Wilks test was used to assess normality, while the Levene's test was utilized to assess homogeneity of variances.[25]ANOVA was used to compare study groups.[25]	NRS score in the TAP group at rest was lower than both other groups at 1 hour and 12 hour mark (p= 0.007 and p= 0.016).[25] NRS score while coughing for the TAP group was statistically significant at 1 hour (p= 0.004).[25] Total tramadol consumption within 24 hours was significantly decreased in the TAP group compared to the other two groups (p < 0.001).[25] Patient satisfaction was highest in the TAP block group.	At 1 hr, NRS average score for TAP was 3.29, LA was 4.95, and CV was 5.7.[25] At 6 hr, TAP was 1.7, LA was 2.29, CV was 2.62.[25] At 24 hr, TAP was 0.83, LA was 1.29, and CV was 1.50.[25] Average tramadol consumption in TAP block group was 229 mg vs 335 mg in LA infiltration group vs 358 mg in control group.[25] 83.3% of patients wanted to receive the TAP block again if were to have a similar procedure as they were satisfied with the analgesia they received versus 62.5% in the local anesthetic filtration and 70.8% with the control group.[25]	Local anesthetic infiltration and regular IV analgesia were inferior to unilateral subcostal TAP block in decrease opioid consumption post-operatively.[25] It is recommended to include a unilateral subcostal TAP block in the anesthetic plan for patients undergoing a LC.	Strengths: randomized Limitations: no follow up after 24 hours, sensory block could not be evalued Feasibility of use in practice/ confidence to act: very feasible as a TAP block is quick and easy to perform for lasting results after a LC. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Vrsajkov et al,[26] 2021	Design: randomized, double-blinded, controlled trial This study's goal was to the influence an ESP block has on a patients post-operative pain undergoing a LC.[26] Groups were divided into two, one group received the ESP block, while the other group received standard multi-modal analgesia.[26] Data was then measured post-operatively.	62 patients, years old.[24] • ESP group: 30 patients • Control group: 30 patients Characteristics of participants: average age 54, average weight 81, average duration of surgery 67 minute.[26] Attrition rate: 4% • Lost due to withdrawal or inappropriate cooperation.[26] Setting: = Clinical Centre of Vojvodina, Novi Sad, Serbia	IV: ESP block with 20 ml per side of 0.25% levobupivacaine + Decadron 2 mg CV: standard multi-modal analgesia of 100 mg of tramadol at procedure end DV:NRS scores DV: total tramadol consumption	NRS scores (interval) at 10 min, 30 min, 2 hr, 4 hr, 8 hr, 12 hr, and 24 hr.[26] total tramadol consumption	ESP group had significantly lower pain scores throughout all time periods the NRS was assessed ($p < 0.007$).[26] Total tramadol consumption in ESP group was lower then control group ($p < 0.001$).[26]	Average NRS score with ESP vs CV • 10 min= 2.76 vs 4.26.[26] • 30 min= 2.81 vs 4.23.[26] • 2 hr= 3.20 vs 4.33.[26] • 4 hr= 2.70 vs 3.90.[26] • 8 hr= 2.13 vs 3.03.[26] • 12 hr= 1.46 vs 2.46.[26] • 24 hr= 1.20 vs 2.23.[26] Average tramadol consumption for ESP group was 25.02 mg vs 208.3 mg in the control group.[26]	An ESP block for a LC can provide more pain controlling qualities than regular IV systemic analgesia. Total opioid administration and need is decreased with an ESP block; therefore, its use for these surgeries is effective.	Strengths: randomized Limitations: no follow up after 24 hours, only recorded pain at rest, no placebo, lack of PCA usage Feasibility of use in practice/ confidence to act: very feasible and proven results to offering better post-op pain control. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Park et al,[27] 2022	Design: randomized, prospective, double-blinded, controlled trial This study's purpose is to determine if including a TAP block in the anesthetic plan for a patient undergoing a laparoscopic nephrectomy has the ability to improve the postoperative quality of recovery and prevent pain-related negative outcomes. Two groups were randomized into the intervention group (TAP block) and control group.[27] Post-operative data was collected to come to a conclusion on the TAP block's efficacy.[27]	60 patients, 20-80 years old, ASA I-III.[24] • TAP group: 30 patients • Control group: 30 patients Characteristics of participants: average age 59, average BMI 24, average weight 68 kg, average duration of surgery 191.5 minute,. Attrition rate: 10% • Lost due to side effect of PCA and conversation of open procedure Setting: = Kyungpook National University Chilgok Hospital	IV: TAP block 40 ml of 0.375% ropivacaine CV: TAP block 40 ml of normal saline DV: QoR-40 DV: total usage time of PCA pump DV: number of boluses pushes in PCA pump	QoR-40 (nominal) Total usage time of PCA pump Number of boluses pushes in PCA pump Data was analyzed using IBM SPSS statistics.[27]	The Intervention group (TAP block) received better QoR-40 scores than the control group (p = 0.006).[27] The cumulative time usage for PCA was significantly different in the TAP group compared to the control group (p= 0.30).[27]	Average score for the QoR-40 was 171.0 in the IV group vs 151.9 in the CV group.[27] Total time usage for PCA pump was 34 hours hours for TAP group and 32.6 hours for CV.[27]	To improve surgical outcomes and decrease morbidity rates for patients undergoing a laparoscopic nephrectomy, an ultrasound-guided TAP block is a good addition to the anesthetic technique and has shown its effectiveness through this study.[27]	Strengths: randomized Limitations: small sample size Feasibility of use in practice/ confidence to act: highly feasible to do a TAP block in this case to prevent negative surgical outcomes and improve quality of care Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Huang et al,[28] 2022	Design: randomized, prospective, double-blinded, controlled trial This study aims to assess if U/S guided ESP block can improve post-operative analgesia in patients under laparoscopic hepatectomy.[28] Two groups were created, one of which would receive the ESP block and the other would receive standard IV analgesia.	50 patients, 18-80 years old, ASA I-III.[28] • ESP group: 25 patients • Control group: 25 patients Characteristics of participants: average age 58, average BMI 24, average weight 62 kg, average duration of surgery 249 minute.[28] Attrition rate: 0 Setting: = West China Hospital, Sichuan University	IV: bilateral, U/S guided ESP block with 15 ml on each side of 0.5% of ropivacaine.[28] CV: IV analgesia DV: VAS resting at 3 hr DV: VAS resting and with movement at 6 hr, 12 hr, 16 hr, 20 hr, 24 hr, 48 hr, and 72 hr. DV: post-op rescue analgesia	VAS score (interval) Post-op rescue analgesia Shapiro-Wilk test was used to determine normality.[28] Categorical data differences were assessed using fisher exact probabilities test or Pearson x^2 test.[28] The Mann-Whitney U-test was used for ordinal or skewed data.[28]	ESP block group showed significantly lower VAS scores at 3 hours post-op than the CV ($p < 0.001$).[28] Also, lower scores were seen in the ESPB group during movement and rest at 6-24 hours post-op.[28] ESPB group experienced less rescue analgesia consumption within 72 hours ($p < 0.001$).[28]	Average VAS scores at 3 hours for ESPB group was 2 vs 4.3 in the CV.[28] Average rescue analgesia consumption for ESPB group was 9 mg vs 20.3 mg in the CV group.[28]	ESPB improves post-operative analgesia and accelerates patient recovery by decreasing opioid consumption and VAS scores in patients undergoing laparoscopic heptectomy.[28]	Strengths: randomized, similar characteristics of subjects Limitations: small sample size, no placebo Feasibility of use in practice/ confidence to act: highly feasible to perform in patients under going laparoscopic hepatectomy to improve post-op results Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Breazu et al,[29] 2022	Design: randomized, prospective, double-blinded, controlled trial Three groups were randomly divided to assess what analgesic technique is most efficient in controlling post-operative pain after a LC. The groups would consist of: an oblique subcostal TAP block (OSTAP) , local anesthetic infiltration (LAI) of port sites, and classic multimodal IV opioid analgesia.[29]	79 patients, >18 years old, ASA I-II. • TAP group: 26 patients • LA infiltration group: 27 patients • Control group: 26 patients Characteristics of participants: average age 52, average weight 75 kg, average duration of surgery 42 minute.[29] Attrition rate: 6% • Lost due to conversion to open and violation of protocol. Setting: = Regional Institute of Gastroenterology and Hepatology	IV: bilateral OSTAP with 20 ml per side 0.25% of bupivacaine IV: local anesthetic infiltration of port sites with 5 ml 0.25% of bupivacaine CV: classic multimodal IV opioid analgesia (fentanyl). DV: VAS scores DV: post op pethidine consumption	VAS scores (interval) at 0, 6, 12, and 24 hours. Post-op pethidine consumption within first 24 hours Shapiro-Wilk test to determine normal distribution.[29]	Compared to the LAI and CV, the OSTAP VAS scores within the first 24 hours were significantly lower ($p < 0.001$).[29] The total pethidine consumption in 24 hours was lower in the OSTAP block group than the LAI group and opioid analgesic group ($p < 0.006$ and < 0.001).[29]	At 6 hours, the average VAS score for OSTAP group was 0.7 vs 4 for the LAI and 4.5 for the CV groups.[29] Average pethidine consumption for the OSTAP group was 30 mg vs 60 mg in the LAI group vs 90 mg in the CV group.[29]	The study has shown that the implementation of an OSTAP block has the ability to reduce pain scores and opioid consumption post-operatively compared to LAI and standard IV analgesia.[29]	Strengths: randomized Limitations: small sample size, could not assess sensory block, pain score only evaluated during rest, no assessment of pain from 0-6 hours, lower volume of LA for the port infiltration than the TAP block.[29] Feasibility of use in practice/ confidence to act: very practical to implement as results show positive outcomes. Level of Evidence: L-II

