Optimizing Postoperative Pain Management in VATS: Evidence-Based Analysis of ESPB and SAPB

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ABSTRACT:

Background

The serratus anterior plane block (SAPB) and erector spinae plane block (ESPB) are viable options for post-VATS pain relief, often chosen based on provider preference. SAPB effectively addresses lateral thoracic incisions and chest tubes, offering benefits such as simplicity and safety, making it popular in VATS. ESPB provides broader somatic and visceral analgesia by targeting the thoracic nerve rami. This study aims to compare which block more effectively reduces postoperative opioid use, pain scores, timing of rescue analgesia, and complications.

Methods

A literature review compared the analgesic effectiveness of SAPB and ESPB in adults undergoing VATS, showing that ESPB consistently reduced opioid use and improved postoperative pain, especially in the first 24 hours. An online educational module was created to present these findings to anesthesia providers, accompanied by pre- and post-surveys to assess knowledge gain. The module was distributed anonymously to alumni of a South Florida University Nurse Anesthesia program, and the collected data was analyzed to evaluate participant learning.

Results

Twenty-four anesthesia providers consented to and started the survey, with 21 completing it. The pre-test showed 82% correctly identified that ESPB reduces opioid use, increasing to 90% after the educational module. All post-test questions showed improved knowledge except one, which stayed at 86%. Overall, the results indicate increased understanding of ESPB and SAPB targets, efficacy, and evidence-based practices for postoperative pain management in VATS.

Discussion

The educational intervention improved anesthesia providers' knowledge of ESPB and SAPB for VATS, with post-test scores rising in all areas. This demonstrates the module's effectiveness in clarifying the anatomy of blocks, analgesic mechanisms, and indications. The steady improvement aligns with evidence of ESPB's broader dermatomal coverage and opioid-sparing benefits, reflecting current evidence. The study indicates that concise, evidence-based education can translate research into practice and support opioid-conscious analgesia. Limitations include a small sample size and a lack of a control group, which may limit generalizability.

Conclusion

This project enhanced anesthesia providers' understanding of ESPB and SAPB through targeted education. Post-test results showed significant improvement, validating evidence-based teaching. Findings indicate ESPB offers better pain control and reduces opioid use after VATS compared to SAPB. The study emphasizes the importance of ongoing education to implement research into practice, promoting ESPB in multimodal analgesia and ERAS pathways. Further research with larger, diverse groups is needed to evaluate long-term knowledge retention, clinical impact, and patient outcomes.

Keywords**:** video-assisted thoracoscopic surgery, opioid consumption, erector spinae plane block, serratus anterior plane block

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Introduction

Video-assisted thoracoscopic surgery (VATS) has become a widely adopted approach to thoracic surgery due to its minimally invasive nature, resulting in smaller incisions, reduced surgical stress, and faster recovery compared to traditional thoracotomy.[1,2] However, despite these advantages, the pain experienced by VATS patients remains comparable to that of more invasive procedures, often described as moderate to severe.[2] Poorly controlled postoperative pain can significantly impair respiratory function, hinder early mobilization, and increase the risk of postoperative pulmonary complications, including atelectasis, as well as chronic post-surgical pain (CPSP).[2,3]

Historically, opioids have been heavily relied upon to manage post-surgical pain following VATS, but their widespread use comes with numerous complications.[2,3] Postoperative nausea and vomiting (PONV), ileus, and respiratory depression are common opioid side effects that exacerbate the risk of complications, further hindering recovery.[2,3] These effects can also impede a patient's ability to achieve key enhanced recovery targets, such as early mobilization, PONV control, and rapid return to oral diet.[4,5]

To address these concerns, the Enhanced Recovery After Surgery (ERAS) guidelines, with a focus on thoracic surgery introduced in 2019, emphasize the adoption of opioid-sparing analgesia strategies based on regional anesthesia techniques.[4,5] The thoracic epidural block (TEB) and thoracic paravertebral block (TPVB) have long been established as first-line methods for pain control in VATS.[3,5-7] With newer evidence, however, the ERAS guidelines have recognized that the risks associated with perioperative use of epidural and paravertebral analgesia are becoming more evident and may be greater than previously presumed.[4]

The growing number of patients who are unsuitable candidates for central neuraxial or paravertebral blockade underscores the urgent need for alternative regional techniques. The serratus anterior plane block (SAPB) and erector spinae plane block (ESPB) are two such blocks that have become increasingly popular as alternatives to current standards.[3,5] With the more invasive analgesic clinical standards not being suitable for every surgical candidate, less invasive yet just as clinically effective interfascial blocks are growing exponentially in clinical relevance.

Both the SAPB and ESPB have emerged as promising analgesic alternatives to TEB and TPVB in the management of postoperative pain following VATS. These ultrasound-guided interfascial plane blocks aim to deliver local anesthetic agents near the thoracic spinal nerves, but they differ in their precise location, nerve targets, and specific advantages.[3] Currently, the choice of interfascial block is often influenced by the anesthesia provider's personal preferences, skill level, and experience, rather than a clear, evidence-based standard. [3] As evidence-based practice is a cornerstone of anesthesia care, there is a critical need to investigate and determine the most clinically effective interfascial block for improving pain outcomes and minimizing opioid use in thoracic surgical patients.

Purpose and PICO Question

VATS is the predominant approach for thoracic procedures, and the use of regional anesthesia, including interfascial nerve blocks, is widespread and increasing, driven by enhanced recovery protocols and the need for adequate, opioid-sparing analgesia. The most commonly used regional techniques for VATS are thoracic epidural analgesia (TEA) and paravertebral block (PVB). The ESPB and SAPB are preferred in patients undergoing video-assisted thoracoscopic surgery (VATS) who are not candidates for thoracic epidural analgesia (TEA) or paravertebral block (PVB), as they provide noninferior analgesia, with pain scores and opioid

consumption similar to those with TEA or PVB.[8,9] However, no consensus stands as far as the best interfascial plane block for pain management and reduced opioid consumption in patients undergoing VATS.[8,9]

Both the ESPB and SAPB are effective and practical alternatives to TEA and PVB and offer several advantages, especially in patients with challenging anatomy, obesity, or when rapid block placement is required.[10-14] Between the two, however, no consensus lies regarding which interfascial block is the most effective in reducing postoperative opioid consumption. [8,9] Therefore, this project serves to answer the following question: In adult patients undergoing video-assisted thoracoscopic surgery (VATS) (Population), how does the ESPB (Intervention), compared to the SAPB (Comparison), reduce opioid consumption within the first 24 hours post-surgery (Outcome)?

Problem Statement

Video-assisted thoracoscopic surgery (VATS) refers to endoscopically assisted direct, robotic, and other minimally invasive approaches to thoracic surgery that produce a small surgical incision and low stress response.[1,2] While it has widely replaced traditional thoracotomy due to its demonstrated faster recovery and less invasiveness, it has been concluded that the pain experienced by patients is comparable, if not the same, and is often described as moderate to severe.[2] Poorly controlled, acute postoperative pain negatively affects breathing and lung function, increasing the risk of postoperative pulmonary complications (PPCs), [2] early mobilization efforts, and can also result in chronic postsurgical pain (CPSP).[3] Therefore, early and adequate pain control that allows for effective breathing and free coughing is ideal for improving respiratory function and lung atelectasis [2] and reducing the incidence of chronic pain syndromes.

Opioids have been a long-standing solution to reduce post-surgical pain after VATS, [2] but their many side effects, such as postoperative nausea and vomiting (PONV), ileus, and respiratory depression, can exacerbate the postoperative risk of complications. [2, 3] These effects may also impact a patient's ability to achieve enhanced recovery targets such as PONV control, early mobilization, and a quick return to oral diet.[4] Enhanced recovery after surgery (ERAS) guidelines, with a focus on thoracic surgery, published in 2019, therefore endorse the incorporation of regional anesthesia-based, opioid-sparing analgesia regimens.[4,5] Thoracic epidural block (TEB) and thoracic paravertebral block (TPVB) are often the recommended first-line forms of regional anesthesia for pain management after VATS.[3, 5-7] However, the expanding cohort of patients that may not be suitable for central neuraxial or paravertebral blockade warrants the need for alternative regional techniques, such as the SAPB and ESPB interfascial blocks.[2, 5]

Previously, studies were found to be too heterogeneous to determine a superior interfascial plane block for VATS.[2] The choice of loco-regional technique is often influenced by the anesthesia provider's personal preference, skill level, and block experience rather than a strong evidence foundation.[2] Therefore, because evidence-based knowledge is a pillar of anesthesia practice, there is a need to determine the most clinically effective interfascial plane block in improving postsurgical pain and reducing opioid consumption in thoracic surgical patients.

The SAPB and ESPB are two novel ultrasound-guided, interfascial plane blocks described for use in VATS.[2-3,15] While both aim to deposit local anesthetics away from the spinal cord in an interfascial plane, their precise location, peripheral nerve involvement, and unique advantages and disadvantages differ.[3] The SAPB was first proposed in 2013, and involves the

injection of local anesthetics into the surface of the anterior serratus muscle or deep interstitial space.[2] Due to its relative ease of performance, safety, and adequate analgesia for lateral thoracic wall incisions, the SAPB has grown increasingly in favor of VATS, and it has even been cited in ERAS guidelines.[2,4] The ESPB, however, blocks both the dorsal and ventral rami of the thoracic spinal nerves and may elicit some degree of sympathetic blockade.[3] First described in 2016, its broad dermatomal coverage has been argued to be less targeted for VATS incisions than SAPB, and there is conflicting evidence as to whether or not local anesthetic consistently spreads to the paravertebral space.[3]

Although evidence regarding the two blocks is limited, they are both considered safe and technically easier to perform than their thoracic epidural and paravertebral counterparts.[3] However, as there is no current gold standard for interfascial nerve blocks, there is a substantial need to analyze the evidence and determine the overall superior interfascial block in reducing opioid consumption in patients undergoing VATS.

Problem Identification

Video-assisted thoracoscopic surgery (VATS) has become a widely adopted approach to thoracic surgery due to its minimally invasive nature, resulting in smaller incisions, reduced surgical stress, and faster recovery compared to traditional thoracotomy.[1,2] However, despite these advantages, the pain experienced by VATS patients remains comparable to that of more invasive procedures, often described as moderate to severe.[2] Poorly controlled postoperative pain can significantly impair respiratory function, hinder early mobilization, and increase the risk of postoperative pulmonary complications (PPCs), including atelectasis, as well as chronic post-surgical pain (CPSP).[2,3]

Historically, opioids have been heavily relied upon to manage post-surgical pain following VATS, but their widespread use comes with numerous complications. [2,3]Postoperative nausea and vomiting (PONV), ileus, and respiratory depression are common opioid side effects that exacerbate the risk of complications, further hindering recovery. [2,3] These effects can also impede a patient's ability to achieve key enhanced recovery targets, such as early mobilization, PONV control, and rapid return to oral diet. [4,5]

To address these concerns, the thoracic Enhanced Recovery After Surgery (ERAS) guidelines, introduced in 2019, emphasize the adoption of opioid-sparing analgesia strategies based on regional anesthesia techniques.[4,5] Thoracic epidural block (TEB) and thoracic paravertebral block (TPVB) have long been established as first-line methods for pain control in VATS.[3, 5-7] However, the growing number of patients who are unsuitable candidates for central neuraxial or paravertebral blockade underscores the urgent need for alternative regional techniques, such as the SAPB and ESPB.[3,5]

With newer evidence, it has been recognized by the ERAS guidelines that the risks associated with the perioperative use of epidural and paravertebral analgesia are becoming more evident and may be greater than previously presumed.[4] The lower risk of serious complications (e.g., hypotension, urinary retention, hematoma, pneumothorax) of the ESPB and SAPB blocks compared to TEA and PVB makes them attractive for patients at higher risk of adverse events or with contraindications to neuraxial techniques.[16-18] Therefore, as more invasive analgesic clinical standards are increasingly questioned, less invasive yet clinically effective interfascial blocks are gaining exponential clinical relevance.

Both the SAPB and ESPB have emerged as promising analgesic alternatives to TEB and TPVB in the management of postoperative pain following VATS. These ultrasound-guided interfascial plane blocks aim to deliver local anesthetic agents near the thoracic spinal nerves, but they differ in their precise location, nerve targets, and specific advantages.[3] However, the choice of an interfascial block is often influenced by the anesthesia provider's personal preferences, skill level, and experience, rather than a clear, evidence-based standard.[3] As evidence-based practice is a cornerstone of anesthesia care, there is a critical need to investigate and determine the most clinically effective interfascial block for improving pain outcomes and minimizing opioid use in thoracic surgical patients.

Background

Case reports describing the analgesic superiority of the ESPB over the SAPB have been increasing in the literature; however, there is no clinical standard interfascial block for patients undergoing VATS. As a result, anesthesia providers tend to rely on personal preferences rather than scientific evidence when choosing blocks.

The SAPB, first proposed in 2013, targets the surface of the serratus anterior muscle or its deep interstitial space, offering adequate analgesia for lateral thoracic incisions.[2] Anatomical advantages of the SAPB include coverage of most VATS incisions and the location of the chest tube, which can provide advantageous postoperative analgesia for patients.[2] Its relative ease of performance, safety, and growing adoption in VATS have contributed to its increasing popularity, with its use even cited in ERAS guidelines.[4]

In comparison, the ESPB, introduced in 2016, targets both the dorsal and ventral rami of the thoracic spinal nerves, providing broad dermatomal coverage. While its wide coverage may

be less targeted for VATS incisions, some evidence suggests it could provide more extensive pain relief across a larger area. The somatic and visceral analgesia supplied by the ESPB aids in its efficacy in the treatment of pain originating from VATS.[15]

Analgesic efficacy can be defined in various measures. Such efficacy measures include time to rescue analgesia, total rescue opioid dose, and patient satisfaction scores.[19] Numerous studies have focused on the incorporation of regional anesthesia techniques as part of multimodal analgesia regimens to reduce postoperative pain scores; however, they have also focused less on reducing opioid consumption as a result.[2] Because of the major detriment opioids can have on this patient population, the primary outcome measure chosen for this project was postoperative opioid consumption. In this way, the ideal interfascial block should be the least invasive, most clinically effective block, determined primarily by reduced postoperative opioid consumption and, secondarily, supported by patient visual analog scale (VAS) scores, time to rescue analgesia, and the incidence of postoperative complications or side effects.

Scope of the Problem

It is estimated that approximately 530,000 general thoracic surgery cases are performed in the United States annually, with VATS being the most commonly performed procedure.[20] Primarily, VATS are performed to treat lung cancer, the deadliest and second most prevalent malignancy nationwide in both men and women.[20] Despite advancements in surgical technique and movement towards minimally invasive procedures, postoperative pain remains significant in its intensity and duration. The etiology of postoperative pain after VATS stems from pleural irritation, damage to intercostal nerves and muscles, and chest tube placement, all of which contribute to VATS' association with one of the most severe postsurgical pains.[21] Of patients who undergo minimally invasive thoracic surgery, including VATS, approximately 25-60% will

experience chronic pain, defined as pain lasting 2-3 months postoperatively, and persistent postsurgical pain (PPSP).[21-23] Acute and chronic postsurgical pain is associated with decreased mobility, impaired respiratory function, and hemodynamic instability, contributing to significant morbidity among patients.[21]

Systemic opioids have a long history in the treatment and reduction of post-surgical pain after VATS.[2] However, their highly associated adverse effects, including postoperative nausea and vomiting and respiratory depression, are cause for considerable concern among anesthesia providers to lessen their use. As a result, regional anesthesia has been incorporated into ERAS guidelines for thoracic surgery since 2019.[4,5] While TEB and TPVB remain the gold standards in regional anesthesia for VATs, only 10% (TEB) and 50% (TPVB) utilize these techniques.[23] This is likely due to their difficulty in administration, potential side effects, and risk of complications that limit their use among high-risk candidates.[15] Therefore, the estimated remaining 40% of patients remain without a clear clinical standard for regional anesthetic management, leaving anesthesia providers' block of choice decision to be left up to personal preference rather than a scientific basis.

Consequences of the Problem

If the choice of the interfascial block for VATS continues to be determined arbitrarily by provider preference rather than on a scientific basis, there could be significant economic, social, political, and environmental consequences. If not fixed, there could be no improvement or an even increased incidence of chronic and persistent postsurgical pain. This could contribute to prolonged length of hospital stays, readmissions, and increased opioid usage and dependency. A direct consequence of these predicaments is increased healthcare expenditures. Considering the large number of patients who undergo VATS annually,[20] an increased incidence of chronic pain

or PPSP may find patients unable to return to work and/or facing long-term disability, negatively affecting the economy. In terms of social impact, if blocks that have demonstrated superior analgesic efficacy, such as the ESPB, are not universally accessible, this could profoundly exacerbate healthcare disparities, especially for low-income and rural patients. Politically, the increased recognition of the risks and adverse effects of opioids could contribute to increased regulation of opioids. Thus, the need for the most effective opioid-sparing technique is paramount. On the other hand, increased use of opioids with respect to improper pain management for VATS patients could result in environmental consequences such as pharmaceutical waste and water contamination.

Lastly, the underuse of superior efficacious regional anesthetic techniques, such as the ESPB, can result in a lack of experience and proficiency amongst anesthesia providers, further contributing to their limited use in practice. This could exacerbate the cycle of suboptimal pain management for thoracic surgery patients, reducing the overall quality of care.

Knowledge Gaps

As a novel regional anesthetic technique for VATS, the ESPB's limited utilization appears to stem from a lack of provider experience.[8] In addition, although ERAS guidelines promote the adoption of a multimodal anesthetic regimen tailored to individual patients, there is no current consensus regarding the best interfascial plane block for VATS.[4,8] Literature regarding ESPB versus SAPB is limited, with comparison between all other interfascial blocks even more scarce. This contributes to the overall heterogenicity of studies, creating uncertainty among the anesthesia community and increasing a preference for personal preference over scientific evidence in determining block choice. Addressing these knowledge gaps through further

research, including clinical trials, systematic reviews, and collaboration among the anesthesia community, is crucial for improving this problem.

Proposed Solution

This project aims to provide evidence-based education and recommendations towards the ESPB for patients undergoing VATS to reduce opioid consumption and improve patient outcomes among this patient population. Developing an educational module for anesthesia providers on the ease of technique, reduced postoperative opioid consumption, and overall analgesic efficacy can be incredibly effective in addressing the aforementioned knowledge gaps regarding this clinical problem. To be successful, the project module includes a thorough SWOT analysis, identification of learning objectives, evidence-based content, and an accessible delivery platform. A pre- and post-module questionnaire evaluates baseline provider knowledge and attitudes, as well as learning, knowledge improvement, and changes in attitudes regarding the incorporation of the ESPB into multimodal analgesic regimens for patients undergoing VATS. As there is no consensus on the preferred interfascial block for patients undergoing VATS, the project aims to provide evidence-based recommendations to address this clinical problem.

