12-1-2023

Sphenopalatine Ganglion block for Post-dural puncture headache: An Evidence-Based Educational Module

Erick G. Zuniga Mejia
Florida International University, ezuni008@fiu.edu

Fernado Alfonso Dr.
Florida International University, falfonso@fiu.edu

Sandra Taylor Dr.
Florida International University, sandritataylor@gmail.com

Sphenopalatine Ganglion block for Post-dural puncture headache: An Evidence-Based Educational Module

A DNP Project Presented to the Faculty of the Nicole Wertheim College of Nursing and Health Sciences
Florida International University

In partial fulfillment of the requirements for the Degree of Doctor of Nursing Practice

By

Erick Zuniga Mejia, MSN, RN

Supervised By

Fernando Alfonso, DNP, CRNA, APRN

Sandra Taylor, DNP, CRNA

Approval Acknowledged DocuSigned by: Ann Miller A986D8685093471..., DNP Program Chair

Date: 11/30/2023

Approval Acknowledged DocuSigned by: 27267E9FF76F460..., DNP Program Director

Date: 12/1/2023

ABSTRACT

Background: Post-dural puncture headache (PDPH) commonly occurs as a complication following neuraxial anesthesia in obstetric patients. The occurrence of this complication is influenced by the type and size of the needle used during the anesthesia procedure. Treating PDPH promptly is crucial due to its potential for severe complications such as vertigo, cranial nerve dysfunction, double vision, back pain, persistent headaches, and the development of subdural hematoma. Risk factors for PDPH include being younger, female, pregnant, and having a history of previous PDPH. Obstetric patients are particularly susceptible to PDPH due to factors such as their gender, young age, and the frequent utilization of neuraxial anesthesia.

Methods: A Quality Improvement Project (QI) was conducted at a 589-bed acute care hospital in South Florida. A pre-test and post-test survey was sent to participants, and data was collected anonymously.

Results: Post-implementation data collection proved a need for more understanding regarding using SPGB as an alternative treatment option within anesthesia providers indifferent to years of experience. Most participants reported being open to trying SPGB as an alternative treatment option before more invasive options.

Discussion: An educational intervention has the potential to significantly improve healthcare providers' knowledge and attitudes regarding the use of Sphenopalatine Ganglion Block (SPGB) as a first-line treatment option for Post-Dural Puncture Headache (PDPH). By implementing targeted educational programs, healthcare professionals increase awareness about SPGB's benefits, efficacy, and appropriate application in managing PDPH. Such interventions can effectively improve providers' understanding of the procedure, its potential outcomes, and its place in the treatment algorithm for PDPH. As a result, healthcare providers are more likely to consider and recommend SPGB as an initial therapeutic approach, ultimately enhancing patient care and outcomes for individuals suffering from PDPH.

Keywords: Sphenopalatine ganglion block, PDPH, Obstetrics, Spinal, epidural blood patch, post-dural puncture headache, obstetrics, neurology.

TABLE OF CONTENTS

Sphenopalatine Ganglion block for Post-dural puncture headache: An Evidence-Based Educational Module

Introduction:

Post-dural puncture headache (PDPH) is a commonly observed complication following the administration of neuraxial anesthesia in obstetric patients.[1,2] The incidence of this condition is affected by factors such as the type and size of the needle used during the anesthesia procedure. It is crucial to promptly address PDPH due to its potentially severe complications, including vertigo, cranial nerve impairment, double vision, back pain, persistent headaches, and even subdural hematoma. Obstetric patients are particularly susceptible to PDPH due to their gender, young age, and the frequency of neuraxial anesthesia usage.[2,1] When an unintended dural puncture occurs with an epidural needle, the patient typically experiences worsening PDPH symptoms in an upright position, which can be resolved by lying down. Evidence-based practice (EBP), considered the gold standard, is the preferred approach for managing PDPH. [2,1]

PICO Clinical Question:

In obstetrics, is sphenopalatine ganglion block (SPGB) an effective first-line treatment option for Post-dural puncture headache (PDPH)?

Problem Identification

Post-dural puncture headache (PDPH) is a common complication after neuraxial anesthesia in obstetric patients; the incidence of this occurrence is affected by the type and size of the needle utilized in neuraxial anesthesia.[1] It is essential to treat PDPH early due to its severe complications, including vertigo, cranial nerve palsy, diplopia, back pain, chronic headache, and subdural hematoma.[5] The risk factors for PDPH include younger age, females, pregnancy, and

previous history of PDPH.[2] The obstetrics are at increased risk for PDPH due to their gender, young age, and frequency of the use of neuraxial anesthesia.[4,1] After an unintentional dural puncture with an epidural needle, the patient will experience PDPH worsening by sitting upright and relieved by lying down.[4] In current practice, EBP is the gold standard for treating PDHP.[4,3] Complications of EBP include facial nerve pain, back pain, infection, cauda equina syndrome (CES), and meningitis.[5,3] Topical transnasal SPGB is a non-invasive treatment for headaches, and many studies concluded that it could effectively treat PDPH in obstetric patients.[5,1] Transnasal SPGB is emerging as an effective treatment for migraine headaches, cluster headaches, trigeminal neuralgia, and PDPH.[5,4]

Background

PDPH is a postural headache caused by decreased cerebrospinal fluid (CSF) within the intrathecal space from the puncture of a dural "wet tap" and the body's inability to rapidly compensate for the production of CSF.[1] It is commonly thought that the loss of CSF causes the brain to lose its cushion, resulting in a caudal movement of the brain structures that cause intracranial pain, relieved when lying supine.[2,1] The Monro-Kellie hypothesis accounts for many symptoms associated with PDHP, which states that the sum of brain volumes, CSF, blood, and intracranial compartments remain constant.[2,1] The theory states that if one compartment decreases, the other must increase to maintain equilibrium.[1,2] In Post-dural puncture after a spinal anesthetic, there is a believed loss of CSF through the dural puncture. Since the brain cannot expand to maintain the intracranial volume, the body compensates by cerebral vasodilation, resulting in headaches associated with PDPH due to increased blood flow and intracranial

pressure.[2] The parasympathetic nervous system (PNS) is ordinarily responsible for the cerebral vasodilation seen with PDPH to compensate and equilibrate the three compartments.[2]

Scope of the Problem

It is essential to treat PDPH early due to its severe complications, including vertigo, cranial nerve palsy, diplopia, back pain, chronic headache, and subdural hematoma.[5] The risk factors for PDPH include younger age, females, pregnancy, and previous history of PDPH.[2] The obstetrics is at increased risk for PDPH due to their gender, young age, and frequency of the use of neuraxial anesthesia.[4,1] After unintentional dural puncture with an epidural needle, the patient will experience PDPH worsening by sitting upright and relieved by laying down.[4] In current practice, EBP is the gold standard for treating PDHP.[4,3] Complications of EBP include facial nerve pain, back pain, infection, cauda equina syndrome (CES), and meningitis.[5,3] Topical transnasal SPGB is a non-invasive treatment for headaches, and many studies concluded that it could effectively treat PDPH in obstetric patients.[5,1] Transnasal SPGB is emerging as an effective treatment for migraine headaches, cluster headaches, trigeminal neuralgia, and PDPH.[5,4] Several small retrospective studies have demonstrated the use of SPGB as an effective and minimally invasive treatment for PDPH in obstetric patients.[5] A study concluded that patients showed significant relief in their PDPH and associated symptoms within 30-60 mins after treatment with SPGB than after treatment with EBP and its duration of action increased with longer-acting anesthetics use.[3,4] Only the EBP patients complained of post-treatment complications, which all resolved in 48 hours.[5,4] A study published its data collection of 13

parturient with moderate to severe PDPH.[2] Out of the patients treated with SPGB, 11 out of 11 patients experienced good pain relief and did not require EBP.[19,16] The remaining patient's PDPH was only relieved by EBP.[16,17] SPGB is a simple and less invasive treatment modality at the bedside.[18] In a study of twenty parturient patients treated for PDPH, 89% of patients treated with SPGB have adequate pain relief within 5 mins; the data supports the fact that SPGB is an effective modality for treating and managing PDPH.[14,15]

Consequences of problem

If SPGB successfully relieves symptoms, there is less need for EBP and fewer complications from EBP, including facial nerve pain, back pain, infection, cauda equina syndrome (CES), and meningitis.[10,11] Therapeutic EBP has a success rate of 68% - 90%, making it an excellent treatment modality. However, its associated sequelae, such as subdural hematoma, infection, and delayed radicular pain, make SGPB an attractive alternative.[12,13] There is sufficient data to support the use of SPGB to alleviate the symptoms associated with PDPH, and if ineffective in alleviating pain, EBP is rescue therapy.[3,2] SPGB is a safe, inexpensive, well-tolerated treatment as a conservative modality.[4,2] Current data support the benefits of treating patients with PDPH with SPGB before EBP; however, this is not widely practiced.[5,3] The significance of addressing this practice gap can help reduce the unnecessary use of EBP and decrease complications with EBP since it is an invasive procedure with many previously described complications.[3,2] The author intends to create awareness of the benefits of using SPGB as a conservative measure to treat PDPH; the author understands that EBP is the gold standard, which has a high success rate.[2] EBP should be used as rescue therapy if other measures, such as SPGB, fail.