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Canitez et al,[4] 2021	Design: randomized, prospective, double-blinded, controlled trial This study sought to determine if the postoperative quality of recovery can be improved by incorporating a ESP block into the anesthetic plan for a patient undergoing a LC.[4] In order to assess, two groups were created with one that would receive the ESP block and one that would receive standard analgesic regimen.[4]	85 patients, 18-65 years old, ASA I-II.[4] • ESP group: 42 patients • Control group: 43 patients Characteristics of participants: average age 35, average weight 72 kg, average BMI is 26, average duration of surgery 77 minute.[4] Attrition rate: 4% • Lost due to lack of follow up. Setting: = University of Health Science, Konya Education and Research Hospital.	IV: bilateral ESPB with 20 ml on each side of a LA mixture of bupivacaine 0.5% (7.5 ml), lidocaine 2% (2ml), and NaCL 0.9% (10 ml).[4] CV: standard IV analgesia DV: QoR-40 scores DV: pain numerical rating scores DV: total tramadol consumption	QoR-40 (nominal) Pain scale (interval) Total tramadol consumption within 24 hours Kolmogorov-Smirnov test was used to examine the normal distribution of the variables while the Mann-Whitney U-test tested normality of the variables.[4]	QoR-40 scores were higher in the ESPB group than CV group ($p < 0.01$).[4] Pain scores at each time period assessed were found to be significantly lower in the ESBP than the CV group ($p < 0.01$).[4] Total tramadol consumption within the first 24 hours was higher in the CV group than ESB group ($p < 0.01$).[4]	Average QoR-40 scores in the ESPB group was 181 vs 167 in CV group.[4] This indicates that the quality of recovery was better in the ESPB group. Total tramadol consumption for the ESB group was 0 mg and 180 mg in the CV group.[4]	The study recommends the inclusion of an ESPB in patients undergoing a LC to see improvements in patients pain and recovery post-operatively.[4]	Strengths: randomized Limitations: small sample size, lack of sensory evaluation Feasibility of use in practice/ confidence to act: ESPB is great addition to reduce post-operative pain and improve quality of recovery after a LC. Level of Evidence: L-II

Discussion/Summary of Evidence

Administration of an ESP block prior to or immediately after a laparoscopic procedure has shown to be a great addition to the multimodal approach in combating the post-operative pain and discomfort that is common after this type of surgical route. Eight randomized controlled trials were chosen, and data was pulled to reveal if an ESP block could prove to be superior to other pain treatments, such as IV analgesics and port site entry infiltration. Statistically significant evidence was found in each study supporting an ESP block with its pain-relieving effects. Altiparmak et al[18] found the mean tramadol consumption and PCA pump usage 24 hours after a LC was much lower in the ESPB group than in the placebo group that received 40 ml's of saline instead of 0.25% bupivacaine. In the same study, NRS scores at five different time periods saw vastly higher scores in the placebo group.

Vrsajkov et al[26] wanted to assess implementing an ESP block on a patient undergoing a LC also saw similar results with lower NRS scores and total tramadol consumption. Vrsajkov et al[26] found the average tramadol consumption for the ESPB group to be 25.02 mg versus 208.3 mg in the control group; while, Altiparmak et al[18] found the average tramadol to be 100 mg versus 143 mg for the control group. Nevertheless, in both studies, ESPB proved to be successful. Canitez et al[4] showed similar results after a LC with an ESP block, where the average tramadol consumption in the first 24 hours was 0 mg versus 180 in the control group, which consisted of standard IV analgesia. This study incorporated a QoR-40 score that gives insight into patient satisfaction, comfort, emotional state, pain, and more.[4] The QoR-40 score for the ESPB group was higher than the control, indicating a better recovery.[4]

Atinsory et al[2] showed that after a laparoscopic hernia surgery, the patients who received an ESP block showed lower NRS scores, higher QoR scores, and consumed less tramadol post-

procedure (60 mg vs 80 mg).[2] Common themes were seen across a few more studies with the ESP block leading to reduced analgesic consumption after the laparoscopic procedures for colon cancer, gastric sleeve, and hepatectomy.[21,24,28] Visual analog scores were recorded across multiple studies where the ESP block showed significant differences between the groups that did not receive it. The VAS scores were reportedly lower in those with the block in the post-operative period.[21,23,24,28]

Currently, a TAP block is the preferred and most commonly chosen block for patients undergoing laparoscopic procedures. Vrsaikov et al[5] found that after a LC, patients who received standard IV pain medication of tramadol experienced higher NRS scores and consumed more analgesic medications post-operatively than the TAP block group (240 mg vs 24 mg). Another study produced the same results after a LC; however, in addition to the NRS score and total tramadol consumed, a Likert-type scale and PCA pump to measure the analgesic need better was used.[25] These additional measurements produced better results for the TAP block group.

Arik et al[25] performed a study comparing a TAP block, local infiltration, and regular IV analgesia. In this study, through the Likert scale, 83.3% of patients wanted to receive the TAP block again if they were to have a similar procedure as they were satisfied with the analgesia they received versus 62.5% in the local anesthetic filtration and 70.8% with the control group.[25] These results indicated that patient satisfaction with pain management post-operatively was highest in the TAP block group.[25] Another study similarly compared a TAP block, LAI, and classic multimodal opioid analgesia; however it used VAS scores to determine the post-operative efficacy.[29] VAS scores were recorded for this study during the 1st hour, 6th, 12th, and 24th.[29] At each mentioned hour, the TAP group was significantly lower than the LA infiltration and IV analgesic group.[29] VAS scores recorded in another study after a laparoscopic gastric sleeve

resection that experimented the TAP block's efficacy also found them to be in favor of the block with the lower scores patient's reported.[22] Park et al[27] recorded QoR-40 scores after a laparoscopic nephrectomy to gather more about the patient's pain experience, comfort level, and overall recovery. In this study, it was evident that the QoR-40 score for the patients who received the TAP block was higher (171.0) than the control group of a placebo of 40 ml's of normal saline (151.9).[27]

Furthermore, it is noticed across two more studies that the incorporation of a TAP block for laparoscopic procedures of colorectal cancer and inguinal hernia repair improves the perioperative experience for the patients with lower NRS scores, lower total tramadol consumption, and higher patient satisfaction scores.[19,20] However, Sorenstua et al[19] found that there was no difference between a TAP block and a quadratus lumborum block (QLB) in morphine consumption after a laparoscopic inguinal hernia, but pain scores were higher at the one-hour mark in the TAP group versus the QLB group.[19] Although both blocks showed better results than sole IV opioid medication, this opens the door to the possibility of bringing light to implementing other blocks apart from a TAP into the anesthetic plan for a laparoscopic case.

Organizational Assessment

Organizational Assessment

The following sections will cover the goal of the quality improvement (QI)project, present SMART objectives, discuss the program structure, offer a SWOT analysis, and provide a theoretical framework. Strengths, weaknesses, opportunities, and threats will be identified at the facility that will be incorporating the QI project. This will assist in pinpointing areas that may make it challenging to implement this project and, further, help identify areas that need improvement to be successful.

Primary DNP Project Goal/ Program Structure

The goal of this QI project is to determine which regional anesthetic technique, erector spinae plane (ESP) or transversus abdominis plane block (TAP), is more efficient in decreasing opioid consumption after a laparoscopic procedure. As an ESP block is a more novel technique and has recently started to be used for these procedures, it is questioned if this block is superior to a TAP block, which is the go-to block for most anesthesia providers for these cases. Through research, it is seen that a TAP block can lessen post-operative pain; however, this block does not provide the visceral pain relief that is needed to fully manage post-operative pain.[16] An ESP block contains that missing aspect; therefore, it could become the gold standard if research proves to support better patient outcomes and recovery.

The facility where this QI project was implemented is a level I trauma center with 797 beds, 21 operating rooms (OR), 4 gastrointestinal suites (GI), 6 electrophysiology rooms, and 2 obstetrics ORs. The anesthesia department is separate from the actual facility as it is a national anesthesia group that focuses on and values extraordinary care, teamwork, joy, trust, and curiosity. CRNAs and Anesthesiologist Assistants (AAs)are medically directed by anesthesiologists; therefore, since they are the key stakeholders, it is vital to get the anesthesiologist onboard and present the evidence with which block is better for laparoscopic surgeries to prevent post-operative complications and improve patient outcomes.

