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An Educational Module for the Utilization of Sphenopalatine Ganglion Blocks as a Treatment Alternative for Post Dural Puncture Headache: A Quality Improvement Project

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DNP Project Title

Educating Anesthesia Providers on Sphenopalatine Ganglion Block as Post Dural Puncture Headache Treatment.

Abstract

Background: Post-dural puncture headache (PDPH) is a possible adverse effect of some spinal and neuraxial anesthesia procedures; it is characterized by visual disturbances, nausea, vomiting, dizziness, photophobia, and a postural component occurring within five days of a dural puncture. The epidural blood patch (EBP) has been considered the standard treatment for PDPH; however, the EBP has a considerable number of risks due to its invasive nature. The Sphenopalatine Ganglion Block (SPGB) is a non-invasive alternative therapy that shows promise in the treatment of PDPH.

Methods: A thorough search of research was performed utilizing MEDLINE (ProQuest) and CINAHL to distinguish research studies published within the past five years that have assessed the efficacy of the sphenopalatine ganglion block as a treatment for post-dural puncture headaches.

Results: Five published studies were classified as appropriate for analysis. The studies evaluated sphenopalatine ganglion block as an alternative to conservative treatment for post-dural puncture headache.

Keywords: Sphenopalatine Ganglion Block, Post Dural Puncture Headache

Introduction

Problem Identification

Neuraxial analgesia is the most frequent type of anesthesia delivered in the United States in obstetrics.[1] The most common complication arising from neuraxial labor analgesia is Post Dural Puncture Headache (PDPH).[1] Obstetric patients have a higher possibility of developing this condition because they possess many patient-specific risk factors; these include young age, female sex, pregnancy, vaginal delivery, and non-smoking status.[2] Typically, the PDPH resolves on its own; however, it can cause substantial morbidity in the postpartum patient and can interfere considerably with the mother's capability to care for her newborn or herself.[2]

Currently, the definitive treatment for postnatal PDPH is the epidural blood patch (EBP).[3] The EBP is not only an invasive treatment option, but it is also not without inherent risks; while uncommon, EBP treatment can lead to an additional accidental dural puncture, acute or chronic back pain, arachnoiditis, spinal hematoma, meningitis, cerebral hemorrhage, or cerebral ischemia.[4] Numerous alternative treatments for PDPH exist, ranging from conservative, such as bed rest, caffeine, and oral analgesic medication administration, to invasive, including acupuncture, epidural morphine, and greater occipital nerve blocks. Due to the invasive nature of the current gold standard treatment and the potential side effects, alternate, less invasive, less hazardous treatment modalities should be utilized. One promising, minimally invasive, low-risk alternative to the EBP is the sphenopalatine ganglion block (SPGB).[3] The purpose of this project is to enhance the knowledge of obstetric anesthesia providers regarding the use of sphenopalatine ganglion blocks in the treatment of post-dural puncture headaches.

Background

All across America, the use of neuraxial labor analgesia has risen.[1] It is the most frequently used technique for pain relief of laboring mothers, with nearly 75% of vaginal delivery patients and almost 90% of cesarean delivery patients receiving epidural or spinal anesthesia.[5] The use of an epidural for a vaginal delivery is a versatile technique allowing for an easy transition to the operating room if urgent obstetrical intervention is necessary or the delivery needs to be emergently converted to a cesarean delivery; this reduces the occurrence of general anesthesia when critical interventions are required.[1] Similarly, spinal anesthesia is the most extensively utilized anesthetic for planned cesarean sections; it is relatively safe, reliable, easy to administer, has a rapid onset, and is low cost.[6] Based on these statistics, roughly two million women in the United States undergo procedures with the placement of neuraxial analgesia.[5]

PDPH is more commonly caused by an accidental dural puncture from an epidural catheter placement than a spinal anesthetic; the reason for this is the gauge and type of needle used for the different procedures, spinals are performed using a small, pencil tip needle, whereas epidurals are performed using a larger gauge Tuohy needle.[2] When an accidental dural puncture is recognized, a PDPH diagnosis is simple to make; however, roughly one in every 3 PDPH is diagnosed following an unrecognized dural puncture.[3] PDPH is categorized by the International Classification of Headache Disorders criteria as a headache occurring within 5 days of a dural puncture, which has an orthostatic component and is associated with nausea, neck stiffness, photophobia, or tinnitus.[6] The cause of the PDPH is suggested to be a leak of cerebrospinal fluid (CSF) through a hole in the dura; the low volume of CSF leads to intracranial hypotension and structures sagging into the foramen magnum, as evidenced by radiological studies.[3] While not fatal, a PDPH can severely worsen a patient's quality of life and lead to increased length of stay

in the hospital, ultimately causing increased costs and decreased patient satisfaction.[7] The most commonly used treatment for PDPH is the EBP; while effective, the EBP is an invasive procedure that can cause complications ranging from back pain to cauda equina syndrome.[9]

Scope of the Problem

Narrowing down the exact numbers of the incidence of PDPH can be challenging. The frequency of accidental dural puncture during epidural placement is estimated to be roughly 1.5%, with upwards of 80% of those patients who experienced an accidental dural puncture developing a PDPH;[2,8] alternatively, rates of PDPH following spinal anesthetic falls between 1.5% to 11.2% with rates varying based on needle design and size.[3] One of the most extensive US studies which looked at the instance of PDPH and neuraxial labor analgesia was performed by Delgado and associates; the study looked at nearly 2 million insured parturients in locations across the US over a seven-year period.[5] Delgado and colleagues showed the probability of PDPH following a vaginal delivery with neuraxial analgesia was roughly 0.58%, whereas a cesarean delivery with and without prior neuraxial analgesia was 0.47% and 0.64%, respectively.[5] With approximately two million obstetric neuraxial anesthetics performed annually, that equates to around 4,000 PDPHs plaguing new mothers yearly.

Consequences of the Problem

PDPH has a broad range of consequences for the patient and the healthcare system. Patients with PDPH are more likely to have a delayed discharge from the hospital, causing an increased length of stay; they are also more likely to have subsequent emergency room or hospital visits.[5] Ultimately, these discharge delays and readmissions lead to increased healthcare costs for the patient and the facility. If patients cannot be discharged in a timely manner, this can lead to

delays in care within the obstetrics department. Moreover, a new mother who must care for her newborn child in the immediate postpartum period will significantly suffer from the side effects of a PDPH; she may be unable to perform her activities of daily living and unable to provide care for her child.[1] Finally, PDPH is one of the most frequent causes of malpractice claims against anesthesia providers.[5]

As far as EBPs go, treatment with EBP is given to more than 50% of patients who suffer from PDPH, with approximately 1 in 10 of those receiving an EBP requiring a second EBP treatment.[5] Each additional EBP is a procedure with its own cost to the patient and the healthcare facility. As previously stated, there are numerous risks to even performing an EBP. Complications occurring following an EBP include arachnoiditis, meningitis, spinal hematoma, repeat dural puncture, acute/chronic back pain, bradycardia secondary to increased intracranial pressure, or infection.[4]

Knowledge Gaps

One of the most frequently cited studies comparing the SPGB to the EBP is a retrospective study by Cohen et al.[9] Cohen and colleagues evaluated a 17-year period at a single institution and compared the outcomes and complication rates of the patients who received the SPGB versus those who received the EBP; the results of the study indicated that more patients had faster relief of their symptoms without any additional complications when SPGB was the intervention.[9] Similarly, a study by Youssef and associates executed a randomized clinical trial to assess the effectiveness of SPGB versus Greater Occipital Nerve Block (GONB) in PDPH patients following spinal anesthesia; this study found that the less invasive SPGB had similar efficacy with no adverse effects.[10] In addition to these larger-scale studies, numerous case studies indicate the efficacy of SPGBs as PDPH therapy.[3]

Russell and colleagues published a two-part series on the management of PDPH; additionally, a recent comprehensive update was published in 2020 on the management and treatment of PDPH by Patel and associates.[3,11] Both of these practice updates list SPGB as optional therapy for the management of PDPHs.[3,11] However, providers are not using this therapy as an option for patients. Delgado et al. showed that the EBP is primarily utilized as the treatment for PDPH, with 60-70% of postpartum PDPH patients receiving an EBP.[5] Since most of the literature is targeted at the use of the EBP as a definitive treatment for severe PDPH, it can be presumed that the lack of use of SPGB as a primary intervention is due to the provider's lack of knowledge on the treatment.

Proposal Solution

The SPGB has been suggested as a therapy for many pain disorders.[12] SPGB can be performed through 3 different approaches with varying advantages and disadvantages; it can be performed via a transnasal topical or injection approach, a transoral approach, or an infrazygomatic approach.[12] The transnasal technique is the least invasive, has the lowest risk and can be implemented bedside without any additional imaging equipment.[13] Transnasal SPGBs have fewer instances of complications, and even when complications occur, they are minor; some minor complications include epistaxis, numbness, or decreased sensation of the nose, palate, and pharynx or eye tearing.[12] When compared with the efficacy of an EBP and time to relieve PDPH symptoms, SPGBs have quicker symptom relief and similar long-term pain alleviation.[9] Since SPGBs have already been indicated for the treatment of other various syndromes, have demonstrated effectiveness in the treatment of PDPH, and have fewer complications than an EBP, they should become a more utilized alternative in the obstetric anesthetists' treatment repertoire.[9,13] Implementation of an educational module will increase

obstetric anesthesia providers' knowledge and improve attitudes toward using topical transnasal SPGBs for the treatment of PDPH.

Additional Background

One frequent, severe complication following a dural puncture is post-dural puncture headache (PDPH).[14] PDPH may occur following a spinal anesthetic, an accidental dural puncture during an epidural anesthetic, a therapeutic or diagnostic lumbar puncture, or the administration of intrathecal medications.[14-18] A PDPH can be classified by specific criteria; the International Classification of Headache Disorders certifies a PDPH happens within five days of a dural puncture and is associated with symptoms of photophobia, neck stiffness, nausea, and has an orthostatic component.[1,2]

Following neuraxial procedures, the frequency of PDPH ranges from 6 to 36%; PDPH can delay patient discharge, increase morbidity and lead to higher readmission rates.[11] Initial treatment for PDPH may be conservative, consisting of intravenous (IV) hydration, bed rest, and caffeine; however, if this is unsuccessful, the epidural blood patch (EBP) is considered the most successful therapy.[2,11] The EBP is an invasive therapy that carries risks ranging from back pain to cauda equina syndrome.[11]

One non-invasive, low-risk intervention which causes minimal adverse effects is the sphenopalatine ganglion block (SPGB).[18] There are three SPGB approaches transnasal, transoral, and transcutaneous; the transnasal topical approach is the simplest technique and can be performed bedside in the shortest amount of time with the lowest complication risk.[13] The SPGB has been found to have faster relief onset and fewer complications than the EBP and can be used as a treatment alternative to conservative PDPH management.[9]

Rationale

Regardless of proper technique and prevention practices, accidental dural punctures and PDPH are infrequent but inevitable complications of neuraxial procedures; as such, anesthesia providers should be aware of the various treatment options available.[2] PDPH therapy has been widely studied, and numerous treatment options have been used effectively.[11] Pain from PDPH is speculated to be because of a cerebrospinal fluid leak greater than the production rate.[12] The sphenopalatine ganglion is the biggest and most upper ganglion of the sensory, parasympathetic, and sympathetic nervous system; secondary to its accessibility, this ganglion has been used to treat multiple facial and head pain syndromes.[12] The SPGB is believed to work by obstructing the parasympathetic flow to the brain's vasculature; this allows the blood vessels to constrict to a standard diameter and relieves the headache.[12] SPGB has demonstrated success as a PDPH treatment in numerous case studies and can be advantageous in patients who have contraindications for an EBP.[15,19-24]

PDPH leads to decreased patient satisfaction, increased length of stay, and increased readmission rates.[7] The current definite treatment for PDPH is the EBP.[2] However, an EBP may be contraindicated in patients who have an infection at the site, are on an anticoagulant, or are coagulopathic; furthermore, complications from an EBP can be severe and include meningitis, intrathecal hematoma, abscess, or nerve palsies.[11] If effective, the SPGB could be another treatment option added to the PDPH treatment algorithm.

Objective

This literature review intends to examine and synthesize studies centered on the success of SPGB as an alternative treatment for PDPH. As much of the current research studies center on SPGB as a substitute for conservative treatment, the review focuses on SPGB as an

intervention compared with conservative treatment or as an adjunct treatment when conservative treatment is unsuccessful. The goal of the review is to present the material in a way that allows anesthesia providers to assess SPGB's efficacy and improves providers' knowledge and attitudes toward its use in the treatment of PDPH.

Methodology of Literature Review

Eligibility Criteria

Health science peer-reviewed journals were evaluated for this literature review; specific inclusion and exclusion criteria were utilized to select those studies that best ascertained the review's objectives. Studies printed within the previous five years, published in English, and with complete article accessibility were included. Those studies where patients were less than 18 years of age, had a small sample size, or were published in other languages without total article translation were excluded. Publications chosen included both obstetric and non-obstetric patients suffering from PDPH and focused on transnasal SPGBs. Florida International University's (FIU) library service was employed to access the research studies through medical journal databases.

Keywords were chosen based on the clinical question, and the subsequent search used the applicable search symbols and Boolean operators: Postdural Puncture Headache, Sphenopalatine Ganglion Block.

Information Sources

The two databases used for the search were MEDLINE (ProQuest) and The Cumulative Index to Nursing and Allied Health Literature (CINAHL).

Search Strategy

Significant search terms were extended to incorporate: (Postdural Puncture Headache OR Post-dural Puncture Headache OR Post Dural Puncture Headache OR PDPH OR Post lumbar-puncture headache OR Spinal Headache) AND (Sphenopalatine Ganglion Block OR SPGB). The preliminary search yielded 227 articles. CINAHL generated 213 reports, and MEDLINE yielded 14 articles. All the articles in the MEDLINE search were also found in the CINAHL search. Only studies circulated within the past five years, printed in English, and peer-reviewed were incorporated to guarantee the most relevant and most recent studies were examined. This elimination yielded 4 for MEDLINE and 50 articles for CINAHL. Additional duplicate articles were eliminated, resulting in 36 studies that required supplementary evaluation. Titles were rejected if they failed to meet inclusion criteria. For instance, studies that included broad PDPH treatment updates or evaluated different methods of SPGBs were eliminated.

Twenty-eight studies were assessed and accepted for a complete abstract review. Eleven of those studies were examined through comprehensive text analysis. The studies eliminated consisted of small case studies consisting of 1 to 5 patients; the five studies selected for review had larger sample sizes ranging from 20 to 60 participants.