Knowledge Gaps

Several small retrospective studies have demonstrated using SPGB as an effective and minimally invasive treatment for PDPH in obstetric patients.[8,9] A study concluded that patients showed significant relief in their PDPH and associated symptoms within 30-60 minutes. After treatment with SPGB and EBP, its duration of action increased with longer-acting anesthetics.[3,4] Only the EBP patients complained of post-treatment complications, which all resolved in 48 hours.[5,4] A study published its data collection of 13 participants with moderate to severe PDPH.[2] Out of the patients treated with SPGB, 11 out of 11 patients experienced good pain relief and did not require EBP.[4] The remaining patient's PDPH was only relieved by EBP.[2] SPGB is a simple and less invasive treatment modality at the bedside.[4] In a study of twenty parturient patients treated for PDPH, 89% of patients treated with SPGB have adequate pain relief within 5 mins; the data supports the fact that SPGB is an effective modality for treating and managing PDPH.[4,2]

Proposed Solution

Literature search and current data have favorably supported using SPGB as an effective and less invasive treatment option for PDPH.[2,3,1] After gathering data from all articles that had case studies with positive results, the author proposed the idea of implementing education and protocol in a hospital to implement this initiative and increase the use of SPGB.[2,1] there are a few irregularities with the effectiveness, duration of action, and provider-dependent variables that create different outcomes.[6,7] Most case studies used a cotton tip swab with different concentrations of local anesthetics. The anatomy of accessing the SPG nerves is curved, making the straight cotton tip challenging to apply and reach the site of action. The implementation includes standardizing local anesthetics and concentration and using the SphenoCath to inject a

local anesthetic into the sphenopalatine ganglion.[16,11] These interventions aim to reduce provider errors and increase consistency between results and effectiveness. Additionally, it will increase hospital acceptance of the project and implement this alternative treatment as a first-line treatment.[19]

Methodology of Literature Review

The search strategy used for the evidence appraisal involved an extensive search for electronic journals and databases. The following databases were searched to identify articles that meet the search criteria: CINAHL, MEDLINE, EBSCO Open Access Journals, ScienceDirect, Nursing & Allied Health Database, and Ovid. For increased validity, the author set limits to increase search results relevant to topics, including full-text, peer-reviewed journals, and publications from 2017 and 2022. Evidenced-based primary studies with high similarity and RCTs regarding PDPH, and sphenopalatine ganglion block were selected based on this search data limit. Searches were conducted using keywords and included the following:

- "Postdural puncture headache" and "Sphenopalatine ganglion block" returned 600 results.
- "PDPH," "Obstetrics," and "Spinal" returned 1,324 results
- "Obstetric," "spinal needle," and "PDPH" returned 568 results.
- "22-gauge Quincke," "22-gauge Sprotte," "cerebrospinal fluid," " diagnostic lumbar puncture," "post-dural puncture headache," and " PDPH" returned 118 results.
- "epidural blood patch," "nerve block; placebo," "post-dural puncture headache," "sphenopalatine ganglion block," "PDPH," "local anesthetic," "LA," "lidocaine," "obstetrics" and "pregnancy" returned 150 results.

Literature Review

Evidence collection using the Florida International University (FIU) online nursing library to access EBP databases. Based on clinical relevance and using the Polit-Beck Level of Evidence Scale, the selected data to support the project yield Level I and Level II data utilized to help the EBP problem and appraisal of the evidence. Evidence collection using the Florida International University (FIU) online nursing library to access EBP databases. The most relevant and high-quality 20 articles from our search underwent in-depth review, and the three primary consistent articles with RCTs passed selection for this article appraisal. Seventeen articles fail inclusion due to duplication or needing more RCT and quantitative data. The three remaining studies underwent vigorous reviews, and Level I and Level II articles were appraised and further reviewed. The literature review based on the reports supported the benefit of SPGB for PDPH as an effective alternative.

Several research studies have showcased the effectiveness of SPGB in relieving symptoms associated with PDPH. These studies often encompass diverse techniques such as transnasal, intraoral, or percutaneous approaches. Many of these trials have highlighted the efficacy of SPG block in diminishing both the severity and duration of headaches in PDPH patients, suggesting its potential as a viable alternative to conventional treatments. However, some research indicates that while SPG block could offer relief, its effectiveness may differ among individuals, leading to inconclusive outcomes in certain instances. Comparative analyses assessed SPGB compared to established treatments like EBP, the primary standard for severe PDPH cases. Results from these studies vary, with some indicating similar efficacy between SPGB and EBP, while others emphasize the superiority of EBP in specific scenarios. SPGB is safe, with most studies reporting minimal adverse effects. Nevertheless, like any medical

intervention, there are potential risks, including nasal discomfort, local irritation, or rare instances of more severe complications. Ensuring proper techniques and careful patient selection is essential to minimize these risks. Ongoing research endeavors focus on refining SPGB techniques, determining appropriate dosages, and establishing criteria for patient selection to enhance its effectiveness and safety profile. Furthermore, there is a recognized necessity for more robust randomized controlled trials (RCTs) with larger participant groups and more extended observation periods to establish definitive guidelines for utilizing SPGB in managing PDPH. The experiences and satisfaction levels of patients who undergo SPGB for PDPH vary considerably. While some individuals report rapid relief from symptoms, others may require additional treatments or only experience partial relief.[7,14] Several research studies have demonstrated SPGB's effectiveness in alleviating symptoms associated with PDPH, employing diverse techniques such as transnasal, intraoral, or percutaneous approaches. These trials highlighted SPG block's efficacy in reducing both the intensity and duration of headaches in PDPH patients, suggesting its potential as a viable alternative to conventional treatments. However, while some research supports SPGB's efficacy, indications indicate its effectiveness may vary among individuals, leading to inconclusive outcomes in some instances. Comparative analyses between SPGB and established treatments like EBP, the primary standard for severe PDPH cases, have shown varied results, some indicating similar efficacy between SPGB and EBP. In contrast, others emphasize the superiority of EBP in specific scenarios. Most studies report SPGB as safe, with minimal adverse effects. Potential risks such as nasal discomfort, local irritation, or rare severe complications exist. Ensuring proper techniques and careful patient selection is crucial to mitigate these risks.

Ongoing research aims to refine SPGB techniques, determine appropriate dosages, and establish criteria for patient selection to enhance its effectiveness and safety profile. However, there is a recognized need for more robust randomized controlled trials (RCTs) involving larger participant groups and more extended observation periods to establish definitive guidelines for using SPGB in managing PDPH. Patient experiences and satisfaction levels with SPGB vary considerably; while some report rapid symptom relief, others may require additional treatments or experience only partial relief.

Sphenopalatine ganglion block for the treatment of postdural puncture headache

In contrast to the commonly performed epidural blood patch, the sphenopalatine ganglion block is notably less invasive and carries a substantially lower risk. Consequently, there has been a growing interest in utilizing this treatment approach. In a recent study conducted by Jespersen and fellow researchers, 40 patients participated in a double-blinded randomized controlled trial (RCT) to assess whether sphenopalatine ganglion block was more effective than a sham procedure in reducing headache scores when in an upright position, 30 minutes after the block.[1] The study results revealed no significant variance in this primary outcome.[1] Moreover, there was no observable difference in the rates of epidural blood patch use between the groups receiving the sphenopalatine ganglion block and the sham procedure.[1] Interestingly, Jespersen and colleagues noted that in both the groups receiving either the local anesthetic or saline injection, headache pain scores while upright were notably lower than the baseline scores at 30- and 60-minutes post-procedure.[1] Consequently, they hypothesized that their selection of the sham procedure might have had a biological impact.[1] Other than considering the potential issue of an active placebo causing the observed effects, we propose an alternative interpretation for the results observed.[1] The transnasal sphenopalatine ganglion block was executed while the patient

was lying down with the head extended. If the patient remained in a supine position throughout the procedure, assuming each procedure took approximately 30 minutes, encompassing preparation time, it's plausible that there could have been a restoration of cerebrospinal volume. Consequently, this might have led to a decrease in pain scores regardless of which group the patient was assigned to.

The efficacy of sphenopalatine ganglion block for the treatment of postdural puncture headache among obstetric population

The study conducted by Alwarhi FI et al,[2] reviewed a comprehensive search on Google Scholar, PubMed, Science Direct, and Scopus to identify pertinent reports. Among the gathered data, ten reports directly linked to the utilization of sphenopalatine ganglion block (SPGB) for managing Post-Dural Puncture Headache (PDPH) in obstetric populations were included in the analysis.[2] The primary focus was evaluating significant headache relief without additional interventions and initial headache relief necessitating further treatments. Additionally, they examined post-SPGB complications as a secondary outcome.[2] The analysis comprised 68 identified patients. Notably, 41 out of 68 patients (60.3%) experienced effective management with substantial headache relief, requiring no further interventions. Moreover, 27 out of 68 patients (39.7%) initially responded positively to treatment but later needed additional interventions. Of the various local anesthetics used, 2% lidocaine emerged as the most effective, demonstrating an 85.7% success rate in managing PDPH.[2] Interestingly, individuals who developed PDPH following spinal anesthesia exhibited a better response to SPGB compared to those with other obstetric neuraxial techniques. This systematic review underscores SPGB as a promising approach for PDPH management, displaying no reported complications. However,

before advocating this technique as a standard treatment for PDPH, there are recommendations to advocate for randomized clinical trials to validate and ascertain its efficacy.[2]