This facility is seeing more than a handful of laparoscopic cases done daily, whether it is for cholecystectomies, appendectomies, hysterectomies, nephrectomies, kidney donations, bariatric procedures, and other abdominal-related procedures. TAP blocks are occasionally administered, depending on the attending's plan of care and consent, post-procedure while the patient is still in the OR. As research shows and has been mentioned above, post-operative pain

is a high risk as more than half of the patients can experience it to moderate to severe levels once in the recovery room area.[1] Furthermore, if a TAP block is administered, the patient is still at risk for visceral pain, which is a type of pain that comes from within, harder to locate, and is difficult to treat. Although the literature proves regional anesthesia is the best route to implement if the procedure allows for it, some anesthesiologists still chose to opt out of doing a regional block and treating pain intraoperatively with opioids or nonopioid analgesics, then putting in PACU orders for as-needed pain medication depending on patients reported pain level from 0-10 (0 being least and 10 being severe). Another aspect that presents an issue is many providers at this site do not know how to perform an ESP block since it is a newer regional block; therefore, education and training are needed for this block that has the potential to treat post-operative pain after any laparoscopic procedure better.

It was also important to note that patients in this area where the facility is come from many different backgrounds regarding ethnicity and education. It is critical to be culturally competent when discussing anesthesia with the patient and to speak in terms that are understandable for those who are not medically trained. The participants received the educational module for this QI project include the anesthesiologist, who are the key stakeholders, and CRNAs, who are other important stakeholders as anesthesia personnel work together in a cohesive environment. The educational module consisted of research about pain after laparoscopic surgeries, the origin of that pain due to the route, information about the TAP block, introduction of the ESP block, and how to perform an ESP block. Before this module, a preliminary survey was sent to the anesthesia staff consisting of questions that gauge where the providers stand in terms of knowledge on this DNP project. After this questionnaire, the educational module was provided in PowerPoint format. Lastly, the staff completed a post-

module survey with additional questions to allow for the researcher to compare the two questionnaires after education was provided and assess what changed with the new knowledge gained.

SMART Objectives

The SMART model is used to create objectives that are specific, measurable, achievable, relevant, and time-based. This DNP QI project has identified the following SMART objectives to follow as a guide to moving in the right direction to properly assess the outcomes produced and goals set. These objectives include:

Specific

Anesthesia staff was presented with evidence-based research on post-operative pain experienced after laparoscopic surgeries, including statistics, consequences, and ways to combat it. This was completed by participating in a educational module created by the researcher.

Measurable

The researcher sent a pre-questionnaire to be able to assess the success of the educational module through the post-questionnaire. A successful educational module showed new knowledge was acquired and well-received.

Achievable

Anesthesia staff was educated on the two different regional blocks, ESP and TAP, to treat post-operative pain after laparoscopic procedures.

Realistic

Anesthesia staff was given the tools and research necessary to make the change in handling post-operative pain after laparoscopic surgeries at their facility.

Timely

The educational module was created in a timely matter of 4 months and presented to anesthesia personnel of the facility chosen by the researcher.

SWOT Analysis

After completing an organizational assessment, a SWOT analysis is an imperative next step toward the successful implementation of the QI project at the chosen facility. Four important areas are analyzed and identified in order to determine positive qualities, potential obstacles, areas that are lacking, improvements needed, limitations regarding resources, etc. These four domains include strengths, weaknesses, opportunities, and threats that related to the specific site.

Strengths

Many strengths can be identified through the implementation of this project, such as fewer post-operative complications, reduced issues with post-operative pain after a laparoscopic case, and, overall, improved patient outcomes. Introducing a superior regional anesthetic block allows anesthesia providers to stray away from opioids that lead to a plethora of issues, including possible dependence, delayed discharge, GI issues, prolonged time to ambulation, respiratory depression, and altered mentation.[4] Due to these improvements, the organization will see more positive patient results from the discharge surveys and feedback to the surgeon. This also leads to better surgeon satisfaction as they will see less complications and more patient referrals. This entices the stakeholders as it creates a healthier work environment and decreases stress. Another strength revolves around the organization's desire to move toward more use of regional anesthesia for cases as it is the future of anesthesia.[30] As technology has improved with ultrasound guidance, nerves and fascia planes where the nerves live are easily located and targeted for better regional results.[30]

Weaknesses

An organizational weakness noted is the providers' lack of knowledge of an ESP block and lack of skill to perform that block. Therefore, training is needed to be successful, which could be seen as extra work and hard to make time for in an already busy hospital OR environment. Furthermore, providers may lack knowledge of the origin of pain that occurs post-operatively after laparoscopic procedures. As mentioned above, a laparoscopic route brings forth referred, visceral, incisional, and peritoneal pain, whereas traditional laparotomy deals with primarily somatic pain.[8] Additionally, treating visceral pain is complex, and providers who know about this pain have yet to find a regimen that manages it; however, an ESP block has the ability to provide visceral pain relief.[7] Some providers may not know that a TAP block lacks the visceral pain relief and also can sometimes unreliably block the T7 and T8 dermatomes that are needed to provide somatic pain relief post-operatively.[6] Despite this, a TAP block is the only block used for some laparoscopic procedures performed at the facility.

Opportunities

A big opportunity seen with the implementation of this QI project is the reduction of patients who experience post-operative pain after laparoscopic surgeries. In addition to less pain, the hospital will see less complications, faster recoveries, and decreased use of opioids as a direct result. Patients will be more satisfied post-operatively and, with an ESP block, will have more encompassing analgesia.

Threats

A few threats have been identified as potential problems to initiating this DNP project. One threat is changing the common practice of administering TAP blocks or using solely opioids. Anesthesia providers can be reluctant to change and want to stick to their traditional

ways of anesthetic plans. However, this puts the patient at risk for worse outcomes that can be avoided with new evidence-based techniques such as performing an ESP block.

Another threat is the more work it takes to do an ESP block. For example, with a TAP block, it can be done after the surgeon completes the surgery while the patient is still sedated on the OR table. However, with an ESP block, it is to be completed pre-operatively, with patient cooperation. Another way to perform this block is lateral, which can be done after the surgery while the patient is still sedated on the OR table, but many providers may not want to do the extra work to administer the ESP block.

Conceptual Underpinning and Theoretical Framework

Theory Overview/Clinical Fit/Evaluation

In healthcare, change should always be welcomed, especially in anesthesia, as new evidence-based research is found, and practice guidelines are formed to enhance patient safety, outcomes, and satisfaction. A clinical change that may seem simple through discussion is sometimes challenging to implement because of reluctance to adopt new practices, traditional culture, and lack of planning.[31] However, if an organizational theory of change is used to implement the desired change, then the odds are more likely that it will be accepted into everyday practice and be successful.[31]

Lewin's theory of change will be used to help guide this QI at the facility chosen. The theory has three stages in the order presented: unfreezing, moving, and refreezing.[32] Unfreezing is ensuring the staff knows that change is needed and why, moving is initiating that change and communicating effectively with the staff, and refreezing is when a new expectation is established as the change has been implemented and accepted.[32] This helps sustain the change.

With this QI project, in the unfreezing stage, the staff should be provided with evidence-based research on the likelihood of pain after a laparoscopic procedure, the risks associated with it, and what is currently being done at the hospital. Information about the two blocks presented and the pros and cons of each should also be brought to light. It should be made evident that change in the current anesthetic plan is necessary for better patient outcomes. This will be done with the help of the educational module. In the moving phase, anesthesia providers will administer ESP blocks pre-operatively for laparoscopic cases and utilize regional anesthesia to their advantage in decreasing intraoperative and post-operative opioid use and need, seeing reduced pain levels post-operatively, and producing superior surgical outcomes. The last phase of Lewin's theory of change, refreezing, will result in a policy change within the organization with new guidelines and protocols on the anesthesia regimen for a laparoscopic case. This phase ensures that the new expectation to treat post-operative pain is being held to the new standard.

Methodology for Proposal

Setting and Participants

A level I trauma center in South Florida was the setting chosen for this QI project to be implemented. Anesthesia is provided daily for multiple laparoscopic cases at this site; therefore, the QI project would tremendously benefit the organization by decreasing adverse patient outcomes post-surgery and improving its reputation. Certified Registered Nurse Anesthetists (CRNAs) and Anesthesiologists were the participants used as the topic relates to and directly affects their everyday practice. For provider convenience, all activities to complete were done through email and online for the educational module. Two surveys, the pre-and post-questionnaires, were sent via email that each anesthesia personnel provided.

Description of Approach and Project Procedures

The DNP project began by receiving approval of the PICO by a designated faculty advisor. After approval, the researcher gathered evidence-based information to form a proposal over four months. This proposal was presented to the Florida International University (FIU) faculty, and approval was granted to move forward to the next step, which would be to receive permission from the Internal Review Board (IRB). Once approval from the IRB was obtained, the QI project was able to move on to gathering the participants and their emails to begin the results section. Informed consent was provided via Qualtrics prior to accessing the survey approved by the IRB to ensure the rights of individuals are protected and respected. This part entailed sending an initial questionnaire to determine the current knowledge on the topic at hand. Next, an educational module using PowerPoint was presented, and following that, a post-questionnaire was sent via email to assess new knowledge that was acquired. Results from the two questionnaires were analyzed and compared to determine the importance of education and come to a conclusion on the topic provided.