Section Two: Literature Review

Patients undergoing VATS are at risk for moderate to severe pain. Early and adequate pain control is necessary to facilitate recovery, improve respiratory function, and reduce the incidence of chronic pain. Regional techniques are favored because they reduce opioid consumption, postoperative nausea and vomiting, and facilitate early mobilization and discharge. Guidelines now recommend multimodal analgesia with regional blocks as a cornerstone of perioperative pain management in VATS, but research regarding which interfascial plane block promotes superior analgesia is limited.

The adoption of interfascial plane blocks (ESPB, SAPB) is rising, especially in minimally invasive settings.[24,25] The ESPB blocks the dorsal rami of the spinal nerves, as it targets the fascial plane between the erector spinae muscles and the posterior border of the transverse processes.[26] Compared to the TEA or PVB, the ESPB is easier to perform, with a lower failure rate and less technical complexity.[27,28] The SAPB targets the lateral cutaneous branches of the intercostal nerves and their insertion into the serratus anterior muscle.[26] Still, it is generally less effective than ESPB for deep pain and recovery outcomes.[3] Currently, however, there is no consensus as to the analgesic superiority of either for patients undergoing VATS.

PICO Question

The literature review was aimed at exploring the clinical question of whether the ESPB provides superior analgesic efficacy in terms of reduced opioid consumption among patients undergoing VATS compared to the SAPB. As previously stated, this resulted in the following PICO question: In adult patients undergoing video-assisted thoracoscopic surgery (VATS), how does the erector spinae block (ESPB), compared to the serratus anterior plane block (SAPB), reduce opioid consumption within the first 24 hours post-surgery?

Population: Adult patients undergoing VATS

Intervention: Usage of the erector spinae plane block (ESPB)

Comparison: Usage of the serratus anterior plane block (SAPB)

Outcome: Reduced postoperative opioid consumption within the first 24 hours

Literature Search Process

A comprehensive literature review was conducted using the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and EBSCOhost databases, focusing on keywords related to video-assisted thoracoscopic surgery (VATS), serratus anterior plane block (SAPB), and opioid use. The Boolean Search keywords used included: "video-assisted thoracoscopic surgery," "VATS," "minimally invasive thoracic surgery," "continuous serratus anterior plane block," "SAPB," "regional anesthesia," "erector spinae plane block," "ESPB," "opioid consumption," "opioid use," and "post-surgical pain." Articles were filtered for randomized controlled trials (RCTs). Initial search yielded 8 articles. The search was re-conducted, replacing "continuous serratus anterior plane block," "regional anesthesia," "erector spinae plane block," and "esp" with the terms "regional anesthesia" and "nerve block." A total of 36 RCTs were retrieved. Articles were then manually sorted into those comparing the SAPB and ESPB. This resulted in 8 studies qualifying for use.

Inclusion and Exclusion Criteria

The inclusion criteria were full-text, published within the last 5 years, peer-reviewed, and involving adult human subjects undergoing VATS or thoracic surgery under anesthesia. Articles also included measurement of analgesic efficacy via postoperative opioid consumption. Exclusion criteria included studies that did not pertain to patients undergoing thoracic procedures or VATS, non-English-language articles, and duplicate articles. All considered articles were randomized controlled trials (RCTs), level II evidence or higher.

Literature Appraisal and Literature Matrix

Citation	Design/ Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Das et al,[19] 2022	A prospective, randomized study comparing the TPVB, ESPB, and SAPB according to analgesic efficacy using visual analog scale (VAS) scores.	Sample: Ninety adult patients of either sex, aged 18-65, scheduled to undergo posterolateral thoracotomy for lung surgery under general anesthesia. Why: Sample size calculated based on pain levels 3 hours after extubation as primary outcome measure. 28-30 people per group were needed to detect a 10 mm difference in pain levels. Setting: Cardiothoracic operating room and postcardiac surgery intensive care unit (ICU) of a tertiary-care hospital in India	IV1 = ESPB IV2 = TPVB IV3 = SAPB DV = VAS scores in the intensive care unit at 0, 3, 6, 12, and 24 hours Secondary outcome measures = time to first rescue analgesic, **total rescue opioid dose used**, patient satisfaction at 24 hours, success of one-time attempt, occurrence of adverse effect	Visual Analog Scale (VAS) 10-cm pain scale where 0 = no pain and 10 = extreme/intolerable pain. Researchers calculated that 30 subjects per group were needed to identify a 10 mm difference in pain levels with 80% statistical power and a 5% chance of error. This calculation, based on a 13 mm standard deviation of the pain score, was performed using Statistica version 8 (StatSoft Inc., Tulsa, OK). Patient satisfaction score 1 = very dissatisfied 2 = dissatisfied 3 = satisfied 4 = very satisfied	Data were analyzed using Statistica version 8 and summarized using mean and SD for numerical variables that are distributed normally, median and IQR for skewed numerical variables, and counts and percentages for the categorical variables. The numerical variables were compared among the groups by one-way analysis of variance (ANOVA), if normally distributed. The numerical variables (if distribution is skewed) were compared among the groups by the Kruskal-Wallis H-test. *Post hoc* analysis after ANOVA was done by Tukey's test and after Kruskal-Wallis ANOVA by Dunn's test.	The 90 patients were allocated into 3 groups with 30 patients each. There were 2 dropouts in the TAPB group and 1 in the SAPB group. VAS score at 0, 3, 6, and 24 hours was significantly lower in the ESPB group. The VAS score at 12 hours was significantly higher in the SAPB group. Patient satisfaction level was best in the ESPB group.	Authors concluded that ESPB provided the best analgesia and fewest side effects, followed by TPVB and SAPB. Therefore, the authors find that ESPB should be considered first-choice in relieving post-thoracotomy pain.	Limitations: Smaller sample size VAS scores are subjective Risk or harm: Minimized by having specific exclusion criteria of patients. Feasibility: The study is feasible and repeatable. All blocks are currently used in practice and can be easily implemented. Strength: Level II – Randomized Controlled Trial (RCT). The level of evidence is strong due to the randomization of patients and limited bias.

Citation	Design/ Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Ekinci et al,[29] 2020	A randomized, controlled trial comparing perioperative and postoperative (48 hours) opioid consumption.	Sample: 60 adult patients, age 18-65, undergoing unilateral thoracoscopic lobectomies/wedge resection randomized into two groups, ESPB (N = 30) and SAPB (N = 30). There were no significant differences between the two groups in terms of demographic data, durations of surgery and anesthesia, or the types of surgical procedures they underwent.	IV1 = ESPB IV2 = SAPB DV1 = **0–48-hour postoperative opioid consumption** DV2 = static/dynamic VAS scores	Outcomes were evaluated and recorded by a single pain nurse anesthetist who was blinded to the study protocol. Pain was documented using the Visual Analog Scale (VAS): 10-cm pain scale where 0 = no pain, 10 = the most severe pain. VAS scores were recorded 1, 2, 4, 8, 16, 24 and 48 hours into the post-operative period.	Intraoperative and postoperative opioid consumption at 0-8, 8-16, and 16-24 hours were all significantly lower in the ESPB group compared with the SAPB group. At 24-48 hours, postoperative opioid consumption was similar. Total postoperative 48-hour opioid consumption was significantly lower in the ESPB group than SAPB group. No significant difference between static VAS scores of the two groups at hour 4 ($P < 0.05$).	ESPB was more effective in controlling patient pain compared with SAPB for thoracoscopic lung surgery. ESPB resulted in less intra-operative and postoperative opioid consumption at 24 hours, lower rescue analgesic usage, and lower active/ passive VAS scores compared with SAPB. Similar between the two groups were block procedure time, one-time puncture success, and opioid use at 24-48 hours.	The authors concluded that while clinicians may have a preference for either block for pain management after VATS, the current study shows that ultrasound (US)-guided ESPB provides superior pain control compared to SAPB.	Strengths: Patients were observed for 48 hours instead of 24 (most studies). Limitations: Did not use dermatomal sensory testing (better comparison of efficacy between the two blocks). Second, did not use continuous infusion catheters for postoperative pain control. Strength: Level II – Randomized Controlled Trial (RCT). The level of evidence is strong due to the randomization of patients and limited bias.

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Elsabeeny et al,[30] 2021	A randomized, controlled trial comparing TEA, ESPB, and SAPB analgesic efficacy in adults undergoing posterolateral thoracotomies for lung cancer. All the blocks were performed by an expert anesthesiologist. Surgeries were done by the same surgeon through serratus-sparing posterolateral incision at the level of the fifth intercostal space.	Sample: 51 adult patients, aged 18-65, with cancer undergoing posterolateral thoracotomy. Randomly allocated into thoracic epidural analgesia (TEA) (n = 17), SAPB (n = 17), and ESPB (n = 17) groups. Why: Sample determined using G*power 3.1.9.2. Mean VAS score at 8 h post-op was 2.70 (±0.79) based on a prior study - projected to be the same for ESPB and 30% higher for SAPB. To achieve 80% power and a 95% confidence interval, and accounting for potential dropouts, 17 patients were recruited per group.	IV1 = TEA IV2 = SAPB IV3 = ESPB DV = 24 hours postoperative VAS score Secondary outcomes = intraoperative rescue fentanyl consumption, perioperative heart rate, mean arterial pressure (MAP), and **total postoperative morphine consumption**.	Pain was assessed using the Visual Analog Scale (VAS), a 0-10 scale whereas 0 = no pain and 10 = the worst experienced pain. VAS was recorded in PACU at rest and then at at 2, 4, 8, 16, and 24 hours, or any time patients expressed pain. VAS with cough was documented at 2, 4, 8, 16, and 24 hours.	PACU and at 24 hours: VAS scores were significantly lower for the TEA than SAPB (p = 0.002 and 0.017). VAS scores for TEA and ESPB groups comparable. No significant differences among the 3 groups at any other time intervals. VAS with cough scores were higher in the SAPB than TEA group at 8 and 24 hours (p = 0.035 and p = 0.001); comparable between TEA and ESPB. No significant differences among the 3 groups at any other time intervals.	TEA and ESPB were superior to SAPB for perioperative pain control (lower VAS scores, less postoperative morphine consumption, and longer time to first postoperative morphine).	ESPB is a safe and effective alternative to TEA with comparable pain scores. ESPB is superior in analgesic management over SAPB for patients undergoing VATS, determined by lower VAS scores and less 24-hour morphine consumption.	Limitations: short study duration (limited to 24 hours). Extending the duration of the study may be more informative. Second, lack of verification of sensory level extension (different timing of block activation limited assessment of sensory level). Strength: Level II – Randomized Controlled Trial (RCT). The level of evidence is strong due to the randomization of patients and limited bias.

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Finnerty et al,[3] 2020	An RCT comparing the quality of recovery and overall morbidity between ESPB and SAPB after minimally invasive thoracic surgery (MITS).	Sample: 60 adult patients, aged 18-80, undergoing unilateral MITS under general anesthesia. Randomly assigned to receive either single-shot ESPB or SAPB before surgery. Setting: Division of Anaesthesiology, Mater Misericordiae University Hospital, Dublin, Ireland	IV1 = ESPB IV2 = SAPB DV = quality of patient recovery (QoR) at 24 hours Secondary outcomes = pain verbal rating scale (VRS) over time (area under curve [AUC]), time to first opioid analgesia, **postoperative 24 h opioid consumption**, in-hospital comprehensive complication index (CCI) score, and hospital stay (LOS)	Quality of Recovery-15 (QoR-15) scale: Assessment of 5 domains (pain, physical comfort, physical independence, psychological state, and emotional state). VRS AUC: Likert scale of 0-10 (0 = no pain, 10 = worst pain experience) CCI: Clavien–Dindo Class-ification system defines a postop complication as any deviation from the ideal postop course. LOS: days in hospital Data were analyzed in GraphPad Prism version 8.	QoR-15 score higher among ESPB than SAPB group – mean (standard deviation): 114 (16) vs 102 (22) (P = 0.02) VRS AUC at rest: 92 (31) mm h^{-1} in ESPB vs 112 (35) in SAPB (P = 0.03) CCI: Median (25-75%) in ESPB was 1 (0-2) vs 4 (0-26) in SAPB (P = 0.03) Hospital LOS: 3 (2-6) days in ESPB vs 6 (3-9) days (P = 0.17) in SAPB.	VRS pain scores at rest and on deep inspiration were similar at all time intervals except at 24 h, where the scores were 4 for ESPB and 5 for SAPB, which is a significant difference. The total pain over time at rest was lower for the ESPB group compared to the SAPB group.	The ESPB provides clinically relevant superior quality of recovery (QoR) at 24 h postoperatively, results in decreased morbidity, and provides better analgesia after MITS. The superior analgesia of the ESPB (evidenced by lower VRS AUC time and superior QoR-15) likely contributed to its decreased complications, such as postoperative pneumonia, and warrants further discussion and research.	Limitations: Differences in surgery performed (i.e. pleurectomy), younger patients with lower BMI in SAPB group, lack of dermatomal assessment since conducted under general anesthesia. Risk or Harm: Patients are not exposed to any surgical insult when blocks are performed under general anesthesia and consistent with routine practice. Feasibility: Each block is simple to perform and currently used; therefore, implementing ESPB over SAPB in VATS is highly feasible. Strength: Level II RCTs are strong level of evidence due to randomization of patients and limited bias.

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Gaballah et al,[31] 2019	An RCT designed to compare the postoperative pain management efficacy between the ESPB and SAPB in patients undergoing VATS.	Sample: 60 adult patients were randomly assigned to receive either ESPB (n = 30) or SAPB (n = 30) in a single-shot, ultrasound guided manner. Setting: Department of Anesthesiology, Faculty of Medicine, Menoufia University, Shibin el-kom, Menoufia, Egypt	IV1 = ESPB IV2 = SAPB DV1 = pain severity DV2 = time to first post-operative analgesia DV3 = intra-operative and postoperative analgesic requirements.	VAS was assessed as soon as patient was alert enough to report pain, at PACU admission, every hour for the first 8 hours, followed by every 3 hours. VAS was recorded as static (normal breathing) and dynamic (voluntary cough) measurements.	ESPB had lower VAS static scores except for hour 4 (1.87 ± 0.35 v 2.0 ± 0.01; p = 0.04) to hour 6 (3.33 ± 0.48 v 3.73 ± 0.4; p =0.002). Time to first required analgesic was longer in the ESPB group (379.07 ± 7.78 v 296.04 ± 6.62 minutes; p < 0.001). The proportion of patients who required 2 doses of pethidine was lower in the ESPB group (36.7%) than the SAPB group (70%). The total number of patients who required 3 doses of ketorolac was comparable between the two groups (46.7% in ESPB v 70% in SPB; p = 0.248).	The ESPB provided adequate analgesia after VATS, the average static and dynamic VAS score did not exceed 4 in most of the postoperative periods, it prolonged the time until the first analgesic (approx. 8 hours) and reduced the need for ketorolac and pethidine.	Both the ESPB and SAPB are simple and safe techniques that are suitable for postoperative pain management in patients who undergo VATS. While the ESPB provided statistically significant greater analgesia and a longer time until the first required rescue analgesic, the authors found the differences between the two techniques to be clinically subtle and request further trials to validate these findings.	Limitations: Use of an indwelling catheter for continuous infusion rather than single-shot performance of the blocks would allow for better pain control. Adjuvants to local anesthetics might have provided longer duration of sensory motor block and better analgesia. Risk or Harm: ultrasound-guided interfascial nerve block techniques are simple and safe to perform, without serious structural injuries, and fewer anesthesia-related toxicities due to easily identification of vessels and nerves with the use of ultrasound. Therefore, they are not only simple to implement but also clinically safe. Strength: Level II RCTs are strong level of evidence due to randomization of patients and limited bias.

Citation	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Wu et al,[28] 2023	RCT comparing the analgesic efficacy of ESPB and SAPB following uniportal thoracoscopic surgery defined by postoperative opioid consumption.	Sample: 150 adult patients were randomly assigned to three groups: ESPB (n = 50), SAPB (n = 50), and control (n = 50). Accounting for a 10% dropout rate, the planned total sample size was 150 patients, with 50 subjects allocated to each group. Setting: Department of Anesthesiology, Shanghai Pulmonary Hospital, School of Medicine, Tongji University, Shanghai, China	IV1 = ESPB IV2 = SAPB Control DV1 = **24-hour sufentanil consumption** Secondary outcomes = Area under the curve (AUC) of pain numerical rating scale (NRS) scores, occurrence of moderate to severe pain, time to initial sufentanil request, and postoperative adverse events.	Total consumption of sufentanil during initial 24-hours postoperatively was recorded from patient-controlled analgesia (PCA) device. AUC NRS scores: documented for pain at rest and on movement over a 24-hour period. Occurrence of moderate to severe pain: defined as an NRS score of 3 or higher Time to initial sufentanil request: defined in minutes	No significant difference in postop 24-hour sufentanil consumption between ESPB and SAPB [95% CI, -5.15 to 2.08]; both were significantly less than control. No significant differences in AUC of NRS scores between ESPB and SAPB at rest (7.10 [95% CI, 1.33 to -15.55]) and movement (5.61 [95% CI, -13.23 to 2.01]). 6 h postop moderate to severe pain was less in ESPB than SAPB (-1.37% [95% CI, -2.29% to -0.45%]). SAPB group had the longest median (IQR) time to first sufentanil dose (~205 min), followed by the ESPB group (~172 min), and the control group (~30 min).	There was comparable postoperative sufentanil consumption between the two blocks, with no significant difference for pain scores during rest and move-ment. However, the ESPB group has less moderate to severe pain at 6 h postop compared to the SAPB group. Time to initial sufentanil analgesia was longer in the SAPB group than ESPB.	Both the ESPB and SAPB demonstrate decreased opioid consumption and need for rescue analgesics in a 24-h postoperative period. In this study, patients undergoing ESPB demonstrated a lower incidence of moderate to severe pain at 6 h postoperatively. Therefore, the authors concluded that due to potential differences in port locations, variability in local anesthetic spread, and use of uniportal thoracoscopic surgery compared to traditional VATS, differences in opioid consumption between the two groups are narrow and comparable.	Limitations: Study took place over 24-h, a limited timeframe. Absence of sensory testing following the nerve block. Study conducted at single center, posing limitations on generalizability. Feasibility: ESPB and SAPB are two of several regional blockade techniques currently used and widely available for thoracic surgery. This study simply compared analgesic efficacy, so implementing either in practice is feasible. Risk or Harm: the study displayed an absence of any block-related complications in the ESPB and SAPB groups, indicating their relative safety. Strength: Level II – RCTs are strong level of evidence due to randomization of patients and limited bias.