Topical Sphenopalatine Ganglion Block Compared With Epidural Blood Patch for Postdural Puncture Headache Management in Postpartum Patients

The study by Cohen S et al[3] represents a first-of-its-kind 17-year retrospective examination of patient records, aiming to compare the effectiveness of sphenopalatine ganglion block (SPGB) to EBP in treating PDPH among postpartum patients.[3] The research involved a review of charts belonging to obstetric patients of the primary authors who suffered from PDPH due to an accidental dural puncture caused by a 17-gauge Tuohy needle used for labor epidural.[3] Demographic information, headache intensity, and related symptoms were collected before treatment. The study by Cohen S et al[3] identified 42 patients who underwent SPGB and 39 who received EBP.[3] The assessment involved comparing persistent headaches, recovery from associated symptoms, and potential new treatment complications between these two groups at 30 minutes, 1 hour, 24 hours, 48 hours, and one week following treatment.[3] More patients exhibited significant alleviation of their Post-Dural Puncture Headache (PDPH) and related symptoms within 30 and 60 minutes following SPGB treatment compared to those treated with EBP ($P < 0.01$).[3] All the patients treated with EBP reported post-treatment complications, which were resolved within 48 hours.[3] A more significant number of patients encountered a faster onset of headache relief, devoid of any new complications, through SPGB treatment as opposed to EBP.[3] The articles suggest that SPGB is a secure, cost-effective, and well-tolerated therapeutic approach. It anticipates that future clinical trials will validate findings, enabling the recommendation of SPGB as a preferable treatment for PDPH before proposing EBP to patients.[3]

Sphenopalatine Ganglion Block for the Treatment of Acute Migraine Headache

The article by Binfalah M et al,[4] investigates transnasal sphenopalatine ganglion block as an appealing and efficient therapeutic approach for treating acute migraine headaches, cluster headaches, trigeminal neuralgia, and various other conditions.[4] The article by Binfalah M et al,[4] evaluated the effectiveness and safety of this treatment technique utilizing the SphenoCath device. A total of 55 patients experiencing acute migraine headaches underwent this procedure, wherein they received 2 ml of 2% lidocaine in each nostril.[4] Throughout the assessment, they recorded the pain numeric rating scale at baseline, 15 minutes, 2 hours, and 24 hours post-procedure, and the patient's global impression of change at 2 hours and 24 hours following treatment. Most patients became free from headaches at 15 minutes, 2 hours, and 24 hours post-procedure (70.9%, 78.2%, and 70.4%, respectively).[4] The rate of headache relief, defined as a 50% or more reduction in headache intensity, was 27.3% at 15 minutes, 20% at 2 hours, and 22.2% at 24 hours.[4] There was a notable decrease in the mean pain numeric rating scale at 15 minutes, 2 hours, and 24 hours, respectively.[4] Most patients assessed the results as favorable. Additionally, the procedure demonstrated good tolerance among patients, with few adverse events reported.[4] Consequently, this treatment modality appears to be an increasingly effective and safe option for managing acute migraine attacks. Participants eligible for the study were between 18 and 60 years who had received a diagnosis of migraine headache at least one year prior. They were required to present with moderate to severe headaches lasting between 4 and 72 hours that did not respond to abortive medications.[4] Exclusion criteria encompassed patients with medication overuse headaches, bleeding disorders, abnormal neurological examinations, and a history of allergic reactions to local anesthetics.[4]

Sphenopalatine ganglion block for treatment of post-dural puncture headache in obstetric patients

This study by Rajan S et al,[5] aimed to assess the efficacy of SPGB in managing PDPH as the primary objective. The secondary objectives included examining the onset and duration of pain relief and identifying any adverse effects.[5] The research involved recruiting twenty parturient diagnosed with PDPH who had shown resistance to standard treatments such as intravenous fluids, abdominal binder usage, bed rest, and caffeine.[5] The participants were divided into two groups: Group A received intravenous paracetamol (1 g every 8 hours) for a day, followed by diclofenac (75 mg every 12 hours) if adequate pain relief was not achieved. Group B underwent SPGB using 2% lignocaine—statistical analysis employed Fisher's exact test, Mann-Whitney test, and independent sample t-test.[5] The findings revealed that 88.89% of patients in Group B experienced adequate pain relief within 5 minutes of the block ($P < 0.001$). Furthermore, Group B exhibited significantly lower pain levels for up to 8 hours without any reported adverse effects. The study concluded that SPGB is an effective initial treatment for severe headaches in PDPH patients.[5] Patients with specific conditions like coagulopathy, nasal issues, or a history of allergic reactions to local anesthetics were managed with traditional medical treatments due to potential difficulties or risks associated with administering SPGB. Additionally, the study was conducted to compare the efficacy of two existing practices within the institute—SPGB treatment by one obstetric consultant and conservative measures by another.[5] When comparing the average pain scores between the two groups, it was observed that in group A, the mean pain score gradually decreased and fell below four after 4 hours, remaining at that level afterward. Conversely, in group B, following the administration of the block, the median pain score remained at or below four throughout the entire study duration. The onset of pain relief was notably faster in group B compared to group A [4.1 ± 1.1 vs. 206 ± 90.6 minutes, $P < 0.001$.[5.]

A randomized placebo-controlled trial assessing sphenopalatine ganglion block in endoscopic sinus surgery.

Two of the 184 initially enrolled patients opted to withdraw from the study following surgery.[6] The primary surgical procedures performed included maxillary antrostomy alone (n = 64) and extended Endoscopic Sinus Surgery (ESS) (n = 114).[6] Both groups administered Anesthetic and analgesic drugs equally during the surgical procedures. Regarding the average VAS pain score at H2 (2 hours post-surgery), no notable difference was observed between the groups (1.63 ± 2.06 with ropivacaine and 0.99 ± 1.78 with placebo, p = 0.02). At H4 (4 hours) and H6 (6 hours) post-surgery, the mean VAS pain score did not display any statistically significant distinction between the two groups.[6] Patient self-assessment of VAS pain scores between day one and day seven following surgery showed no discernible differences. Adults who had undergone Endoscopic Sinus Surgery (ESS) for chronic rhinosinusitis or benign sinonasal tumors were chosen at random to receive either bilateral SPGB using 4 ml of ropivacaine (2 mg/ml) or an equal volume of saline solution (0.9%).[6] The selection process involved block randomization. ESS entailed the opening of one or more sinuses. Patients with preexisting pain conditions that required treatment with antidepressants, benzodiazepines, gabapentin, or opioid medications were not included in the study.[6] The articles by Morisse, M et al,[6] observed lower average pain scores in the placebo group at H2, although this difference lacked statistical significance.[6] Additionally, there was no noticeable disparity in the intake of pain relief medication from day 1 through day 7. These outcomes contrast with findings from other research studies. Seven of the eight studies evaluated by SPGB effectively alleviated short-term pain following Endoscopic Sinus Surgery (ESS) and facilitated recovery from sedation.[6]

Efficacy of pharmacological therapies for preventing post-dural puncture headaches in obstetric patients.

This Bayesian network meta-analysis by Zhao G et al, [7] investigated various pharmacological therapies, dexamethasone, gabapentin/pregabalin hydrocortisone, magnesium, ondansetron, and propofol for their impact on PDPH incidence and other related outcomes.[7] The primary focus was on the cumulative occurrence of PDPH within seven days postoperatively, with secondary outcomes including PDPH incidence at 24 and 48 hours after surgery, headache severity in PDPH patients, and PONV.[7] The study incorporated 22 randomized controlled trials comprising 4,921 pregnant women, with 2,723 parturient receiving prophylactic pharmacological therapies.[7] Analysis revealed that propofol, ondansetron, and aminophylline, exhibited effectiveness in reducing the cumulative incidence of PDPH during the follow-up period when ,compared to the placebo group.[7] Furthermore, PPF and OND demonstrated lower PONV incidences than the placebo group. The original studies were considered suitable if they met the following criteria: (i) conducted as a randomized controlled trial (RCT); (ii) available in full text written in English; (iii) included only pregnant women as participants; and (iv) focused on evaluating the effectiveness of pharmacological treatments to prevent Post-Dural Puncture Headache (PDPH) in parturient. Studies were deemed ineligible for the following reasons:[7] (i) observational studies, conference abstracts, or case reports; (ii) investigations involving invasive treatments (such as prophylactic epidural blood patch or prophylactic intrathecal/subarachnoid morphine/fentanyl); (iii) lacked necessary data to establish odds ratios (ORs) and 95% confidence intervals (CI) for assessing the effectiveness of pharmacological treatments or mean difference and 95% CI related to the severity of PDPH; or (iv) studies involving research on laboratory animals.[7]

Sphenopalatine ganglion block in primary headaches

The article by Burkett JG et al,[8] clearly emphasis that Sphenopalatine Ganglion (SPG) procedures must be established, especially with the introduction of newer commercial devices. To evaluate clinical practice patterns involving SPG blocks, a survey comprising 22 multiple-choice questions was formulated and distributed to American Headache Society (AHS) members.[8] The survey aimed to ascertain indications, preferred applicators, medications used, perceived effectiveness, tolerability, and reimbursement.[8] Of 1,346 AHS members, 172 (12.8%) participated in the survey. Among respondents, 93 (56.3%) had administered SPG blocks to 50 patients or fewer. The SphenoCath (42.4%) and Tx360 (41.8%) were the most utilized application methods, with ease of use being the primary reason for provider preference regarding applicator type.[8] SPG blocks were predominantly employed as a single, as-needed procedure.[8] When a scheduled protocol was followed, twice-weekly treatments for six weeks were most frequently reported. Chronic migraine emerged as the most treated headache disorder and was deemed most likely to respond positively to SPG blocks.[8] Experienced practitioners indicated that SPG was more beneficial when used as a standalone treatment and often reported that immediate relief did not necessarily predict lasting improvement.[8] The diverse range of responses from clinicians strongly suggests the necessity for standardized protocols governing SPG blocks. Experienced practitioners might have devised personalized protocols they perceive as more efficacious.[8] The absence of evidence-based protocols contributes to the infrequency of SPG block procedures among clinicians.[8]