Protection of Human Subjects

Qualtrics Pre and post-survey qualitative responses are completely separate from any kind of personally identifiable information. Respondents could not be identified through unique identifiers in Qualtrics and email addresses used through the distribution list for recruitment were not used to analyze data. Only aggregated data were reported. The emails of each participant were kept secure and were only used on three occasions to send the initial questionnaire, educational module, and post-questionnaire. Answers to the questionnaires were anonymous; therefore, it was not possible to determine which participant answered what. Informed consent was obtained before sending any of the QI project interventions via email. They were presented

with the benefits of participating in the project, which consisted of new knowledge and ways to deliver better anesthesia for their patients. Any risks, although minimal, or potential harm would have been prevented, which may include mild physical discomfort or emotional stress from sitting on a chair for an extended period.

Data Collection

Data that was collected during this project was gathered from the pre-and post-questionnaire results. This allowed the researcher to gauge the anesthesia providers' initial knowledge and, later, knowledge gained from the educational module that will be presented via PowerPoint slides. Qualtrics is an electronic system that was used to help with the comparison of the questionnaires. The educational module was sent to the anesthesia providers' emails so they can have evidence-based information readily available to educate others or re-educate themselves. There will be approximately 56 anesthesia providers asked to participate in the project. The demographics of these individuals were requested; however, disclosure was optional.

Data Management and Analysis Plan

Through Qualtrics, data was analyzed under a secure server, and the PI and co PI only had access to the results. Emails were protected by the researcher by not sharing with others and not releasing personal information if provided by the participants. This all ensures confidentiality with the results that were developed and through the conclusion that was made.

Discussion of the Results

After evaluating the results of the 15 randomized controlled trials that were presented earlier in this project, it is clear that regional anesthesia decreases opioid administration in the post-operative area after various kinds of laparoscopic surgeries. Now that it is known of the

efficacy of incorporating regional anesthesia into the anesthetic regimen to decrease opioid consumption after this kind of surgery, the question lies in which block providers should chose for better pain-relieving effects. Through the research, ESP blocks have been gaining popularity due to their ability to target multiple pain pathways that a TAP block does not.[7] Discovering this characteristic of an ESP block proves that it is a superior option to offering a more all-encompassing analgesic effect after minimally invasive abdominal-related procedures. After reviewing the results of the educational module through Qualtrics, it was clear that the baseline knowledge of providers was lacking in regards to how common pain after laparoscopic surgery is and what kind of pain felt by those patients. Furthermore, providers did not know key facts about regional blocks and how to properly treat this kind of pain. However, after the educational video, providers became much more educated on the topic and could identify that an ESP block that has visceral pain-relieving effects is an excellent choice to manage postoperative pain after a laparoscopic procedure. Therefore, this DNP project was successful in educating anesthesia providers to improve patient outcomes.

Timeline

The QI project took place over the course of three academic semesters. The first semester, which consists of four months, included creating a PICO that would help the clinical site improve and could help other sites. This semester was where all the research took place to develop a DNP proposal that will be presented to the FIU faculty for approval to move forward. The next semester included getting approval for IRB, creating the pre-and post-questionaries, developing the educational module, and gathering participants after approval was received. The last semester was where the surveys and educational module were sent out, and the data was collected in order to form the results section. The last semester was a three month summer

semester, which gives participants enough time to do the initial survey, educational module, and post survey at their convenience.

Results

Participant Demographics

Table 1. Participant Demographics

Category	# of Participants (11 Total)	Percentages %
Gender		
Male	4	36%
Female	5	45%
Prefer not to say	2	18%
Age		
25-35	5	45%
35-50	5	45%
50-70	1	9%
70-75	0	0%
Ethnicity		
Hispanic	6	55%
Caucasian	3	27%
African American	1	9%
Asian	1	9%
Position Title		
CRNA	9	82%
Anesthesiologist	2	18%
Resident	0	0%
Anesthesiologist Assistant	0	0%
Level of Education		
Bachelors	2	18%
Masters	4	36%
DNP	5	45%
Years of Experience		
10+	1	9%
5-10	3	27%
2-5	3	27%
1-2	4	36%

The demographics of the participants are presented in table 1 above. 56 surveys were sent out, with only 11 participants completing it fully (19.6% response percentage). 11 participants

from a level I trauma center consented to the educational module before preceding to complete the demographics, pre-survey, educational video, and post-survey. The demographics collected from these individuals included their gender, age, ethnicity, position title, level of education, and years of experience. The group consisted of 9 CRNAs (82%) and 2 anesthesiologist (18%) who were in the age ranges of 25-35 (n=5, 45%), 35-50 (n=5, 45%), and 50-70 years old (n=1, 9%). There were a good mix of females (n=5, 45%) and males (n=4, 36%). However, there were two participants who chose not to disclose their gender, accounting for 18%. Majority of the participants were Hispanic (n=6, 55%), while others were Caucasian (n= 3, 27%), African American (n=1, 9%), and Asian (n=1, 9%). Of these participants, 2 (18%) have bachelors, 4 (36%) have masters, and 5 (45%) have doctoral degrees. Experience wise, 4 (36%) have 1-2 years of experience, 3 (27%) have 2-5 years, 3 (27%) have 5-10 years, and 1 (9%) has 10+ years.

Pretest Knowledge

The pre-survey consisted of 10 questions to determine the baseline knowledge of the 11 providers that participated in the educational module. Less than half of them (n=4, 36%) were able to correctly answer that 70% percent of patients experience moderate to severe levels of pain after abdominal-related laparoscopic procedures, while 4 (36%) answered 50%, 2 (18%) answered 20%, and 1 (9%) answered 10%. When asked, what kind of pain is felt postoperatively after laparoscopic surgeries, 7 (64%) correctly answered somatic and visceral pain, 2 (18%) incorrectly chose solely visceral pain, 1 (9%) chose solely somatic pain, and 1 (9%) chose neuropathic pain. Majority of participants (82%) correctly answered the question regarding what postoperative pain can lead to, which is nausea and vomiting, delayed recovery, and longer hospital stay. Additionally, almost, except one, all (82%) were able to correctly answer that TAP and ESP block are the two blocks to help with postoperative pain after these type of surgeries.

When asked to identify the type of pain-relieving effects that a TAP blocks offers, 5 (45%) correctly answers somatic pain relief, 2 (18%) answered visceral pain relief, 3 (27%) answers somatic and visceral pain relief, and 1 (9%) chose neuropathic and somatic pain relief. The next question asked to identify the type of pain-relieving effects of ESP blocks and 7 (64%) answered correctly that ESP blocks provide somatic and visceral pain relief, while the other 6 chose between solely visceral, somatic or neuropathic pain relief. The participants were further asked to decide the best way to treat postoperative pain felt after a laparoscopic procedure and more than half (n=7, 64%) correctly answered a multimodal approach. 1 (18%) chose opioids, 1 (18%) chose regional anesthesia, and the last 2 (18%) chose non-opioid analgesics. A TAP block can be inconsistent in blocking T7 and T8 dermatomes, which are necessary to be blocked in order to provide adequate analgesia for surgeries involving the abdominal area. Only 3 (27%) participants were able to correctly identify those dermatomes. When asked what kind of results are seen postoperatively after an ESP block is administered, 9 (82%) correctly chose lower opioid administration, 8 (73%) correctly chose longer time to first rescue dose, and 5 (45%) correctly chose decreased VAS scores. Finally, when participants were asked how likely they were to implement an ESP block into their anesthetic plan after a laparoscopic surgery, 6 (55%) chose neither likely nor unlikely, 3 (27%) chose somewhat unlikely, 1 (9%) chose somewhat likely, and 1 (9%) chose extremely likely.

Posttest Knowledge

Before completing the post-survey, participants took the pre-test survey and then were instructed to view the educational video to learn about ESP vs TAP blocks after laparoscopic surgeries in decreasing opioid consumption. The post-survey allows to assess new knowledge gained from the video by retesting using the same questions given in the pre-survey. The correct

answer when answering what is the percentage (70%) of patients who experience moderate to severe levels of pain after abdominal-related laparoscopic procedures increased from 36% (n=4) in the pre-survey to 55% (n=6) in post-survey. 8 (73%) of participants answered correctly that visceral and somatic pain is felt after laparoscopic surgeries, while 3 (27%) others chose solely visceral. However, this showed a 9% increase in the correct answer. When asked what postoperative pain can lead to, 9 (82%) correctly chose nausea and vomiting, delayed recovery, and a longer hospital stay, which remained unchanged from the pre-survey as two other participants answered incorrectly. A percentage decrease was seen when asked which regional blocks would help after laparoscopic surgeries with a percentage of 73% (n=8) answering correctly versus in the pre-survey 82 (n=9) did.