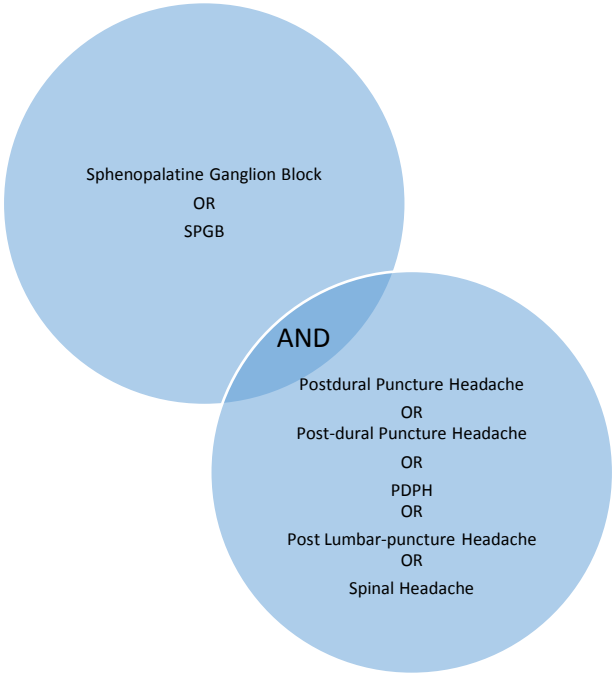


Diagram 1. Search Keywords

Results of Literature Review

Study Characteristics

The five articles selected for this literature review explored the use of the sphenopalatine ganglion block and its efficacy in treating PDPH. The studies by Puthenveetitil et al., Yilmaz et al., and Kumar et al. compared the SPGB to conservative treatment; in contrast, the studies by Takmaz et al., and Khawaja et al., evaluated the patient response before and after the SPGB as a treatment intervention.[14-19] The research performed by Kumar and associates was further subdivided into comparison groups that evaluated the efficacy of two different local anesthetic concentrations.[17] The reports performed by Takmaz and colleagues and Kumar and associates also assessed patient satisfaction as an additional measurement of treatment efficacy.[14,17]

The three studies by Yilmaz et al., Puthenveetitil et al., and Kumar et al. were all prospective.[14,17,18] Yilmaz et al., and Kumar et al. utilized randomized selection while Puthenveetitil et al. performed their study as an observational study.[15,17,18] Khawaja and

colleagues conducted their research as a large case series, while Takmaz and associates used a retrospective approach to their analysis.[14,16]

Results of individual studies

Yilmaz and colleagues compared conservative treatment to conservative treatment with the addition of the SPGB.[15,18] The study by Yilmaz et al. was conducted as an experimental, prospective, randomized controlled trial (RCT) and is considered Level I evidence.[15, 25] Yilmaz and associates enrolled 20 women diagnosed with PDPH following cesarean delivery with spinal anesthesia.[15] The conservative management group received 200mg of IV theophylline, 1 liter of 0.9% normal saline, 1g of acetaminophen every 6 hours, and 1500mg of magnesium sulfate; the intervention group received a unilateral SPGB with 2cc of 10% lidocaine situated in the nose for 15 minutes.[15] Pain assessments were completed at 4, 12, and 24-hour intervals using the visual analogue scale (VAS); despite higher initial pain scores, participants in the intervention group had a more significant reduction in pain by the first assessment interval and had lower pain scores through the study completion.[15]

Yilmaz and associates concluded that while the pain scores were lower in the intervention group, the differences in pain scores between the two groups were not statistically significant; however, since the *p*-value (p=0.089) was approaching the significance limit ($p<0.05$), the authors believed that the difference is more noteworthy than reported.[15] The lack of significance in the results was attributed to the study's small sample size.[15] One complication the authors noted in a solitary participant; the participant suffered a single tonic-clonic seizure 2 hours after treatment with an SPGB, which was caused by cerebral edema as evidenced by post-seizure magnetic resonance imaging. The authors acknowledge the small sample size, the lack of control group receiving a simulated SPGB with a plain cotton-tipped applicator, and the fact that neither

the physicians nor participants were blinded were limitations of the study.[15] Overall, Yilmaz and colleagues established SPGB is a fast and efficient treatment for PDPH but suggested that further clinical trials be performed.[15]

Kumar and colleagues compared conservative medical management to SPGBs performed using 4% lidocaine and 10%to treatreatment of PDPH; similar to the study by Yilmaz and associates, this study is considered Level I evidence because it was performed as an experimental, prospective, randomized, observational study.[17, 25] Twenty participants were placed into the control group and received oral tramadol 37.5mg and acetaminophen 325mg twice a day, caffeine 300-500mg daily, and were directed to rest in bed and increase fluid intake.[17] The first intervention group of 20 participants received a bilateral SPGB with a cotton-tipped applicator soaked in 1.5cc of 4% lidocaine for 10 minutes while the second intervention group, also containing 20 participants, received two puffs of 10% lidocaine intranasally; pain assessments using the VAS were performed at timed intervals beginning at 15 minutes and increasing to every 24 hours until the patients were discharged.[17] There was a noteworthy decrease in VAS score following the SPGB in both intervention groups when compared to the control group, and both intervention groups had 90% or greater of the participants ready for discharge, defined by a VAS <3, at the 72-hour assessment compared to only 5% in the control group.[17] Kumar et al. determined SPGB is a cost-effective treatment for PDPH because it decreases the length of hospital stay, as evidenced by the greater amount of patients ready for discharge at 72 hours of treatment, with 10% lidocaine being slightly more effective than 4% lidocaine at blocking the sphenopalatine ganglion.[17]

Similar to the studies by both Yilmaz et al. and Kumar et al., the research by Puthenveetitil and associates assessed the application of SPGB as an alternative treatment option

to conservative management for PDPH. Puthenveetitil et al study was a quantitative, quasi-experimental, prospective, unblinded, observational study classified as Level II evidence.[18,25] At the time of the study, the two obstetric consultants on staff at the facility treated PDPH with two different methods: one used the sphenopalatine ganglion block, and the other used additional conservative medical therapies.[18] Puthenveetitil et al. enrolled 20 postoperative cesarean patients who developed a PDPH within seven days of a subarachnoid block that was not alleviated with conservative treatments of bed rest, intravenous fluids, caffeine, and abdominal binders; the participants were not randomized, nor were they or the researchers blinded to the treatment the participants were receiving.[18] The conservative management group received 1g of acetaminophen three times for a single day, if their pain was not adequately alleviated, 75 mg of intravenous diclofenac (a non-steroidal anti-inflammatory drug) was added two times per day; the intervention group was placed supine and received a SPGB with a 2%-lidocaine-soaked cotton-tipped applicator situated anterior to the sphenopalatine ganglion for five minutes.[18] Pain levels for both groups were assessed at specific intervals from 30 minutes to 24 hours.[18] Puthenveetitil et al. established a reduction of pain to a numeric score of less than four was considered adequate.[18] Since most of the patients in the SPGB group achieved a pain level of zero, the authors used the median score of the intervention group to compare pain levels with the mean score of the conservative management group.[18] The conservative management group's mean pain score gradually decreased to a level below four at the 4-hour interval and remained there until the termination of the study; in contrast, the SPGB group's median pain score was immediately reduced to less than four at the initial 30 minute assessment period and stayed below 4 to the conclusion of the study as well.[18] Puthenveetitil and associates acknowledge the study was limited because it was not randomized not blinded; since it was an observational

study, it was not registered with the Clinical Trial Registry.[18] The onset of pain relief was significantly reduced in the SPGB intervention group; as such, Puthenveetitil et al recommend that the SPGB be used as an early treatment for PDPH and suggest that it can control severe pain.[18]

The research performed by Takmaz and associates evaluated the efficacy of the SPGB as a treatment for PDPH and the resulting patient satisfaction; similar to the study by Kumar et al., the participants were non-obstetric patients.[14] The analysis was performed as a retrospective, quasi-experimental study and is considered Level II evidence.[14, 25] Twenty-six participants were recruited into the study after being diagnosed with PDPH, and all received a bilateral SPGB with 2% lidocaine-soaked cotton-tipped applicators placed for a duration of 15 minutes; pain assessments were performed using the VAS at intervals from 15 minutes to 48 hours post block.[14] Additionally, at 48 hours post block, patient satisfaction was evaluated using the Patient Global Impression of Change (PGIC) scale.[14] Takmaz and colleagues reported all participants achieved adequate analgesia, which they defined as a VAS score <3, within 24 hours of the procedure, with more than 90% of participants achieving that result at the initial 15-minute assessment; furthermore, 100% of the participants rated their satisfaction as either "much improved" or "very much improved," the two highest degrees of improvement on the PGIC scale.[14] Takmaz et al. concluded that PDPH unresponsive to conservative treatments could be treated effectively with a SPGB and that the SPGB would be a reasonable treatment to consider before treatment with an EBP.[14]

Khawaja and colleagues assessed the efficacy of the SPGB in the treatment of PDPH. However, the authors performed a descriptive, cross-sectional case series; this study is deemed non-experimental and is considered Level III evidence.[16,25] The researchers gathered 53

participants suffering from PDPH with VAS scores ranging from 7-10 and performed an SPGB with 3-5cc of 1% lidocaine sprayed intranasally and kept the patients positioned supine for 2 minutes following the procedure; the pain was assessed before the block and 2 minutes after the block using the VAS.[16] Participants in the case series reported a significant decrease in pain following the SPGB; the mean VAS dropped from 9.377 to 1.175, a reduction of 73% in the first 5 minutes following the block.[15] By performing a paired t-test, the *p*-value<0.001 was deemed significant and supported the reduction in pain following the SPGB; intrinsically, the authors concluded that the SPGB is a reasonable treatment selection for PDPH.[15]

Discussion

Postdural Puncture Headache (PDPH) is a severe complication following accidental or intentional dural puncture during various neuraxial procedures.[14] The current gold standard treatment is the epidural blood patch (EBP); however, the therapy can cause adverse effects from bleeding to infection and even paralysis.[14, 18] The sphenopalatine ganglion is a nervous system structure with direct access to the outside environment through the nasal cavity; it encompasses somatic sensory roots and parasympathetic and sympathetic components located in the pterygopalatine fossa.[14,16] The sphenopalatine ganglion block (SPGB) is a simple procedure that has been shown to provide relief in treating many headaches and neuralgic pain syndromes.[18] The above literature review sought to collect recent and relevant studies regarding the use of SPGB for treating PDPH.

Yilmaz et al. demonstrated a unilateral SPGB as an effective treatment for a rapid reduction in pain caused by a PDPH; this was evidenced by the significant decrease in VAS pain score at the 4-hour interval following the SPGB.[15] Furthermore, Yilmaz et al. discussed that a larger sample size might contribute to significant decreases in VAS pain scores following SPGB

for the other interval periods in future studies.[15] The most extensive study evaluated, performed by Kumar et al., also showed a significant reduction in pain and increased readiness for discharge amongst patients who received the SPGB.[17] Puthenveetitil et al. also had a promising decrease in pain scores for nearly 90% of their study participants within 5 minutes of receiving the SPGB; moreover, most of the SPGB group participants reported a pain level of zero.[18]

Takmaz et al. reported a rapid reduction in headache pain within 15 minutes of the SPGB, and the entire intervention group had attained adequate analgesia within 24 hours of the procedure; additionally, the patient satisfaction with this procedure was very high.[14] Finally, Khawaja et al. reported a significant reduction in PDPH pain within 5 minutes of the block.[16]

Conclusion

PDPH can be an unavoidable complication arising from neuraxial procedures, and as such, providers should be up to date on the treatment options for their patients. The first-line treatment for PDPH is conservative medical management, and the definitive therapy is the epidural blood patch; however, other alternatives may be equally as effective as the EBP with as few side effects as conservative management. The sphenopalatine block is a safe, effective treatment for PDPH; it is inexpensive, easy to perform at the patient's bedside, and requires limited tools and equipment.

Current evidence-based research focusing on SPGB for the treatment of PDPH was reviewed. The goal of the review was to establish evidence of the efficacy of the SPGB. The information in the five studies will create the foundation of a quality improvement (QI) project which centers on educating anesthesia providers on the use of the SPGB in the treatment of PDPH. By utilizing the most recent evidence-based research, the QI project is anticipated to

improve anesthesia providers' knowledge and attitudes toward using sphenopalatine ganglion block either as an adjunct or independent therapy for the treatment of PDPH.

Purpose/ PICO Clinical Questions/Objectives

PICO Question or Purpose

Population (P): Anesthesia providers

Intervention (I): Sphenopalatine Ganglion Block Education

Comparison (C): No education

Outcomes (O): Improve provider attitudes and knowledge toward the use of Sphenopalatine Ganglion Block

Primary DNP Project Goal

One common complication of neuraxial procedures is post-dural puncture headache (PDPH).[11] The hallmark of PDPH diagnosis is a headache arising within five days of a neuraxial procedure that is exacerbated when sitting or standing and alleviated when lying supine.[17] PDPH is caused by a disproportionate deficit of cerebrospinal fluid (CSF) production to CSF loss which causes intrathecal hypotension.[15] Conservative management with hydration, bed rest, oral analgesics, and caffeine is the initial therapy for PDPH; however, if conservative treatment fails, the epidural blood patch (EBP) is considered the most effective treatment.[14,15] EBP is an invasive procedure with risks ranging from an additional inadvertent dural puncture to infection and neurological complications.[17] As a result of the invasiveness and dangers of the EBP, PDPH treatment alternatives have been studied extensively.[11]

The sphenopalatine ganglion is found in the pterygopalatine fossa. It possesses somatic sensory, parasympathetic, and sympathetic roots; through this ganglion, the Sphenopalatine ganglion block (SPGB) works by blocking the parasympathetic outflow to cerebral vessels.[17]

The SPGB has been previously used to treat various types of headaches and neuralgic pain syndromes.[14] Numerous case studies have shown success with using the SPGB to treat PDPH; it can also be a vital treatment option for those patients who have contraindications to EBP.[15,19-24] Furthermore, multiple more extensive studies proved that the SPGB provides a rapid decrease in pain caused by PDPH, improves readiness for discharge, and increases patient satisfaction.[14-18]

The prevalence of PDPH after neuraxial procedures ranges from 6 to 36% and can also be found following procedures performed for pain management; PDPH is most commonly seen following neuraxial procedures performed for surgery, secondary only to its occurrence in obstetrics anesthesia.[11] Since PDPH is an inevitable complication, anesthesia providers should be knowledgeable of current treatment modalities.[2] The main objective of developing the SPGB educational module is to enhance the knowledge of the anesthesia provider on the use of the SPGB. Ideally, by increasing providers' knowledge and familiarity with the block, the educational module will improve their attitude toward using the block in treating PDPH.

Goals and Outcomes

The SMART format was utilized in developing the target objectives; the SMART format indicates that objectives ought to be specific, measurable, achievable, realistic, and timely.[26]

Specific

Anesthesia providers will receive an evidence-based educational module highlighting the use of the SPGB in the treatment of PDPH.