Transnasal sphenopalatine ganglion block for the treatment of postdural puncture headache in obstetric patients

This case series by Kent S et al,[9] presents a limited study where three obstetric patients with Post-Dural Puncture Headache (PDPH) were treated using SPGB in a labor and delivery

suite. Among these patients, one had an American Society of Anesthesiologists physical status of 1, while the other two were categorized as having an American Society of Anesthesiologists physical status of 2.[9] The intervention involved performing Transnasal SPGB utilizing cotton-tipped applicators and 2% viscous lidocaine on all three patients.[9] While previous studies on this method have utilized 4% or 5% lidocaine concentrations, our choice was to employ 2% viscous lidocaine due to its availability within our institution's pharmacy.[9] In the instance of patient 2, the Post-Dural Puncture Headache (PDPH) did reoccur after 18 hours, resembling outcomes noted in another published study involving the same SPGB technique and local lidocaine concentration administered to PDPH patients who arrived at the Emergency Department following diagnostic lumbar puncture.9 The evaluation included measurements of height, weight, and vital signs for each patient. Additionally, the pain levels while seated were assessed using a numeric rating scale (ranging from 0 to 10) before the procedure, immediately after the procedure, 24 hours post-procedure, and 48 hours post-procedure.[9] The primary findings revealed that all three patients experienced considerable relief from pain following the administration of SPGB without needing an Epidural Blood Patch (EBP).[9] When weighing the potential risks associated with transnasal SPGB, such as bleeding and temporary discomfort, against those linked to an EBP, which are documented as dural puncture, neurological complications, bleeding, and infection, it appears justifiable to consider offering SPGB as a preferable option before resorting to EBP.[9]

Needle gauge and tip designs for preventing post- dural puncture headache.

Research by Arevalo-Rodriguez et al ,[10] compared various needle internal diameters which has shown that larger-diameter needles tend to create more significant openings in the dura mater, potentially elevating the risk of post-dural puncture headache.[10] However, using thinner needles has been associated with increased procedural difficulty, resulting in a higher

incidence of bone punctures and possible deformities in the needle tip.[10] Some experts argue for the utilization of needles with cutting or traumatic tips, theorizing that these types of needles can induce larger lesions compared to pencil-point or atraumatic needles.[10] The concept behind pencil-point needles is their ability to penetrate and then separate the fibers of the dura mater, potentially causing less trauma and subsequently reducing cerebrospinal fluid (CSF) loss, thus lowering the likelihood of post-dural puncture headache (PDPH).[10] Larger lesions generated by traumatic needles can prompt a robust inflammatory reaction, potentially leading to quicker closure of the injury due to the rapid migration of cells involved in scar formation. Microscopic examinations of cadavers have shown that injuries caused by pencil-point needles are more intricate than those induced by cutting needles.[10] Needle tips are categorized based on their design into traumatic and atraumatic types. Atraumatic needles, such as Whitacre, Sprotte, Cappe, and Deutsch, are designed to minimize tissue trauma. In contrast, traumatic needles like Quincke and Greenem possess a bevelled tip that cuts the dura mater.[10] Modern atraumatic needles usually have a pencil-point configuration, aiming to create separation among tissue fibers that heal easily upon needle removal. Traumatic needles, by contrast, tend to induce tissue loss and provoke a substantial inflammatory reaction, leading to longer healing times.[10] The external diameter of a needle is determined by its cross-sectional area; larger diameters correspond to larger openings in the dura mater, potentially resulting in increased CSF leakage. Needle sizes are denoted by gauge numbers, with larger gauges indicated by smaller numbers (e.g., 16-gauge, 17-gauge) and smaller gauges represented by larger numbers (e.g., 29-gauge, 32-gauge).[10]

Project Implementation

Conceptual Underpinning and Theoretical

The conceptual and theoretical framework is the soul of every research paper and guides the idea of the project and gives it direction. The Iowa Model of Evidence-Based Practice will guide the project.[9] The model is a practice model with a primary focus on guiding clinicians in using EBP to improve healthcare outcomes. The model incorporates evidence from research data, case reports, and expert opinions.[8] The model consists of seven steps: 1) topic selection, 2) team formation, 3) retrieval of evidence, 4) grading the evidence, 5) EBP development, 6) implementation of EBP, and 7) final evaluation. The previously mentioned steps and theory will guide the conceptual underpinning.[6] The theory will guide the implementation of education and possible protocol adaptation by the institution to increase provider awareness and benefits of SPGB. The practice's sustainability depends on the change guided by the new change's results and acceptance from stakeholders and providers.[6] The proposal will include information regarding the decreased need for provider time and equipment to perform EBP compared to the time and supplies required for an SPGB.[10,12] Organizational support for change is essential for change to occur and for its translation into practice. A quality improvement plan ensures that results are non-biased and guided by data to provide the efficacy and safety of SPGB for the first-line treatment of PDPH.[18,15]

Organizational Assessment

The project aims to develop a protocol for SPGB administration and its usability as a minimally invasive treatment option and first-line treatment for PDPH in a local community. The project was implemented by a certified registered nurse anesthetist (CRNA) staff member and anesthesiologist. They will receive training and education on the effectiveness of SPGB for PDPH and provide them with the newest evidence-based practices (EBP) data. We will gauge provider understanding and current knowledge based on the SPGB application before education and training to evaluate the effectiveness of the study. Anesthesia providers at the hospital

consist of anesthesiologists and CRNAs. Currently, the team treats PDPH with conservative modalities and EBP depending on the duration of onset and severity of symptoms presented by the patient. Now, providers are only partially satisfied with their treatment options and patient outcomes. A SWOT (Strength, Weakness, Opportunity, and Threat) will identify any strength or weakness that can hinder or aid in implementing the project goal. The project's strengths include that SPGB is very safe and has a very low incidence of side effects. SPGB is fast-acting; data proves it is safely performed with minimal complications.

Additionally, the support from the facility, stakeholders, and staff will help implement this project and is a strength. Weaknesses of the project include limited randomized controlled trials to test the effectiveness of the intervention, restrictions on the amount of supporting data, and hesitance for acceptance by institutions. Opportunities for the project are improved patient outcomes and satisfaction from PDPH pain, reduced complications, and the need for EBP, an invasive treatment option. The project's treatments include hesitance for change, perceived lack of efficacy by patients or providers, and insurance reimbursement for procedures.

SWOT Analysis

The project aims to develop a protocol for SPGB administration and its usability as a minimally invasive treatment option and first-line treatment for PDPH in a local community. The project was implemented by a certified registered nurse anesthetist (CRNA) staff member and anesthesiologist. They will receive training and education on the effectiveness of SPGB for PDPH and provide them with the newest evidence-based practices (EBP) data. We will gauge provider understanding and current knowledge based on the SPGB application before education and training to evaluate the effectiveness of the study. Anesthesia providers at the hospital consist of anesthesiologists and CRNAs. Currently, the team treats PDPH with conservative

modalities and EBP depending on the duration of onset and severity of symptoms presented by the patient. Now, providers are only partially satisfied with their treatment options and patient outcomes. A SWOT (Strength, Weakness, Opportunity, and Threat) will identify any strength or weakness that can hinder or aid in implementing the project goal. The project's strengths include that SPGB is very safe and has a very low incidence of side effects. SPGB is fast-acting; data proves it is safely performed with minimal complications.

Additionally, the support from the facility, stakeholders, and staff will help implement this project and is a strength. Weaknesses of the project include limited randomized controlled trials to test the effectiveness of the intervention, restrictions on the amount of supporting data, and hesitance for acceptance by institutions. Opportunities for the project are improved patient outcomes and satisfaction from PDPH pain, reduced complications, and the need for EBP, an invasive treatment option. The project's treatments include hesitance for change, perceived lack of efficacy by patients or providers, and insurance reimbursement for procedures.

Goals and Outcomes (SMART)

The SMART goals will guide the goals and outcomes for the project to present the project with reasonable expectations and deadlines and how we can close the gap in current practice. Current data collection from the facility reveals that providers are unsatisfied with the current protocol and treatment options and need more knowledge and acceptance of SPGB. This project aims to close the gap in everyday practice to utilize SPGB as a first-line treatment option for obstetric patients who experience PDPH after epidural insertion. Recent data support the use of this method as a first-line treatment option with positive results regarding its efficacy and margin of safety. The goals will be measured by collecting patient data and reporting relief of symptoms and the decreased need for EBP as the first line but as a last resort. The project goal

will be achievable by implementing education modules and protocols on the proper usage of SPGB to increase the standard of care. The project's relevance is specific to the obstetrics population and addresses an issue with a gap in practice. The implementation will take place between January 2023 and November 2023. During that time, the providers will have an interview on the topic and time to implement SPGB as a first-line treatment for patients who experience a PDPH.