Citation	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Zengin et al,[32] 2022	RCT comparing the analgesic efficacy of ESPB and combined deep and superficial SAPB (C-SAPB) in adult patients undergoing VATS.	Sample: 60 adult patients, aged 18-65, were randomly assigned to the ESPB group (n = 30) or SAPB group (n = 30). Setting: University of Health Sciences, Ankara Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital, Anesthesiology and Reanimation Clinic, Ankara, Turkey	IV1 = ESPB IV2 = SAPB DV1 = VAS scores at rest and coughing Secondary outcomes = **postoperative morphine consumption** and the requirement of rescue analgesics.	VAS: pain intensity was assessed using VAS scores on a 10-point scale (0 = no pain, 10 = unbearable pain). VAS scores at rest and while coughing were recorded in postoperative hours 1, 2, 4, 8, 16, and 24. Morphine consumption as recorded via PCA usage. Requirement of rescue analgesic (0.5 mg/kg of IV tramadol given to patients for VAS score at rest was ≥4) was recorded.	No statistically significant difference between VAS for all resting and cough scores ($p > 0.05$). Both blocks also displayed similar postoperative morphine consumption and rescue analgesic requirements ($p > 0.05$).	During the first postoperative 24 hours, patients undergoing VATS and receiving either ESPB or C-SAPB had similar pain scores (in terms of VAS scores), opioid consumption (morphine), and rescue analgesic.	The authors concluded that due to their similar analgesic efficacy in terms of pain scores, opioid consumption, and use of rescue analgesia, the SAPB can be a viable alternative to ESPB since they have similar application and ease of use with ultrasound.	Limitations: Being performed in a single-center, high-volume thoracic surgery center may limit generalizability. Dermatomal assessment of the block level was not done since blocks were performed under general anesthesia. Study was only conducted for initial 24 hours postop. Strengths: ultrasound allows visualization of local anesthetic spread. Feasibility: Both blocks are widely used and easily implemented, especially with the use of ultrasound. Risk or Harm: Ultrasound allows for reduced risk of injury or toxicity. Strength: Level II – RCTs are strong level of evidence due to randomization of patients and limited bias.

Citation	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Zhang et al,[33] 2022	RCT comparing the roles of three fasical block techniques (SAPB, ESPB, and rhomboid intercostal block [RIB]) in the post-operative pain management of patients undergoing VATS.	Sample: 90 adult patients, aged 18-80, undergoing unilateral VATS under general anesthesia, randomly assigned into three groups: SAPB, ESPB, and RIB. Setting: Department of Anesthesiology and Pain Medicine, The Affiliated Hospital of Jiaxing University, Jiaxing, Zhejiang, China	IV1 = SAPB IV2 = ESPB IV3 = RIB DV1 = **Postoperative sufentanil consumption**, postoperative NRS pain scores Secondary outcomes = time to first postoperative analgesic demand.	NRS: 11-point Numerical Rating Scale (NRS) ranging from 0 = no pain to 10 = worst pain imaginable. NRS scores were measured at 0.5, 1, 3, 6, 12, 18, 24, 36, and 48 hours. Time to first postoperative analgesic demand was recorded via PCA usage.	From hours 0-12, sufentanil was lower in the RIB (35.2 ± 3.3 μg) and ESPB (35.4 ± 2.8 μg) groups than SAPB (43.3 ± 2.7 μg) ($P < 0.001$). At hours 12-24, sufentanil was again lower in RIB and ESPB compared to SAPB ($P < 0.001$). No difference between RIB and ESPB at any time. At hours 6, 12, 18, and 24, postoperative dynamic NRS scores were significantly lower in RIB and ESPB groups than the SAPB group ($P < 0.05$ for all). The time-to-first postoperative analgesic demand and the satisfaction scores in groups RIB and ESPB were greatly shorter than those in group SAPB ($P < 0.05$ at any time).	Patients receiving RIB and ESPB had lower sufentanil consumption and dynamic NRS scores in the first 24 hours postoperatively in comparison to SAPB. RIB and ESPB also had a longer time-to-first postoperative analgesic demand compared to SAPB. There were no significant differences in the sufentanil consumption and NRS scores in the 24-48 hour marks among all three blocks.	Both RIB and ESPB are more effective in reducing the consumption of sufentanil within 24 hours after VATS than with the SAPB.	Limitations: the depth of anesthesia during the procedure was not monitored, which may have influenced the anesthetic dosage. Feasibility: RIB, ESPB, and SAPB are all widely available regional nerve blocks used for analgesia after thoracic surgery. Each are feasible to implement into practice. All are suitable options, although further clinical studies are needed to determine which possesses the greatest analgesic efficacy, especially between the ESPB and RIB. Risk or Harm: The RIB, ESPB, and SAPB have all been shown to have analgesic efficacy ranging rom “good” to “superior” after VATS. Strength: Level II – RCTs are strong level of evidence due to randomization of patients and limited bias.

Characteristics of the Included Studies

The literature review matrix table synthesizes the relevant literature focused on the aforementioned PICO clinical question and purpose. Eight randomized controlled trials and one systematic review provided the primary insights on comparing the ESPB and SAPB as interfascial plane blocks used in multimodal analgesic regimens for patients undergoing VATS. Each study's quality and validity were individually assessed.

Das et al.[19] conducted a prospective RCT comparing TPVB, ESPB, and SAPB for analgesic efficacy using visual analog scale (VAS) scores and total rescue opioid dose. A total of 90 patients were allocated into three groups (30 patients each): ESPB, TPVB, and SAPB. The total opioid dose required was lowest in the ESPB group ($p < 0.05$). The VAS score at 0, 3, 6, and 24 hours was significantly lower in the ESPB group ($p < 0.05$). The VAS score at 12 hours was significantly higher in the SAPB group ($p < 0.05$). The ESPB group had the highest patient satisfaction level ($p < 0.001$). Therefore, the authors concluded that ESPB provided the best analgesia and the fewest side effects, followed by TPVB and SAPB. In this study, the authors even determined that the ESPB should be considered the first choice in relieving post-thoracotomy pain.

Ekinci et al.[29] performed an RCT comparing perioperative and postoperative opioid consumption between the ESPB and SAPB within 48 hours postoperatively following VATS. In this study, sixty adult patients were randomized into two groups. Outcomes were evaluated and recorded by a single pain nurse anesthetist who was blinded to the study protocol. Intraoperative and postoperative opioid consumption at 0-8, 8-16, and 16-24 hours was all significantly lower in the ESPB group compared with the SAPB group, while consumption was similar between the two at 24-48 hours. In total, the ESPB resulted in less intra-operative and postoperative opioid

consumption at 24 hours, lower rescue analgesic usage, and lower active/passive VAS scores compared with SAPB.

Elsabeeny et al.[30] conducted an RCT comparing TEB, ESPB, and SAPB analgesic efficacy in adults undergoing posterolateral thoracotomies for lung cancer. The study comprised 51 adult patients, aged 18-65, with cancer undergoing posterolateral thoracotomy, who were randomly allocated to TEB (n = 17), SAPB (n = 17), and ESPB (n = 17) groups. In addition to VAS scores, postoperative morphine consumption was measured and was the primary focus of this project. As a result, TEB and ESPB were superior to SAPB for perioperative pain control, with lower VAS scores, less postoperative morphine consumption, and longer time to first postoperative morphine, supporting TEB as the gold standard and ESPB as the superior interfascial plane block.

Finnerty et al.[3] performed an RCT comparing the quality of recovery and overall morbidity between ESPB and SAPB after minimally invasive thoracic surgery (MITS). Although the study identified reduced postoperative opioid consumption over 24 hours in the ESPB group compared to the SAPB group, the authors primarily concluded that ESPB's superior analgesia was evidenced by lower VRS area under the curve and higher quality-of-recovery (QoR) scores.

Gaballah et al.[31] designed an RCT to compare the efficacy of postoperative pain management between ESPB and SAPB in patients undergoing VATS. In this study, sixty adult patients were randomly assigned to receive either ESPB (n = 30) or SAPB (n = 30) in a single-shot, ultrasound-guided manner. In the study, it was determined that the proportion of patients who required a total 24-hour consumption of 2 doses of the opioid pethidine (0.5 mg/kg each) was lower in the ESPB group than in the SAPB group. While the ESPB provided statistically significantly greater analgesia and a longer time until the first required rescue analgesic, the

authors found the differences between the two techniques to be clinically subtle and requested further trials to validate these findings.

Wu et al.[28] performed an RCT comparing the analgesic efficacy of ESPB and SAPB following uniportal thoracoscopic surgery, defined by postoperative opioid consumption. In this study, 150 adult patients were randomly assigned to three groups: ESPB (n = 50), SAPB (n = 50), and control (n = 50). Total sufentanil consumption in 24 hours postoperatively was recorded from a patient-controlled analgesia (PCA) device, and the Area under the curve (AUC) of pain numerical rating scale (NRS) scores at rest and on movement over 24 hours was documented. Although the time to initial sufentanil analgesia was longer in the SAPB group than in the ESPB group, postoperative sufentanil consumption was comparable between the two groups.

Zengin et al.[32] conducted an RCT comparing the analgesic efficacy of the ESPB. They combined deep and superficial SAPB (C-SAPB) in adult patients undergoing VATS, reducing postoperative morphine consumption in addition to at rest. Both blocks also displayed similar postoperative morphine consumption and rescue analgesic requirements ($p > 0.05$).

Zhang et al. [33] performed an RCT comparing the roles of three interfascial block techniques (SAPB, ESPB, and rhomboid intercostal block [RIB]) in postoperative pain management in patients undergoing VATS. In this study, patients receiving RIB and ESPB had lower sufentanil consumption and dynamic NRS scores in the first 24 hours postoperatively than those receiving SAPB.

Synthesis of the Literature

The available evidence provides support for the ESPB being superior to the SAPB in reducing opioid consumption for patients undergoing VATS. Multiple randomized controlled

trials (RCTs) have demonstrated that ESPB consistently results in lower opioid consumption and improved pain control across the postoperative period, particularly in the first 24 hours after surgery. For instance, Das et al.[9] found that patients who received ESPB required significantly less opioid than those who received SAPB, with lower Visual Analog Scale (VAS) scores at multiple time points (0, 3, 6, and 24 hours), indicating better pain relief. Similarly, Ekinci et al.[29] reported reduced opioid consumption in the ESPB group during the first 24 hours post-surgery, although the difference became less pronounced after 48 hours. Gaballah et al.[31] also reported that patients receiving ESPB had a longer time first to rescue analgesic and required fewer opioids overall. However, the authors noted that the clinical differences were subtle and called for further studies to confirm these findings.

Although not the primary outcome of the project, patient satisfaction was undeniably higher in the ESPB group, in addition to reduced opioid consumption. Das et al.[9] reported that ESPB was associated with the best patient satisfaction ($p < 0.001$), which is likely related to both its reduced opioid use and better pain management. Furthermore, Finnerty et al.[3] showed that ESPB led to superior quality of recovery (QoR) and overall morbidity outcomes compared to SAPB, reinforcing the advantages of ESPB not only for pain control but also for overall recovery. However, Allah et al.[31] also note that the clinical significance of the differences between ESPB and SAPB, while statistically significant, may not be as great as some other studies suggested.

Therefore, while both ESPB and SAPB offer adequate analgesia following VATS, ESPB consistently outperforms SAPB in reducing opioid consumption, providing better pain relief, and improving patient satisfaction. The evidence supports the notion that ESPB should be considered a first-line regional block for thoracic surgery. However, additional studies with larger sample

sizes and longer follow-up periods are needed to validate these findings further and refine clinical recommendations.

Effect of ESPB on postoperative opioid consumption

Ekinci et al.[29] found significantly lower 0–48-hour opioid consumption in the ESPB group compared with the serratus anterior plane block (SAPB), particularly in the first 24 hours following surgery. Das et al.[19] similarly observed that patients receiving ESPB required the lowest total opioid doses and had reduced visual analog scale (VAS) scores compared with SAPB and thoracic paravertebral block (TPVB) groups ($p < 0.05$). Elsabeeny et al.[30] reported that both thoracic epidural analgesia (TEA) and ESPB groups achieved superior analgesia and lower morphine consumption than SAPB, suggesting that ESPB's analgesic profile approaches that of the current gold standard. Gaballah et al.[31] further showed that ESPB prolonged the time first to rescue analgesic and decreased the number of required opioid doses. Synthesizing these findings reveals strong and consistent evidence that EPSB provides meaningful opioid-sparing benefits during the immediate postoperative period, validating its role as a highly effective regional technique for VATS pain management.

Effect of SAPB on postoperative opioid consumption

Across randomized controlled trials, the serratus anterior plane block (SAPB) has demonstrated a measurable but variable reduction in postoperative opioid consumption among patients undergoing video-assisted thoracoscopic surgery (VATS). Gaballah et al.[31] reported lower total opioid use and prolonged time to first rescue analgesic in the SAPB group compared with patients who received systemic analgesia alone. Ekinci et al.[29] found that postoperative opioid consumption was higher in the SAPB group than in the erector spinae plane block (ESPB) group during the first 24 hours. However, both groups required fewer opioids than those reported

in studies without regional anesthesia. Wu et al. [28] observed similar findings: both the SAPB and ESPB groups showed decreased 24-hour sufentanil consumption compared to the control group, but there was no statistically significant difference between the two interfascial blocks. Zengin et al. [32] also noted comparable morphine requirements between the SAPB and ESPB groups. Overall, the synthesized evidence indicates that SAPB contributes to postoperative opioid reduction relative to no block, though its efficacy appears comparable rather than superior when directly compared to ESPB.

ESPB influence on pain intensity and quality of recovery after VATS

A secondary but influential discovery of the ESPB was its extended effects beyond opioid consumption to overall pain intensity and recovery. Finnerty et al.[3] demonstrated that patients receiving ESPB achieved significantly higher Quality-of-Recovery-15 (QoR-15) scores and lower pain verbal rating scale (VRS) area-under-the-curve values than those receiving SAPB ($P = 0.02$). Das et al.[19] and Zhang et al.[17] corroborated these findings, showing lower postoperative VAS and numerical rating scale (NRS) pain scores for ESPB recipients during the first 24 hours. These results were reinforced by greater patient satisfaction ratings and improved comfort levels, suggesting that ESPB not only reduces analgesic demand but also enhances subjective recovery experiences. This aligns with the objectives of the Thoracic Enhanced Recovery After Surgery (ERAS) guidelines, which emphasize early mobilization, reduced opioid exposure, and optimal functional recovery. The evidence therefore supports ESPB as an intervention that improves both physiologic and experiential dimensions of postoperative recovery, underscoring its relevance to modern multimodal analgesia frameworks.

SAPB influence on pain intensity and quality of recovery after VATS

Evidence from multiple studies supports the analgesic effectiveness of SAPB in reducing postoperative pain intensity after VATS, though it may provide more localized coverage than broader plane blocks. Gaballah et al.[31] reported that static and dynamic visual analog scale (VAS) scores remained below 4 throughout most postoperative intervals, indicating adequate analgesia. Wu et al.[28] and Zengin et al.[32] found that SAPB resulted in similar pain scores at rest and during coughing compared to ESPB, with both groups reporting significantly lower pain than control groups without blocks. Finnerty et al.[3] observed that, while SAPB patients achieved satisfactory pain control and stable hemodynamics, quality-of-recovery scores were lower than those with ESPB, suggesting that limited dermatomal coverage may limit its effect on global recovery outcomes. Synthesized findings across the literature indicate that SAPB consistently reduces postoperative pain and improves comfort compared with systemic analgesia alone. However, its impact on overall recovery and analgesic duration is less robust than that observed with ESPB.

Comparative safety and feasibility of ESPB versus SAPB for thoracic surgery

Across reviewed RCTs, ESPB was consistently reported as a safe and feasible block for thoracic procedures. Ekinci,[29] Wu,[28] and Zengin[32] all found no significant block-related complications in either ESPB or SAPB groups. The use of ultrasound guidance in all trials enhanced procedural safety, minimized the risk of vascular or pleural injury, and improved visualization of local anesthetic spread. Studies by Wu et al.[28] and Zengin et al.[32] also emphasized that ESPB and SAPB share similar procedural success rates and ease of performance, indicating that ESPB can be integrated into routine thoracic anesthesia practice without additional risk or training burden.

Discussion

The reviewed literature provides consistent evidence that both the ESPB and SAPB are effective regional anesthesia techniques for managing postoperative pain following VATS. However, the ESPB demonstrates superior outcomes in several domains, including postoperative opioid consumption. Across randomized controlled trials, ESPB has been shown to significantly reduce opioid consumption within the first 24 hours after surgery compared to SAPB. Das et al.[19] reported that ESPB recipients required less opioid and had lower visual analog scale (VAS) scores at multiple postoperative intervals, while Ekinci et al.[29] found similar reductions in the ESPB group during the early recovery phase. Gaballah et al.[31] also noted longer times to first rescue analgesic and fewer total opioid doses among ESPB patients, although they described the difference as modest.

In terms of patient-centered outcomes, studies such as Finnerty et al.[3] and Das et al.[19] demonstrated higher satisfaction and better quality-of-recovery scores among patients receiving ESPB compared to SAPB. These results suggest that ESPB not only improves analgesia but also enhances overall postoperative recovery and patient comfort. However, SAPB may remain a practical option, particularly for lateral thoracic incisions, and provides a safe and technically straightforward alternative for providers. Both blocks have been associated with minimal adverse events and low complication rates when performed under ultrasound guidance.

Overall, the synthesis of current evidence supports the ESPB as the more effective interfascial plane block for reducing opioid consumption and improving pain control after VATS. Nevertheless, further high-powered studies with standardized protocols and long-term follow-up are recommended to validate these findings and establish more straightforward clinical guidelines for block selection.

Definition of Terms

Video-Assisted Thoracoscopic Surgery (VATS): A minimally invasive thoracic procedure involving small incisions and video guidance, associated with moderate to severe postoperative pain.

Erector Spinae Plane Block (ESPB): An ultrasound-guided regional anesthesia technique targeting the fascial plane between the erector spinae muscle and the transverse processes to achieve both somatic and visceral analgesia.

Serratus Anterior Plane Block (SAPB): An ultrasound-guided block targeting the fascial plane either superficial or deep to the serratus anterior muscle, primarily anesthetizing the lateral cutaneous branches of the intercostal nerves.