Measurable

The success of the educational intervention will be assessed through the analysis of a survey administered to the participants as a pre and post-test surrounding the academic module. Outcomes will be evaluated by appraising the changes in the anesthesia providers' knowledge and attitudes towards PDPH, current standard PDPH treatments, SPGB, and the use of SPGB as a treatment for PDPH. Qualtrics® software will be utilized to generate the surveys and analyze the records.

Achievable

With the assistance of DNP Preceptor Lisa Mills, CRNA, ARNP, and DNP Advisor Jorge Valdes, DNP, CRNA, APRN, an online educational module will be created that highlights the research, benefits, and efficacy of the SPGB.

Realistic

Anesthesia providers will be educated on the SPGB via an online educational module. The online module creates an easily accessible format that can reach providers on all shifts at their leisure.

Timely

The "Educating Anesthesia Providers on Sphenopalatine Ganglion Block as Post Dural Puncture Headache Treatment" educational module will be finalized and presented to anesthesia providers within a 6-month time frame. The results from this education will be available after the 9-month project; the timeline of the project is as follows: within 6 months the educational

module will be developed, the educational module will then be available for 60 days for providers to access and build competency, after the module closes, within 30 days the data will be analyzed and synthesized to show the results of the knowledge questionnaire.

Program Structure

Creating the SPGB for PDPH treatment educational module will necessitate a concerted effort from providers and educators. A thorough analysis will be executed to assess the significance and value of the project and how it will benefit the organization and the providers; this will emphasize the differences in the current state of practice versus what the future state of practice at this facility can be.[26] Utilizing the SWOT assessment tool, an evaluation of the project's strengths, weaknesses, opportunities, and threats will be completed.[26]

This program intends to establish the providers' understanding of the current clinical practice and the use of the SPGB in the treatment of PDPH. At the start of the project, a panel of professionals will be identified to direct the development of the learning module. Participants will initially be given a survey to evaluate their understanding of post-dural puncture headaches, treatment options, and sphenopalatine ganglion blocks. An educational course will then be electronically distributed focusing on PDPH, its prevalence, the SPGB as an alternate treatment, and its efficacy and benefits. Following the educational intervention, the participants will be provided with a survey to assess the changes in their knowledge and attitudes toward SPGB following the educational module.

Strengths

In the SWOT analysis, strengths are the internal characteristics of the intervention that are beneficial to the plan.[26] The transnasal sphenopalatine ganglion block (SPGB) is a reliable and favorable treatment for PDPH.[11] The technique has low risks and is minimally invasive.[11]

The ease of application of the SPGB is the greatest strength of the block; it can be done bedside with local anesthetic and cotton-tipped applicators.[15] The educational module will be an online module that facilitates provider accessibility. The facility where the intervention will be implemented advertises research and innovation as a benefit to its patients; the research and education of the module align with the organization's vision. These strengths benefit the implementation of the project.

Weakness

Weaknesses of the intervention consist of any internal attributes that could be destructive to the intervention.[26] The number of controlled studies for SPGB is limited, so it has yet to be promoted as a definitive treatment for PDPH.[13] Some contraindications to the block include allergy to local anesthetic, infection, patient refusal, facial trauma history, and anticoagulation therapy.[13] Minor complications from SPGB include epistaxis, palate, pharynx, and nose numbness, and eye tearing.[13] Furthermore, the educational module will be distributed via email to anesthesia providers at the facility; since participation is entirely voluntary, providers may not participate or view the information included in the course. These drawbacks may weaken the acceptance of the SPGB as a therapy for PDPH and interfere with the execution of the intervention.

Opportunities

Opportunities, in contrast, are any future external opportunities that may benefit the program.[26] The SPGB is commonly performed by neurologists and pain management specialists for chronic pain syndromes; as a result, it is a treatment option that anesthesia providers may not be familiar with.[13] This educational module is the opportunity to expand providers' knowledge of the block and its application to use in PDPH. The organization has four other facilities within the

hospital system; if the educational intervention performs well at the initial facility, it is possible to distribute the material to the other facilities to expand its reach. These opportunities may promote the potential of the project.

Threats

Threats are external considerations that may damage the plan or obstruct the intervention's capacity to accomplish its objectives.[26] Providers may have a standard protocol that they follow for PDPH; as a result, they may have opinions about what has worked for them and be unwilling to change their practice. Additionally, the small sample size of the RCTs in the literature and the single patient who suffered a seizure may be enough to dissuade practitioners from utilizing the SPGB. These factors may impede the success of the project.

Organizational factors

Implementation of the "Educating Anesthesia Providers on Sphenopalatine Ganglion Block as Post Dural Puncture Headache Treatment" learning module will be achieved through a multi-step collaborative approach. Initially, the steps to develop the program will be established. Goals will be created to assess the efficacy of the intervention. During the evaluation, the overall effectiveness of the module will be appraised. After the intervention, the team will be required to deliver a synopsis of outcomes. The overview will be understandable and consist of the program narrative, interventions, purpose statement, data collection methods, and data analysis; it will include background on the clinical issue, collection tools, findings, conclusions, outcomes, limitations, and recommendations for the program improvement.

Definitions and Outcomes

The main outcome that was assessed was the relief of Post-dural Puncture Headache (PDPH) symptoms. The intervention that was evaluated was the Sphenopalatine Ganglion Block

(SPGB). A numeric pain rating score was used by Puthenveettil, et al., while the Visual Analog Score (VAS) was utilized in the remaining studies.[14-18]

Post-dural Puncture Headache (PDPH). Kumar et al. recognizes PDPH by the International Classification of Headache Disorders definition which describes a headache arising within 5 days following a subarachnoid block that is exacerbated when seated or standing and alleviated when lying supine.[17] The headache may be associated with tinnitus, photophobia, neck stiffness, hypoacusia, and neck stiffness.[2]

Sphenopalatine Ganglion (SPG). The Sphenopalatine Ganglion is a parasympathetic ganglion \ situated outside the cranium; it is positioned within the pterygopalatine fossa.[13] The SPG has both autonomic and sensory innervation.[13] The parasympathetic terminates in the SPG where second-order neurons deliver a secretomotor function to lacrimal glands, mucous membranes, and offshoots to the cerebral and meningeal blood vessels.[13]

Sphenopalatine Ganglion Block (SPGB). SPGB can be accomplished by three approaches: transcutaneous, transoral, or transnasal.[13] All of the studies evaluated employed the transnasal SPGB as the intervention of choice because it is the simplest technique with low risk and a short procedure time.[13-18] Cotton-tipped applicators soaked with varying concentrations of lidocaine were utilized in four of the studies evaluated.[14-15, 17-18] The study by Khawaja et al., and one intervention group from the study performed by Kumar et al. sprayed lidocaine intranasally.[16,17]

Numeric rating scale (NRS). Puthenveettil, et al. assessed the presence of pain for its participants using the numeric pain score.[18] The scale ranges from zero to ten, with ten being the worst possible pain imaginable, and zero being no pain.[18] Assessments were performed at predefined intervals following the intervention (at 30 minutes, 1, 2, 4, 6, 8, 12 and 24 hours post intervention).[18]

Visual Analog Score (VAS). The remaining studies used the visual analog scale to rate participants' pain.[14-17] Khawaja et al. quantified the VAS from 0-10, with 0 equating to "no pain at all" and 10 equating to "severe pain."[16] Pain assessments were performed using the VAS at varying intervals. Takmaz et al. performed assessments at 15 minutes, 30 minutes, 24 hours, and 48 hours.[14] Similarly, Kumar and colleagues executed assessments for 15 minutes, 30 minutes, 1 hour, 2 hours, and every 24 hours until the participants were discharged.[17] Khawaja et al. performed the assessment before and after the block; while Yilmaz and associates performed the assessment at 4, 12, and 24 hours post intervention.[15,16]

Methodology of Quality Improvement

Setting

The setting for this DNP project is Memorial Regional Hospital (MRH), a 797-bed hospital in Hollywood, Florida.[27] MRH is "the flagship facility of [Memorial] healthcare system and is one of the largest hospitals in Florida." [27] Anesthesia services are provided by certified registered nurse anesthetists (CRNAs), anesthesia assistants (AAs), and anesthesiologists in 26 anesthesia delivery locations, including the main operating room (OR), interventional radiology laboratories, cardiac catheterization laboratories, obstetrics, and more.[27]

Recruitment and Participants

To effectively accomplish the objectives of this quality improvement project, a series of activities will be performed that require a specific group of study participants to receive an educational intervention on SPGB and its use in the treatment of PDPH. Primary participants include anesthesia providers employed by Envision Physician Services who primarily practice at MRH. Participation will be voluntary, and the sample size is anticipated to be between 10-15 participants.

Following the receipt of approval from the Institutional Review Boards (IRB), email addresses will be acquired for MRH CRNAs, AAs and anesthesiologists. To safeguard the anonymity of the participants, the emails will be kept confidential. An email invite containing the pre-test, educational module, and post-test will be delivered to participating staff. Participation in the quality improvement project is entirely voluntary, and the target population can drop out at any time, for any reason.

Intervention and Procedures

To reduce gaps in provider knowledge and improve the quality of patient care received, it is crucial for providers to receive continuing education. The educational intervention is designed to expand anesthesia providers' knowledge about the use of the SPGB as a treatment alternative for PDPH. An email invite to the learning intervention will be delivered to the anesthesia staff at MRH. An online pre-test survey will be administered to participants to assess their existing knowledge and perceptions of PDPHs and current treatment options. Following this pre-test, a ten-minute educational module will be delivered discussing SPGB and its use in the management of PDPH. The educational module will be delivered in the form of a voiceover PowerPoint which permits the participant to either listen to the speaker or read through the PowerPoint depending on individual learning style. The presentation will inform participants of the background and physiology of PDPH as well as the SPGB, current treatments for PDPH, and the prospect of using the SPGB as a treatment alternative for PDPH. After the educational intervention, a post-test survey will be given to assess any learning that was accomplished as a result of the educational module.

Data acquired from the post-test survey will offer insight into the effectiveness of the educational module. Results from the survey will also assist in guiding the intra-facility

expansion of the use of the SPGB for treating PDPH. Outcomes from the survey will assess if additional education is necessary and if the program would benefit other providers throughout the hospital system or the anesthesia physician group.

Protection of Human Subjects

No individual identifiers will be employed when gathering or storing data, and no medical record data will be extracted for use in this project. All participants will remain anonymous for the entirety of the QI project to safeguard the rights and confidentiality of those involved. Data collected will be kept in a secure, password-protected computer.

Data Collection

Qualtrics software will be utilized to collect participant demographics and data from the pre and post-tests. Before the pre-test, participants will be asked questions to gather demographic information. The pre-test will include ten multiple-choice questions designed to establish knowledge of PDPH, current treatments, SPGB, and its use in the treatment of PDPH. A single attitude-based question will be incorporated to determine if practitioners will consider using SPGB in their practice. The post-test survey will contain an identical set of the 11 questions to quantify the extent of learning that occurred, and if a practice change is feasible. Both pre and post-test survey questions will be structured as multiple-choice or true/false.

Data Management and Analysis Plan

The DNP student will be the co-investigator responsible for administering the survey for this project. The Participants will be provided two weeks to carry out the surveys and educational module via the link included in the email. Excel software will be utilized to assess pre and post-test replies; this will show if participant knowledge was increased and if there is a potential modification in participant practice because of the educational module. All replies will be

transferred from Qualtrics to Excel software to evaluate the statistical comparison between pre and post-test responses; the educational intervention efficacy and its impact on clinical practice will be assessed through statistical analysis. This breakdown will help establish practitioner assessments of the intervention and if learning transpired.

Discussion of Results

At the end of the data collection, the results will be analyzed. Conclusions can be drawn from the comparisons made between the pre-test questionnaires and the post-test questionnaires. The comparisons will show if significant learning has occurred and if providers are more likely to consider using SPGB for the treatment of PDPH.

Quality Improvement Project Results

Demographics

A total of 47 invitations were distributed via email to Envision Anesthesia providers employed at Memorial Regional Hospital. Seven participants consented to participate and completed the educational intervention, including the pre-and post-test. The demographics of those who participated are as follows: male (n = 3, 43%), female (n = 4, 57%), age in years 25-35 (n = 3, 43%), age 36-45 (n =1, 14%), age 46-55 (n =3, 43%), Hispanic (n = 1, 14%), Caucasian (n = 3, 43%), African American (n =2, 29%), and other (n = 1, 14%). All participants were certified registered nurse anesthesthetists (n = 7, 100%), with either a Master's degree (n = 1, 14%), or Doctorate (n = 6, 86%), and 1-2 years experience (n = 3, 43%), 2-5 years experience (n=1, 14%) or >10 years experience (n = 3, 43%) as an anesthesia provider.

The demographics of the participants surveyed are represented below.

Table 1. ***Participant Demographics***

Demographics	N (%)

Total Participants	7(100%)
Gender	
Male	3 (43%)
Female	4 (57%)
Non-binary/third gender	0 (0%)
Prefer not to say	0 (0%)
Age	
25 - 35 yr	3 (43%)
36 - 45 yr	1 (14%)
46 - 55 yr	3 (43%)
56 - 65 yr	0 (0%)
> 65 yr	0 (0%)
Ethnicity	
Hispanic	1 (14%)
Caucasian	3 (43%)
African American	2 (29%)
Asian/Pacific-Islander	0 (0%)
Other	1 (10%)
Position/Title	
CRNA	7 (100%)
MD Anesthesia	0 (0%)
Other Anesthesia	0 (0%)
Education	
Associate	0 (0%)
Bachelor	0 (0%)
Masters	1 (14%)
Doctorate	6 (86%)
Other	0 (0%)
Years of Practice	
1 – 2 yr	3 (43%)
2 – 5 yr	1 (14%)
5 – 10 yr	0 (0%)
> 10 yr	3 (43%)

Pre-test Knowledge of Sphenopalatine Ganglion Blocks for the Treatment of PDPH

The pre-test consisted of 12 questions that assessed providers' knowledge of Postdural Puncture Headaches (PDPHs), current treatment guidelines for PDPHs, and the use of Sphenopalatine Ganglion Blocks (SPGBs) for the treatment of PDPHs. Most participants were able to correctly identify the consequences of PDPHs, the mechanism of action of the SPGB, and the ways in which the SPGB has been shown to improve the treatment of PDPH (n=5, 71.43%). Slightly more than half of the participants (n=4, 57.14%) were able to correctly identify the hallmark symptom, the current gold standard treatment, and the suspected causation of PDPH, as well as the least invasive SPGB technique. Less than half of the participants (n=3, 42.86%) could correctly identify the most common complication of neuraxial anesthesia, the location of the sphenopalatine ganglion, and what the parasympathetic response of the sphenopalatine ganglion causes.