Definition of Terms

PDPH refers to a type of headache that occurs when there is a decrease in cerebrospinal fluid (CSF) within the intrathecal space due to a dural puncture, also known as a "wet tap," and the body's limited ability to replenish CSF quickly.[2] The reduction in CSF leads to a lack of cushioning for the brain, causing the brain structures to shift downwards, resulting in pain within the skull.[1,2] This pain is typically alleviated when the affected individual lies flat on their back. The symptoms of PDPH typically appear with a delay, and the headache usually starts between 12 to 48 hours after the meningeal puncture, rarely exceeding five days.[3,2] In a significant observational study, the researchers found that 84.8% of patients with data on symptom onset experienced headaches within three days of receiving spinal anesthesia, marking an important milestone in understanding the condition.[5,2]

The headache associated with PDPH always affects both sides of the head and can be felt in the frontal region (25%), occipital region (27%), or in both areas simultaneously (45%).[4,5] Individuals commonly describe the headache as either "dull/aching," "throbbing," or "pressure-like.[2,3] The severity of the headache can vary significantly among patients, and this factor is essential to consider when determining treatment approaches.[3,4,5] While there is no universally accepted scale for measuring headache severity, a practical method involves patients rating their

intensity on a 10-point analog scale.[3,2] Headaches with ratings of 1 to 3 are "mild," 4 to 6 are "moderate," and 7 to 10 are "severe."[3,4]

Setting

The project occurs in a 589-bed acute-care hospital in Miami Beach, Florida. This privately owned and independent hospital operates as a not-for-profit institution, offering various specialized medical services. Anesthesia services are provided by certified registered nurse anesthetists (CRNAs) and anesthesiologists in 12 operating rooms and four obstetric suites within the hospital. South Florida has a percentage of pregnant women 53.4 per 1,000 women ages 15-44. Anesthesia providers must know the specific considerations and challenges associated with caring for the OB patient, including a higher incidence of PDPH and other complications, and implement techniques to mitigate its occurrence. Before recruiting providers for the project, approval from Florida International University (FIU) and the hospital will be acquired. The target population for this EBP educational project includes CRNAs and anesthesiologists. An email will be sent to anesthesia providers at the hospital inviting them to participate, ensuring representation from various genders, employment types (full-time, part-time, per-diem), and diverse age and ethnic groups. A student registered nurse anesthetist will be excluded from the project, as it aims to enhance practicing anesthesia providers' knowledge and clinical practice. All participants will undergo both pretest and posttest assessments.

Procedure

Participants will participate in the project through an email link sent to nurse anesthetists and anesthesiologists in the selected acute care hospitals. The email will contain a link to access via Qualtrics with a pretest. It is important to note that the survey will not collect personal information and will maintain anonymity throughout the project. After completing the pretest,

participants will watch an educational module virtually with the most up-to-date EBP data. Subsequently, the post-test survey link will collect the data of participants who completed the entirety of the module.

Protection of Human Subjects

Throughout the EBP education module project, the pretest and post-test surveys will not collect personally identifiable information. The project will prioritize privacy and ensure that identifiers are confidential to safeguard the data's safety and security. Before implementing the intervention, the project will obtain approval from the Institutional Review Board (IRB) per the guidelines of Florida International University and the hospital in South Florida. Participants will receive a disclosure of their right to discontinue their involvement in the intervention at any point if they wish to do so. The researcher will have CITI program training and certifications in Human Subjects Research.

Data Collection

The volunteer survey participants will receive an educational presentation on SPGB and its benefits as a first-line treatment option. The pre/post-test will assess the provider's prior knowledge, knowledge gap, and if implementation increases the provider's comfort level. The presentation is a 10-minute educational module with information on SPGB and current EBP data. There will be ten pre/post-test questions to assess the provider's prior and new knowledge.

Timeline

For eight weeks, conducting data collection via literature search can be a comprehensive and valuable method to gather relevant information for research or analysis purposes. Through this approach, researchers delve into existing literature, including academic papers, articles, books, and online resources, to explore and extract pertinent data related to their topic of interest.

The process involves formulating search queries, selecting appropriate databases and search engines, and meticulously reviewing and assessing the obtained literature for relevance and credibility. By carefully examining a wide range of sources, researchers can compile a comprehensive dataset, enabling them to identify patterns, trends, and insights that contribute to advancing knowledge in their respective fields. The eight-week timeframe allows for a thorough exploration of the literature, ensuring the collection of robust and diverse data to support evidence-based conclusions and facilitate informed decision-making.

Demographics

A total of 13 CRNAs participated in the study, which included watching the educational module and answering the pre-test and post-test. The participants' demographic is as follows: Females (n=3, 27.27%), males (n=8, 72.73%), and non-binary or other (n=0, 0%). There was a higher number of male participants compared to Female participants. Ethnicities data reported the following: Caucasian (n=1, 9.09%), Black/African American (n=3, 31.58%), Hispanic/Latino (n=6, 54.55%), Native American/Alaska Native (n=1, 9.09%). The age groups reported the following: 18-25 (n=1, 9.09%), 26-45 (n=9, 81.82%), 46-64 (n=21.05%). For the study, only Master's and Doctorate education levels were included, reposting the following: Masters (n=2, 25%), Doctorate (n=6, 75%).

Results

Table 1. Comparison in Pretest and Posttest Attributes

Questions	**Pre-Test**	**Post-Test**	**Difference**
PDPH is consider a “minor complication” of dural puncture and it’s the cause of _____ % of obstetrics claims?	14% - 54.66%	14% - 87.50%	14% - 32.84%
What are risk factors for Post-Dural Puncture headaches? **Select 2**	Age <40 – 26.32% PDPH- 26.32%	Age <40- 28.57% PDPH- 21.43%	Age <40 –2.25% PDPH -4.89%

What are some non-invasive treatment options for Post-Dural Puncture headache? **Select 3**	Hydration-29.63% Caffeine-33.33% Sumatriptan-22.22%	Hydration-33.33% Caffeine-33.33% Sumatriptan- 28.57%	Hydration-3.7% Caffeine- Sumatriptan-6.35%
What is the definitive treatment for Post-Dural Puncture headache?	EBP- 63.64%	EBP- 50%	EBP- 13.64%
Is sphenopalatine ganglion block an invasive treatment modality for Post-Dural Puncture Headache?	False- 63.64%	False- 75%	False- 11.36%
The larger the needle diameter the higher the incidence of PDPH?	True- 54.55%	True- 62.50%	True- 7.95%
The onset of PDPH is not immediate and does not have a postural component:	False- 81.82%	False- 87.50%	False- 5.68%
How should PDPH unresponsive to other measures be treated?	EBP- 63.64%	EBP- 50%	EBP- 13.64%
Where should an Epidural blood patch be placed for the treatment of PDPH? **Select 2**	Same- 21.05% One below- 21.05%	Same- 46.15% One below- 38.46%	Same- 25.1% One below-17.41%
Mechanism of action of Sphenopalatine ganglion block:	Inhibit PNS- 72.73%	Inhibit PNS- 75%	Inhibit PNS-2.27%

Overall scores showed increased provider knowledge after the educational module based on the data collected and the difference percentage. However, there is one category where we had the opposite; participants selected SPGB as the ideal treatment option. Additional participants chose SPGB as the treatment option for PDPH unresponsive to other treatment modalities. The author will look for the reasons and causes for this confusion and why the data reflects this confusion in the correct response. Besides these two questions, all others had an increase in participant improvement and reflected an increase in the percentage of correct answers.

DISCUSSION

Limitations:

A total of 38 surveys were sent out electronically via email to the anesthesia group selected to participate in the study, and out of the 38 emails sent out, only 13 participants

responded to the email. The survey was initially open for six weeks; due to the low response rate, the survey was extended for an extra week to allow more participants to participate in the study. Despite the spare time, the number of participants stayed the same. The small sample size is a limiting factor for this project, and a larger pool of participants will help implement the project. The extension of the survey response window did not increase response numbers.

Implications for Anesthesia Practice:

PDPH is a relevant issue in the obstetric population, with incidence as high as 10 % of the patients will experience PDPH as a complication from neuraxial anesthesia. PDPH is associated with a wide range of neurological symptoms that can debilitate the patient after labor, which include vertigo, cranial nerve palsy, diplopia, back pain, chronic headache, and subdural hematoma. Current practice guidelines advocate for EBP as the treatment option for PDPH if all medications fail to resolve symptoms. However, emerging evidence and data support the usage of SPGB as a first-line treatment option that is not invasive and carries less risk when compared to EBP. Data collection helps practitioners be open to using SPBG for PDPH when other treatment options fail. SPBG is viewed as a safe and highly effective treatment option that requires minimal skills.

Conclusion:

Based on a review of existing literature and up-to-date information, using SPGB is a beneficial and minimally invasive treatment approach for PDPH. By examining various articles that presented case studies with positive outcomes, the author suggests the introduction of education and protocols within a hospital setting to promote the adoption of this initiative and enhance the utilization of SPGB. Data collection resulted in positive acceptance by providers to utilize SPGB when other initial treatments fail and before Epidural Blood Patch (EBP). A good

amount of data supports the utilization and effectiveness of SPGB for treating PDPH and its efficacy in decreasing the need for an epidural blood patch (EBP). The project's goal is not to replace EBP as the definitive treatment but to decrease the need for EBP.