Thoracic Epidural Analgesia (TEA): A neuraxial technique traditionally considered the gold standard for thoracic analgesia, often used as a comparator in studies evaluating newer plane blocks.

Paravertebral Block: A regional technique producing unilateral thoracic analgesia by targeting the paravertebral space; frequently used as a reference for analgesic efficacy comparisons.

Enhanced Recovery After Surgery (ERAS) Guidelines: Evidence-based protocols that endorse the incorporation of regional anesthesia-based, opioid-sparing analgesia regimens.

Section Three: Methodology

The methodology section outlines the design, procedures, and analytical strategies used to implement and evaluate this quality improvement (QI) project. The primary purpose of this section is to provide a transparent and replicable account of how the project was structured to assess the impact of an educational intervention on anesthesia provider knowledge regarding the erector spinae plane block (ESPB) and serratus anterior plane block (SAPB) in the context of

video-assisted thoracoscopic surgery (VATS). Guided by evidence-based practice and the Knowledge, Attitudes, and Practices (KAP) framework, this project sought to measure baseline knowledge, deliver a targeted educational module, and evaluate post-intervention knowledge improvement through pre- and post-test assessments.

Organizational Assessment

The purpose of this Doctor of Nursing Practice (DNP) project is to reduce opioid consumption in adult patients undergoing video-assisted thoracoscopic surgery (VATS) by comparing the effectiveness of the erector spinae plane block (ESPB) to the serratus anterior plane block (SAPB) in the first 24 hours post-surgery. Currently, opioid use remains high in the postoperative period for VATS patients, leading to adverse effects such as sedation, constipation, and delayed recovery.[3] Through an organizational assessment using Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis,[34] it has been identified that while there is institutional interest in reducing opioid use, there is heterogeneity regarding the interfascial plane block of choice for VATS. The goal is to assess how the adoption of these techniques, particularly the ESPB, can reduce opioid consumption, improve pain management, and support the broader institutional objective of opioid stewardship.

Primary DNP Project Goal

The primary goal of this project is to increase CRNAs' knowledge of the erector spinae plane block (ESPB) compared to the serratus anterior plane block (SAPB) in reducing opioid consumption in patients undergoing VATS. According to current evidence, the ESPB shows greater analgesic efficacy than the SAPB in this parameter. Currently, there is no consensus or guideline standard for the interfascial plane block of choice for patients undergoing VATS who are not candidates for TEA or PVB.

To achieve this, an educational module centered on evidence-based research regarding the ESPB and its analgesic efficacy, reduced postoperative opioid consumption, and numerical rating scale (NRS) and visual analog scale (VAS) scores compared with the SAPB will be administered. This module will support the project's goal to improve the knowledge and attitudes of anesthesia providers regarding the ESPB as the interfascial plane block of choice for patients undergoing VATS to reduce postoperative opioid consumption.

Optimum postoperative pain management that employs opioid-sparing regimens is crucial in patients undergoing VATS to decrease the incidence of postoperative complications and to meet thoracic enhanced recovery after surgery (ERAS) guidelines, both of which contribute significantly to overall improved patient outcomes and satisfaction. [4,8] Currently, thoracic epidural blockade (TEB) and thoracic paravertebral blockade (TPVB) are the first-line regional anesthetic interventions recommended by ERAS.[5] However, interfascial blocks are gaining in relevance and popularity as patients presenting for VATS have increasingly become less suitable candidates for TEB and TPVB.[4]

Both the SAPB and ESPB have demonstrated effective pain management in terms of reduced opioid consumption following VATS compared to general anesthesia alone. Initially proposed for breast surgery, the SAPB has often been used in thoracic surgery, accepted as a second-choice intervention when the TPVB is not feasible.[8] It provides analgesia directly to the chest wall by targeting the lateral branches of the T2-T9 intercostal nerves,[29] making its limited invasiveness and greater hemodynamic stability a favorable alternative to TEB and TPVB.[8] The ESPB, however, is a newly described technique in thoracic anesthesia that has been most often used for neuropathic pain, rib fractures, and rescue after epidural failure.[8] Despite its reported superior analgesic efficacy compared to the SAPB,[29] the ESPB is limited in its defined role in

anesthetic regimens for VATS amongst anesthesia providers due to a lack of experience.[8] Therefore, the goal of this project is to target improving the knowledge and attitudes of CRNAs regarding the ESPB through an educational module.

While numerous regional management techniques and interfascial blocks are available for VATS, the choice of analgesic regimen is often influenced by the anesthesia provider's personal preference rather than a strong scientific evidence base.3.[3] Of these interfascial blocks, the SAPB seems to be one of the most commonly used by providers at the practice site. This seems to be due to its technical ease and the belief that its site of action directly covers the surgical area affected by VATS.[2] However, compared to the SAPB, the current literature, as described in several studies, concluded that ESPB provides superior analgesia and reduced opioid consumption.[3,19,29] Das et al.[19] reported that based on their findings, ESPB should be considered the first-choice treatment for post-thoracotomy pain, even over TPVB, due to its decreased incidence of postoperative complications. Therefore, there is a current gap between what is described in the literature and what is commonly practiced, hence the need for this project.

Crucial to the success of this project is the support and collaboration with key stakeholders. CRNAs and anesthesia providers are essential stakeholders and the primary target group for the project, as their desire to improve perioperative practice depends on their involvement to enhance knowledge and attitudes regarding ESPB use in VATS. In addition, thoracic surgeons, anesthesiologists, and other medical doctors may be responsible for prescribing pain management strategies, and their attitudes toward locoregional anesthetic management, especially regarding reducing opioid use, can significantly influence patient outcomes. Nurses, such as post-anesthesia care unit (PACU) staff and intensive care unit (ICU)

nurses, are also key stakeholders, as their significant roles in postoperative pain assessment, education, and management are essential to practice change. Lastly, hospital administrators, patient advocacy groups, university researchers, and even patients themselves can be part of a patient-centered care team, thereby reinforcing the potential success of this project.

The FIU Department of Nurse Anesthesia can facilitate the presentation of this educational module and the survey of participants via electronic mail, and in-services can be included, per approval of the hospital's institutional review board regulations. Before the educational module, a pre-survey will assess CRNAs' baseline knowledge and attitudes. After the academic module, participants will complete a post-survey to evaluate learning. A strengths, weaknesses, opportunities, and threats (SWOT) analysis will be conducted as it is instrumental in understanding the essential variables that influence and guide the development of this QI project.

The practice site will include the vast database of FIU CRNA alumni from the last 10 years, provided by the FIU program director. Participants will be provided with an educational module and pre- and post-module survey questionnaires to assess improvements in knowledge and changes in attitudes. The support and collaboration of CRNAs who are motivated to create positive practice change based on strong scientific evidence is imperative to the implementation of this project. Thus, the nationwide spread of FIU CRNA alumni provides a robust network of practice sites to disseminate the project. The culture and values of anesthesia alumni emphasize evidence-based practices, patient safety, and continuous improvement to foster positive practice changes and enhance the quality of care in the field.

SMART Objectives

To close the gap between the current opioid consumption rates and the desired outcomes, Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) goals will guide the

project. The Knowledge, Attitudes, and Practices (KAP) model[35] will serve as the conceptual underpinning for this project; through the organizational assessment, the KAP model will help evaluate healthcare providers' knowledge, attitudes, and practices regarding the ESPB. By assessing anesthesia providers' baseline knowledge and attitudes regarding the ESPB and SAPB, providing an educational module to anesthesia providers on the analgesic efficacy and postoperative opioid consumption after VATS for the ESPB compared to the SAPB, and subsequently evaluating the improvement of knowledge and change in attitude regarding the ESPB, the project aims to provide a robust scientific evidence foundation supporting the superior analgesic efficacy of the ESPB in reducing opioid consumption for patients undergoing VATS.

The SMART model identifies specific, measurable, achievable, realistic, and time-limited objectives to direct the development of the project and drive towards its implementation. For this DNP quality improvement project, the following SMART objectives were identified.

Specific

- The project's primary goal is to educate CRNAs on the available scientific evidence regarding the ESPB for VATS, including its ease of administration, limited side effects, and its overall impact on pain management, with reduced opioid consumption compared to other interfascial plane blocks, such as the SAPB. As there is no current gold standard for interfascial plane blocks for VATS, the project aims to provide a scientific evidence base for block choice rather than rely on anesthesia providers' personal preferences.

Measurable

- The efficacy of the educational module will be analyzed by collecting pre- and post-educational questionnaire data on participants' knowledge and understanding of the ESPB for VATS, including its technique, application, and impact on opioid consumption,

as well as their attitudes towards the block. Comparing pre- and post-module data will allow for a quantitative measure of providers' changes in attitude and improvements in knowledge.

Time-Limited

- The project will provide anesthesia providers with an educational module on incorporating the ESPB into anesthetic regimens for patients undergoing VATS within 3 months of the start of the quality improvement project. This timeframe binds the project's completion to a measurable timeline, enabling a comprehensive analysis and evaluation.

Description of the Program Structure

Ensuring the success of an educational module aimed at improving anesthesia providers' knowledge and attitudes regarding the ESPB during VATS requires the support and collaboration of stakeholders, including university staff, FIU alumni representatives, and potential module developers. Stakeholders should align with alumni and institutional priorities of scholarship and quality improvement (QI). Once stakeholders are identified, a pre-intervention assessment determines stakeholders' baseline understanding of the ESPB, the SAPB, and the importance of reducing postoperative opioid consumption in patients undergoing VATS. Then, an educational module is distributed, followed by a post-intervention survey. The post-intervention survey aims to evaluate participant learning, shift in attitudes, and narrowing of knowledge gaps. Thus, the program structure is designed to support the module's primary goal of educating CRNAs and improving perioperative anesthesia practice.

Organizational SWOT Analysis

Utilization of the SWOT analysis methodically assesses the impact of potential advantages, vulnerabilities, and external factors on the development of the QI project.[34]

Evaluating SWOT analysis variables strengthens a project by detecting any supportive or harmful qualities that can affect its implementation. In addition, SWOT analysis helps to determine the longevity of a project and any threats to its sustainability, such as the positive practice change, which depends on the long-term viability of its application.[34] Strengths and weaknesses are internal factors, while opportunities are external, all of which help address gaps within, enhance implementation, and contribute to the project's overall success.[34] Threats are direct or potential barriers to the project's goals.[34] The SWOT analysis step is crucial, as its meticulous examination will facilitate the translation of research and evidence into practice by targeting the project's opportunities for improvement in using the ESPB to enhance anesthetic management regimens for patients undergoing VATS.

Strengths

CRNAs have largely incorporated regional anesthetic techniques into analgesic regimens due to the widespread recommendations of enhanced recovery protocols, such as the thoracic enhanced recovery after surgery (ERAS) guidelines.[4] Currently, there is no gold standard for interfascial nerve blocks for thoracic surgery, including VATS; instead, the first-line regional anesthetic technique recommended by ERAS remains to be TEB and TPVB,[4] despite an ever-growing patient population that lessens in its candidacy for such techniques.[35] ESPB, however, has several advantages, including a decreased risk of hypotension, greater simplicity of technique, and a lower incidence of hematoma, which CRNAs will likely find favorable given providers' dedication to patient safety and improved patient outcomes.

Weaknesses

Weaknesses attributed to the organization of interest include the widespread heterogeneity in anesthetic and analgesic management among anesthesia providers, driven by

provider preference rather than evidence-based practice. Given the novelty of the ESPB, an anesthesia provider may default to a block with which they are more familiar. While statistically significant, the current evidence regarding the ESPB is clinically limited. Muhammad et al. implied that, while findings comparing the ESPB and SAPB supported the ESPB's superior analgesic efficacy in reducing opioid consumption, the difference was below their threshold for clinical importance.[21] Therefore, further investigations of the ESPB amongst patients undergoing VATS with larger study samples are needed to make findings more conclusive and generalizable.

Opportunities

An aging patient population and an expanding cohort of surgical candidates create an opportunity for the widespread implementation of the ESPB, as neuraxial and paravertebral blockade may become increasingly unsuitable.[35] Patients undergoing VATS commonly present with pre-existing chronic obstructive pulmonary disease (COPD) and borderline respiratory functional reserve.[35] The potential for thoracic epidural and paravertebral blocks to cause sympathetic blockade in these patients can exacerbate their reduced ability to compensate for respiratory distress and maintain adequate ventilation, increasing their risk of postoperative complications such as atelectasis and pneumonia.[3] Finnerty et al.[3] proposed that the superior analgesia evidenced by the ESPB contributed to its reported lower incidence of postoperative pneumonia when directly compared with the SAPB, making this finding a positive opportunity to support its use. By implementing the ESPB for VATS patients, CRNAs can help minimize postoperative complications and improve patient safety and satisfaction.

Threats

The ESPB has been described in case reports for the treatment of neuropathic pain, rib fractures, and as rescue pain control in thoracotomy after epidural failure.[3] It is a newly described

technique for thoracic anesthesia.[8] Therefore, the novelty of the block and limited literature regarding it may explain why it is not explicitly recommended by current national anesthesia and thoracic surgery guidelines. Thus, thoracic epidural and paravertebral blocks remain the gold standard. In addition, despite the reported decrease in complications with the ESPB compared to thoracic epidural or paravertebral blocks, most complications with the latter techniques are often linked to provider skill. Therefore, anesthesia providers may be more inclined to improve the safety of the gold standard rather than focus on learning new techniques.[36] Although the ESPB does provide anesthesia to sensory dermatomes, the anatomical rationale for more central regional techniques is understandable, as the distribution of local anesthetic occurs closer to the pertinent neuronal structures. The mechanism of the ESPB may be less predictable than that of epidural and paravertebral techniques, leading to greater variability in spread. Therefore, these are potential threats to the project's successful implementation.

Theoretical Framework/Conceptual Underpinning

Theories are constructed to allow researchers to integrate facts and observations into a coherent structure, making a body of evidence more clinically relevant.[37] Conceptual findings, patterns, and relationships discovered and validated through research become the basis of theories; thus, a framework provides the overall conceptual groundwork of the research.[37] The Knowledge, Attitudes, and Practices (KAP) model suggests that a person's practiced behaviors result from their knowledge (what they know), attitudes (how they feel), and practices (how they act) towards the behaviors.[35] Using this middle-range theory, the project's primary goal of improving anesthesia providers' knowledge and attitudes toward utilizing the ESPB can be applied. Thus, anesthesia providers' knowledge of the anatomical landmarks, application, and technique of the ESPB, along with their attitudes towards the impact of interfascial plane blocks

on reducing postoperative opioid use, affects the effectiveness and success of the project's implementation.

Theory Overview

The KAP model is one of the most often used in the healthcare and medical sectors.[35] First described in the mid-nineteenth century, the KAP model has been most commonly used to demonstrate the variations in healthcare providers' pain management practices as influenced by their knowledge and attitudes.[35] The KAP model suggests that healthcare providers' knowledge (what they know), attitudes (how they feel), and practices (how they act) are interlinked, with each influencing the others and, in turn, shaping the quality of patient care delivered.[35] Findings of numerous studies utilizing the KAP model support the theory's notion that interventions should focus on shifting attitudes and perspectives and improving knowledge to enhance pain management practices.[35] Applications of the KAP model include bridging knowledge gaps, exploring the motivations behind provider practice, and evaluating the impact of educational initiatives on knowledge and attitudes.[35]

A growing body of research supports the central premise of the KAP model—that interventions aimed at improving healthcare providers' pain management practices should target not only the enhancement of their clinical knowledge but also the modification of their attitudes and perspectives.[35-39] For example, studies have consistently shown that healthcare providers' knowledge of pain management protocols is often incomplete or outdated, and personal, cultural, and institutional factors can influence their attitudes towards pain relief.[40] Such gaps in knowledge and negative or ambivalent attitudes towards pain management regimens can lead to suboptimal pain relief for patients, highlighting the need for targeted interventions.

Theory/Clinical Fit

As the KAP model explains, while numerous block techniques and analgesic options exist for VATS, factors that commonly affect the choice of locoregional technique include the anesthesia provider's personal preferences rather than scientific evidence.[3] In this way, the KAP model aligns with this DNP project as it focuses on enhancing providers' knowledge of the ESPB to promote practice change that enhances the patient experience and reduces postoperative opioid consumption. The KAP model supports the idea that anesthesia providers' personal knowledge and experience with specific blocks, as well as their attitudes toward them, can have a tremendously significant impact on their choice of locoregional technique. Thus, the KAP model provides the basis for the project to improve anesthesia providers' practices in selecting interfascial blocks for VATS by providing CRNAs with an educational module grounded in the current literature.

Moreover, the KAP model has been instrumental in evaluating the impact of educational initiatives on healthcare providers.[35] Several studies have shown that structured educational interventions, aimed at both enhancing knowledge and addressing attitudes, can lead to improved pain management practices.[39,40] In a randomized controlled trial examining the effects of a pain management education program for nurses, results demonstrated significant improvements in both pain assessment and the use of effective pain relief strategies following a multimedia-style training intervention, such as the educational module proposed in this project.[41] The study found the multimedia training method to be more effective than a lecturing method and further described advantages such as long-distance learning by employing this method.[41] These findings underscore the importance of education in transforming attitudes and ultimately improving clinical outcomes for patients.

Theory Evaluation

Using the Peterson and Bredow framework for the evaluation of theories,[42,] the KAP model, which serves as the conceptual foundation for this project, can be thoroughly analyzed for clarity, complexity, grounding, appropriateness, and clinical relevance and importance using the following six questions.

The KAP model suggests that behaviors are directly influenced by two key constructs: knowledge and attitudes. The model assesses the relationships among providers' knowledge, attitudes, and practices, including pain management practices.[35] Therefore, this model is congruent with the project as it can assess and evaluate CRNAs' usage of the ESPB in VATS and promote its understanding and application.

As one of the most commonly used theories in healthcare, the KAP model is undeniably relevant, as it has historically helped determine underlying motivational factors in providers' pain management practices.[35] In one study, knowledge of pain management was found to be the strongest predictor regarding managing patients' pain and explained 69% of the variance in providers' pain management.[35] Therefore, its ability to enhance pain management practices is well-supported in the literature.

The KAP model has been applied to many settings and populations, including healthcare and medicine, business, and even agriculture.[43,44] In the context of national FIU CRNA alumni and the evaluation of knowledge and attitudes regarding the ESPB, the KAP model is entirely appropriate and helpful, as the project aims to assess and address knowledge gaps while shifting attitudes through an educational module.

The KAP model most often offers a testable hypothesis as to whether its main elements, attitudes, and knowledge significantly predict the variation in practice.[35] For this project, more

specific testable hypotheses were derived concerning the knowledge and attitudes of CRNAs regarding the ESPB for VATS and how these can be improved and changed through the use of an educational module.