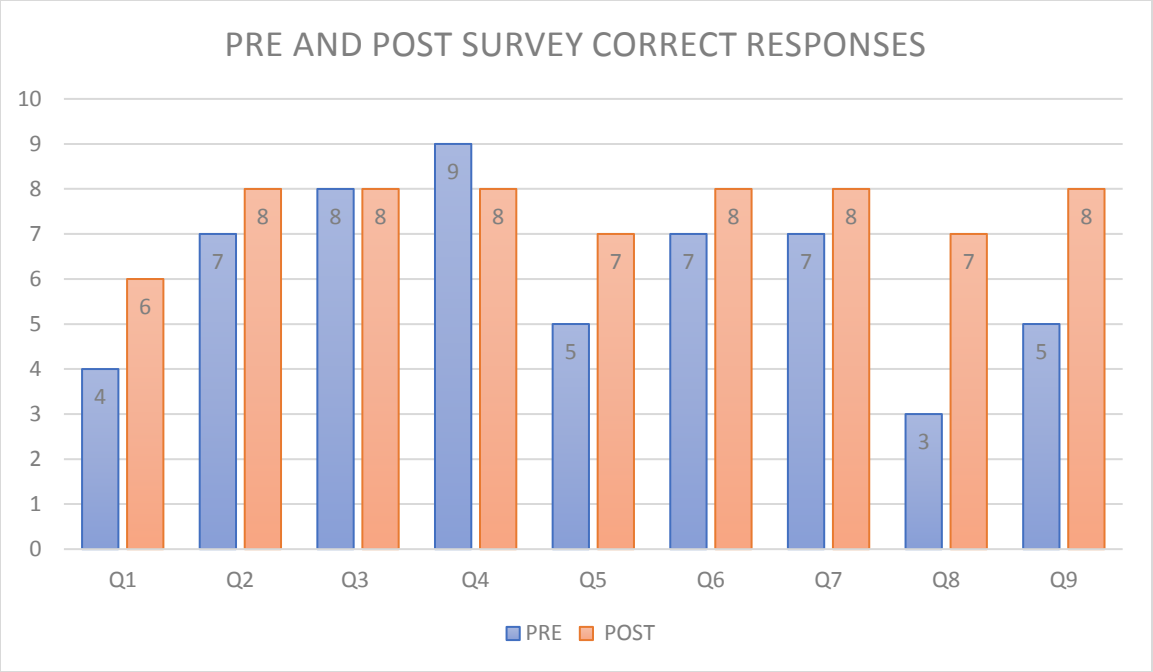
Participants were asked again what kind of pain relieving effects are seen with TAP blocks and 7 (64%) answered somatic pain relief correctly, while 1 (9%) chose visceral pain, 2 (18%) chose somatic and visceral, and 1 (9%) chose somatic and neuropathic pain. This question saw a 19% increase from the pre-survey of 45% to the post-survey of 64%. When asked the same question but regarding an ESP block, majority of the providers (n=8, 73%) chose the correct answer of an ESP block causes visceral and somatic pain relief, which showed a 9% increase from the pre-survey results of 64%. 8 (73%) of participants chose the correct answer of using a multimodal approach as the best way to treat pain after laparoscopic surgery, while 3 (27%) others incorrectly chose regional. The percentage increase seen in this question was 9%. When asked what block inconsistently blocks T7 and T8, the percentage increased from correctly answered to 64% (n=7) from 27% (n=3). Others chose ESP block or a combination of ESP and TAP block for inconsistently blocking the T7 and T8 dermatome, which is incorrect. When asked what kind of results an ESP block provides postoperative, more correct answers were

chosen in the post-survey, with 10 (91%) choosing lower opioid consumption, 8 (73%) choosing longer time to first rescue dose, and 6 (55%) choosing decrease in VAS scores.

Comparison of Pre- and Post-Knowledge

Question	Pretest	Posttest	% Change
1).*After an abdominal-related laparoscopic surgery, up to what percent of patients are at risk for experiencing moderate to severe levels of pain?*			
10%	1 (9%)	2 (18%)	↑ 9
20%	2 (18%)	2 (18%)	0
50%	4 (36%)	1 (9%)	↓ 27
70%	**4 (36%)**	**6 (55%)**	**↑ 19**
2).*What kind of pain is felt postoperatively after a laparoscopic surgery?*			
Solely somatic pain	1 (9%)	0 (0%)	↓ 9
Solely visceral pain	2 (18%)	3 (27%)	↑ 9
Visceral and somatic pain	**7 (64%)**	**8 (73%)**	**↑ 9**
Neuropathic pain and somatic	1 (9%)	0 (0%)	↓9
3).*Untreated postoperative pain can lead to (Select 3):*			
Nausea and vomiting	**8 (73%)**	**8 (73%)**	**0**
Faster return to daily activities	1 (9%)	2 (18%)	↑ 9
Delayed recovery	**9 (82%)**	**7 (64%)**	**↓ 18**
Early discharge	1 (9%)	0 (0%)	↓ 9
Longer hospital stay	**8 (73%)**	**8 (73%)**	**0**
Patient satisfaction	0 (0%)	0 (0%)	0
4).*Which regional anesthetic blocks that can help with postoperative pain after laparoscopic surgery? (SELECT 2)*			
TAP block	9 (82%)	8 (73%)	↓ 9
Supraclavicular block	1 (9%)	1 (9%)	0
ESP block	9 (82%)	8 (73%)	↓ 9
Fascia Ilica block	0 (0%)	1 (9%)	↑ 9
5).*Complete the statement. TAP block can provide what kind of pain relief:*			
Visceral pain relief	2 (18%)	1 (9%)	↓ 9
Somatic pain relief	**5 (45%)**	**7 (64%)**	**↑ 19**
Visceral and somatic pain relief	3 (27%)	2 (18%)	↓ 9
Neuropathic and somatic pain relief	1 (9%)	1 (9%)	0
6).*Complete the statement. ESP block can provide what kind of pain relief:*			
Visceral pain relief	1 (9%)	1 (9%)	0
Somatic pain relief	3 (27%)	2 (18%)	↓ 9
Visceral and somatic pain relief	**7 (64%)**	**8 (73%)**	**↑ 9**
Neuropathic and somatic pain relief	0 (0%)	0 (0%)	0

7).*What is the best way to treat pain after laparoscopic surgery?*			
Opioids	1 (9%)	0 (0%)	↓ 18
Regional Anesthesia	1 (9%)	3 (27%)	↑ 18
Non-opioid analgesics	2 (18%)	0 (0%)	↓ 18
Multimodal approach	**7 (64%)**	**8 (73%)**	**↑ 9**
8).*Which block can be inconsistent in blocking T7 and T8 dermatomes?*			
ESP block	3 (27%)	3 (27%)	0
TAP block	**3 (27%)**	**7 (64%)**	**↑ 37**
ESP and TAP block	4 (36%)	1 (9%)	↓ 27
None of the above	1 (9%)	0 (0%)	↓ 9
9).*ESP blocks see what kind of results in the postoperative area (Select 3)?*			
Increased NRS scores	2 (18%)	1 (9%)	↓ 9
Lower opioid administration	**9 (82%)**	**10 (91%)**	**↑ 9**
High opioid administration	0 (0%)	0 (0%)	0
Longer time to first rescue dose	**8 (73%)**	**8 (73%)**	**0**
Shorter time to first rescue dose	1 (9%)	0 (0%)	↓ 9
Decreased VAS scores	**5 (45%)**	**6 (55%)**	**↑ 9**
10).*How likely are you to consider performing an ESP block for postoperative pain management in your anesthetic plan for laparoscopic surgeries?*			
Extremely unlikely	0 (0%)	2 (18%)	↑ 18
Somewhat unlikely	3 (27%)	2 (18%)	↓ 9
Neither likely or unlikely	6 (55%)	3 (27%)	↓ 28
Somewhat likely	1 (9%)	1 (9%)	0
Extremely likely	1 (9%)	3 (27%)	↑ 18



Limitations

The DNP project contained a few limitations that will be discussed in this section. The sample size that completed the survey was small (n=11), therefore, the results cannot be generalized or represent a bigger group of anesthesiologist, CRNAs, or AA's. Another limitation includes technology issues with Qualtrics or the participants wifi/phone. Furthermore, this educational module is delivered through an online service and one cannot ensure that the participants are giving there undivided attention when completing the survey. In turn, this could affect the overall results if participants aimlessly answered either the pre or post survey.

Future Implications For Advanced Nursing Practice

As demonstrated through the results of the educational module, educating providers on an effective block, such as an ESP block, to manage postoperative pain after laparoscopic surgeries is paramount, as many do not know the type of pain that a laparoscopic procedure brings forth, nor do they know what block can treat that pain. In this case, visceral pain was not being treated

adequately because opioids and a TAP block do not cause visceral pain relief, like an ESP block does. This module stimulated a change in practice to become more educated on treating pain after certain procedures and how to treat it. This intended to improve patient outcomes and satisfaction as untreated postoperative pain will decrease and, in return, providers will see less complications.