Pre-test provider attitude questions resulted in varied responses. Regarding their likelihood of using alternative methods for PDPH treatment, both "somewhat likely" and "somewhat unlikely" received equal responses (n=3, 42.86%). In contrast, only one participant (n=1, 14.29%) remained neutral and chose "neither likely nor unlikely". Regarding their likelihood to recommend the SPGB, most participants were neutral and chose "neither likely nor unlikely" (n=3, 42.86%), some were more conservative and chose "somewhat unlikely" (n=2, 28.57%), and one participant each selected "most likely" and "somewhat likely" (n=1, 14.29%).

Post-test Knowledge of Sphenopalatine Ganglion Blocks for the Treatment of PDPH

Participants completed a post-intervention questionnaire following the voiceover PowerPoint educational intervention; this questionnaire consisted of the same questions presented in the pre-test. The results assessed an increase in knowledge gained from the educational intervention and are displayed below (Table 1). Nearly every question demonstrated an increase in knowledge, as evidenced by an increase in the quantity of correct answers selected when the post-test results were compared to those of the pre-test. The most significant increase was noted on the questions which asked about the most common complication of neuraxial anesthesia, the location of the sphenopalatine ganglion, and the suspected causation of a PDPH; all three questions saw a 42.9% increase in participants (n=3) identifying these answers correctly. The two questions regarding the pathophysiology of the sphenopalatine ganglion's sympathetic outflow and the current gold standard treatment for PDPH showed a 28.6% increase in participants answering correctly (n=2). While the remaining four questions showed improved results by 14.3% (n=1).

There was no change in the results of one question in the pre and post-test. This question addressed which Sphenopalatine Ganglion Block technique was the least invasive. Four participants of the seven answered this question correctly both before and after the educational intervention.

When questions were posed regarding providers' attitudes toward the utilization of SPGB in the treatment of PDPH, significant increases were noted following the educational intervention. The question was asked to participants regarding their likelihood to use alternative methods for PDPH treatment; a positive score for this question was counted if providers described themselves as "most likely" or "somewhat likely". Prior to the educational

intervention, zero participants described themselves as “most likely” (n=0, 0%), and 3 participants described themselves as “somewhat unlikely” (n=3, 42.86%) to use alternative methods for PDPH treatment. However, after viewing the educational intervention, zero participants described themselves as “somewhat unlikely” (n=0, 0%), and 3 participants described themselves as “most likely” (n=3, 42.86%) to use alternative methods for PDPH treatment. This demonstrates an increase in the likelihood of using alternative methods for PDPH treatment by 42.9% (n=3).

Similarly, when the question was posed regarding the likelihood of providers recommending the SPGB, the largest positive change was noted. A positive score for this question was counted if providers described themselves as “most likely” or “somewhat likely” to recommend SPGB. Prior to the educational intervention, 2 participants characterized themselves as “somewhat unlikely” (n=2, 28.57%), and 3 participants characterized themselves as “neither likely nor unlikely” (n=3, 42.86%) to recommend the SPGB. However, after completing the educational intervention, an increase in “most likely” and “somewhat likely” responses was noted. Four participants characterized themselves as “most likely” (n=4, 57.14%) 2 participants described themselves as “somewhat likely” (n=2, 28.57%), and only one participant characterized themself as “neither likely nor unlikely” (n=1, 14.29%) to recommend the SPGB. This demonstrates an increase in the likelihood to recommend by nearly two-thirds of the participants (n=4, 57.1%).

Table 2. ***Difference in Pre- and Post-Test Responses (Knowledge About PDPH & SPGB)***

CORRECT RESPONSES	**PRE-TEST (N=7)**	**POST-TEST (N=7)**	**DIFFERENCE (%)**
THE MOST COMMON COMPLICATION RESULTING FROM NEURAXIAL ANESTHESIA IS:	3	6	*42.9*
CONSEQUENCES OF POSTDURAL PUNCTURE HEADACHE (PDPH) INCLUDE:	*5*	*6*	*14.3*

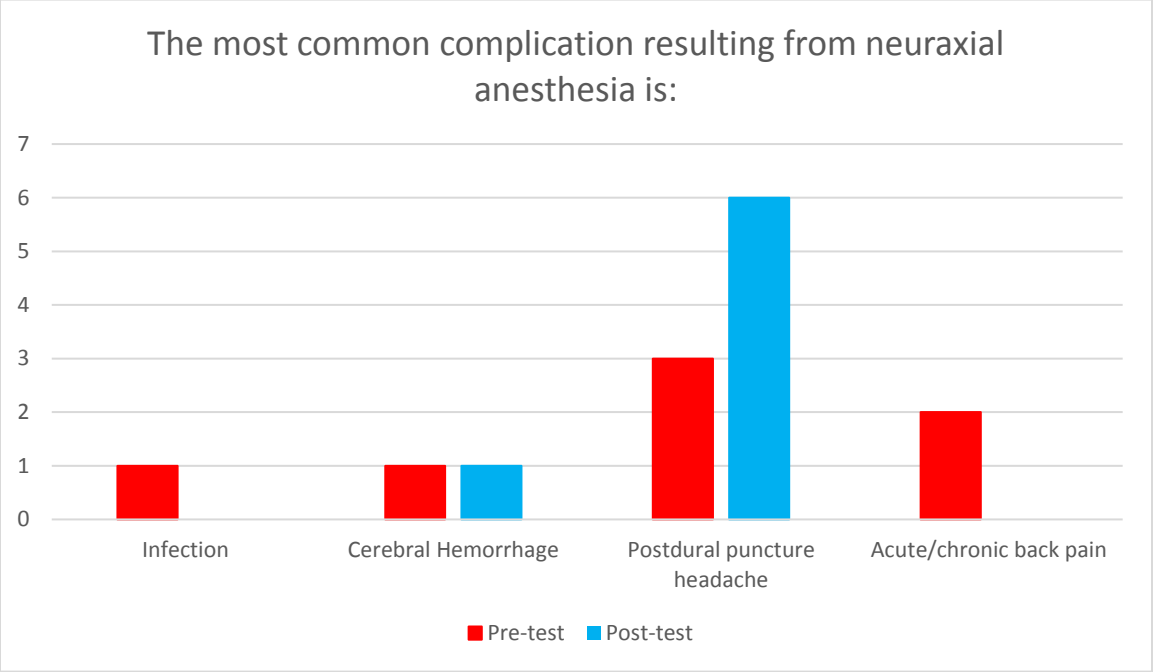
THE HALLMARK SYMPTOM OF A POSTDURAL PUNCTURE HEADACHE (PDPH) IS:	*4*	*5*	*14.3*
THE SPHENOPALATINE GANGLION IS LOCATED IN THE:	*3*	*6*	*42.9*
THE MAJOR PARASYMPATHETIC OUTFLOW OF THE SPHENOPALATINE GANGLION CAUSES?	*3*	*5*	*28.6*
WHAT IS THE CURRENT GOLD STANDARD TREATMENT OF POSTDURAL PUNCTURE HEADACHE (PDPH)?	4	*6*	*28.6*
WHICH SPHENOPALATINE GANGLION BLOCK (SPGB) TECHNIQUES IS THE LEAST INVASIVE:	4	*4*	*0*
POSTDURAL PUNCTURE HEADACHE (PDPH) IS SUSPECTED TO RESULT FROM	*4*	*7*	*42.9*
SPHENOPALATINE GANGLION BLOCK (SPGB) WORKS BY	5	6	14.3
SPHENOPALATINE GANGLION BLOCK (SPGB) HAS BEEN SHOWN TO IMPROVE THE TREATMENT FOR POSTDURAL PUNCTURE HEADACHE (PDPH) BY?	5	6	14.3

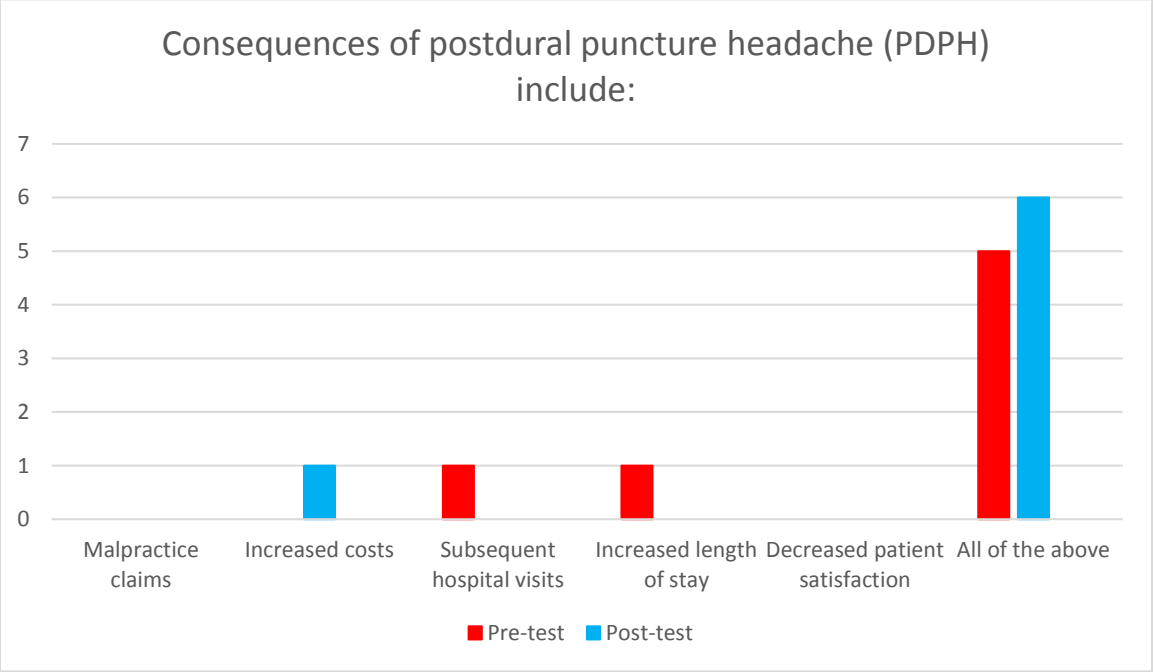
Table 3. ***Difference in Pre- and Post-Test Responses (Attitudes Toward PDPH & SPGB)***

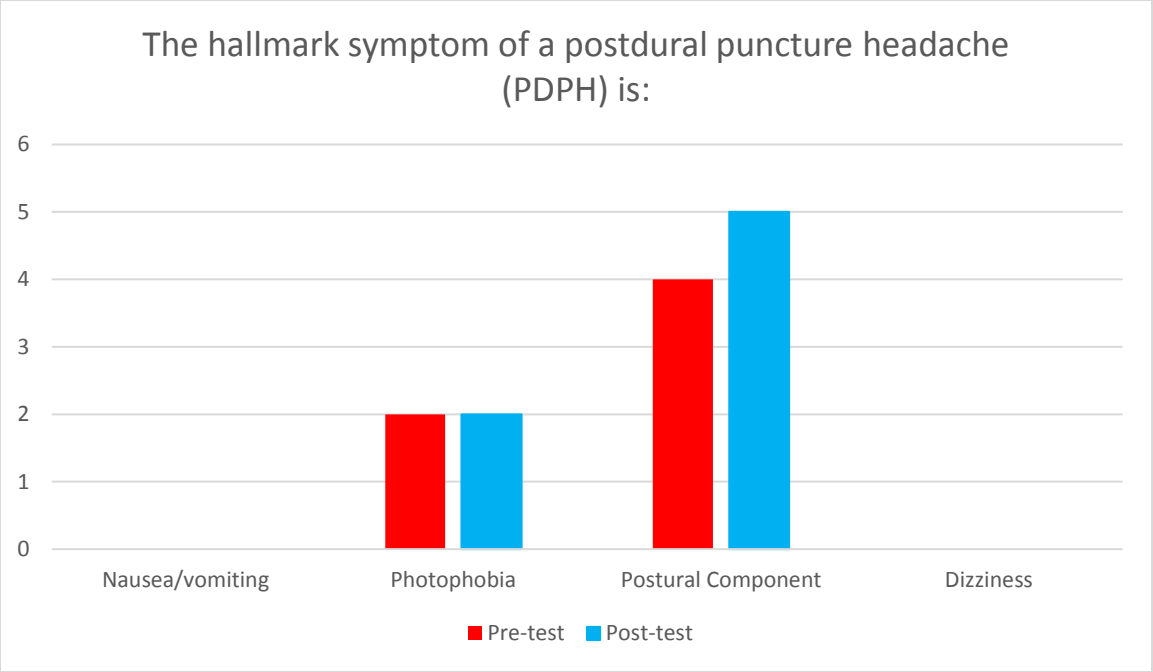
CORRECT RESPONSES	**PRE-TEST (N=7)**	**POST-TEST (N=7)**	**DIFFERENCE (%)**
HOW LIKELY ARE YOU TO USE ALTERNATIVE METHODS FOR POSTDURAL PUNCTURE HEADACHE (PDPH) TREATMENT?	3	6	*42.9*
HOW LIKELY ARE YOU TO RECOMMEND SPHENOPALATINE GANGLION BLOCK?	2	*6*	57.1