The independent variables in this project, linked to the KAP model, would be CRNAs' knowledge and attitudes regarding the ESPB. The dependent variable, as a result of the educational module, would be improvements in knowledge and changes in attitudes, as evidenced by pre- and post-educational questionnaires.

Currently, there is substantial empirical support for the theory's relevance in healthcare and anesthesia. Thus, the model can be confidently applied to assess the influence of anesthesia providers' knowledge and attitudes on the choice of interfascial plane locoregional technique for VATS, specifically between the ESPB and SAPB.

Methodology

Setting and Participants

The practice site will include the vast database of CRNA alumni from a South Florida University, provided by the FIU program director. Participants will be provided with an educational module and pre- and post-module survey questionnaires to assess improvements in knowledge and changes in attitudes. The support and collaboration of CRNAs who are motivated to create positive practice change based on strong scientific evidence is imperative to the implementation of this project. Thus, the nationwide spread of FIU CRNA alumni provides a robust network of practice sites to disseminate the project. The culture and values of anesthesia alumni emphasize evidence-based practices, patient safety, and continuous improvement to foster positive practice changes and enhance the quality of care in the field.

Procedures

The FIU Department of Nurse Anesthesia facilitated the presentation of this educational module and the survey of participants via electronic mail. They included in-services, per approval from the hospital's institutional review board. This DNP project employed a pre- and post-intervention design to determine improvements in knowledge and changes in attitudes regarding the implementation of ESPB into multimodal analgesic regimens for VATS. Before the educational module, a pre-survey will assess CRNAs' baseline knowledge and attitudes. After the academic module, participants will complete a post-survey to evaluate learning. A strengths, weaknesses, opportunities, and threats (SWOT) analysis will be conducted as it is instrumental in understanding the essential variables that influence and guide the development of this QI project.

Participant Recruitment

Following approval from the IRB via FIU, the Chair of the FIU Department of Nurse Anesthesia will provide the email addresses of alumni who have graduated from a South Florida State Institution. The addresses are private and obtained upon graduation and do not violate the Family Educational Rights and Privacy Act. In total, 200 detailed emails explaining the QI project will be sent to alumni via Qualtrics, protecting anonymity. The goal is to obtain at least 20 responses.

Anesthesia providers invited to participate are all CRNAs who have graduated. Not included in the QI project are Student Registered Nurse Anesthetists (SRNAs), those who did not graduate from a South Florida program, anesthesiologists, and anesthesia assistants (AAs).

Data Collection

Upon receiving official IRB and faculty approval, the project will use electronic data collection via the Qualtrics platform to enhance efficiency and ensure data accuracy. Emails containing an invitation to follow Qualtrics's link were submitted to the list of FIU CRNA alumni provided by the faculty. The Qualtrics survey, including the pre- and post-questionnaires and the educational module, will be administered to FIU CRNA alumni nationwide.

The pre-questionnaire will evaluate anesthesia providers' baseline knowledge of the ESPB and SAPB in reducing opioid consumption in VATS patients and overall analgesic efficacy. After the educational intervention, the responses will be reviewed for accuracy and compared to assess the effectiveness of the academic module. The analysis will also examine whether participants intended to adjust their current practices in light of the knowledge gained from the educational initiative.

Participants will have approximately 2 months to complete the survey, with reminders sent every 2 weeks (a total of 3 reminders). Once replies are collected, demographic information will be analyzed, including age, gender, and ethnicity of participants, to assess the demographic spread of the sample properly. Data will be presented visually in charts, figures, and tables.

Data Analysis

The statistical analysis of the data will involve both descriptive and inferential methods. Descriptive statistics can be used to summarize key features of the dataset, providing a comprehensive overview of CRNAs' knowledge of the erector spinae plane block (ESPB) in multimodal analgesic regimens for VATS patients. This will allow for a clear picture of baseline knowledge and the extent of knowledge improvement achieved through the educational

intervention. In addition to descriptive analysis, inferential statistics were applied to assess the significance of the findings and evaluate the effectiveness of the academic module in enhancing CRNAs' understanding of the ESPB technique and its role in improving postoperative analgesia for VATS patients.

Protection of Human Subjects

The project is geared towards improving knowledge and changing providers' attitudes towards using the ESPB in analgesic regimens for patients undergoing VATS. The recruitment strategy involved emailing FIU CRNA alumni and providing them with an educational module describing the project's objectives, purpose, significance, and clinical relevance. The module also explained the role of the participants in contributing to reducing postoperative opioid consumption and consequently preventing postoperative complications in these patients. The initiative guaranteed subject privacy and confidentiality, as responses were kept anonymous and there was no means to link questionnaires to specific participants. Basic demographic information was collected to analyze the sample, but participants could choose to withhold it.

Consent was obtained from participants once the project's goals, projected time commitment, and purpose were provided. As part of the recruitment process, participants were provided with a consent form outlining these details, which is included in the appendices of this document. Additionally, participants were informed that the study results would be presented in aggregate, ensuring that individual responses would remain anonymous. To further safeguard participant confidentiality, the project adhered to the Institutional Review Board (IRB) standards and guidelines.[37] Securing IRB approval was a crucial step in ensuring the research was conducted ethically.

Data Management

The study will ensure strict confidentiality and security of the data collected for this project. Electronic data collected via the Qualtrics system will be stored on a password-protected laptop, with access limited to authorized personnel only. Personal information is to remain anonymous to the public, with identifiable data accessible only to essential personnel. Results are to be presented in a format to safeguard participant privacy. These measures will be communicated to participants as part of the informed consent process. Upon completion of the project, all data, including electronic files, will be securely disposed of and permanently deleted.

Discussion of the Results with Implications for Advanced Practice Nursing

The anticipated outcomes for this QI project could significantly impact advanced practice nursing for CRNAs. Regional anesthesia is a cornerstone of perioperative anesthesia management, improves patient outcomes, and is highly emphasized by enhanced recovery protocols. With the growth and expansion of regional anesthesia, educational modules on this topic not only support the professional development of CRNAs but also ultimately impact patient care and outcomes.

This project highlights the need for continuous education for CRNAs, as their role in providing regional anesthesia to patients undergoing VATS is expanding. It emphasizes the current shift toward minimally invasive surgery, emphasis on multimodal and opioid-sparing analgesia, and increasing safety and accessibility of interfascial plane blocks such as ESPB and SAPB.[26,45-47] In addition, it highlights the significant risk patients undergoing VATS are at for moderate to severe postoperative pain, increased opioid consumption, and the development of chronic pain syndromes, making some form of regional anesthesia near-universal in their anesthetic management.[2,3]

Guidelines now recommend multimodal analgesia with regional blocks as a cornerstone of perioperative pain management in VATS.[8,49] The choice among TEA and PVB and interfascial blocks is often individualized based on patient and institutional factors. However, in terms of safety, ESPB and SAPB blocks have a lower risk of serious complications (e.g., hypotension, urinary retention, hematoma, pneumothorax) compared to TEA and PVB, making them attractive for patients at higher risk of adverse events or with contraindications to neuraxial techniques.[16,27-28] Therefore, this project can improve patient outcomes and access to care by using evidence-based interventions to promote knowledge gain and potential impact on CRNA practice.

As ultrasound guidance has made regional anesthesia and peripheral nerve blocks easier to learn and perform safely, this has facilitated broader use by CRNAs nationwide. The literature highlights that interfascial plane blocks are now widely used in thoracic surgery, including VATS, and are considered safe and effective alternatives to traditional neuraxial techniques. The project also explains how their technical simplicity and favorable safety profile have made them particularly suitable for implementation by CRNAs in diverse practice settings.

As the project serves to educate providers on two different interfascial plane blocks for patients undergoing VATS, it educates CRNAs on the fundamental differences between the blocks in terms of patient outcomes. ESPB blockade is ultimately noninferior to TPVB for pain control,[10,14,50] while the SAPB is generally less effective than ESPB for deep pain and recovery.[3] The most significant impact this project aims to discover and educate CRNAs on, however, is the difference in postoperative opioid consumption in these patients.

A final significant impact this project could have in advanced nursing practice is the standardization of superior interfascial plane blocks. Determining superiority between different

interfascial plane blocks, such as the ESPB and SAPB, and establishing standardization is needed to optimize analgesia, minimize opioid use and complications, and ensure consistent, evidence-based care for patients undergoing video-assisted thoracoscopic surgery (VATS).

Timeline

The project is anticipated to take 6 months from start to finish. Initially, the project's SMART goals and objectives were defined. A literature review was then conducted to provide the data for the project's proposal. Following this, tasks such as preparing the Institutional Review Board (IRB) application will be performed. The researcher will take all precautions to maintain ethical standards and protect and uphold human rights. Upon IRB approval, participant recruitment will take place utilizing FIU's CRNA alumni database. All participants must provide consent before participating, as the project relies on voluntary participation. Once participants agree to be involved in the project, a pre-module questionnaire will be provided as a baseline assessment. Then, an educational module regarding the ESPB will be disseminated. Following the module, a post-intervention questionnaire will evaluate learning. The final steps will be dedicated to the project's final report and dissemination of results.

Conclusion

In conclusion, this DNP project aims to reduce opioid consumption in patients undergoing VATS by promoting the use of the ESPB over the SAPB as the interfascial plane block of choice. If they are not candidates for TEB or TPVB, the ESPB is a suitable, non-inferior alternative. Therefore, regarding the use of an interfascial plane block, the project's primary focus is to educate CRNAs on the superior analgesic efficacy of the ESPB, particularly in reducing opioid use and improving postoperative pain management.

The project is guided by the KAP model, which assesses anesthesia providers' baseline knowledge and attitudes, followed by the delivery of an evidence-based educational module. A pre- and post-module survey will measure changes in knowledge and attitudes to foster evidence-based practices in anesthetic management for VATS patients. By addressing a significant gap in current practice, this project aims to improve patient outcomes, reduce postoperative opioid consumption, and align with institutional goals of opioid stewardship and enhanced recovery after surgery. The project's success hinges on collaboration among anesthesia providers, thoracic surgeons, and other stakeholders, supported by ongoing evidence and continuous quality improvement efforts.

Results

Distribution Summary

CRNAs who consented to participate in the survey after receiving a distribution email or via QR code. The survey was distributed to 200 CRNAs via email, while 12 participants participated via QR code. Data were collected over 2 months, and 24 participants consented to and began the survey. Of these, 21 participants completed it in its entirety, indicating an attrition rate of approximately 12.5%. Question response counts ranged from 24 responses (consent and initial demographics) to 21 responses (final post-test questions). The number of skipped questions gradually increased in later sections, with most skipped items occurring in the post-test portion, where three participants did not complete the remaining items. Overall, the dataset shows full participation through the demographic and pre-test sections, with a light but consistent decline in completion toward the end of the survey.

Demographics

A total of 24 CRNAs initially participated in the survey. Twelve (52%) identified as female and 11 (48%) as male. As for participants' ages, 15 (65%) were aged 31-40, making them the majority age group. 5 (22%) were 23-30, and the remaining 3 (13%) aged 41-50. Regarding ethnic background, 13 participants identified as Hispanic (57%), 7 as Caucasian (30%), 1 as Asian (4%), and 2 as Other (9%). All providers had more than 1 year of experience, with 15 (65%) having 1-2 years, 5 (22%) having 2-5 years, 1 (4%) having 5-10 years, and 2 (9%) having over 10 years of experience as a CRNA. Twenty-three participants responded to the education level question, and all held a Doctor of Nursing Practice (DNP) degree. Patient demographic information is summarized in Tables 1-4 below.

Table 1: Demographics - Gender

Gender	**Count (%)**
Female	12 (52%)
Male	11 (48%)
Other	0 (0%)

Table 2: Demographics – Age

Age	**Count (%)**
23 – 30	5 (22%)
31 – 40	15 (65%)
41 – 50	3 (13%)
51 – 60	0 (0%)
61 +	0 (0%)

Table 3: Demographics – Ethnicity

Ethnicity	**Count (%)**
Hispanic	13 (57%)
Caucasian	7 (30%)

African American	0 (0%)
Asian	1 (4%)
Other	2 (9%)

Table 4: Demographics – Years as Anesthesia Provider

Years as an Anesthesia Provider	**Count (%)**
1 – 2 years	15 (65%)
2 – 5 years	5 (22%)
5 – 10 years	1 (4%)
> 10 years	2 (9%)

Pre-Test Knowledge

A 10-question pre-test questionnaire was provided to obtain baseline provider knowledge. After presenting the educational module, a 10-question post-test was administered to assess knowledge gained. Before the educational intervention, 100% of participants correctly recognized that the primary goal of regional anesthesia in thoracic surgery is to manage postoperative pain while reducing opioid consumption. 86% correctly understood, however, that the main advantage of VATS over traditional thoracotomy is faster recovery and smaller incisions. Remaining participants assumed it was a reduction in pain and opioid requirements of patients. As far as identifying the anatomical structure targeted by the ESPB, there was a wide spread of answers; 41% correctly identified the thoracic spinal nerves, 27% selected the serratus anterior muscle, 23% selected the intercostal muscles, and 9% selected the paravertebral space.

82% of participants correctly determined that the SAPB was administered on or beneath the serratus anterior muscle. Regarding which block was known to provide broader dermatomal coverage, 55% of participants correctly selected the ESPB. When determining the use of ESPB

and SAPB for VATS analgesia, the majority of participants answered this question incorrectly; 50% thought they were gold standards according to national guidelines, 41% correctly found neither to be a gold standard according to national guidelines, and 9% assumed only the SAPB was recommended as a gold standard. 82% correctly recognized that the ESP resulted in reduced opioid consumption. 59% correctly selected limited dermatomal coverage as a limitation of the SAPB. 41% of participants correctly identified the variability in local anesthetic spread regarding the ESPB compared to the SAPB. Lastly, 73% correctly recognized the type of analgesia, somatic and visceral, provided by the ESPB, contributing to its efficacy.

Post-Test Knowledge

Following the pre-test and educational module, 21 out of 24 total participants completed the post-test. The post-test results, compared with the pre-test, indicated that the module effectively improved provider knowledge of the ESPB and SAPB. In 9 out of 10 paired questions, the percentage of correct responses increased in the post-test. For the remaining question asking what the main advantages of VATS over traditional thoracotomy are, the rate of postoperative complications (86%) remained the same, along with faster recovery and smaller incisions. The most significant increase was in recognizing whether the two blocks met the criteria for gold standards according to national guidelines. In the pre-test, only 9 of 22 participants (41%) correctly identified that neither ESPB nor SAPB is explicitly recommended as a gold standard by national guidelines. In the post-test, 16 of 21 participants (76%) answered correctly, representing a 35-percentage point increase, with one participant not completing the post-test. The second-highest score increase was for correctly identifying the anatomical target for the ESPB, a modest rise from 41% to 67%.

All participants (100%) demonstrated mastery of understanding the primary goal of regional anesthesia in thoracic surgery, which is to manage postoperative pain while reducing opioid consumption. As for locating the site for SAPB administration, correct responses increased from 82% to 86%. When determining which of the two blocks has broader dermatomal coverage, the accuracy of identifying the region increased from 55% to 76%. Impact of the ESPB on reducing postoperative opioid consumption was correctly recognized as reducing opioid consumption by promoting broad analgesic coverage in 90% of participants, an increase from 82%. When answering that the SAPB has limited dermatomal coverage for VATS incisions, the percentage improved from 59% to 81%. Variability in local anesthetic spread was correctly identified as a potential drawback of the ESPB by 43% of participants, up from 41%. Lastly, the correct identification of somatic and visceral analgesia as the type of analgesia provided by the ESPB improved from 73% to 86%.

Table 5: Pre-Test / Post-Test Responses – Question 1

What is the primary goal of using regional anesthesia in thoracic surgery?

Answer	**Pre-Test Count (%)**	**Post-Test Count (%)**
To eliminate the need for general anesthesia	0 (0%)	0 (0%)
To manage postoperative pain while reducing opioid consumption	22 (100%)	21 (100%)
To decrease the duration of surgery	0 (0%)	0 (0%)
To reduce the need for preoperative fasting	0 (0%)	0 (0%)

Table 6: Pre-Test / Post-Test Responses – Question 2

What are the main advantages of video-assisted thoracoscopic surgery (VATS) over traditional thoracotomy?

Answer	**Pre-Test Count (%)**	**Post-Test Count (%)**
Faster recovery and smaller incisions	19 (86%)	18 (86%)

Reduced risk of postoperative nausea	0 (0%)	1 (5%)
Greater exposure of surgical anatomy	0 (0%)	0 (0%)
Reduced pain and requirement for opioids	3 (14%)	2 (10%)

Table 7: Pre-Test / Post-Test Responses – Question 3

What anatomical structure is primarily targeted by the erector spinae plane block (ESPB)?

Answer	**Pre-Test Count (%)**	**Post-Test Count (%)**
Serratus anterior muscle	6 (27%)	3 (14%)
Thoracic spinal nerves	9 (41%)	14 (67%)
Intercostal muscles	5 (23%)	2 (10%)
Paravertebral space	2 (9%)	2 (10%)

Table 8: Pre-Test / Post-Test Responses – Question 4

Where is the serratus anterior plane block (SAPB) typically administered?

Answer	**Pre-Test Count (%)**	**Post-Test Count (%)**
Near the dorsal root ganglia	3 (14%)	1 (5%)
On or beneath the serratus anterior muscle	18 (82%)	18 (86%)
At the paravertebral space	0 (0%)	2 (10%)
Near the brachial plexus	1 (5%)	0 (0%)

Table 9: Pre-Test / Post-Test Responses – Question 5

Which block provides broader dermatomal coverage?

Answer	**Pre-Test Count (%)**	**Post-Test Count (%)**
Erector spinae plane block (ESPB)	12 (55%)	16 (76%)
Serratus anterior plane block (SAPB)	2 (9%)	1 (5%)
Thoracic epidural block (TEB)	6 (27%)	4 (19%)
Paravertebral block (PVB)	2 (9%)	0 (0%)

Table 10: Pre-Test / Post-Test Responses – Question 6

Which of the following statements is true regarding the use of ESPB and SAPB for VATS analgesia?

Answer	Pre-Test Count (%)	Post-Test Count (%)
Both ESPB (Erector Spinae Plane Block) and SAPB (Serratus Anterior Plane Block) are explicitly recommended as gold standards by national guidelines.	11 (50%)	4 (19%)
Only ESPB is recommended as a gold standard for VATS analgesia.	0 (0%)	0 (0%)
Only SAPB is recommended as a gold standard for VATS analgesia.	2 (9%)	1 (5%)
Neither ESPB nor SAPB has been explicitly recommended as gold standards by national guidelines.	9 (41%)	16 (76%)

Table 11: Pre-Test / Post-Test Responses – Question 7

How does the ESPB impact postoperative opioid consumption in thoracic surgery?