References

1. Jespersen MS, Jaeger P, Meyhoff CS. Sphenopalatine ganglion block for the treatment of post-dural puncture headache. reply to Br J Anaesth 2020; 124: 739–47. BJA. 2020;125(4). doi:10.1016/j.bja.2020.06.029

2. Cohen S, Levin D, Mellender S, et al. Topical sphenopalatine ganglion block compared with epidural blood patch for post-dural puncture headache management in postpartum patients. ASRA. 2018:1. doi:10.1097/aap.0000000000000840

3. Cohen S, Levin D, Mellender S, et al. Topical sphenopalatine ganglion block compared with epidural blood patch for post-dural puncture headache management in postpartum patients. Reg Anesth and Pain Med. Published online 2018:1. doi:10.1097/aap.0000000000000840

4. Binfalah M, Alghawi E, Shosha E, Alhilly A, Bakhiet M. Sphenopalatine ganglion block for the treatment of acute migraine headache. Pain Res Treat. 2018;2018:1-6. doi:10.1155/2018/2516953

5. Rajan S, Puthenveettil N, Mohan A, Paul J, Kumar L. Sphenopalatine ganglion block for treatment of post-dural puncture headache in obstetric patients: An observational study. IJA. 2018;62(12):972. doi:10.4103/ija.ija_443_18

6. Morisse, M., Rysman, B., Szymanski, C., Fackeure, R., Mouawad, F., & Mortuaire, G. (2021). A randomized placebo- controlled trial assessing sphenopalatine ganglion block in endoscopic sinus surgery. Inter Forum of Allergy & Rhinology, 11(9), 1384–1386. https://doi.org/10.1002/alr.22804

7. Zhao G, Song G, Liu J. Efficacy of pharmacological therapies for preventing post-dural puncture headaches in obstetric patients: A bayesian network meta-analysis of randomized controlled trials. BMC Pregnancy and Childbirth. 2023;23(1). doi:10.1186/s12884-023-05531-7

8. Burkett JG, Robbins MS, Robertson CE, et al. Sphenopalatine ganglion block in primary headaches. Neuro: Clin Practice. 2019;10(6):503-509. doi:10.1212/cpj.0000000000000773

9. Kent S, Mehaffey G. Transnasal sphenopalatine ganglion block for the treatment of postdural puncture headache in obstetric patients. J of Clin Anesth. 2016;34:194-196. doi:10.1016/j.jclinane.2016.04.009

10. Arevalo-Rodriguez I, Muñoz L, Arevalo JJ, Ciapponi A, Roqué i Figuls M. Needle gauge and tip designs for preventing post-dural puncture headache (PDPH). J of Med Anes Reviews. Published online 2013. doi:10.1002/14651858.cd010807

11. Sprigge JS, Harper SJ. Accidental dural puncture and post dural puncture headache in obstetric anaesthesia: Presentation and Management: A 23- year survey in a District General Hospital. Anaesth. 2007;63(1):36-43. doi:10.1111/j.1365-2044.2007.05285.x

12. Ylmaz mehmet. Transnasal sphenopalatine ganglion block for treatment of post-dural puncture headache in obstetric population. Southern Clin of Istanbul Eurasia. Published online 2020. doi:10.14744/scie.2020.39358

13. Russell R, Laxton C, Lucas DN, Niewiarowski J, Scrutton M, Stocks G. Treatment of obstetric post-dural puncture headache. part 2: Epidural blood patch. Inter J of Obstetric Anesth. 2019;38:104-118. doi:10.1016/j.ijoa.2018.12.005

14. Gardner AL, Macnab WR. Obstetric post-dural puncture headache. Anesth; Intens Care Med. 2022;23(8):423-426. doi:10.1016/j.mpaic.2022.04.027

15. Van de Velde M, Schepers R, Berends N, Vandermeersch E, De Buck F. Ten years of experience with accidental dural puncture and post-dural puncture headache in a tertiary obstetric Anaesthesia Department. Inter. J of Obstetric Anesth. 2008;17(4):329-335. doi:10.1016/j.ijoa.2007.04.009

16. Costa AC, Satalich JR, Al-Bizri E, et al. A ten-year retrospective study of post-dural puncture headache in 32,655 obstetric patients. Canadian J of Anesth. 2019;66(12):1464-1471. doi:10.1007/s12630-019-01486-6

17. Miu M, Paech MJ, Nathan E. The relationship between body mass index and post-dural puncture headache in obstetric patients. Inter J of Obstetric Anesth. 2014;23(4):371-375. doi:10.1016/j.ijoa.2014.06.005

18. Rajan S, Puthenveettil N, Mohan A, Paul J, Kumar L. Sphenopalatine ganglion block for treatment of post-dural puncture headache in obstetric patients: An observational study. Indian J of Anaesth. 2018;62(12):972. doi:10.4103/ija.ija_443_18

19. Nair AS, Rayani BK. Sphenopalatine ganglion block for relieving post-dural puncture headache: Technique and mechanism of action of block with a narrative review of efficacy. Korean J Pain. 2017;30(2):93-97. doi:10.3344/kjp.2017.30.2.93

APPENDIX

Appendix A: Literature Review Table-1

Citation	Design/Method	Sample/Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Jespersen MS et al,[1] 2020	In the study the authors compared the effectives of SPGB as a treatment modality for PDPH using RCTs.	The study was conducted with a total of 19 participants who had PDPH, out the 19 only 3 patients required epidural blood patch to relieve symptoms.	The dependent variable in the study group is the number of participants not requiring epidural blood patch. The independent variable is the patient incidence of PDPH.	The participants pain scores were recorded in a 0-10 pain scale to report pain. The onset of symptom relief was documented in hour to corelated data.	The statistical findings produced data to corelated on the effectiveness of SPGB to reduce the need for EBP by 52.5%.	The study found sphenopalatine ganglion block given with local anesthetic and 50% and 55% avoidance of an epidural blood patch.	The study concluded that SPGB is an effective treatment option for PDPH when compared to other modalities.	The studies strength is that its translation into practice will help decrease the number of EBP when treating PDPH. We understand that EBP is the definitive treatment option, but it carries risk with it while SPGB has proven to be effective and less invasive. Level 1
Alwarhi FI et al,[2] 2022	Systematical review. The retrospective review obstetrics patients who experienced PDPH from unintentional dural puncture from a 17-gauge Tuohy needle.	42 patients who received SPGB and 39 patients who received EBP were identified.	The dependent variables include the patient who experienced symptoms relief with SPGB versus those who received EBP.	Comparisons across groups were performed using the Fisher exact test with the symptoms experienced by patients to include stiff neck, tinnitus, photophobia, diplopia, nausea, and vomiting.	Primary outcomes concluded that more patients experienced headache relief 30 minutes after SPGB (38%) than after EBP (20%)	A greater number of patient s showed relief and associated symptoms at 30 and 60 minutes after treatments with SPGB than after treatment with EBP.	A greater number of patients experienced quicker onset of headache relief without any complication from treatment with SPGB versus EBP.	The study included a control group of 40 patients enrolled in a double-blind, randomized controlled trial (RCT) to determine if sphenopalatine ganglion block is better at reducing headaches scores in the upright position after thirty minutes from sphenopalatine ganglion block with lidocaine and bupivacaine at a one-one ratio. Level 1.

Cohen S et al,[3] 2018	A total of 10 reports found to be related to SPGB for the treatment of PDPH in the obstetric population were enrolled. Significant relief of headache with no further intervention and initial relief of headache that requires further interventions were considered as the primary outcomes.	A total of 10 studies found to be suitable to our objectives were included. Eight case reports and case series. One retrospective observational study with a sample size of 81 patients in which 42 of them (51%) underwent SPGB. O	The dependent variable in the study group is the number of participants not requiring epidural blood patch. The independent variable is the patient incidence of PDPH.	The assessment of the severity of pain in most of the reports was performed either by numerical rating scale or by visual analog scale (VAS)	Dara showed that transnasal SPGB was an effective and safe procedure for treating PDPH after obstetric neuraxial block with significant relief of headache. Moreover, the use of 2% lidocaine resulted in higher efficacy than other used LAs, although it was mainly used in patients who developed PDPH secondary to spinal anesthesia.	A total of 68 patients were identified. We found that 41 of 68 patients (60.3%) had effective management with significant relief of headache with no further interventions needed. techniques.	This systematic review showed that SPGB is a promising treatment modality for the management of PDPH with no reported complications.	Based on these data points and using the evidence level and quality guide from Johns Hopkins Nursing evidence-based practices (EBP) guidelines, we can classify this article as a Level I study design.
Binfalah M et al,[4] 2018	RCT We also recorded patient global impression of change (PGIC; very poor,	We conducted an open, uncontrolled retrospective study in the neurology clinic Pain	Another placebo-controlled study compared outcomes for acute treatment of chronic migraine	Pain was assessed using numeric rating scale (NRS), where 0 is no pain and 10 is	In our study, SPG blockade produced a rapid relief of headache at	The baseline NRS range was 4 to 10, with a mean of 6.8. For the primary end	Transnasal SPG blockade is emerging as an effective and safe option for the treatment of several disabling	The main limitation of our study included the lack of a placebo group, as subjective pain response might have a significant placebo