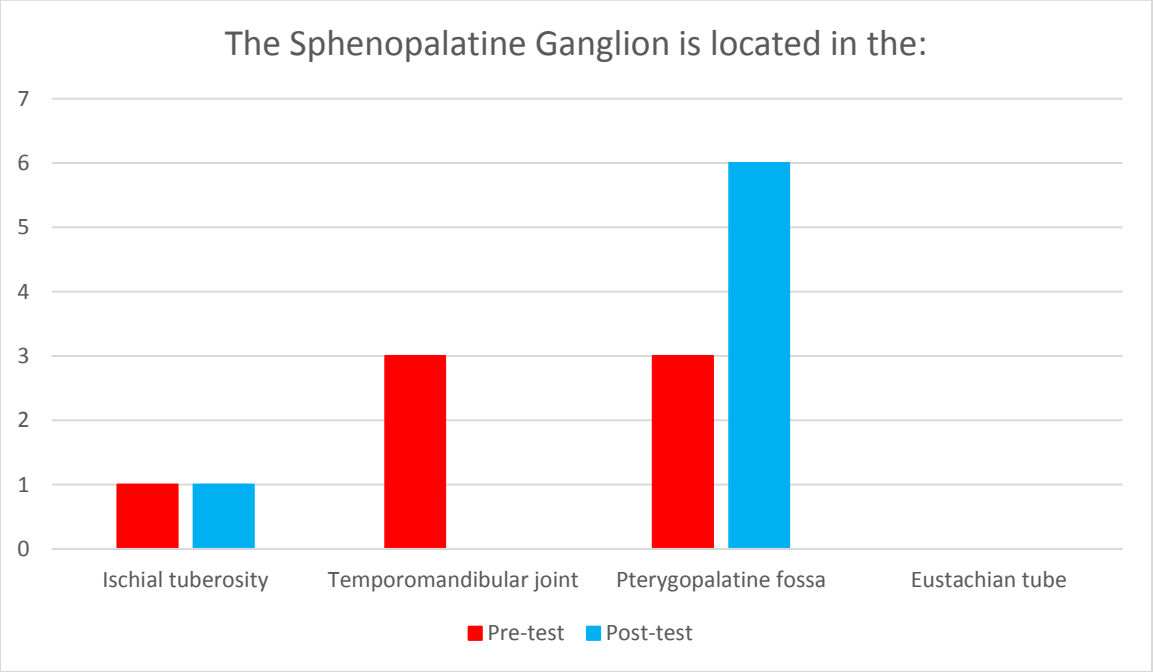
Summary of Data

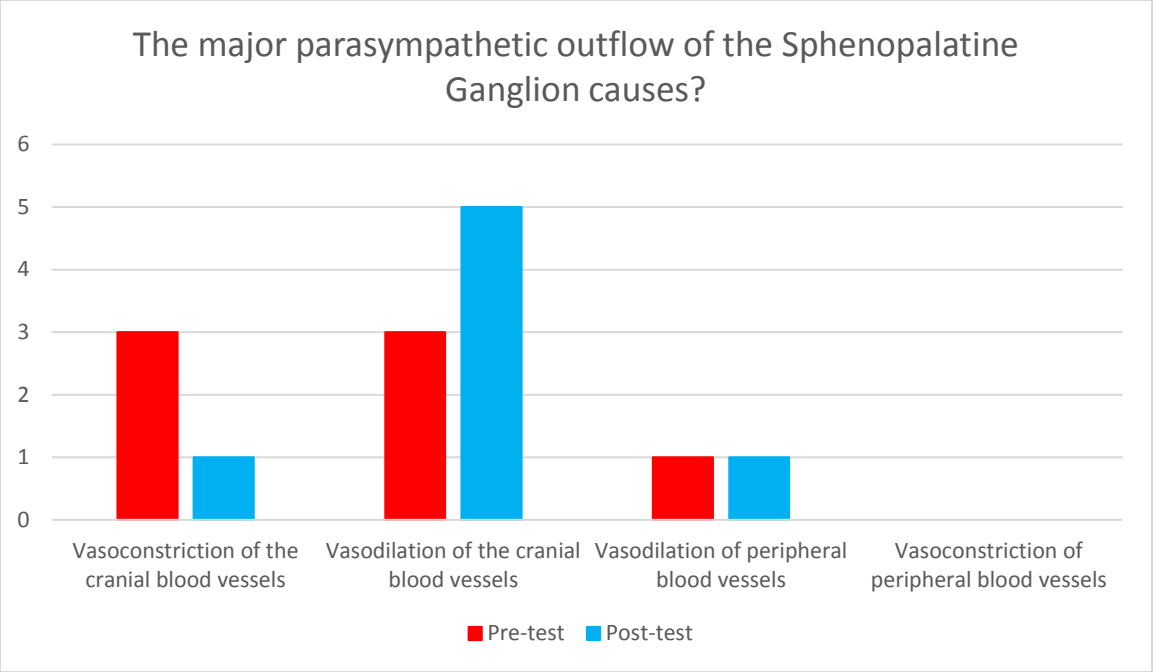
Overall, the outcome of the educational intervention verified an increase in knowledge between the pre-test and post-tests and an increase in the likelihood of participants using or recommending the Sphenopalatine Ganglion Block (SPGB) for Postdural Puncture Headache (PDPH) treatment. One exception was the ability to identify the least invasive technique for the SPGB, as no change was noted between the pre and post-test results despite the educational intervention. The graphs below show the change between the pre- and post-test answers for each question.

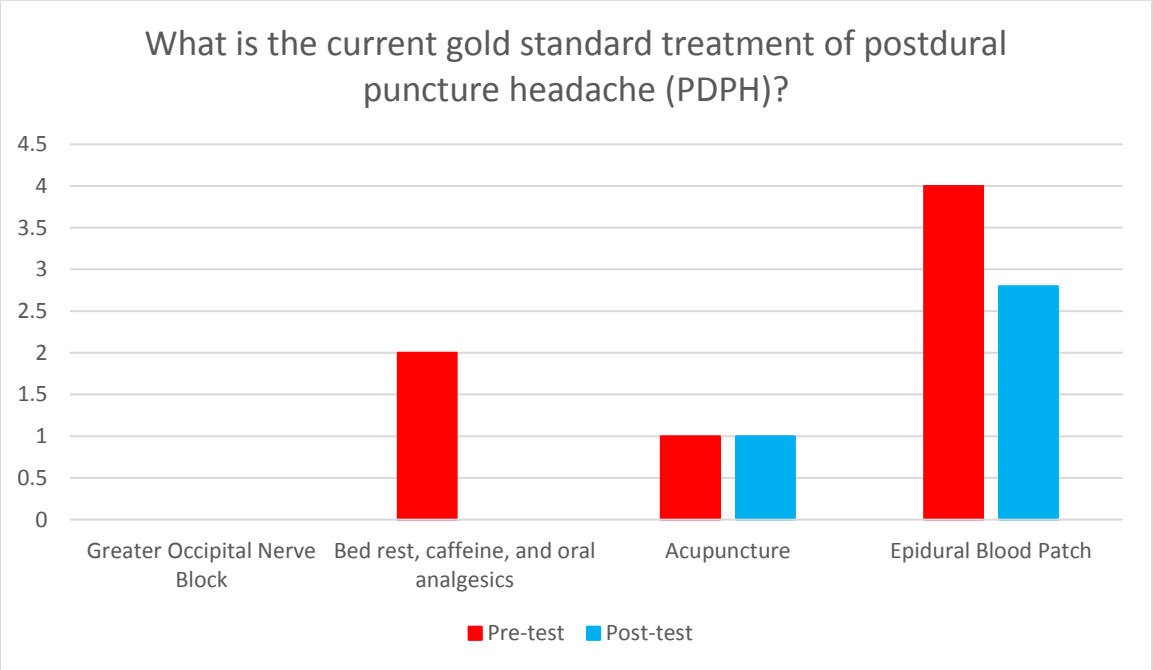

The most common complication resulting from neuraxial anesthesia is:
7
6
5
4
3
2
1
0
Infection
Cerebral Hemorrhage
Postdural puncture headache
Acute/chronic back pain
Pre-test
Post-test

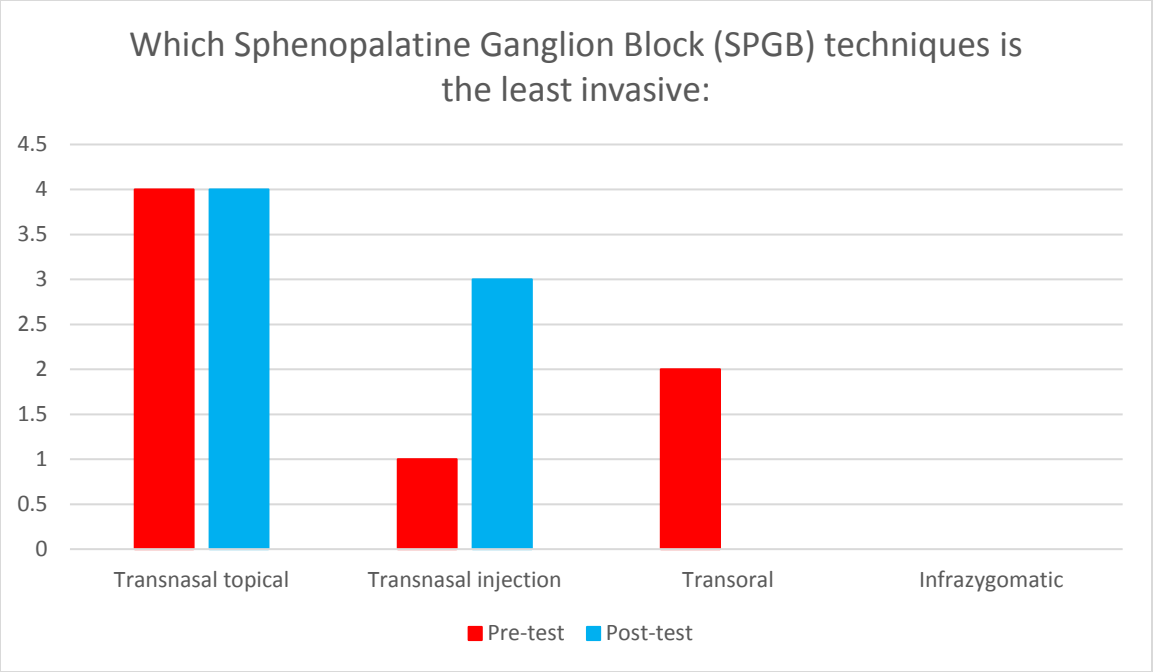

Consequences of postdural puncture headache (PDPH) include:
7
6
5
4
3
2
1
0
Malpractice claims
Increased costs
Subsequent hospital visits
Increased length of stay
Decreased patient satisfaction
All of the above
Pre-test
Post-test

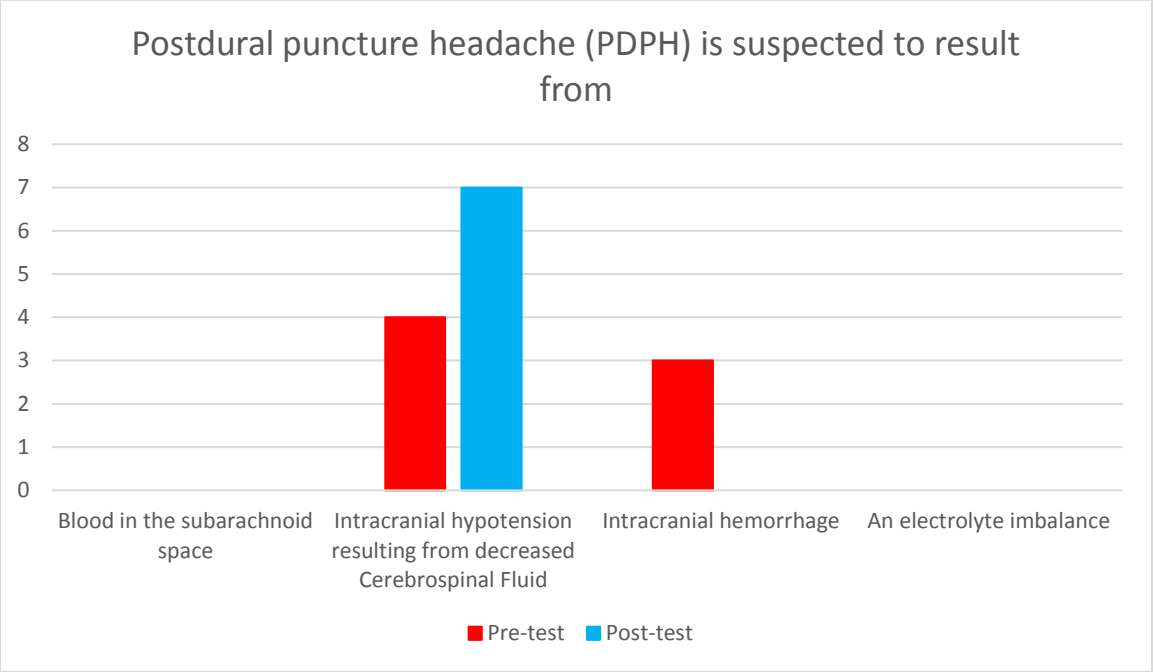

The hallmark symptom of a postdural puncture headache (PDPH) is:
6
5
4
3
2
1
0
Nausea/vomiting
Photophobia
Postural Component
Dizziness
Pre-test
Post-test

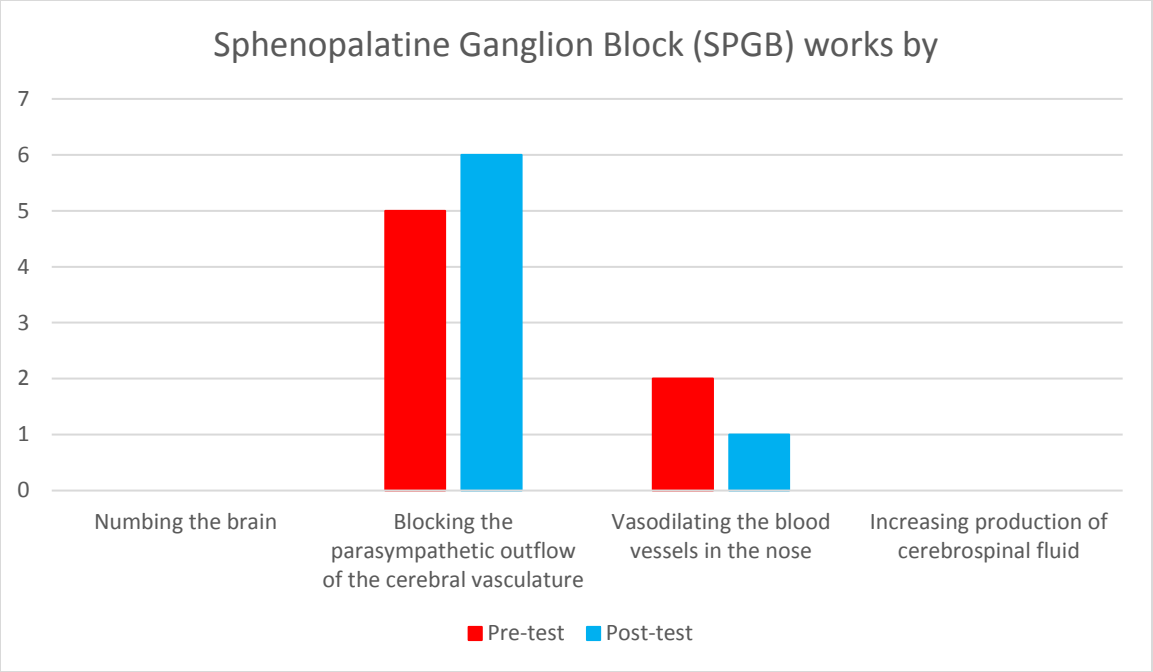

The Sphenopalatine Ganglion is located in the:
7
6
5
4
3
2
1
0
Ischial tuberosity
Temporomandibular joint
Pterygopalatine fossa
Eustachian tube
Pre-test
Post-test