Answer	Pre-Test Count (%)	Post-Test Count (%)
Reduces opioid consumption by promoting broad analgesic coverage	18 (82%)	19 (90%)
Increases opioid consumption due to its limited efficacy	0 (0%)	0 (0%)
There is no significant impact on opioid consumption compared to SAPB	3 (14%)	1 (5%)
Exclusively reduces intraoperative opioid consumption	1 (5%)	1 (5%)

Table 12: Pre-Test / Post-Test Responses – Question 8

What is a common limitation of the serratus anterior plane block (SAPB) compared to the erector spinae plane block (ESPB)?

Answer	Pre-Test Count (%)	Post-Test Count (%)

Increased risk of respiratory depression	2 (9%)	1 (5%)
Limited dermatomal coverage for VATS incisions	13 (59%)	17 (81%)
More technical complexity during administration	7 (32%)	3 (14%)
Poor compatibility with ultrasound guidance	0 (0%)	0 (0%)

Table 13: Pre-Test / Post-Test Responses – Question 9

What is a potential drawback of ESPB compared to SAPB?

Answer	**Pre-Test Count (%)**	**Post-Test Count (%)**
Greater technical difficulty	7 (32%)	9 (43%)
Variability in local anesthetic spread	8 (41%)	9 (43%)
Higher incidence of complications	5 (23%)	2 (10%)
Inadequate coverage of VATS incisions	1 (5%)	1 (5%)

Table 14: Pre-Test / Post-Test Responses – Question 10

What type of analgesia does the ESPB provide that contributes to its efficacy?

Answer	**Pre-Test Count (%)**	**Post-Test Count (%)**
Somatic and visceral analgesia	16 (73%)	18 (86%)
Only somatic analgesia	1 (5%)	1 (5%)
Only visceral analgesia	2 (9%)	0 (0%)
Analgesia limited to dermatomes T1-T2	3 (14%)	2 (10%)

Discussion of Results

The results of the QI project demonstrate an increased understanding of the ESPB's greater efficacy in reducing postoperative opioid requirements for patients undergoing VATS, due to its broader dermatomal coverage compared to the SAPB, which has limited dermatomal

coverage for VATS. There was a consistent upward trend in correct responses across nearly all questions, supporting the effectiveness of the survey and accompanying educational module in improving anesthesia providers' comprehension of ESPB and SAPB principles. The results highlight strengthened knowledge of anatomical targets, comparative efficacy, and evidence-based considerations essential to optimizing postoperative pain management in VATS.

Limitations

While the QI project had notable strengths, it was not without its limitations. Of note was the small sample size (n = 24, of whom 21 completed) despite the large number of alumni (200) recruited. This restricted the generalizability of the findings and the ability to detect statistically significant effects. Additionally, participants responded voluntarily either after receiving an email or by scanning a QR code, potentially introducing self-selection bias. For example, individuals with a preexisting interest in regional anesthesia may have been more inclined to engage in the educational module and participate in the survey. In this way, a significant number of participants with higher baseline knowledge or motivation could skew the observed improvement. Similarly, the nature of self-administered online surveys introduces possible response bias, including inattentive responses.

The study's internal validity was affected by several factors. Participants' prior exposure or experience with either the SAPB or the ESPB could have influenced their answer choices (e.g., choosing "technical difficulty" for either block over the correct answer, which could be a potentially subjective response). The questions and answer choices could have been written better, with this information in mind. Additionally, the short duration of data collection and the absence of long-term follow-up prevent assessment of knowledge retention. Despite these limitations, the results provide valuable evidence supporting the effectiveness of structured,

focused education in improving anesthesia provider understanding of the ESPB and SAPB for VATS analgesia.

Implications for Practice

This educational module demonstrated measurable improvement in anesthesia providers' knowledge across all assessed domains, underscoring the value of incorporating updated evidence and clinical alternatives to traditional thoracic epidural (TEB) and paravertebral (TPVB) blocks into CRNA practice. Although both the SAPB and ESPB are viable options for postoperative analgesia following VATS, no single interfascial plane block has been formally established as the clinical standard. As a result, block selection is often driven by provider preference, institutional culture, and anecdotal experience rather than by standardized evidence-based criteria.

The findings of this project underscore the importance of structured education in guiding CRNA practice toward consistency and safety. By increasing familiarity with anatomical targets, pharmacologic rationale, and outcome data supporting ESPB use, anesthesia providers are better equipped to make informed decisions that align with the current literature. Widespread adoption of the ESPB as a preferred technique for VATS could enhance multimodal analgesia protocols, reduce postoperative opioid consumption, and improve patient recovery metrics.

Integrating ESPB utilization into thoracic Enhanced Recovery After Surgery (ERAS) guidelines represents a key opportunity for system-level improvement. Formal inclusion would promote uniformity in postoperative pain management using interfascial plane blocks when appropriate, while supporting the broader shift toward evidence-based, opioid-sparing practices. Continued dissemination of research findings, simulation-based skill reinforcement, and

interprofessional collaboration will be essential to sustain knowledge translation and practice change.

Lastly, the project highlights the role of ongoing provider education in aligning anesthesia practice with evolving evidence. Incorporating regular updates on regional anesthesia innovations within continuing education curricula and institutional quality initiatives can foster both clinical competency and accountability in patient-centered care.

Conclusion

This quality improvement project increased anesthesia providers' knowledge of both the ESPB and SAPB through a focused, evidence-based educational module. The module emphasized the superior analgesic efficacy of the ESPB, particularly its association with reduced postoperative opioid consumption in comparison to the SAPB in patients undergoing VATS. Assessment of knowledge at baseline and post-intervention revealed measurable improvement in scores, confirming the module's effectiveness in strengthening provider understanding of regional anesthetic alternatives to TEB and TPVB techniques.

Because the educational intervention was designed specifically for practicing anesthesia providers, the findings are both clinically relevant and applicable in real-world settings. The online format had several advantages, including accessibility, ease of distribution, and rapid assessment, making it well-suited for integration into continuing education programs and institutional competency development. This flexible delivery model supports large-scale adoption across anesthesia departments and integrates with credentialing and professional development initiatives.

Furthermore, the CRNAs' demonstrated improvement in knowledge reinforces the need for ongoing education on evolving regional techniques and the importance of evidence-based decision-making in anesthetic planning. As neither the ESPB nor SAPB currently serves as a defined standard of care, informed provider judgment remains essential in selecting the most appropriate analgesic approach. Continued dissemination of evidence and formal incorporation of ESPB use into ERAS guidelines could promote more consistent, evidence-based practice patterns and optimize postoperative pain management for VATS patients.

Ultimately, this project highlights how structured, accessible educational modules can serve as sustainable tools for advancing provider competency, promoting opioid-sparing practices, and fostering the translation of current evidence into everyday clinical decision-making.

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Appendix A: IRB Exemption Letter

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Office of Research Integrity
Research Compliance, MARC 414

MEMORANDUM

To: Dr. Christina Vera
CC: Kimberly Lucas

From: Maria Melendez-Vargas, MIBA, IRB Coordinator

Date: April 2, 2025

Protocol Title: "Optimizing Postoperative Pain Management in VATS: Evidence-Based Analysis of ESPB and SAPB"

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-25-0149 **IRB Exemption Date:** 04/02/25
TOPAZ Reference #: 115480

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.

Special Conditions: N/A

3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

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

MMV/em

Appendix B: Recruitment Letter

FIU Department of Nurse Anesthesiology

Nicole Wertheim College of Nursing & Health Sciences

Optimizing Postoperative Pain Management in VATS: Evidence-Based Analysis of ESPB and SAPB

Dear esteemed FIU Nurse Anesthesiology Alumni and Perioperative Providers:

My name is Kimberley Valencia, and I am a student from the Anesthesiology Nursing Program 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 perioperative providers' awareness of the most clinically effective interfascial block for improving pain outcomes and minimizing opioid use in video-assisted thoracoscopic surgery (VATS) patients. You are eligible to take part in this project because you are a part of FIU's esteemed Nurse Anesthesiology alumni as a perioperative provider.

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, Kimberley Valencia at (954)-648-3727 and kluca016@fiu.edu.

Thank you very much.

Sincerely,

Kimberley Valencia

(954)-648-3727

Kluca016@fiu.edu

Appendix C: Informed Consent

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CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT
Optimizing Postoperative Pain Management in VATS: Evidence-Based Analysis of ESPB and SAPB

SUMMARY INFORMATION
Things you should know about this study:

- **Purpose:** Educational module to increase providers awareness of the superior analgesic efficacy of the erector spinae plane block (ESPB) as the most clinically effective interfascial block for improving pain outcomes and minimizing opioid use in video-assisted thoracoscopic surgery (VATS) patients.
- **Procedures**: If the participant chooses to participate, they will be asked to complete a pretest, watch a voice PowerPoint, and then a post test
- **Duration:** This will take about a total of 20 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 the somatic and visceral analgesia provided by the ESPB and its efficacy in the treatment of pain originating from VATS.
- **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 one of approximately 100 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 how the ESPB reduces postoperative opioid consumption for patients undergoing VATS. Additionally, compared to the serratus anterior plane block (SAPB), the ESPB consistently outperforms the SAPB in reducing opioid consumption, providing better pain relief, and improving patient satisfaction. If you decide to participate, you will be 1 of approximately 100 participants.

DURATION OF THE PROJECT
The participation will require about 20 minutes.

PROCEDURES

If the participant agrees to be in the project, PI will ask you to do the following things:

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

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: An increased knowledge on the analgesic efficacy of the ESPB for patients undergoing VATS in order to promote practice change that enhances the patient experience and reduces postoperative opioid consumption. 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 Kimberley Lucas at (954)-648-3727, or kluca016@fiu.edu, and

Dr. Christina Vera at (305)-348-7728, or chvera@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 D: Pretest and Posttest Questionnaire

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Pretest and Posttest Questionnaire:

Optimizing Postoperative Pain Management in VATS: Evidence-Based Analysis of ESPB and SAPB

INTRODUCTION

The primary aim of this QI project is to increase providers awareness how the erector spinae plane block (ESPB) reduces postoperative opioid consumption for patients undergoing video-assisted thoracoscopic surgery (VATS).

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 the analgesic efficacy of the ESPB for patients undergoing VATS in order to promote practice change that enhances the patient experience and reduces postoperative opioid consumption.

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. What is the primary goal of using regional anesthesia in thoracic surgery?

a) To eliminate the need for general anesthesia

b) To manage postoperative pain while reducing opioid consumption

c) To decrease the duration of surgery

d) To reduce the need for preoperative fasting

2. What are the main advantages of video-assisted thoracoscopic surgery (VATS) over traditional thoracotomy?

a) Faster recovery and smaller incisions

b) Reduced risk of postoperative nausea

c) Greater exposure of surgical anatomy

d) Reduced pain and requirement for opioids

3. What anatomical structure is primarily targeted by the erector spinae plane block (ESPB)?

a) Serratus anterior muscle

b) Thoracic spinal nerves

c) Intercostal muscles

d) Paravertebral space

4. Where is the serratus anterior plane block (SAPB) typically administered?

a) Near the dorsal root ganglia

b) On or beneath the serratus anterior muscle

c) At the paravertebral space

d) Near the brachial plexus

5. Which block provides broader dermatomal coverage?

a) Erector spinae plane block (ESPB)

b) Serratus anterior plane block (SAPB)

c) Thoracic epidural block (TEB)

d) Paravertebral block (PVB)

6. Which of the following statements is true regarding the use of ESPB and SAPB for VATS analgesia?

a) Both ESPB (Erector Spinae Plane Block) and SAPB (Serratus Anterior Plane Block) are explicitly recommended as gold standards by national guidelines.

b) Only ESPB is recommended as a gold standard for VATS analgesia.

c) Only SAPB is recommended as a gold standard for VATS analgesia.

d) Neither ESPB nor SAPB has been explicitly recommended as gold standards by national guidelines.

7. How does the ESPB impact postoperative opioid consumption in thoracic surgery?

a) Reduces opioid consumption by promoting broad analgesic coverage

b) Increases opioid consumption due to its limited efficacy

c) Has no impact on opioid consumption compared to SAPB

d) Only reduces intraoperative opioid consumption

8. What is a common limitation of the serratus anterior plane block (SAPB) compared to the erector spinae plane block (ESPB)?

a) Greater risk of respiratory depression

b) Limited dermatomal coverage for VATS incisions

c) More technical complexity during administration

d) Poor compatibility with ultrasound guidance

9. What is a potential drawback of ESPB compared to SAPB?

a) Greater technical difficulty

b) Variability in local anesthetic spread

c) Higher incidence of complications

d) Inadequate coverage of VATS incisions

10. What type of analgesia does the ESPB provide that contributes to its efficacy?

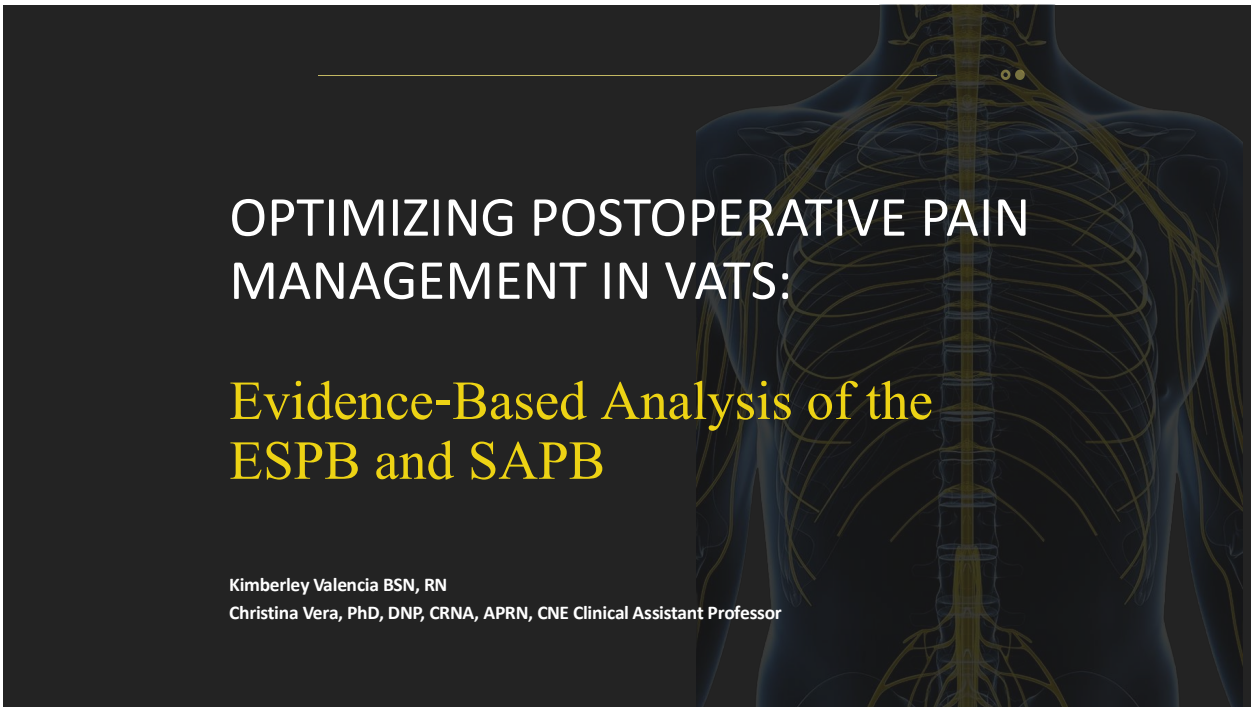
a) Somatic and visceral analgesia

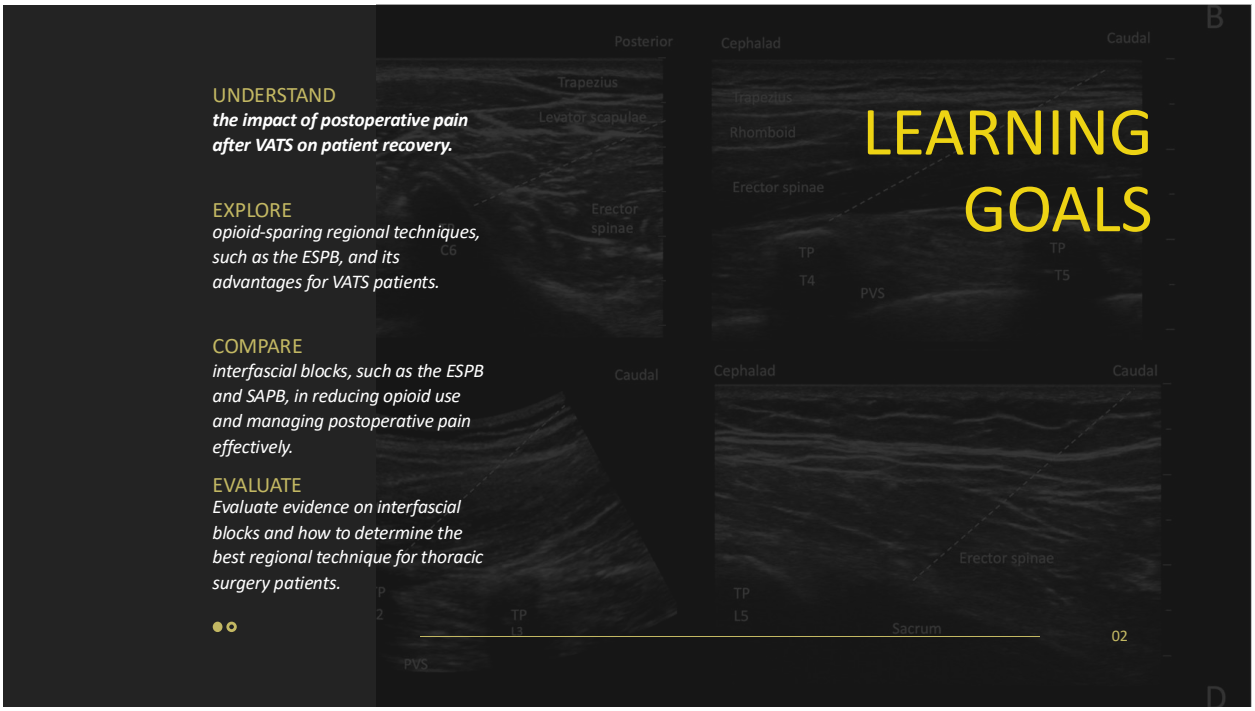
b) Only somatic analgesia

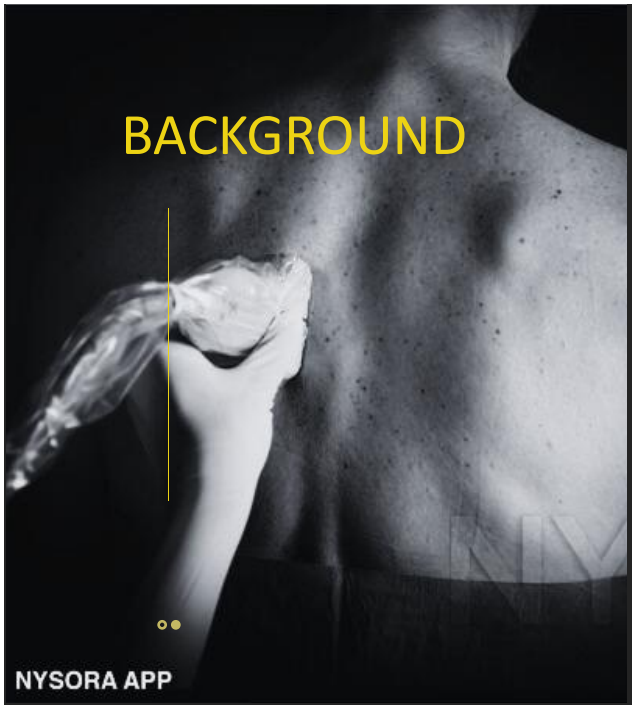
c) Only visceral analgesia

d) Analgesia limited to dermatomes T1-T2

Appendix E: Educational Module







PAIN

VATS is less invasive than traditional surgery, but still associated with moderate to severe postoperative pain.