Conclusion

Administering anesthesia for a laparoscopic case is much more common than doing so for an open-abdominal case because as time has progressed and technology has advanced, surgical instruments have been created to enter the abdomen through small key-hole incisions. However, post-operative pain remains a critical unsolved issue that leaves the patient at vulnerable for post-operative complications. Anesthesia providers have tried various methods to treat this pain and have concluded that regional anesthesia is the answer to lessening the pain the most. TAP and ESP blocks provide postoperative analgesia in these cases as evidently shown in the numerous RCT's analyzed above. However, a big difference between the blocks that is noted from the research is that an ESP block offers the added and needed benefit of visceral pain relief that is needed after a laparoscopic case. Through the educational module, the baseline knowledge of providers showed that many did not know how common pain after laparoscopic surgery is and what kind of pain felt by those patients. Furthermore, providers did not know key facts about regional blocks and how to properly treat this kind of pain. However, after the educational video, providers became much more educated on the topic and could identify that an ESP block that has visceral pain-relieving effects is an excellent choice to manage postoperative pain after a laparoscopic procedure. Therefore, this DNP project was successful in educating anesthesia providers to improve patient outcomes.

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Appendix A: FIU IRB Approval

FIU Research & Economic Development
FLORIDA INTERNATIONAL UNIVERSITY

MEMORANDUM

To: Dr. Yasmine Campbell

CC: Jennifer Lopez

From: Carrie Bassols, BA, IRB Coordinator Ceb

Date: February 2, 2024

Proposal Title: "Erector Spinae Plane vs Transverse Abdominis Plane Block , and their effects on reduction of opioid consumption post-operatively: An Educational Module. A Quality Improvement Project."

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #:	IRB-24-0038	**IRB Exemption Date:**	02/02/24
TOPAZ Reference #:	113910		

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
1) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

Appendix B: Consent

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CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

Erector Spinae Plane vs Transverse Abdominis Plane Block ,and their effects on reduction of opioid consumption post-operatively: An Educational Module.

SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** Educational module to increase providers awareness in postoperative pain felt after laparoscopic surgeries and ways to treat it.
- **Procedures**: If the participant chooses to participate, they will be asked to complete a pretest,5 minutes watch a voice PowerPoint 15 minutes, and then a post test 5 mintues
- **Duration:** This will take about a total of 25 minutes total.
- **Risks**: There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may include mild emotional stress or mild physical discomfort from sitting on a chair for an extended period.
- **Benefits:** The main benefit to you from this research is increase the participants knowledge on postoperative pain felt after laparoscopic surgeries and ways to treat it.
- **Alternatives:** There are no known alternatives available to the participant other than not taking part in this quality improvement project.
- **Participation:** Taking part in this quality improvement project is voluntary.

Please carefully read the entire document before agreeing to participate.

NUMBER OF STUDY PARTICIPANTS:

If the participant decides to be in this study, they will be approximately 1 of 20 people in this research study.

PURPOSE OF THE PROJECT

The participant is being asked to be in a quality improvement project. The goal of this project is to increase providers' knowledge on in postoperative pain felt after laparoscopic surgeries and ways to treat it. If you decide to participate, you will be 1 of approximately 20 participants.

DURATION OF THE PROJECT

The participation will require about 25 minutes

PROCEDURES

If the participant agrees to be in the project, PI will ask you to do the following things after obtaining online informed consent:

1. Complete an online 10 question pre-test survey via Qualtrics, an Online survey product for which the URL link is provided 5 minutes

2. Review the educational PowerPoint Module lasting 15 minutes via Qualtrics, an Online survey product for which the URL link is provided.

3. Complete the online 10 question post-test survey via Qualtrics, an Online survey product for which the URL link is provided. 5 minutes

RISKS AND/OR DISCOMFORTS

The main risk or discomfort from this research is minimal. There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may include mild emotional stress or mild physical discomfort from sitting on a chair for an extended period.

BENEFITS

The following benefits may be associated with participation in this project: increased participants knowledge on the risk for pain felt postoperatively after laparoscopic surgeries, different blocks that combat it, and as a result, engaging in preventative practices that decreases the risk of pain. The overall objective of the program is to increase the providers’

knowledge based on the current literature.

ALTERNATIVES

There are no known alternatives available to the participant other than not taking part in this project. However, if the participant would like to receive the educational material, it will be provided to them at no cost.

CONFIDENTIALITY

The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report, PI might publish, it will not include any information that will make it possible to identify the participant. Records will be stored securely, and only the project team will have access to the records.

PARTICIPATION: Taking part in this quality improvement project is voluntary.

COMPENSATION & COSTS

There is no cost or payment to the participant for receiving the health education and/or for participating in this project.

RIGHT TO DECLINE OR WITHDRAW

The participation in this project is voluntary. The participant is free to participate in the project or withdraw the consent at any time during the project. The participant's withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove the participant without their consent at such time that they feel it is in their best interest.

RESEARCHER CONTACT INFORMATION

If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Jennifer Lopez at 954-612-0126 or jlope562@fiu.edu. You may also contact Dr. Yasmine Campbell at ycampbel@fiu.edu.

IRB CONTACT INFORMATION

If the participant would like to talk with someone about their rights pertaining to being a subject in this project or about ethical issues with this project, the participant may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

PARTICIPANT AGREEMENT

I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. By clicking on the "consent to participate" button below I am providing my informed consent.

Appendix C: Pre/Post Survey

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Pretest and Posttest Questionnaire:

Erector Spinae Plane vs Transverse Abdominis Plane Block , and their effects on reduction of opioid consumption post-operatively: An Educational Module.

INTRODUCTION

The primary aim of this QI project is to increase providers awareness to Erector Spinae Plane (ESP) vs Transversus Abdominis Plane Block (TAP) in Decreasing Opioid Consumption After Laparoscop Surgeries. Please answer the question below to the best of your ability. The questions are either in multiple choice or true/false format and are meant to measure knowledge pain felt after laparoscopic surgeries and ways to manage it.

PERSONAL INFORMATION

1. **Gender:** Male Female Other_____
2. **Ages 25 and above: _____**
3. **Ethnicity:** Hispanic Caucasian African American Asian Other_____
4. **Position/Title:** CRNA Anesthesiologist Resident Anesthesiologist Assistant
5. **Level of Education:** Certificate Bachelors Masters DNP PhD
6. How many years have you been a perioperative provider?

   Over 10 5-10 years 2-5 years 1-2 years

QUESTIONNAIRE

1. After an abdominal-related laparoscopic surgery, up to what percent of patients are at risk for experiencing moderate to severe levels of pain?
    a) 10%
    b) 20%
    c) 50%
    d) 70% *
2. What kind of pain is felt postoperatively after a laparoscopic surgery?
    a) Solely somatic pain
    b) Solely visceral pain
    c) Visceral and somatic pain*
    d) Neuropathic pain and somatic
3. Untreated postoperative pain can lead to (Select 3):
    a) Nausea and vomiting*
    b) Faster return to daily activities
    c) Delayed recovery*
    d) Early discharge
    e) Longer hospital stay *
    f) Patient satisfaction
4. Which regional anesthetic blocks that can help with postoperative pain after laparoscopic surgery? (SELECT 2)
    a) TAP block *
    b) Supraclavicular block
    c) ESP block *
    d) Fascia Ilica block
5. Complete the statement. TAP block can provide what kind of pain relief:
    a) Visceral pain relief
    b) Somatic pain relief *
    c) Visceral and somatic pain relief
    d) Neuropathic and somatic pain relief
6. Complete the statement. ESP block can provide what kind of pain relief:
    a) Visceral pain relief
    b) Somatic pain relief
    c) Visceral and somatic pain relief *
    d) Neuropathic and somatic pain relief
7. What is the best way to treat pain after laparoscopic surgery?
    a) Opioids
    b) Regional Anesthesia
    c) Non-opioid analgesics
    d) Multimodal approach *
8. Which block can be inconsistent in blocking T7 and T8 dermatomes?
    a) ESP block
    b) TAP block *
    c) ESP and TAP block
    d) None of the above

9. ESP blocks see what kind of results in the postoperative area (Select 3)?
    a) Increased NRS scores
    b) Lower opioid administration *
    c) Higher opioid administration
    d) Longer time to first rescue dose*
    e) Shorter time to first rescue dose
    f) Decreased VAS scores*
10. How likely are you to consider performing an ESP block for postoperative pain management in your anesthetic plan for laparoscopic surgeries?
    a) Not likely
    b) Somewhat likely
    c) Likely
    d) Very likely

Appendix D: Recruitment Letter

Nicole Wertheim College of Nursing & Health Sciences

Erector Spinae Plane vs Transverse Abdominis Plane Block, and their effects on reduction of opioid consumption post-operatively: An Educational Module.

Dear Envision Healthcare Physician Services Anesthesia Perioperative Providers:

My name is Jennifer Lopez RN, BSN, CCRN and I am a doctoral student from the Department of Nurse Anesthesiology at Florida International University. I am writing to invite you to participate in my quality improvement project. The goal of this project is to increase health care providers' awareness in postoperative pain after laparoscopic surgeries and ways to treat it. You are eligible to take part in this project because you are a part of the Envision Physician Services Anesthesia Department that clinically practice at Memorial Regional Hospital.