	poor, no change, good, and very good) at 2 hours and 24 hours after procedure.		patients with intranasal 0.5% bupivacaine 26) or saline 12) using the Tx 360 device to block the SPG.	worst pain imaginable; this was recorded at baseline, 15 minutes, 2 hours, and 24 hours after the procedure.	15 minutes, with a significant treatment effect observed at 24 hours and high patient satisfaction.	point (headache freedom at 15 minutes, 2 hours, and 24 hours), the percentages were 70.9%, 78.2%, and 70.4%, respectively	headache and facial pain conditions such as migraine, cluster headache, and trigeminal neuralgia.	component, making it a level 1 RCT.
Rajan S et al,[5] 2018	This is a small case series in which SPGB was used to treat PDPH in 3 obstetric patients. RCT.	Three postpartum patients with PDPH were studied. One patient was American Society of Anesthesia physical status 1 and 2.	The dependent variable in the study group is the number of participants not requiring epidural blood patch. The independent variable is the patient incidence of PDPH.	In addition, the numeric rating scale (0-10) was used to quantify the pain level while in the sitting position preprocedural, immediately. post procedure, 24 hours post procedure, and 48 hours post procedure	All 3 patients had significant pain relief following the SPGB without the need for EBP	Patients consented for SPGB, and immediately following the procedure, her sitting NRS score was 0/10, so, she was discharged. The 24- and 48-hour follow-up NRS scores were both 0/10 as well.	When comparing the risks of a transnasal SPGB, which include bleeding and temporary dis-comfort, against those of an EBP, which are documented as dural puncture, neurologic complications, bleeding, and infection, it seems reasonable to offer the SPGB before EBP	These data would need to be studied in a larger population, but it seems logical to assume that using SPGB as first-line therapy, the sample size is a limitation making it a low-quality result.

Morisse, M et al,[6] 2021	Double-blind Randomized Clinical Trial Purpose: Intranasal lidocaine efficacy on different types of headaches Method: Intranasal lidocaine was administered to the intervention group or saline to the placebo group; headache pain was reassessed	N= 90 headache pts (49 primary headache- migraine, tension) (41 secondary headache- traumatic, nontraumatic) • 45- intranasal lidocaine group: 22 primary headaches, 23 secondary headache) • 45- placebo group (27 primary headache, 18 secondary headache)	V: Intranasal lidocaine (1 puff 10% lidocaine or placebo (1 puff saline) in each nostril DV: headache severity	Visual Analog scale for headache severity 0-10 (0= no pain, 10= worst possible pain) Assessed pre-intervention, 1, 5, 15, 30 mins after **intervention.** Data analysis- • Statistical Package for Social Sciences version 17 t-test repeated measures analysis of variance (ANOV A) Fisher's exact test Mann-Whitney test	Difference between sex (57.8% female, 42.2% male) & age (mean 53.32years): (*P*-values 0.83 sex & 0.21 age) Mean pain scores: Pre-intervention 6.7±1.89 (*P*-value 0.198): • 6.97. lidocaine group • 6.42 placebo group	No significant difference between sex & age in population No significant difference in pre-intervention pain scores between groups	Intranasal lidocaine is effective for pain reduction in headache pts with easy administration, little side effects. Intranasal lidocaine should be used to treat pts presenting to emergency department with headache.	Strengths: • Inexpensive Low risks/side effects Conclusive results No prior meds within 2 hours of intervention Weaknesses: • No long term follow **up.** • Did not state specifics on headache due to trauma; only 3 pts with subarachnoid or subdural hemorrhage in non-trauma group

Zhao G et al, [7] 2023	Method: SPGB was administered with conservative treatments (intervention group) or conservative treatments alone (control group) to PDPH pts, headache pain was reassessed	N= 16 female obstetric pts (ASA II, average: age 28.5 ± 6.4 years, height 65 ± 1.94 inches, weight 149.61 ± 80.1 lbs) Setting: hospital inpatient Attrition: none	Intranasal lidocaine (1 puff 10% lidocaine or placebo (1 puff saline) in each nostril	Visual Analog scale for headache severity 0-10 (0= no pain, 10= worst possible pain)	Difference between sex (57.8% female, 42.2% male) & age (mean 53.32years): (P-values 0.83 sex & 0.21 age)	No significant difference between sex & age in population.	Intranasal lidocaine is effective for pain reduction in headache pts with easy administration, little side effects.	Inexpensive, Low risks/side effects, Conclusive results, No prior meds within 2 hours of intervention.

Burkett JG et al,[8] 2019	Systematical review. The retrospective review obstetrics patients who experienced PDPH from unintentional dural puncture from a 17-gauge Tuohy needle.	The study was conducted with a total of 19 participants who had PDPH, out the 19 only 3 patients required epidural blood patch to relieve symptoms.	The dependent variable in the study group is the number of participants not requiring epidural blood patch. The independent variable is the patient incidence of PDPH.	Comparisons across groups were performed using the Fisher exact test with the symptoms experienced by patients to include stiff neck, tinnitus, photophobia, diplopia, nausea, and vomiting.	In our study, SPG blockade produced a rapid relief of headache at 15 minutes, with a significant treatment effect observed at 24 hours and high patient satisfaction.	The study found sphenopalatine ganglion block given with local anesthetic and 50% and 55% avoidance of an epidural blood patch.	This systematic review showed that SPGB is a promising treatment modality for the management of PDPH with no reported complications.	Based on these data points and using the evidence level and quality guide from Johns Hopkins Nursing evidence-based practices (EBP) guidelines, we can classify this article as a Level I study design.

Kent S et al,[9] 2016	This is a small case series in which SPGB was used to treat PDPH in 3 obstetric patients. RCT.	Three postpartum patients with PDPH were studied. One patient was American Society of Anesthesia physical status 1 and 2.	ntranasal lidocaine (1 puff 10% lidocaine or placebo (1 puff saline) in each nostril	Numeric Rating Scale 0-10 (0= no pain, 10= worst possible pain) Assessed pre- block, 1 hour after, 48 hours after, 72 hours after, 120 hours after	Headache onset PDP (p= 0.8227): 29.51 hours-control group, 28.33 hours-block group	No significant difference between sex & age in population No significant difference in pre-intervention pain scores between groups	When comparing the risks of a transnasal SPGB, which include bleeding and temporary discomfort, against those of an EBP, which are documented as dural puncture, neurologic complications, bleeding, and infection, it seems reasonable to offer the SPGB before EBP	Inexpensive, Low risks/side effects, Conclusive results, No prior meds within 2 hours of intervention.
Arevalo-Rodriguez et al ,[10] 2016	**Case Study** Purpose: SPGB efficacy on PDPH Method: SPGB administered to a patient with PDPH, headache pain was reassessed	Setting: hospital inpatient Eight case reports and case series. One retrospective observational study with a sample size of 81 patients in which 42 of them (51%) underwent SPGB. O	SPGB (cotton tip with 5% lidocaine for 10 mins in both nostrils) headache severity	The participants pain scores were recorded in a 0-10 pain scale to report pain. The onset of symptom relief was documented in hour to corelated data.	**SPGB treated PDPH with no further treatments required.**	**SPGB should be used as a first-line treatment for PDPH due to low risks & quick onset.**	**SPGB should be used as a first-line treatment.**	Strengths: • Inexpensive • Low risks/ side effects

Appendix B: FIU IRB Approval

FIU | Research & Economic Development
FLORIDA INTERNATIONAL UNIVERSITY

MEMORANDUM

To: Dr. Fernando Alfonso

CC: Erick Zuniga Mejia

From: Carrie Bassols, BA, IRB Coordinator

Date: March 17, 2023

Proposal Title: "Sphenopalatine ganglion block as a first-line treatment option for post-dural puncture headache in obstetrics: An Evidence-Based Educational Module"

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-23-0125	**IRB Exemption Date:**	03/17/23
TOPAZ Reference #:	112810		

As a requirement of IRB Exemption you are required to:

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

Special Conditions: N/A

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

Appendix C: Letter of Support

Miami Beach Anesthesiology Associates, Inc.

Mount Sinai Medical Center • Division of Anesthesia

S. Howard Wittels MD
Chairman

Hector Davila MSS, MD
Executive Director

Guillermo Garcia MD
Vice Chairman

Sebastian Baquero MD

Christopher Bauer MD
Obstetrics Chief

Vicente Behrens MD

Mario Consuegra MD

Jayanand D'Mello MD
Research Coordinator

Laura Foster MD

Pablo Fumero MD

Pedro Garcia MD
Residency Program
Assist. Director

Howard Goldman MD

Alejandro Guzman MD

Rick Hasty MD

Flor Marin MD

Mark Nakajima MD

Gerald Rosen MD
Residency Program
Director

Jason Wigley MD

Alexander Volsky MD

J.P. Mato DNP, CRNA
CRNA Director & SRNA
Coordinator

Paula Schultz DNP, CRNA
OB-Chief CRNA

February 12, 2023

Fernando Alfonso, DNP, CRNA, APRN
Clinical Assistant Professor
Department of Nurse Anesthesiology
Florida International University

Dr. Fernando Alfonso,

Thank you for inviting Miami Beach Anesthesiology Associates to participate in the Doctor of Nursing Practice (DNP) project conducted by Erick Zuniga Mejia entitled ***"The use of Sphenopalatine Ganglion block in Obstetrics: An evidence-based education module"*** in the Nicole Wertheim College of Nursing and Health Sciences, Department of Nurse Anesthetist Practice at Florida International University. I have granted the student 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 proposed quality improvement project seeks to investigate and synthesize the latest evidence regarding the effectiveness of Sphenopalatine Ganglion block (SPGB) as a first-line treatment for post-dural puncture headaches (PDPH).