OPIOIDS

Opioids are commonly used; however, they can impede recovery and achievement of enhanced recovery targets.

PATIENT CANDIDACY

The current gold standard regional techniques are thoracic epidural block (TEB) and thoracic paravertebral block (TPVB), but many VATS patients are increasingly unsuitable candidates.

LACK OF STANDARDIZATION

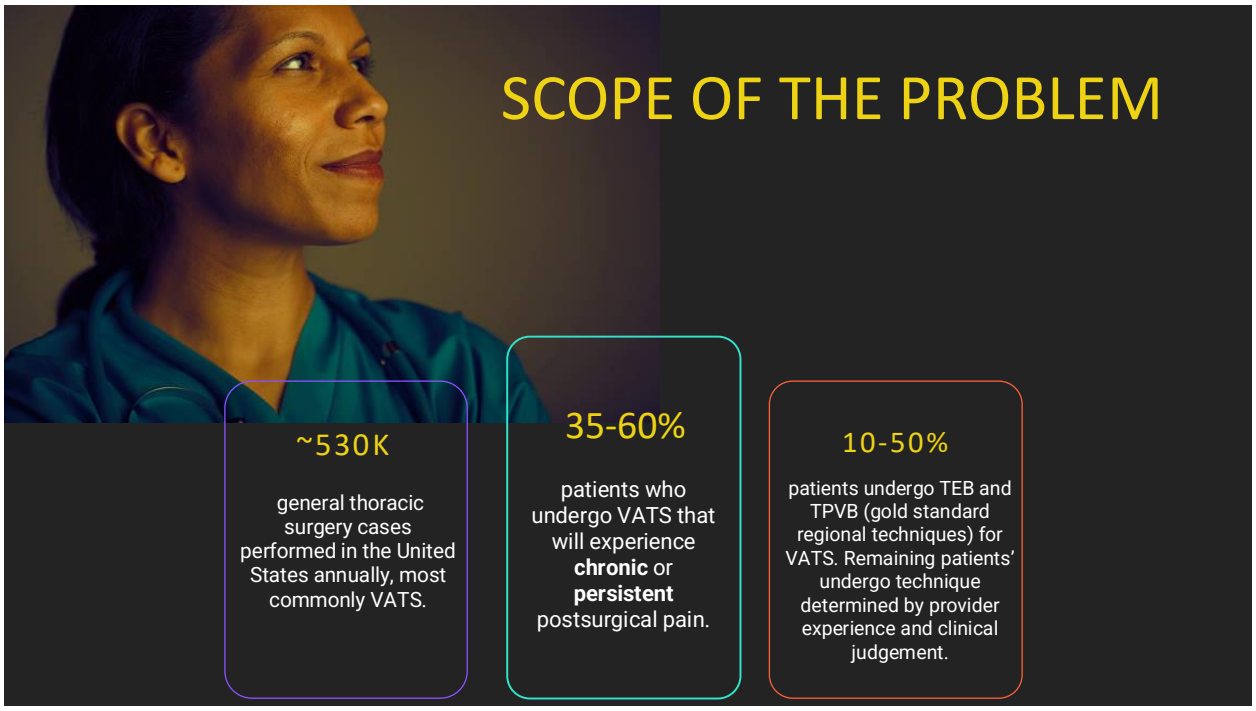
As far as alternative interfascial blocks, there is no established first-line standard.

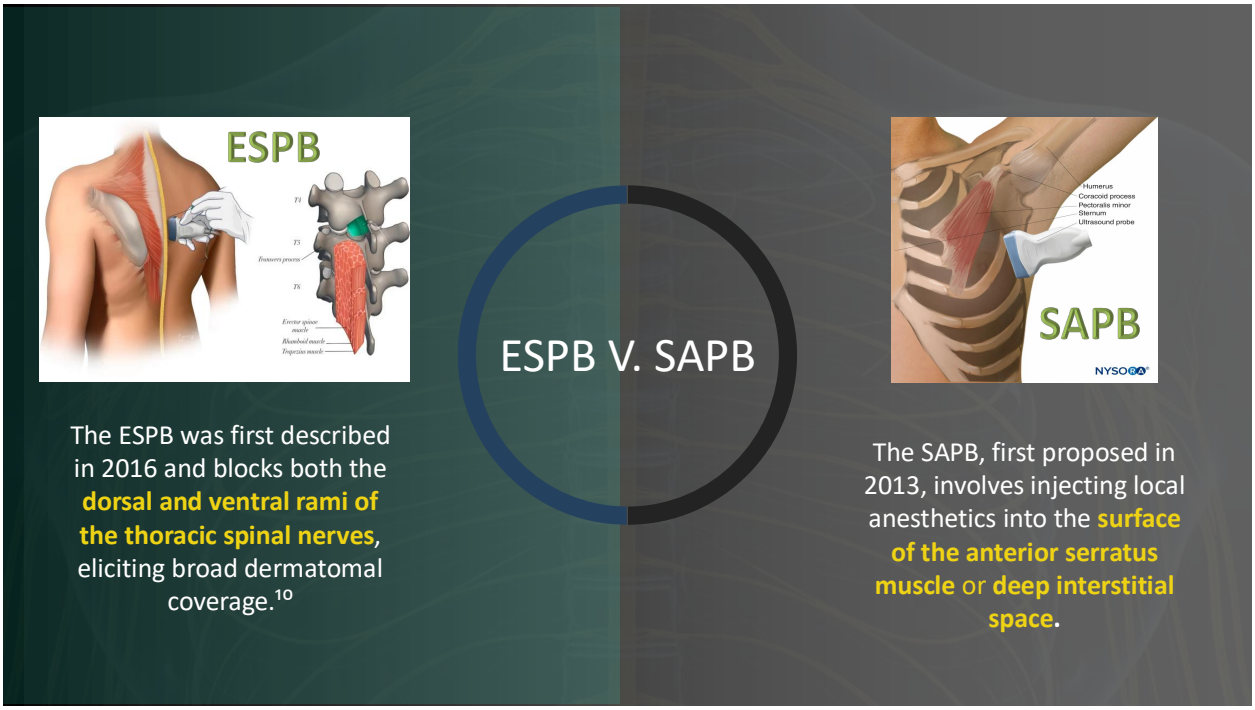
A NEED FOR EVIDENCE

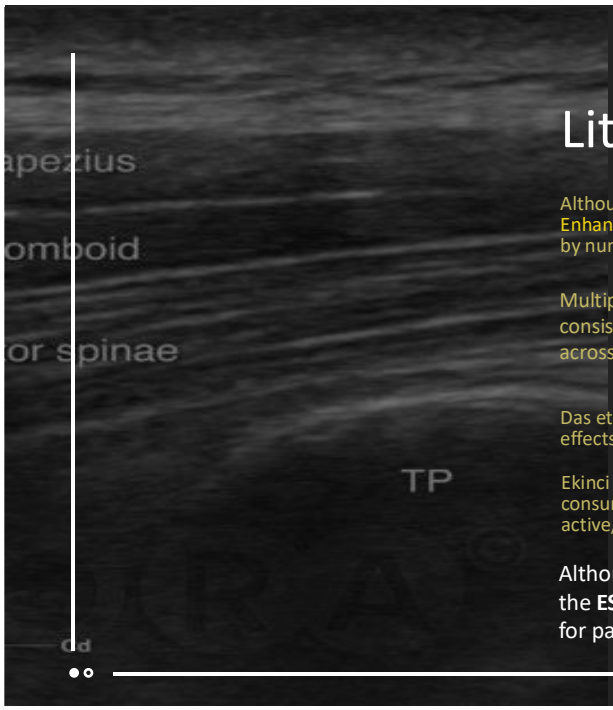
Therefore, choice of alternative interfascial block should be guided by available scientific evidence.

Despite the reported superior analgesic efficacy of the ESPB compared to the SAPB, there is **no current alternative gold standard to TEA and TPVB for VATS**.

As evidence-based practice is a cornerstone of anesthesia care, there is a critical need to investigate and determine the most clinically effective interfascial block for improving pain outcomes and minimizing opioid use in thoracic surgical patients.


SCOPE OF THE PROBLEM
~530K
general thoracic surgery cases performed in the United States annually, most commonly VATS.
35-60%
patients who undergo VATS that will experience **chronic** or **persistent** postsurgical pain.
10-50%
patients undergo TEB and TPVB (gold standard regional techniques) for VATS. Remaining patients' undergo technique determined by provider experience and clinical judgement.


ESPB
ESPB V. SAPB
SAPB
Humerus
Coracoid process
Pectoralis minor
Sternum
Ultrasound probe
NYSORA
The ESPB was first described in 2016 and blocks both the **dorsal and ventral rami of the thoracic spinal nerves**, eliciting broad dermatomal coverage.[10]
The SAPB, first proposed in 2013, involves injecting local anesthetics into the **surface of the anterior serratus muscle** or **deep interstitial space**.



Literature Insights

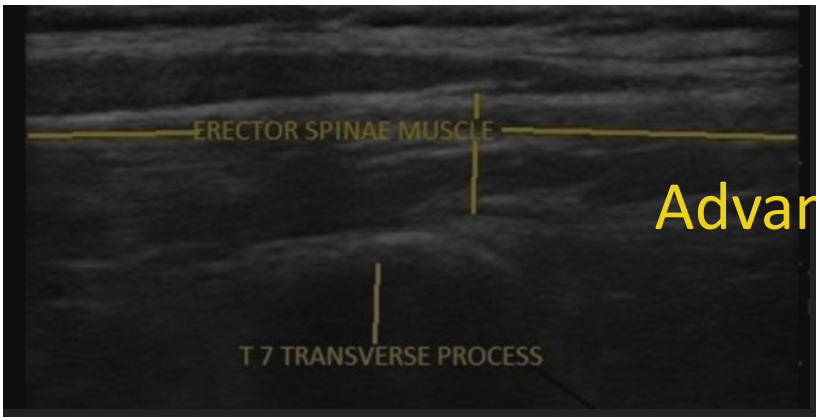
Although neither block is recommended over the other in Thoracic Enhanced Recovery After Surgery (TERAS) guidelines, the ESPB is supported by numerous studies as having superior analgesic efficacy over the SAPB.

Multiple randomized controlled trials (RCTs) have demonstrated that ESPB consistently results in **lower opioid consumption and improved pain** control across the postoperative period, particularly in the first 24 hours after surgery.

Das et al.[4] concluded that ESBP provided the best analgesia and fewest side effects, followed by TPVB and SAPB.

Ekinci et al.[11] reported less intra-operative and postoperative opioid consumption at 24 hours, lower rescue analgesic usage, and lower active/passive VAS scores compared with SABP.

Although limited, the available evidence provides substantial support of the **ESPB being superior to the SAPB** in reducing opioid consumption for patients undergoing VATS.



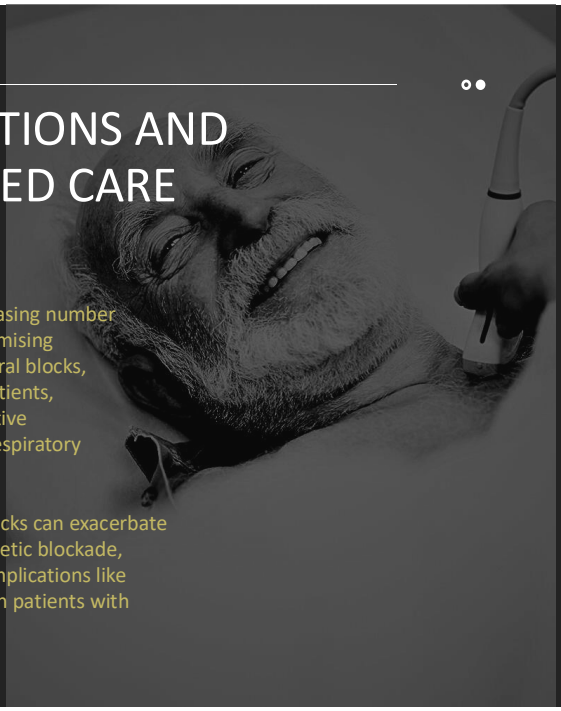
Advantages of the ESPB

In addition to reduced opioid consumption, patient satisfaction was undeniably higher in those who received the ESPB over SAPB.

Das et al.[4] reported that ESPB was associated with the best patient satisfaction ($p < 0.001$), which is likely related to both its reduced opioid use and better pain management.

Finnerty et al.[3] showed that ESPB led to superior quality of recovery (QoR) and overall morbidity outcomes compared to SAPB, reinforcing the advantages of ESPB not just in pain control but in overall recovery.

SPECIAL POPULATIONS AND PATIENT-CENTERED CARE



The aging patient population and increasing number of surgical candidates make ESPB a promising alternative to neuraxial and paravertebral blocks, which may be less suitable for these patients, particularly those with chronic obstructive pulmonary disease (COPD) or limited respiratory reserve.[3]

Thoracic epidural and paravertebral blocks can exacerbate respiratory distress by causing sympathetic blockade, increasing the risk of postoperative complications like atelectasis and pneumonia, especially in patients with compromised lung function.[3]

MINIMIZING POST-OPERATIVE COMPLICATIONS

Studies, such as Finnerty et al.,[3] suggest that the superior analgesia provided by ESPB contributes to lower rates of postoperative pneumonia, enhancing patient safety, satisfaction, and reducing complications following VATS.

By implementing the ESPB for those undergoing VATS, CRNAs can help minimize postoperative complications in addition to improving patient safety and satisfaction.

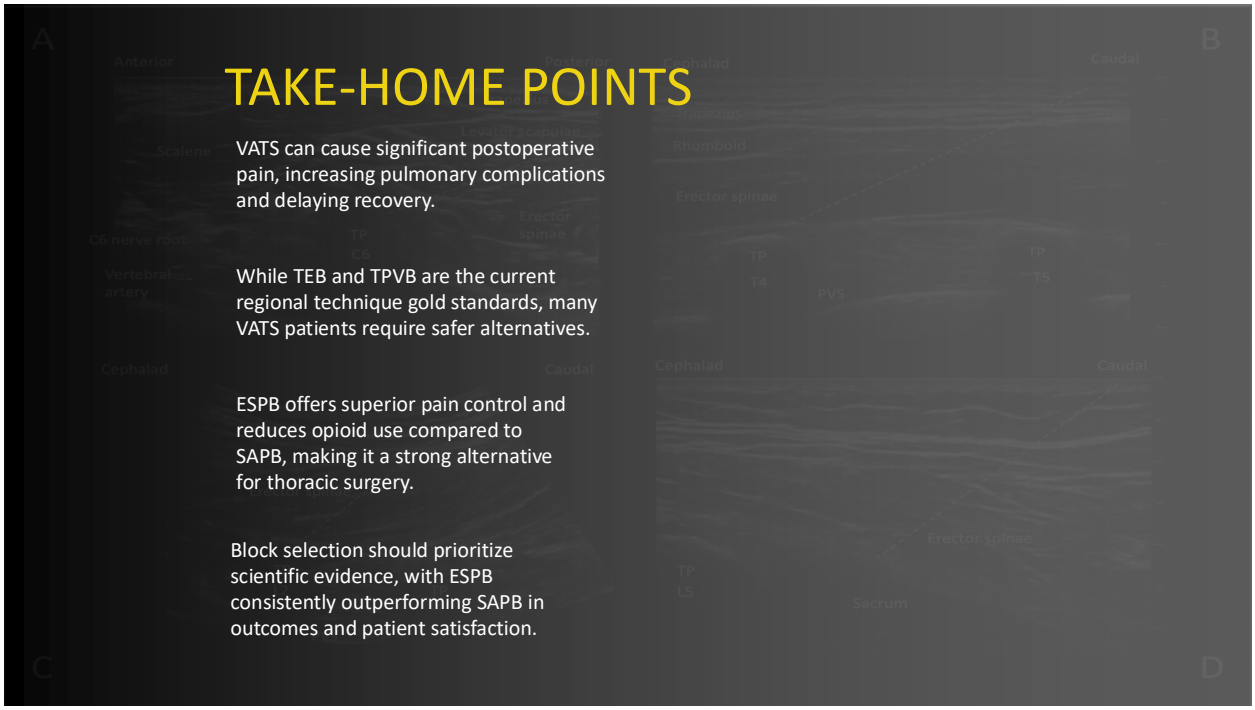
TAKE-HOME POINTS

VATS can cause significant postoperative pain, increasing pulmonary complications and delaying recovery.

While TEB and TPVB are the current regional technique gold standards, many VATS patients require safer alternatives.

ESPB offers superior pain control and reduces opioid use compared to SAPB, making it a strong alternative for thoracic surgery.

Block selection should prioritize scientific evidence, with ESPB consistently outperforming SAPB in outcomes and patient satisfaction.