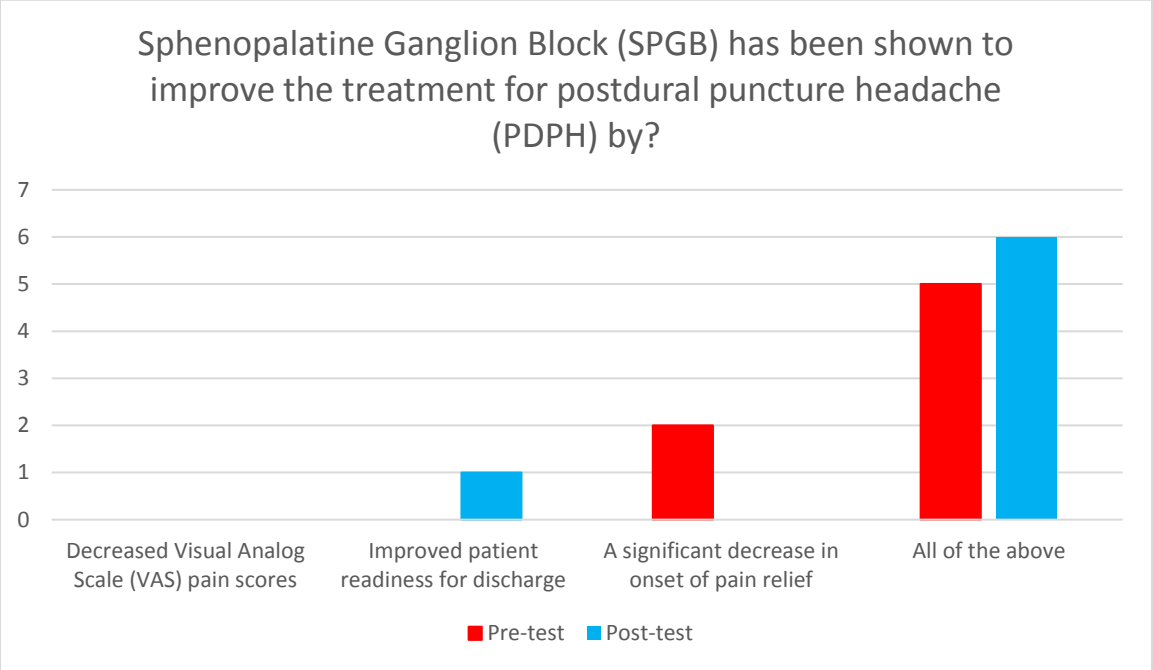

The major parasympathetic outflow of the Sphenopalatine Ganglion causes?
6
5
4
3
2
1
0
Vasoconstriction of the cranial blood vessels
Vasodilation of the cranial blood vessels
Vasodilation of peripheral blood vessels
Vasoconstriction of peripheral blood vessels
Pre-test
Post-test

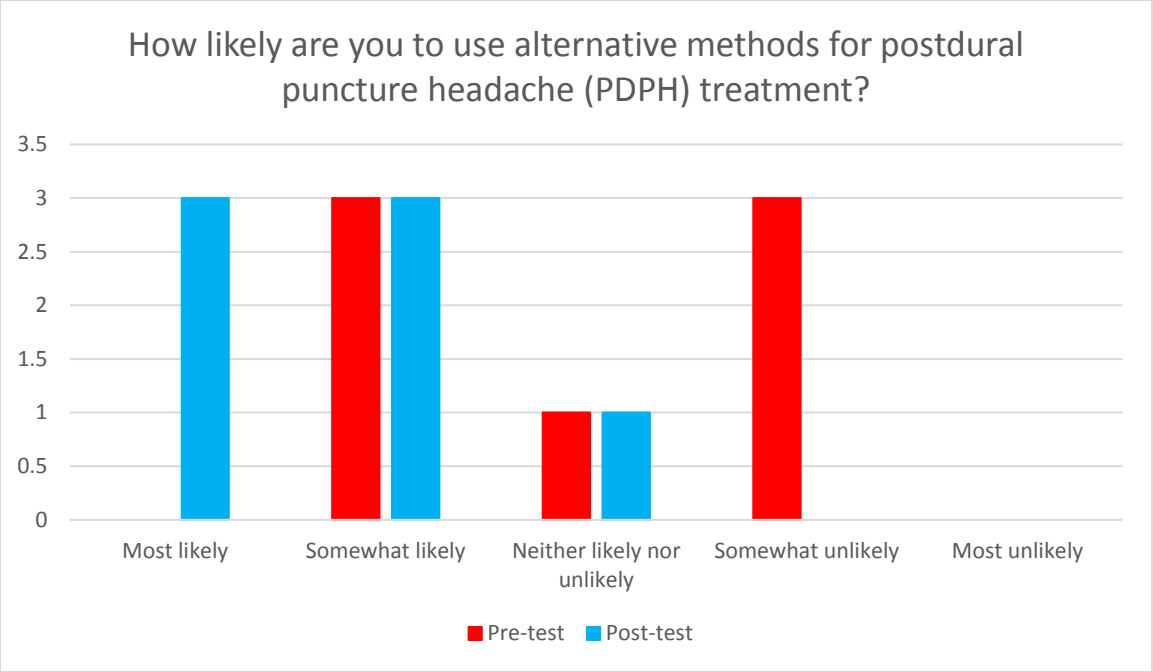

What is the current gold standard treatment of postdural puncture headache (PDPH)?
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Greater Occipital Nerve Block
Bed rest, caffeine, and oral analgesics
Acupuncture
Epidural Blood Patch
Pre-test
Post-test

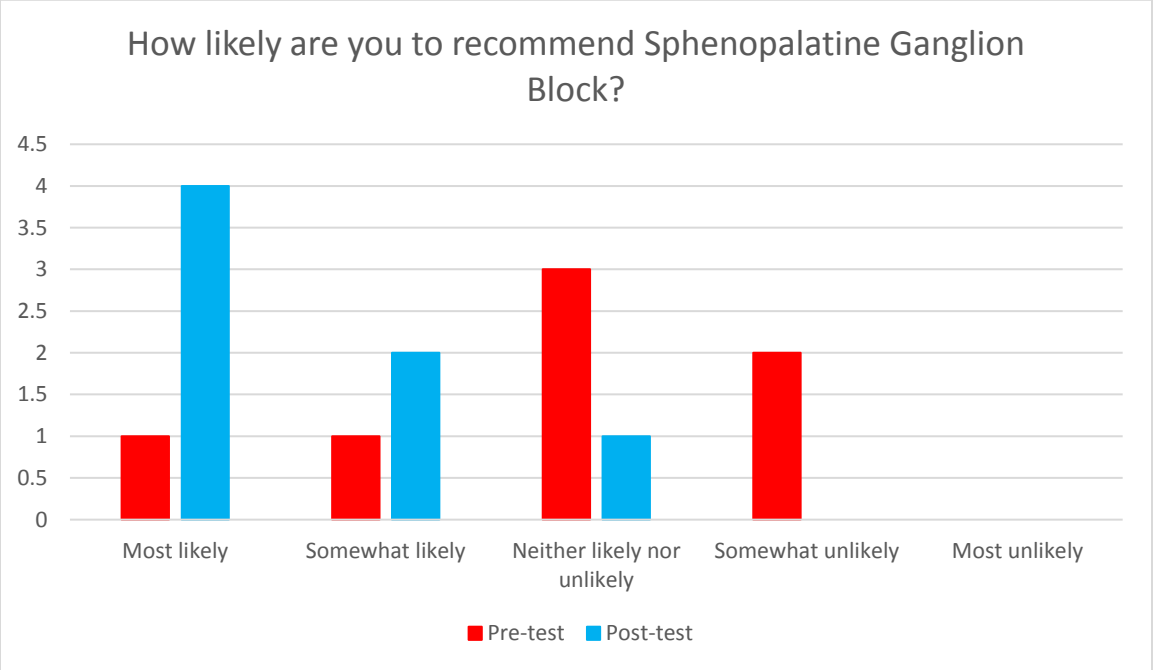

Which Sphenopalatine Ganglion Block (SPGB) techniques is the least invasive:
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Transnasal topical
Transnasal injection
Transoral
Infrazygomatic
Pre-test
Post-test


Postdural puncture headache (PDPH) is suspected to result from
8
7
6
5
4
3
2
1
0
Blood in the subarachnoid space
Intracranial hypotension resulting from decreased Cerebrospinal Fluid
Intracranial hemorrhage
An electrolyte imbalance
Pre-test
Post-test


Sphenopalatine Ganglion Block (SPGB) works by
7
6
5
4
3
2
1
0
Numbing the brain
Blocking the parasympathetic outflow of the cerebral vasculature
Vasodilating the blood vessels in the nose
Increasing production of cerebrospinal fluid
Pre-test
Post-test


Sphenopalatine Ganglion Block (SPGB) has been shown to improve the treatment for postdural puncture headache (PDPH) by?
7
6
5
4
3
2
1
0
Decreased Visual Analog Scale (VAS) pain scores
Improved patient readiness for discharge
A significant decrease in onset of pain relief
All of the above
Pre-test
Post-test





Limitations

Several limitations were noted in this quality improvement project. The first limitation was the small sample size. The survey was distributed to 47 email addresses, however, only 7 people chose to participate. To gain a more accurate picture of providers' preexisting knowledge

of Postdural Puncture Headaches (PDPHs), current treatment guidelines, and the utilization of the Sphenopalatine Ganglion Block (SPGB) in the treatment of PDPH, a larger, more diverse sample would be optimal. A larger sample size would also serve to solidify the findings of this survey and demonstrate the effectiveness of the educational intervention.

The limited time frame of this survey may have contributed to the small sample size, as participants were only given two weeks to respond to the email survey link. Perhaps a longer time period would have allowed participants more time to respond to their invitation. Another identified limitation to this project is that this survey was only distributed to participants at a single facility. By distributing this survey to providers at multiple facilities/locations, a more accurate representation of anesthesia providers' knowledge and practices would be identified as opposed to one facility's culture or standard practice.

Future Implications for Advanced Nursing Practice

The Sphenopalatine Ganglion Block (SPGBs) has shown faster pain relief onset and fewer complications than the EBP and can be employed as an effective treatment alternative to conservative Postdural Puncture Headache (PDPH) management. Anesthesia providers should be up to date on all available treatment options for their patients. With improved education on the topic of SPGBs for the treatment of PDPHs, providers will have the knowledge and confidence to select the appropriate treatment alternative for their patients. The results of this project are significant in establishing approaches accessible to participants which will enhance knowledge and possibly alter providers' practice to improve patient outcomes. The data collected demonstrates that the educational intervention successfully improved anesthesia provider knowledge on the use of SPGB in the treatment of PDPH. Additionally, the conclusions drawn from this project show that providers have an increased likelihood of using the SPGB in treating

PDPH after viewing the educational intervention. The findings of this project can be applied to a larger audience of anesthesia providers. As more research is performed on the efficacy of SPGB in the treatment of PDPH, it will only serve to strengthen the evidence in the educational module and encourage providers to utilize this lower-risk, effective treatment.

Conclusion

Postdural Puncture Headache (PDPH) is a potential adverse effect occurring from neuraxial procedures with a frequency ranging from 6 to 36%; PDPH can increase morbidity, postpone patient discharge, and lead to higher readmission rates. The epidural blood patch (EBP) is thought to be the most effective therapy; however, it carries substantial risks. One non-invasive, low-risk intervention that produces negligible adverse effects is the sphenopalatine ganglion block (SPGB). Without the knowledge of alternative therapies for PDPH management, anesthesia providers may not be able to provide their patients with all their potential treatment options. Through educational interventions like this quality improvement project, provider knowledge and attitudes can be increased, which can lead to an increase in the likelihood of utilization of SPGB over EBP for the treatment of PDPH. Ultimately, this can lead to improved patient outcomes.

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Appendix A: IRB Exemption

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Office of Research Integrity
Research Compliance, MARC 414

MEMORANDUM

To:	Dr. Jorge Valdes
CC:	Jacquelyn O'Connor
From:	Elizabeth Juhasz, Ph.D., IRB Coordinator EJ
Date:	March 22, 2022
Protocol Title:	**"An Educational Module for the Utilization of Sphenopalatine Ganglion Blocks as a Treatment Alternative for Post Dural Puncture Headache: A Quality Improvement Project"**

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

IRB Protocol Exemption #:	IRB-22-0092	**IRB Exemption Date:**	03/22/22
TOPAZ Reference #:	111384		

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

Special Conditions: N/A

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

EJ

Appendix B: QI Project Consent

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CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

"An Educational Module for the Utilization of Sphenopalatine Ganglion Blocks as a Treatment Alternative for Post Dural Puncture Headache: A Quality Improvement Project"

SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** Educational module concerning use of Sphenopalatine Ganglion Block (SPGB) for the treatment of Postdural Puncture Headache (PDPH)
- **Procedures**: Participate in a pre-test, an Educational Module via voice over PowerPoint, and then participate in a post-test
- **Duration:** This will take about a total of 20 minutes.
- **Risks**: The main risk or discomfort from this research is minimal
- **Benefits:** The main benefit to you from this research is increase the participant's knowledge on the sphenopalatine ganglion block
- **Alternatives:** There are no known alternatives available to you other than not taking part in this study.
- **Participation:** Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

PURPOSE OF THE PROJECT

The goal of this project is to increase provider knowledge on the topic of Sphenopalatine Ganglion Blocks (SPGBs) for the treatment of Postdural Puncture Headache (PDPH); the target audience is certified registered nurse anesthetists (CRNAs). You are being asked to participate in this quality improvement project

NUMBER OF STUDY PARTICIPANTS

If you decide to be in this study, you will be one of 10 people in this research study.

DURATION OF THE PROJECT

Your participation will require about 20 minutes of your time, you will be one of 10 people in this study.

PROCEDURES

If you agree to be in the project, we will ask you to do the following things: Participate in a pre-test, view an Educational Module via voice over PowerPoint, and then participate in a post test.

RISKS AND/OR DISCOMFORTS

Minimal risk, risk not greater than if participant was conducting similar activity. Physical, psychological, social, legal, and economic risks minimal and no greater than if a participant was participating in a similar activity. Similar activity such as filling out an online survey and watching voice over PowerPoint.

BENEFITS

The following benefits with your participation in this project: An increase in your knowledge surrounding the pathophysiology of postdural puncture headaches (PDPHs) and sphenopalatine ganglion blocks (SPGBs), current treatments for PDPHs and their pitfalls, as well as how SPGBs can be used as an alternative treatment for PDPH.

ALTERNATIVES

There are no known alternatives available to you other than not taking part in this project. However, if you would like to receive the educational material given to the participants in this project, it will be provided to you 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, we might publish, we will not include any information that will make it possible to identify you as a participant. Records will be stored securely, and only the project team will have access to the records.

PARTICIPATION: Taking part in this research project is voluntary.

COMPENSATION & COSTS

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

RIGHT TO DECLINE OR WITHDRAW

Your participation in this project is voluntary. You are free to participate in the project or withdraw your consent at any time during the project. Your withdrawal or lack of participation

will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove you without your consent at such time that they feel it is in the 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 Jacquelyn O'Connor at 954-295-9699/jbrei001@fiu.edu or Dr. Jorge Valdes at 305-348-7729/jvalde@fiu.edu.