If you decide to participate in this project, you will be asked to complete and sign a consent form for participation. Next, you will complete a pre-test questionnaire, which is expected to take approximately 5 minutes. You will then be asked to view an approximately 15 minutes long educational presentation online. After going through the educational module, you will be asked to complete the post-test questionnaire, which is expected to take approximately 5 minutes. *No compensation will be provided.*

Remember, this is completely voluntary. You can choose to be in the study or not. If you'd like to participate or have any questions about the study, please email or contact me at 954-612-0126 or Jlope562@fiu.edu.

Thank you very much.

Sincerely,

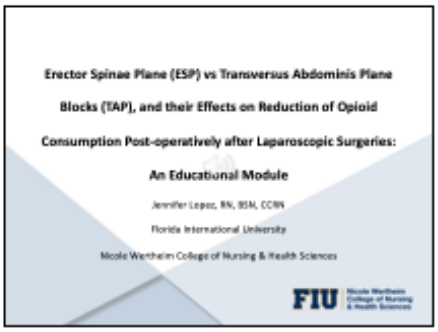
Jennifer Lopez, BSN, RN, CCRN

954-612-0126

Jlope562@fiu.edu.

Appendix E: DNP Educational Module-

6/28/24



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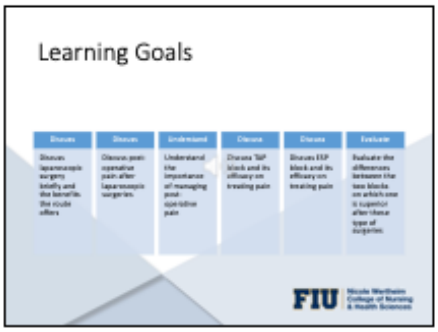

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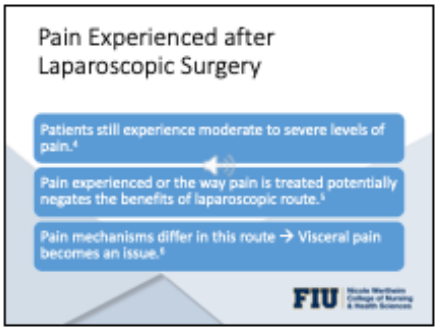

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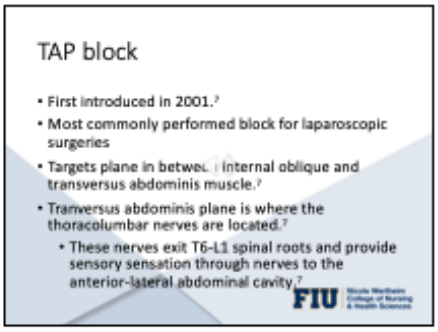

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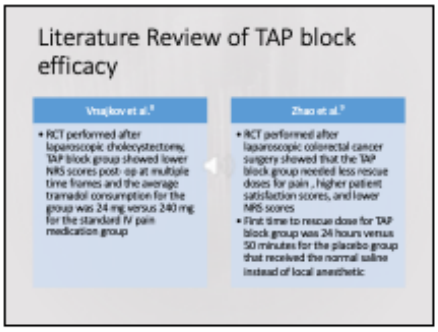

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ESP block

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Literature Review of ESP block efficacy

Canitez et al.[11]	Mostafa et al.[12]
• RCT performed after laparoscopic cholecystectomies that showed ESP block group produced lower pain scores, higher QoR-40 scores, and lower total tramadol consumption within 24 hours (0 mg versus 180 in the control group of standard IV medication).	• RCT performed after laparoscopic bariatric surgeries, showed ESP block group had lower VAS scores post- op, lower overall morphine administration over 24 hours, and a longer time to first rescue dose (420 minutes compared to 27.5 minutes of the placebo group that received normal saline).

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ESP vs TAP block

- TAP blocks
  - Relieves somatic pain but lacks visceral pain-relieving effects.[13,14]
  - Can be inconsistent in blocking T7 and T8 dermatomes needed to lessen the incisional and trocar port site pain felt.[15]
- ESP blocks
  - Provide wider coverage and visceral pain relief.[10]

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Solution

- Provide educational module on pain experienced after laparoscopic surgery and the importance to treat it adequately
- Determine if there is a difference in pain-relieving effects of a TAP block vs ESP through RCT's
- Educate staff on ESP blocks and their efficacy
- Encourage staff to implement training session on ESP block

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Take-home points

- Laparoscopic surgeries still have potential to experience severe levels of pain
- Multimodal approach is needed to treat multiple pain mechanisms
- Regional anesthesia is key to decreasing opioid consumption, increasing patient satisfaction, and decreasing pain scores post-operatively
- As ESP block continues to gain popularity for numerous surgeries, educational workshops and training sessions on the block needs to be implemented in order to fully incorporate this block into anesthetic plans.

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Questions?

Thank you!

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6/28/24

13

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Appendix F: DNP Symposium PPT

9/25/24

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QI Methods

- 3 databases: Embase, Pubmed, Medline
- 127 articles were initially identified; 13 were accepted after applying the inclusion and exclusion criteria
- IRB approval → Anesthesia providers at a level I trauma hospital were asked to participate via online platform called Qualtrics → consents were obtained by those who agreed to participate via email → Educational module created with pre-reviews, educational video and post survey → Data and results obtained from Qualtrics

7

Demographics

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Results

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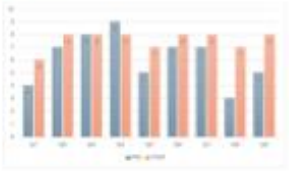
Results Continued

10

Comparison of Pre and Post Survey Correct Responses



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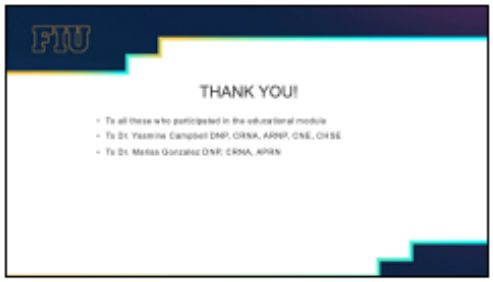
Discussion and Conclusion

- ESP blocks provide wider coverage of analgesia and have shown to have the missing visceral aspect that has not been able to be adequately treated with IV medications or a TAP block.* Also, is more consistent in blocking T1 & T6 dermatomes unlike a TAP block.
- ESP blocks decrease opioid consumption, NRS pain scores, PCA pump usage, and receive higher patient satisfaction based on questionnaires.
- Anesthesia providers should consider incorporating an ESP block for laparoscopic cases to reduce opioid consumption and improve patient satisfaction.
- Limitations: small sample size + online platform
- The educational module improved the knowledge of the participating providers, with most questions receiving an increase in the right answers on the post survey.

12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THANK YOU!
To all those who participated in the educational module
To Dr. Yasmine Campbell DNP, CRNA, ARNP, CNE, CHSE
To Dr. Matias Gonzalez DNP, CRNA, APRN

13


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References

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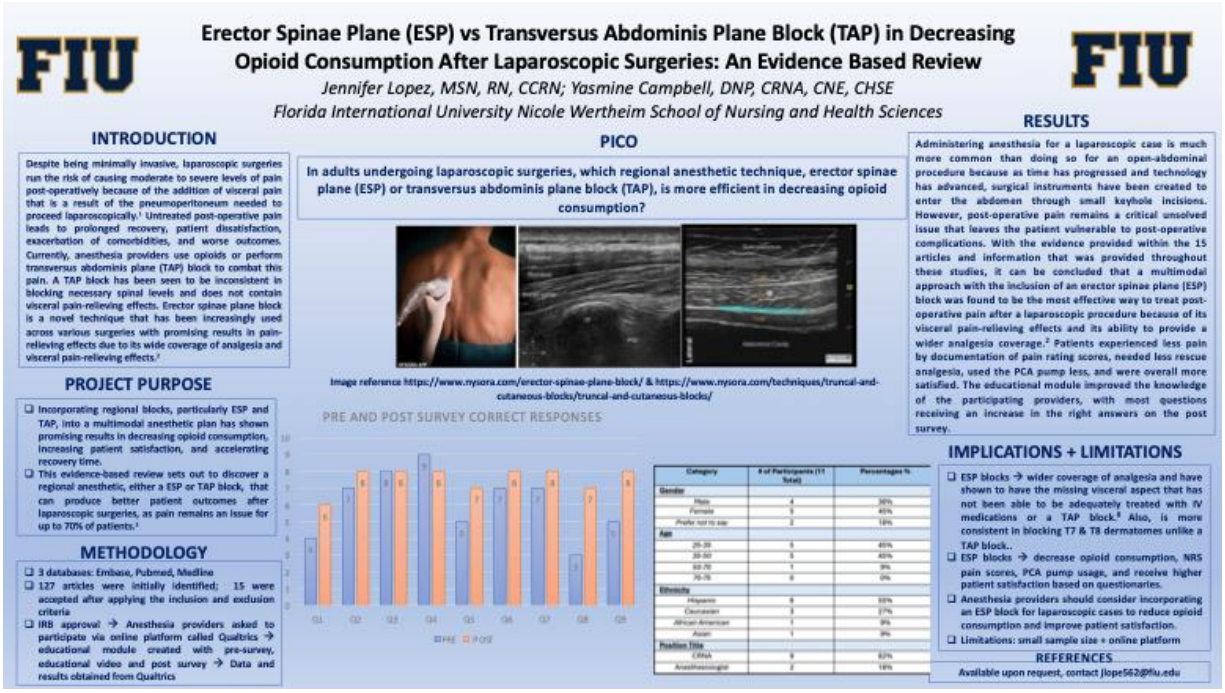
Appendix G: DNP Poster