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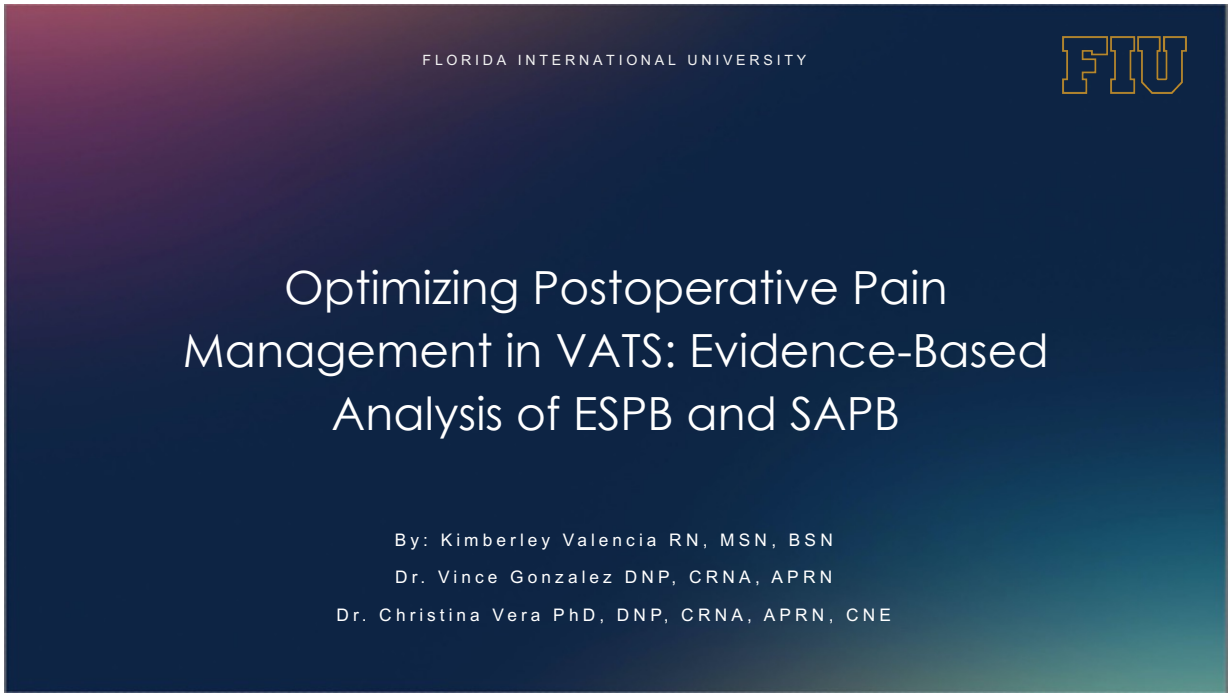
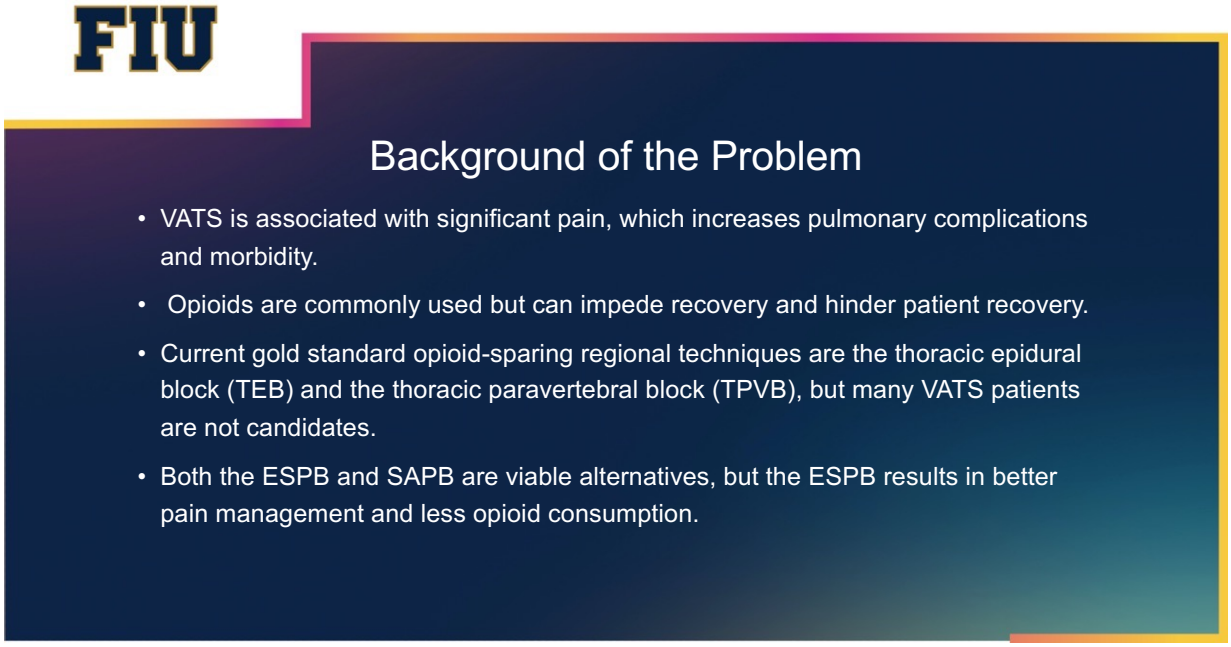
Appendix F: Dissemination and Results





Scope: The Problem with Pain

~25-60% of patients undergoing minimally invasive thoracic surgery will experience persistent postsurgical or chronic pain. Of the 530,000 general thoracic surgeries performed annually, VATS is the most common.

- Acute and chronic postsurgical pain contribute to significant morbidity among patients.
- Decreased mobility, impaired respiratory function, and hemodynamic instability are just some examples of pain-related complications..
- Multimodal regimens, including regional anesthesia, are recommended over opioids.
- Although the current gold standards, TEB and TPVB, are used in only 10% and 50% of cases, respectively.
- Interfascial blocks provide a reasonable alternative to neuraxial and paravertebral blockade for patients who are non-recipients.

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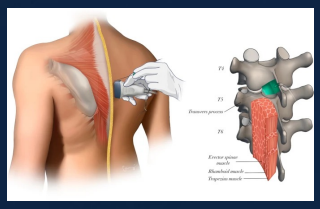
Knowledge Gaps

- The current standard regional techniques, TEB and TPVB, are often unsuitable for many VATS patients.
- These blocks can worsen respiratory distress by causing sympathetic blockade, raising the risk of complications like atelectasis and pneumonia, especially in those with compromised lung function.
- The adoption of interfascial plane blocks (ESPB, SAPB) is rising, especially in minimally invasive settings.
- However, no consensus on the analgesic superiority of either block for patients undergoing VATS.
- **SAPB**
  - Local anesthetic is injected into surface of serratus anterior muscle
  - Generally less effective than ESPB for deep pain and recovery
- **ESBP**
  - Provides somatic and visceral analgesia
  - More effective in controlling patient pain and better patient satisfaction
  - Results in less opioid consumption overall

Erector Spinae Plane Block: Insights and Advantages



The ESPB was first described in 2016 and blocks both the **dorsal** and **ventral rami of the thoracic spinal nerves**, providing **broad dermatomal coverage**.

- Consistently reduces opioid use and improves pain control within 24 hours after surgery.
- Provides the best analgesia with fewer side effects, surpassing TPVB and the SAPB.
- Reduced intra- and postoperative opioid use, lower rescue analgesic needs, and decreased VAS scores compared to SABP.
- Although limited, evidence suggests ESPB is superior to SAPB in lowering opioid consumption after VATS.

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Project Purpose

- To evaluate which interfascial block between the ESPB and SAPB is more successful in reducing opioid consumption in patients undergoing VATS.
- To educate CRNAs on the evidence comparing the ESPB and SAPB.
- To promote improved anesthesia practice change.
- Ultimately, to improve patient outcomes by improving pain management and reducing opioid consumption in adult patients undergoing VATS.

PICO Clinical Question

Population (P): Adult patients undergoing VATS

Intervention (I): Administration of the erector spinae plane block (ESPB)

Comparison (C): The serratus anterior plane block (SAPB)

Outcome (O): Reduced postoperative opioid consumption

Methods

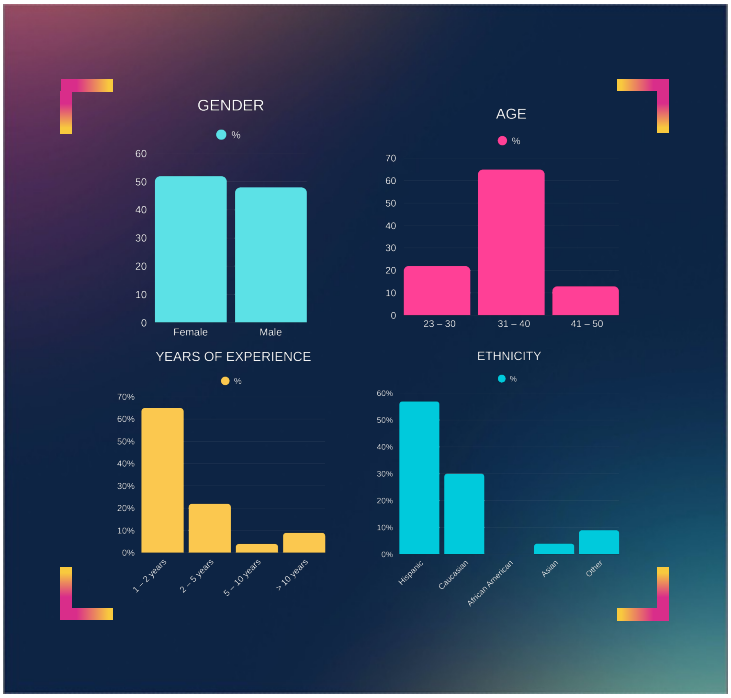
- Setting and Participants
  - Project approved by FIU's IRB
  - Participants: CRNA alumni from a South Florida University
- Recruitment
  - Emails obtained by DNP program director using alumni contacts
  - 200 emails sent explaining the QI project with invitation to participate
  - Goal: Obtain at least 20 responses
- Intervention
  - Survey conducted via Qualtrics, protecting anonymity
  - Pre-intervention survey to assess baseline knowledge
  - Educational module reporting the overall opioid consumption and analgesic efficacy between the ESPB and SAPB
  - Post-intervention survey to evaluate knowledge acquisition

Methods

- Data Collection
  - Demographics: age, gender, ethnicity, experience
  - Data stored with no identifying information
  - Results analyzed using grouped responses and trend analysis
- Ethics
  - Informed consent obtained
  - No incentives or conflicts of interest
  - Private information protected in encrypted database
- Outcome Measures
  - Difference in scores per question before and after intervention
  - Analysis of knowledge improvement

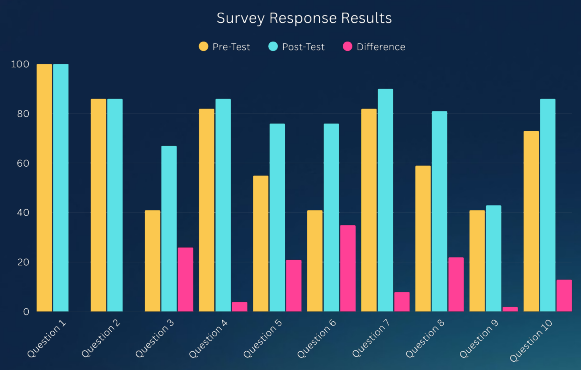
Results: Demographics

- Participant Completion
  - 24 CRNAs initially participated
  - 21 completed entire survey
  - Participation rate declined toward end of survey
  - Attrition: 12.5%
- Demographics
  - 52% female
  - 65% aged 31-40
  - 57% Hispanic
  - 65% 1-2 years' experience
  - All held a Doctor of Nursing Practice (DNP)



Results: Survey Responses

- 24 CRNAs started the survey, and 21 total participants completed it.
- Post-test showed increased provider knowledge on all but two questions, where the pre- and post-percentage remained the same.
- The results highlight strengthened knowledge of anatomical targets, comparative efficacy, and evidence-based considerations essential to optimizing postoperative pain management in VATS.



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Summary of Findings

- Knowledge improved in 8/10 areas, especially recognizing that neither block is a national gold standard (41% → 76%).
- Understanding of ESPB anatomy increased from 41% to 67%.
- Block characteristics were better identified, including ESPB's broader coverage (55% → 76%) and SAPB's limited reach (59% → 81%).
- Clinical effects of ESPB were clearer, with opioid-sparing benefits (82% → 90%) and somatic + visceral analgesia (73% → 86%).
- Baseline strengths stayed high, with 100% recognizing the primary goal of thoracic regional anesthesia and improved SAPB placement accuracy (82% → 86%).

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Interpretation of Results

- The findings of this project highlight the importance of structured education in steering CRNA practice toward consistency and safety.
- Most questions saw an increase in correct answers, showing the survey and training helped anesthesia providers understand ESPB and SAPB better.
- The results highlight improved knowledge of the appropriate anatomical targets, their relative effectiveness, and the evidence-based factors essential for managing postoperative pain in VATS.
- By understanding anatomical targets, pharmacologic rationale, and supporting outcome data, anesthesia providers can make clearer, more informed decisions aligned with current research.

Limitations & Considerations

- Limitations
  - Small sample size (n = 24, of whom 21 completed) despite the large number of alumni (200) recruited
  - Short-term evaluation only; no assessment of long-term retention
- Potential for Bias
  - Participation on voluntary basis – possible pre-conceived interest
  - Response bias, including inattentive responses
  - Influence of prior exposure/experience
- Future recommendations
  - Expansion of sample size
  - Evaluation of long-term retention

Implications for Practice

- Role of ongoing education
  - Evidence-based decision-making is a cornerstone of CRNA practice
  - Ongoing education improves CRNA knowledge of evolving regional techniques
- Organizational Impact
  - Continued dissemination of evidence could allow for formal incorporation of ESPB use into ERAS guidelines
- Patient Outcomes
  - Promotion of consistent, evidence-based practice patterns can optimize postoperative pain management for VATS patients.
  - Increased education of opioid-sparing techniques reduces complications and improves patient recovery

Key Takeaways

- The QI project improved CRNAs' knowledge of the use of ESPB and the SAPB in patients undergoing VATS as viable alternatives to TEB and TPVB for those who are not candidates.
- Anesthesia providers' increased awareness of the following helps improve evidence-based decision-making:
  - Anatomical targets of both interfascial blocks
  - Rationale for superior ESPB analgesic efficacy
  - Patient outcome data, including satisfaction and opioid consumption
- Accessible educational modules are a sustainable way to boost provider skills, encourage opioid-sparing practices, and turn current evidence into everyday clinical decisions.


Thank you!
Dr. Vince Gonzalez, DNP, CRNA, APRN
Dr. Christina Vera, PhD, DNP, CRNA, APRN, CNE
Dr. Ann Miller, DNP, CRNA, APRN, FAANA
FIU

Appendix G: DNP Poster

Optimizing Postoperative Pain Management in VATS: Evidence-Based Analysis of ESPB and SAPB

Kimberley Valencia MSN BSN RN
Faculty: Dr. Vince Gonzalez

INTRODUCTION

Regional anesthesia is essential for managing postoperative pain in video-assisted thoracoscopic surgery (VATS). This project compared the erector spinae plane block (ESPB) and serratus anterior plane block (SAPB) to evaluate their effectiveness in reducing opioid consumption.

PROJECT PURPOSE

To increase CRNA's knowledge of the ESPB compared to the SAPB in reducing opioid consumption in patients undergoing VATS.

RESEARCH OBJECTIVES

1. **Increase provider knowledge** of ESPB and SAPB anatomy.
2. **Assess recognition** of ESPB's superior opioid-sparing efficacy.
3. **Encourage application** of evidence-based block selection in practice.

LEARNING OUTCOMES

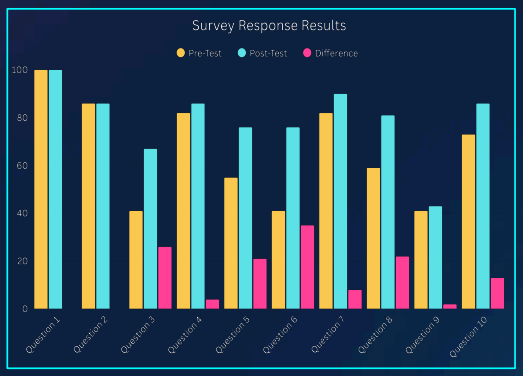
1. **CRNAs will** identify the anatomical landmarks and neural pathways relevant to the ESPB and SAPB techniques.
2. **CRNAs will** distinguish the evidence supporting ESPB's superior analgesic efficacy and opioid-sparing effects following VATS.
3. **CRNAs will** apply evidence-based knowledge to select appropriate regional anesthesia techniques that optimize postoperative pain management.

PICO QUESTION

In adult patients undergoing VATS, how does the ESPB compared to the SAPB reduce opioid consumption within the first 24 hours post-surgery?

METHODS

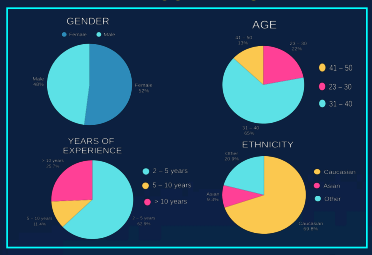
An online educational module was developed following a comprehensive literature review on the erector spinae plane and serratus anterior plane blocks. Certified Registered Nurse Anesthetist (CRNA) alumni from a South Florida university were recruited to complete pre- and post-intervention surveys assessing knowledge acquisition. The collected data were analyzed to evaluate the effectiveness of the module in improving provider understanding and evidence-based practice application.



RESULTS

- 24 CRNAs started the survey, 21 total participants completed it.
- Post-test showed increased provider knowledge on all but one question, where the pre- and post- percentage remained the same.
- The results highlight strengthened knowledge of anatomical targets, comparative efficacy, and evidence-based considerations essential to optimizing postoperative pain management in VATS.

DEMOGRAPHICS



LIMITATIONS

- Small sample size limited generalizability of findings.
- Lack of a control group prevented comparison to standard education or no intervention.
- Short assessment period did not measure long-term knowledge retention.
- Self-selection bias may have favored participants already interested in regional anesthesia.
- Online survey format allowed for potential response bias or inattentive participation.

IMPLICATIONS FOR PRACTICE

- Promotes evidence-based decision-making in regional anesthesia practice.
- Supports integration of ESPB into multimodal and TERAS pain management pathways.
- Encourages continued education to standardize block selection among CRNAs.
- Enhances provider competency in opioid-sparing analgesic strategies.
- Demonstrates that brief, accessible modules can effectively improve clinical knowledge.

FIU Nursing & Health Sciences

REFERENCES:

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