IRB CONTACT INFORMATION

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

PARTICIPANT AGREEMENT

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

Appendix C: Recruitment Letter

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Nicole Wertheim College of Nursing and Health Sciences
Department of Nurse Anesthesiology

An Educational Module for the Utilization of Sphenopalatine Ganglion Blocks as a Treatment Alternative for Post Dural Puncture Headache: A Quality Improvement Project

My name is Jacquelyn O'Connor and I am a student from the Department of Nurse Anesthesiology enrolled in the Doctor of Nursing Practice Program at Florida International University. I am writing to invite you to participate in my quality improvement project. The goal of this project is to improve health care provider knowledge on the use of Sphenopalatine Ganglion Blocks in the Treatment of Post Dural Puncture Headache. You are eligible to take part in this project because you are a member of the Nurse Anesthetist team for Envision at Memorial Regional Hospital.

If you decide to participate in this project, you will be asked to complete and sign a consent form for participation. This survey will take exactly 20 minutes. First, you will complete a pre-test questionnaire, which is expected to take approximately 5 minutes. You will then be asked to view an approximately 10-minute-long educational presentation online. After watching the video, you will be asked to complete the post-test questionnaire, which is expected to take approximately 5 minutes. No compensation will be provided.

Remember, this is completely voluntary. You can choose to be in the study or not. If you'd like to participate or have any questions about the study, please email or contact me at jbrei001@fiu.edu or 954-295-9699.

Thank you very much.

Sincerely,

Jacquelyn O'Connor, SRNA, BSN, CCRN

Appendix D: Letter of Support

Envision
PHYSICIAN SERVICES

February 1, 2022

Jorge A. Valdes, DNP, CRNA, APRN
Clinical Associate Professor,
Department of Nurse Anesthesiology
Florida International University

Dr. Valdes,

Thank you for inviting Memorial Regional to participate in the Doctor of Nursing Practice (DNP) project conducted by Jacquelyn O'Connor entitled "An Educational Module for the Utilization of Sphenopalatine Ganglion Blocks as a Treatment Alternative for Post Dural Puncture Headache: A Quality Improvement Project." in the Nicole Wertheim College of Nursing and Health Sciences, Department of Nurse Anesthetist Practice at Florida International University. I have warranted her permission to conduct the project using our providers.

Evidence-based practice's primary aim is to yield the best outcomes for patients by selecting interventions supported by the evidence. This project intends to evaluate if a structured education targeting providers will increase knowledge Utilization of Sphenopalatine Ganglion Blocks as a Treatment Alternative for Post Dural Puncture Headache.

We understand that participation in the study is voluntary and carries no overt risk. All Anesthesiology providers are free to participate or withdraw from the study at any time. The educational intervention will be conveyed by a 15-minute virtual PowerPoint presentation, with a pretest and posttest questionnaire delivered by a URL link electronically via Qualtrics, an online survey product. Responses to pretest and posttest surveys are not linked to any participant. The collected information is reported as an aggregate, and there is no monetary compensation for participation. All collected material will be kept confidential, stored in a password-encrypted digital cloud, and only be accessible to the investigators of this study: Jacquelyn O'Connor and Dr. Valdes. We expect that Jacquelyn O'Connor will not interfere with normal hospital performance, behave in a professional manner and follow standards of care.

Prior to the implementation of this educational project, the Florida International University Institutional Review Board will evaluate and approve the procedures to conduct this project. Once the Institutional Review Board's approval is achieved, this scholarly project's execution will occur over two weeks. We support the participation of our Anesthesiology providers in this project and look forward to working with you.

Suzanne Hale

Suzanne Hale, MSN, CRNA, ARNP
Advanced Practice Provider Director, Broward and Dade
Chief, Memorial Regional Hospital
Envision Physician Services
954-265-2044

3501 Johnson Street | Hollywood, FL 33021

Appendix E: QI Project Survey

Pretest and Posttest Questionnaire:

Sphenopalatine Ganglion Blocks for treatment of Postdural Puncture Headache

INTRODUCTION

The primary aim of this QI project is to enhance the knowledge of CRNAs pertaining to the use of Sphenopalatine Ganglion Blocks (SPGB) as a treatment alternative for Postdural Puncture Headache (PDPH).

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 and perceptions on Sphenopalatine Ganglion Blocks as a treatment alternative for Postdural Puncture Headache.

PERSONAL INFORMATION

1. **Gender:** Male Female Non-binary Prefer not to answer
2. **Age:** 25-35 36-45 46-55 56-65 >65
3. **Ethnicity:**

Hispanic Caucasian (non-Hispanic) African American Asian

Other_____

4. **Position/Title:**

Certified Registered Nurse Anesthetist MD Anesthesia Other anesthesia provider

5. **Level of Education:** Associates Bachelors Masters

Doctorate Other

6. How many years have you been in practice as an anesthesia provider?

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

QUESTIONNAIRE

1. **The most common complication resulting from neuraxial anesthesia is:**
    a. infection
    b. cerebral hemorrhage
    c. postdural puncture headache
    d. acute/chronic back pain
2. **Consequences of postdural puncture headache (PDPH) include:**
    a. Malpractice claims
    b. Increased costs
    c. Subsequent hospital visits
    d. Increased length of stay
    e. Decreased patient satisfaction
    f. All of the above
3. **The hallmark postdural puncture headache (PDPH) is:**
    a. Nausea/vomiting
    b. photophobia
    c. postural component
    d. dizziness
4. **The Sphenopalatine Ganglion is located in the:**
    a. ischial tuberosity
    b. temporomandibular joint
    c. pterygopalatine fossa
    d. eustachian tube

5. **The major parasympathetic outflow of the Sphenopalatine Ganglion causes?**
    a. Vasoconstriction of the cranial blood vessels
    b. Vasodilation of the cranial blood vessels
    c. Vasodilation of peripheral blood vessels
    d. Vasoconstriction of peripheral blood vessels
6. **What is the current gold standard treatment of postdural puncture headache (PDPH)?**
    a. Greater Occipital Nerve Block
    b. Bed rest, caffeine, and oral analgesics
    c. Acupuncture
    d. Epidural morphine
    e. Epidural Blood Patch
7. **Which Sphenopalatine Ganglion Block (SPGB) techniques is the least invasive:**
    a. transnasal topical
    b. transnasal injection
    c. transoral
    d. infrazygomatic
8. **Postdural puncture headache (PDPH) is suspected to result from**
    a. Blood in the subarachnoid space
    b. Intracranial hypotension resulting from decreased Cerebrospinal fluid
    c. Intracranial hemorrhage
    d. An electrolyte imbalance
9. **Sphenopalatine Ganglion Block (SPGB) works by**

a. Numbing the brain

b. Blocking the parasympathetic outflow of the cerebral vasculature

c. Vasodilating the blood vessels in the nose

d. Increasing production of cerebrospinal fluid

10. Sphenopalatine Ganglion Block (SPGB) has been shown to improve the treatment for postdural puncture headache (PDPH) by?

a. Decreased Visual Analog Scale (VAS) pain scores

b. Improved patient readiness for discharge

c. A significant decrease in onset of pain relief

d. All of the above

11. How likely are you to use alternative methods for postdural puncture headache (PDPH) treatment?

a. Most likely

b. Somewhat likely

c. Neither likely nor unlikely

d. Somewhat unlikely

e. Most unlikely

12. How likely are you to recommend Sphenopalatine Ganglion Block?

a. Most likely

b. Somewhat likely

c. Neither likely nor unlikely

d. Somewhat unlikely

e. Most unlikely

Appendix F: Table with Overview of Literature Review Results

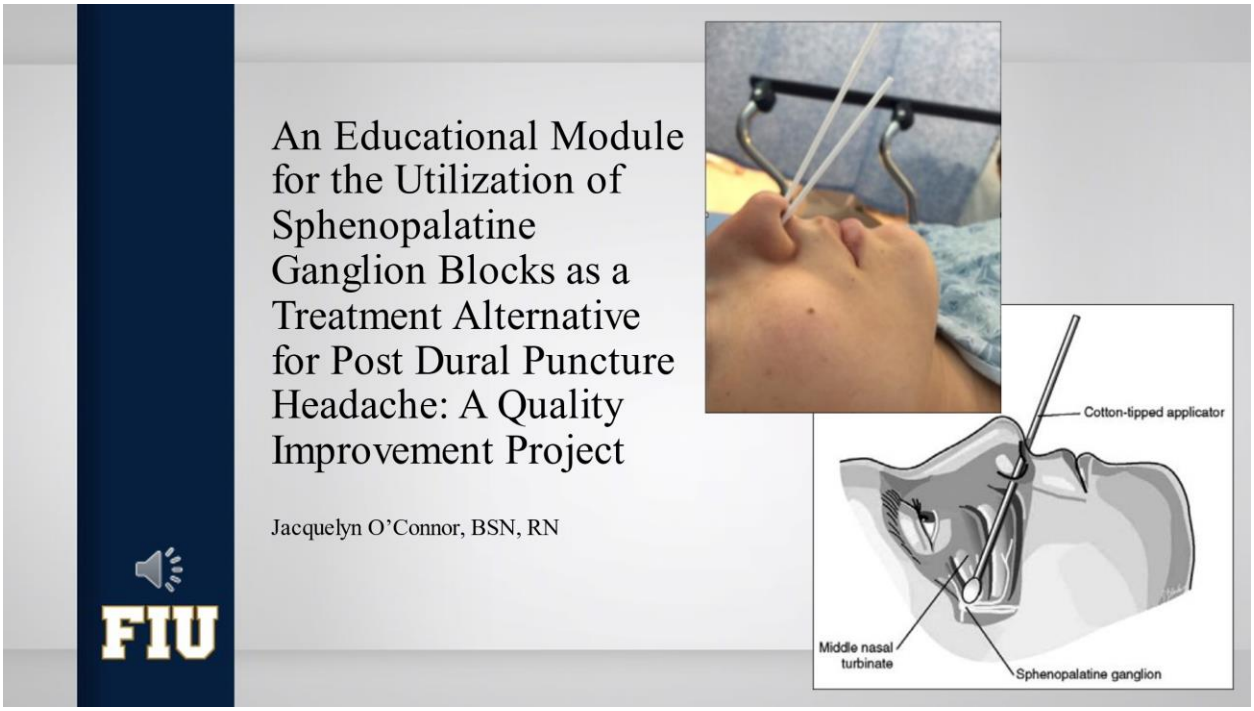
Author(s)	Purpose	Methodology/ Research Design	Intervention(s) / Measures	Sampling/Setting	Primary Results	Relevant Conclusions
Yilmaz et al., (2020)	To evaluate the effects of a transnasal sphenopalatine ganglion block (SPGB) as supportive PDPH treatment.	prospective randomized study	The enrolled subjects were randomly assigned to 2 groups: a medical treatment group (n=10) and a group that would receive medical treatment with the addition of SPGB (n=10). Visual analog scale (VAS) scores were recorded at the time of admission, and at 4, 12, and 24 hours after treatment.	Pregnant women undergoing a cesarean section under spinal anesthesia who developed PDPH	The mean VAS values at the baseline, 12th hour, and 24th hour were similar between the groups. However, the mean VAS score at the fourth hour was significantly lower in the block group (p=0.002).	A unilateral SPGB is a rapid and effective method to treat PDPH.
Kumar et al., 2021	To see if the sphenopalatine ganglion block (SPGB) is beneficial for the treatment of PDPH in comparison to conservative management or not.	prospective, randomized, observational study	Included 60 patients, divided into three groups of 20 each. Group C patients were managed conservatively. Group L4 patients were given SPGB with 4% lignocaine per SPGB. Group L10 patients were given SPGB with	Indira Gandhi Institute of Medical Sciences, India. 60 patients of American Society of Anesthesiologists Grades I and II, aged between 18 and 60 years, undergoing SAB for various	There was a statistically significant reduction in VAS score and mean treatment duration in group L4 and group L10 in comparison to group C. At 72 h of treatment, 5.26% of Group C patients, 88.89% of Group L4, and 95% of Group L10 patients were found ready to discharge. The	SPGB increases the proportion of patients ready to discharge at 72 h of treatment. Lignocaine 10% is more effective than lignocaine 4% solution for SPGB. SPGB decreases the hospital stay, hence cost-effective.

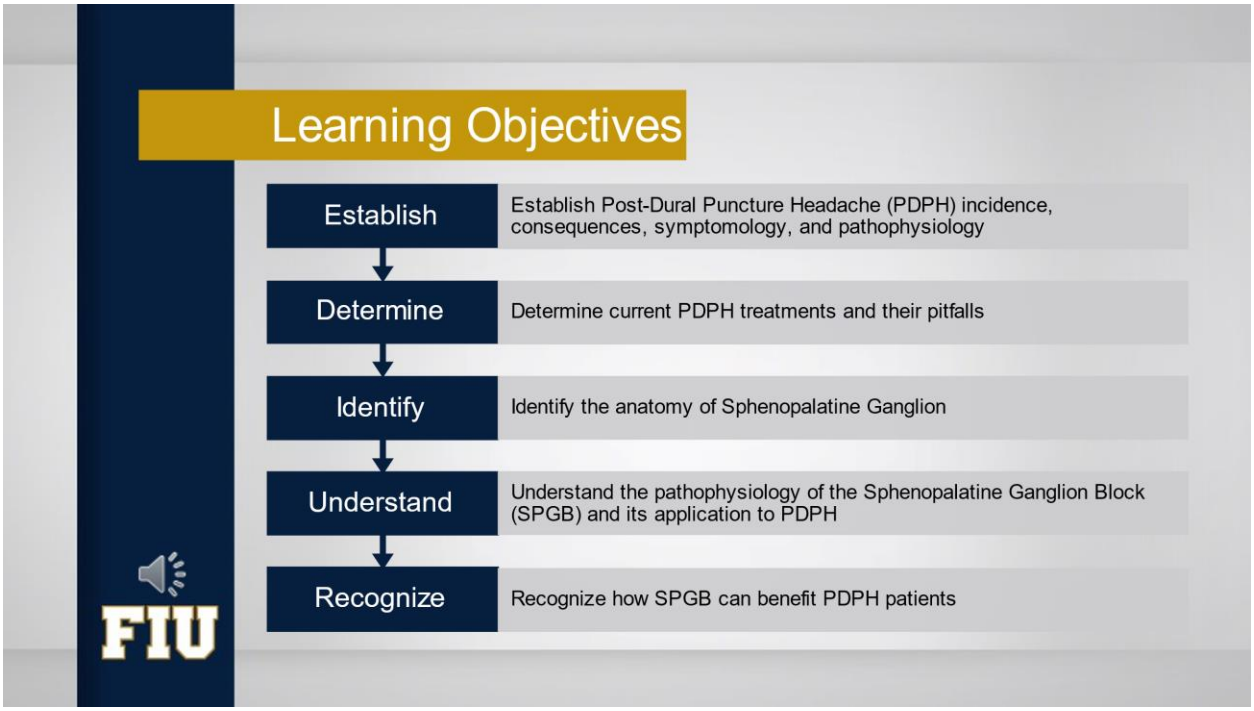
			lignocaine 10% puffs. The patients were assessed at predefined durations for Visual Analog Scale (VAS) score, readiness to discharge, and feel-good index. SPSS 20.0 software was used for data analysis.	surgeries who developed postoperative PDPH. They were divided into three groups, consisting of 20 in each by computer-generated randomization method.	feel-good index was assessed after 15 min of treatment was found best in Group L10, followed by L4 and C groups.	
Puthenveetitil et al., (2018)	The primary objective of this study was to assess the efficacy of SPGB for treatment of PDPH. Secondary objectives were to assess onset of analgesia, duration of block and adverse effects.	Prospective unblinded observational study	Of the two consultants in the obstetric unit in the institute, one of them was treating PDPH with SPGB and the other was treating it with conservative measures. So, the study was planned as an observational study to compare the efficacy of these two existing practices in the institute in relieving PDPH. Group A patients received paracetamol 1 g thrice daily intravenously for a day. If adequate pain	Patients with active PDPH within 7 days after subarachnoid block not relieved with standard treatment such as intravenous fluids, abdominal binder, bed rest and caffeine were recruited into the study. 20 obstetric patients from March 2016 to September 2017. patients were allocated equally to either of the two groups, A and B; there was no randomisation or blinding.	About 88.89% patients in group B had adequate pain relief within 5 min of block ($P < 0.001$). Pain was significantly lower in Group B for up to 8 h, with no adverse effects. In group A, the median pain score was ≥4 up to 2 h and from 4–24 h the median pain score remained <4. In group B after the block was performed, the median pain score was <4 up to 4h and then rose to 4 at 6h and subsequently it was maintained at <4 throughout the study period. While comparing the median pain score, it was seen that from 30min to 4h, group A had	SPGB is an effective initial modality for managing severe headache in patients with PDPH.