FIU

Erector Spinae Plane (ESP) vs Transversus Abdominis Plane Block (TAP) in Decreasing Opioid Consumption After Laparoscopic Surgeries: An Evidence Based Review

Jennifer Lopez, MSN, RN, CCRN; Yasmine Campbell, DNP, CRNA, CNE, CHSE

Florida International University Nicole Wertheim School of Nursing and Health Sciences

FIU

INTRODUCTION

Despite being minimally invasive, laparoscopic surgeries run the risk of causing moderate to severe levels of pain post-operatively because of the addition of visceral pain that is a result of the pneumoperitoneum needed to proceed laparoscopically.[1] Untreated post-operative pain leads to prolonged recovery, patient dissatisfaction, exacerbation of comorbidities, and worse outcomes. Currently, anesthesia providers use opioids or perform transversus abdominis plane (TAP) block to combat this pain. A TAP block has been seen to be inconsistent in blocking necessary spinal levels and does not contain visceral pain-relieving effects. Erector spinae plane block is a novel technique that has been increasingly used across various surgeries with promising results in pain-relieving effects due to its wide coverage of analgesia and visceral pain-relieving effects.[2]

PROJECT PURPOSE

- Incorporating regional blocks, particularly ESP and TAP, into a multimodal anesthetic plan has shown promising results in decreasing opioid consumption, increasing patient satisfaction, and accelerating recovery time.
- This evidence-based review sets out to discover a regional anesthetic, either a ESP or TAP block, that can produce better patient outcomes after laparoscopic surgeries, as pain remains an issue for up to 70% of patients.[1]

METHODOLOGY

- 3 databases: Embase, Pubmed, Medline
- 127 articles were initially identified; 15 were accepted after applying the inclusion and exclusion criteria
- IRB approval → Anesthesia providers asked to participate via online platform called Qualtrics → educational module created with pre-survey, educational video and post survey → Data and results obtained from Qualtrics

PICO

In adults undergoing laparoscopic surgeries, which regional anesthetic technique, erector spinae plane (ESP) or transversus abdominis plane block (TAP), is more efficient in decreasing opioid consumption?

Image reference https://www.nysora.com/erector-spinae-plane-block/ & https://www.nysora.com/techniques/truncal-and-cutaneous-blocks/truncal-and-cutaneous-blocks/

PRE AND POST SURVEY CORRECT RESPONSES

Category	# of Participants (11 Total)	Percentages %
Gender		
Male	4	36%
Female	5	45%
Prefer not to say	2	18%
Age		
25-30	5	45%
30-50	5	45%
50-70	1	9%
70-75	0	0%
Ethnicity		
Hispanic	6	55%
Caucasian	3	27%
African American	1	9%
Asian	1	9%
Position Title		
CRNA	9	82%
Anesthesiologist	2	18%

RESULTS

Administering anesthesia for a laparoscopic case is much more common than doing so for an open-abdominal procedure because as time has progressed and technology has advanced, surgical instruments have been created to enter the abdomen through small keyhole incisions. However, post-operative pain remains a critical unsolved issue that leaves the patient vulnerable to post-operative complications. With the evidence provided within the 15 articles and information that was provided throughout these studies, it can be concluded that a multimodal approach with the inclusion of an erector spinae plane (ESP) block was found to be the most effective way to treat post-operative pain after a laparoscopic procedure because of its visceral pain-relieving effects and its ability to provide a wider analgesia coverage.[2] Patients experienced less pain by documentation of pain rating scores, needed less rescue analgesia, used the PCA pump less, and were overall more satisfied. The educational module improved the knowledge of the participating providers, with most questions receiving an increase in the right answers on the post survey.

IMPLICATIONS + LIMITATIONS

- ESP blocks → wider coverage of analgesia and have shown to have the missing visceral aspect that has not been able to be adequately treated with IV medications or a TAP block.[2] Also, is more consistent in blocking T7 & T8 dermatomes unlike a TAP block..
- ESP blocks → decrease opioid consumption, NRS pain scores, PCA pump usage, and receive higher patient satisfaction based on questionaries.
- Anesthesia providers should consider incorporating an ESP block for laparoscopic cases to reduce opioid consumption and improve patient satisfaction.
- Limitations: small sample size + online platform

REFERENCES

Available upon request, contact jlope562@fiu.edu

Appendix H: AANA and FANA Poster

Erector Spinae Plane (ESP) vs Transversus Abdominis Plane Block (TAP) in Decreasing Opioid Consumption After Laparoscopic Surgeries: An Evidence Based Review

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INTRODUCTION

Despite being minimally invasive, laparoscopic surgeries run the risk of causing moderate to severe levels of pain post-operatively because of the addition of visceral pain that is a result of the pneumoperitoneum needed to proceed laparoscopically.[1] Untreated post-operative pain leads to prolonged recovery, patient dissatisfaction, exacerbation of comorbidities, and worse outcomes. Currently, anesthesia providers use opioids or perform transversus abdominis plane (TAP) block to combat this pain. A TAP block has been seen to be inconsistent in blocking necessary spinal levels and does not contain visceral pain-relieving effects. Erector spinae plane block is a novel technique that has been increasingly used across various surgeries with promising results in pain-relieving effects due to its wide coverage of analgesia and visceral pain-relieving effects.[2]

PROJECT PURPOSE

- Incorporating regional blocks, particularly ESP and TAP, into a multimodal anesthetic plan has shown promising results in decreasing opioid consumption, increasing patient satisfaction, and accelerating recovery time.
- This evidence-based review sets out to discover a regional anesthetic, either a ESP or TAP block, that can produce better patient outcomes after laparoscopic surgeries, as pain remains an issue for up to 70% of patients.[1]

METHODOLOGY

- 3 databases: Embase, Pubmed, Medline
- Inclusion criteria = published within the years of 2017-2023, only RCTs, contained participants within the age range of 18-65 years old, written in English, had full-text accessibility, and pertained to the topic of interest.
- 127 articles were initially identified; 15 were accepted after applying the inclusion and exclusion criteria

PICO

In adults undergoing laparoscopic surgeries, which regional anesthetic technique, erector spinae plane (ESP) or transversus abdominis plane block (TAP), is more efficient in decreasing opioid consumption?

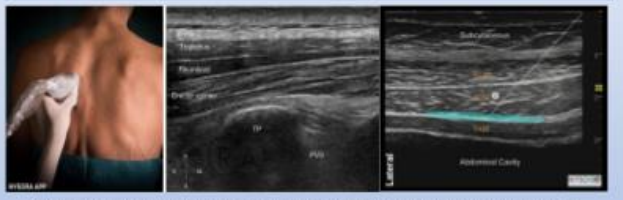

Image reference https://www.nysora.com/erector-spinae-plane-block/ & https://www.nysora.com/techniques/truncal-and-cutaneous-blocks/truncal-and-cutaneous-blocks/

Literature Review Table

Author	Design Sample	Major Findings
Altiparmak et al, 2019.	Randomized controlled trial.	ESP block administration prior to a laparoscopic cholecystectomy contributes to a vast reduction in tramadol consumption post-operatively, in NRS scores at each time frame post-surgery, and in rescue doses of opioid analgesics.
Altinsoy et al, 2022.	Randomized controlled trial.	Performing a unilateral ESP block for a patient undergoing a inguinal hernionrhaphy caused lower PCA usage, reduced NRS scores, and higher QoR-40 scores.
Vrsajkov et al, 2018.	Randomized controlled trial.	A TAP block showed to cause lower pain scores and less tramadol usage post-operatively.
Zhao et al, 2021 .	Randomized controlled trial.	As moderate post-operative pain is associated with laparoscopic colorectal cancer surgery, a posterior TAP block proves to show success in decreasing analgesic requirements more than no regional anesthetic technique

RESULTS

Administering anesthesia for a laparoscopic case is much more common than doing so for an open-abdominal procedure because as time has progressed and technology has advanced, surgical instruments have been created to enter the abdomen through small keyhole incisions. However, post-operative pain remains a critical unsolved issue that leaves the patient vulnerable to post-operative complications. With the evidence provided within the 15 articles and information that was provided throughout these studies, it can be concluded that a multimodal approach with the inclusion of an erector spinae plane (ESP) block was found to be the most effective way to treat post-operative pain after a laparoscopic procedure because of its visceral pain-relieving effects and its ability to provide a wider analgesia coverage.[2] Patients experienced less pain by documentation of pain rating scores, needed less rescue analgesia, used the PCA pump less, and were overall more satisfied.

IMPLICATIONS

- ESP blocks → wider coverage of analgesia and have shown to have the missing visceral aspect that has not been able to be adequately treated with IV medications or a TAP block.[2] Also, is more consistent in blocking T7 & T8 dermatomes unlike a TAP block..
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