			relief was not achieved, intravenous diclofenac 75 mg twice daily was added. Patients in group B received spheno-palatine block, which was performed in the intensive care unit.		significantly higher pain score whereas from 6 to 8h, group A had significantly lower pain score than group B. Though the trend remained the same from 8 to 12 h, the difference was not statistically significant. Median was also used to analyse pain score, other than mean, as most of patients in Group B had a pain score of zero.	
Takmaz et al., (2021)	This study investigated the efficacy and safety of transnasal sphenopalatine ganglion block (SPGB) for treatment of postural puncture headache (PDPH) in non-obstetric patients	retrospective study	The study was conducted at the Ankara Research and Educational Hospital, in Turkey. Transnasal SPGB was performed in each nostril. Pain severity was assessed with the Visual Analogue Scale (VAS) at 15 min, 30 min, 24 h, and 48 h after the procedure, while patients were seated. The patients were monitored for 48 h for adverse effects (AEs). Patient treatment	26 non-obstetric patients (age, ≥18 years) who were diagnosed with PDPH and unresponsive to conservative therapy or unable to continue it because of side effects.	Headache at 15 min post-procedure was relieved rapidly. At 24 h post-procedure, nearly half of patients (42.3%) had no pain, and all patients (100%) had a VAS score of < 3. According to the PGIC scale scores at 48 h post-procedure, 73.1% of patients evaluated themselves as "much improved" and 26.9% evaluated themselves as "very much improved"	When PDPH does not respond to conservative treatment, it may be treated effectively with transnasal SPGB, which is a noninvasive, safe, well-tolerated, and straightforward method with a low complication rate

			satisfaction was assessed at 48 h after the procedure by using the Patient Global Impression of Change (PGIC) scale			
Khawaja et al., (2019)	To evaluate the efficacy of a new& novel technique Sphenopalatine Ganglion Block (SPG) for the treatment of post duralpunctural headache (PDPH)	Case series.	Total of 53 patients of PDPH fulfilling inclusion criteria were offered SPG block and their response was quantified on visual analogue scale (VAS) from 0-10	The study was conducted at department of Anesthesiology, pain and intensive care, Combined Military Hospital, Skardu, from Mar to Oct 2017.	Out of total n=53 all the patients were females, the age of the patients were between 18-37 years, with the mean of 27.08 and ± SD of 5.188), VAS score before undergoing SPG block was between 8 and 10 with the mean of 9.377 ± SD 0.664. For the patients after undergoing SPG block significant decrease on mean i.e. 1.175 with ±SD 0.657 was noted with p-value	SPG block was found more innovative modality for treating post duralpunctural headache.

Appendix G: QI Educational Module





Problem background: Post Dural Puncture Headache (PDPH)

Incidence

- PDPH is the most common complication resulting from neuraxial procedures
- Occurs at a rate between 1.5-11.2% following spinal anesthesia
- Accidental dural puncture occurs during epidural placement at a rate of 1.5% with 80% developing PDPH

Consequences

- Increased length of stay/Delayed discharge
- Subsequent Emergency Room/hospital visits
- Increased costs
- Decreased patient satisfaction/ Impaired Activities of Daily Living
- Malpractice claims

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Problem Background: PDPH (Cont.)

Symptomology

- Postural component
- Nausea/Vomiting
- Dizziness, visual disturbances, and/or photophobia
- Occurring within 5 days of dural puncture

Pathophysiology

- Cerebrospinal fluid (CSF) leak from hole in the dura
- Decreased CSF volume → intracranial hypotension
- Structures sag into the foramen magnum

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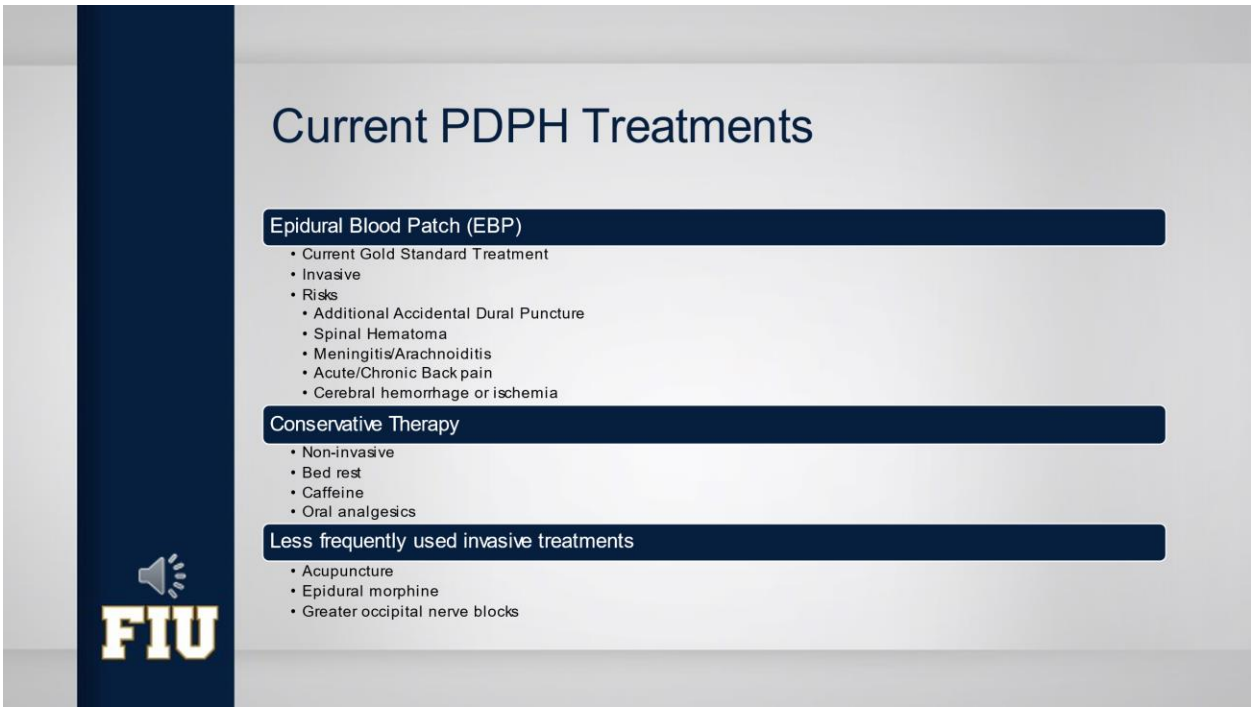
Current PDPH Treatments
Epidural Blood Patch (EBP)
• Current Gold Standard Treatment
• Invasive
• Risks
• Additional Accidental Dural Puncture
• Spinal Hematoma
• Meningitis/Arachnoiditis
• Acute/Chronic Back pain
• Cerebral hemorrhage or ischemia
Conservative Therapy
• Non-invasive
• Bed rest
• Caffeine
• Oral analgesics
Less frequently used invasive treatments
• Acupuncture
• Epidural morphine
• Greater occipital nerve blocks
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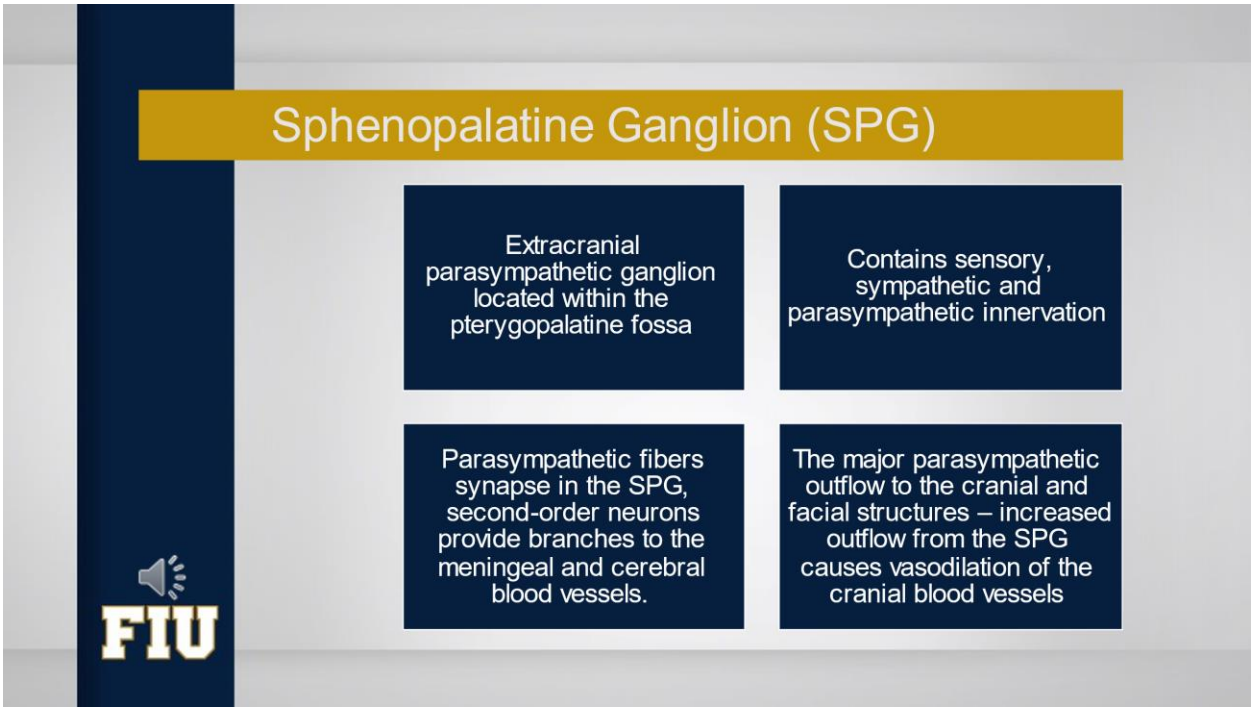
Sphenopalatine Ganglion (SPG)
Extracranial parasympathetic ganglion located within the pterygopalatine fossa
Contains sensory, sympathetic and parasympathetic innervation
Parasympathetic fibers synapse in the SPG, second-order neurons provide branches to the meningeal and cerebral blood vessels.
The major parasympathetic outflow to the cranial and facial structures – increased outflow from the SPG causes vasodilation of the cranial blood vessels
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Sphenopalatine Ganglion Block (SPGB)

Pathophysiology	Works by blocking the parasympathetic outflow to the cerebral vasculature
	Allows the cerebral vessels to return to normal diameter
	Relieves the headache
Application to PDPH	SPGB has been suggested as a therapy for a multitude of headache and facial pain disorders.
	The transnasal topical technique is a minimally invasive procedure, has low risks, and can easily be performed bedside without additional imaging equipment, or an additional invasive procedure.
	Studies have shown that SPGBs are effective treatment for rapid and significant reduction in pain caused by PDPH

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Research Findings

- **Yilmaz et al.** — Randomized Controlled Trial (RCT) showed a significant reduction in pain by the first Visual Analog Scale (VAS) assessment and lower pain scores throughout.
- **Kumar et al.** — Randomized observational study noted a decrease in VAS scores in SPGB groups when compared to the control group, and >90% of participants were ready for discharge at 72 hours compared to 5% in the control group.
- **Puthenveetil et al.** — Using a quasi-experimental, prospective, unblinded observational study, authors established that the SPGB lead to a significant decrease in the onset of pain relief, as well as the reduction of most participants' pain to a level of zero.
- **Takmaz et al.** — Retrospective study concluded that PDPH unresponsive to conservative treatment could be treated with SPGB since greater than 90% of participants achieved relief within 15 minutes. Also, patient satisfaction was rated high.
- **Khawaja et al.** — Descriptive cross-sectional case series which showed a 73% reduction in pain utilizing the VAS in the first 5 minutes after the block.

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Clinical Strengths of SPGB

- Fewer complications than EBP
- Less invasive than EBP
- Faster onset of symptom relief
- Similar long -term pain alleviation
- Increased patient satisfaction
- Improved readiness for discharge

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Take Home Points

Why should we use SPGB?

PDPH IS THE MOST COMMON COMPLICATION OF NEURAXIAL ANESTHESIA

IT CAN LEAD TO INCREASED COSTS, DECREASED PATIENT SATISFACTION, INCREASED LENGTH OF STAY AND ADDITIONAL HOSPITALIZATIONS

THE CURRENT GOLD STANDARD TREATMENT IS THE EBP WHICH IS INVASIVE AND CARRIES NUMEROUS RISKS

SPGB IS A LOW-RISK INTERVENTION THAT HAS DEMONSTRATED EFFECTIVENESS IN THE TREATMENT OF PDPH

IMPLEMENTING SPGB AS A TREATMENT ALTERNATIVE CAN ADEQUATELY TREAT PDPH WHILE INCREASING PATIENT SATISFACTION

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