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: Erick Zuniga Mejia and Dr. Fernando Alfonso

Once the Institutional Review Board's approval is achieved, this scholarly project's execution will occur over two weeks. Erick Zuniga Mejia will behave professionally, follow standards of care, and not impede hospital performance. We support the participation of our Anesthesiology providers in this project and look forward to working with you.

Respectfully,

Jampierre (J.P.) Mato, DNP, CRNA, APRN
Executive CRNA Director
SRNA Coordinator/Supervisor
Electronic Mail: Jampierre@bellsouth.net
Mobile Phone: 954-668-6080

Appendix D: Informed Consent

CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

Sphenopalatine ganglion block as a first-line treatment option for post-dural puncture headache in obstetrics: An Evidence-Based Educational Module

SUMMARY INFORMATION
Things you should know about this study:

- **Purpose:** Educational module to increase providers awareness of Sphenopalatine Ganglion block as a first-line treatment option for post-dural puncture headache.
- **Procedures**: If the participant chooses to participate, they will be asked to complete a pretest, watch a voice PowerPoint, and then a post test
- **Duration:** This will take about a total of 25 minutes total.
- **Risks**: There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may include mild emotional stress or mild physical discomfort from sitting on a chair for an extended period.
- **Benefits:** The main benefit to you from this research is increase the participants knowledge on the effectives SPGB as a first-line treatment option for PDPH in obstetrics.
- **Alternatives:** There are no known alternatives available to the participant other than not taking part in this quality improvement project.
- **Participation:** Taking part in this quality improvement project is voluntary.

Please carefully read the entire document before agreeing to participate.

NUMBER OF STUDY PARTICIPANTS:

If the participant decides to be in this study, they will be one of approximately 10 people in this research study.

PURPOSE OF THE PROJECT

The participant is being asked to be in a quality improvement project. The goal of this project is to increase providers' knowledge on effectiveness of SPGB as a first-line treatment option for post-dural puncture headache and it's decrease in the need for more invasive options, such as epidural blood (EBP) patch. If you decide to participate, you will be 1 of approximately 10 participants.

DURATION OF THE PROJECT
The participation will require about 25 minutes

Appendix E: Recruitment Letter

FIU Department of Nurse Anesthesiology

Nicole Wertheim College of Nursing & Health Sciences

Sphenopalatine ganglion block as a first-line treatment option for post-dural puncture headache in obstetrics: An Evidence-Based Educational Module

Dear Miami Beach Anesthesiology Associates Perioperative Providers:

My name is Erick Zuniga, and I am a student from the Anesthesiology Nursing Program Department of Nurse Anesthesiology at Florida International University. I am writing to invite you to participate in my quality improvement project. The goal of this project is to increase health care providers' awareness on the effectiveness of Sphenopalatine ganglion block as a first-line treatment option for PDPH. You are eligible to take part in this project because you are a part of the Mount Sinai Medical Center perioperative provider.

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

Remember, this is completely voluntary. You can choose to be in the study or not. If you'd like to participate or have any questions about the study, please email or contact me Erick Zuniga at:

786-333-0644

Ezuni008@Fiu.edu

Thank you very much.

Sincerely,

Erick Zuniga

Ezuni008@fiu.edu

786-333-0644

Appendix F: Educational Module

FLORIDA INTERNATIONAL UNIVERSITY

FIU

Sphenopalatine ganglion block as a first-line treatment option for post-dural puncture headache in obstetrics: An Evidence-Based Educational Module

Erick Zuniga Mejia, BSN, RN
Dr. Fernando Alfonso, DNP, CRNA, APRN

1

LEARNING GOALS

From this quality improvement project, we will:

- Evaluate the effectiveness of Sphenopalatine ganglion block for post-dural puncture headache.
- Summarized the different treatment options
- Collaborate with healthcare professionals to increase awareness
- Apply acquired knowledge in the clinical setting
- Use evidence-based data to modify current practice

2

BACKGROUND OF THE PROBLEM

Post-dural puncture headache (PDPH) is a common complication after neuraxial anesthesia in obstetric patients; the incidence of this occurrence is affected by the type and size of the needle utilized in neuraxial anesthesia

During a spinal anesthetic, there is a loss of CSF through the dural puncture, the brain's inability to expand to maintain the intracranial volume; the body compensates by cerebral vasodilation, which results in the headache associated with PDPH due to increase blood flow and increased intracranial pressure.

The parasympathetic nervous system (PNS) is ordinarily responsible for the cerebral vasodilation seen with PDPH to compensate and equilibrate the three compartments.

EDUCATION OF THE PROBLEM

CSF leak from unintentional dural puncture leads to postdural puncture headache.

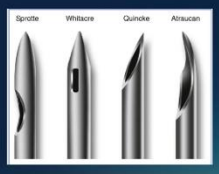
Conservative measures for treating PDPH, including supine position, hydration, analgesics, caffeine, and sumatriptan.

SPGB is less invasive and highly effective in a high percentage of patients.

Epidural blood patch is the definitive treatment making SPGB a great alternative.

Scope of the problem

- PDPH is consider a minor complication of dural puncture, according to the American Society of Anesthesiologist (ASA)
- 14% of obstetrics claims in the ASA Closed Claims Project database were due to PDPH.
- PDPH is associated with other symptoms including nausea, vomiting, neck stiffness, ocular/auditory disturbances.
- Higher incidences noted with **larger diameter needles**
- 17-gauge Tuohy needle> Quincke > **Sprotte**



FLORIDA INTERNATIONAL UNIVERSITY

5

Hallmark sings of PDPH

Postural component → Occurring almost immediately when moving to an upright position → Resolves within minutes when moving to a supine position

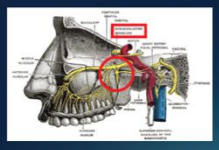
Most common presents as frontal-occipital and neck stiffness . → Photophobia may be present in some cases

FLORIDA INTERNATIONAL UNIVERSITY

6

Sphenopalatine ganglion block (SPGB)

- Blocks the parasympathetic outflow
- Prevents cerebral vascular dilation
- Local anesthetic diffuses across nasal mucosa
- Located within the pterygopalatine fossa



FLORIDA INTERNATIONAL UNIVERSITY

SPGB cont.

Retrospective studies have demonstrated that SPGB is an effective and minimally invasive treatment. → Minimal local side effects → Numbness

Lacrimation → Bitter taste → Epistaxis

FLORIDA INTERNATIONAL UNIVERSITY

Epidural blood patch (EBP)

- Effective in more then 75% of patients when performed 24hrs of PDPH.
- Second EBP is effective in about 50%
- Combined success rate of EBP is 87%
- EBP is the definitive treatment
- MAO: EBP covers the dural leak with fibrin clot

9

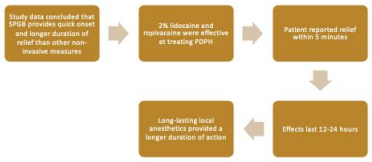
EBP Implications

- Patient must lay flat for 1-2 hours
- Infections
- Neurologic complications
- Hematologic
- Accidental dural puncture

FLORIDA INTERNATIONAL UNIVERSITY

10

Take home summary



FLORIDA INTERNATIONAL UNIVERSITY

Take home summary cont.

- 11 out of 13 patients who were treated with SPGB experience relief and 2 required EBP.
- In a 20-person study, 89% of patient treated with SPGB had adequate pain relief.
- Data support SPGB as a minimally invasive and effective treatment option
- SPGB is safe, inexpensive and well-tolerated
- SPGB is easy to performed and required minimal knowledge by providers.

FLORIDA INTERNATIONAL UNIVERSITY

References AMA

1. Jespersen MS, Jaeger P, Meyhoff CS. Sphenopalatine ganglion block for the treatment of postdural puncture headache: reply to Br J Anaesth 2020; 124: 739–47. *BJA*. 2020;125(4). doi:10.1016/j.bja.2020.06.029
2. Cohen S, Levin D, Mellender S, et al. Topical sphenopalatine ganglion block compared with epidural blood patch for postdural puncture headache management in postpartum patients. *ASRA*. 2018:1. doi:10.1097/aap.0000000000000840
3. Nair AS, Rayani BK. Sphenopalatine ganglion block for relieving postdural puncture headache: Technique and mechanism of action of block with a narrative review of efficacy. *Korean J Pain*. 2017;30(2):93-97. doi:10.3344/kjp.2017.30.2.93
4. Binfalah M, Alghawi E, Shosha E, Alhilly A, Bakhiet M. Sphenopalatine ganglion block for the treatment of acute migraine headache. *Pain Res Treat*. 2018;2018:1-6. doi:10.1155/2018/2516953
5. Rajan S, Puthenveettil N, Mohan A, Paul J, Kumar L. Sphenopalatine ganglion block for treatment of post-dural puncture headache in obstetric patients: An observational study. *IJA*. 2018;62(12):972. doi:10.4103/ija.ija_443_18

Appendix G: Pretest and Post-test Questionnaire

Pretest and Posttest Questionnaire:

Sphenopalatine ganglion block as a first-line treatment option for post-dural puncture headache in obstetrics: An Evidence-Based Educational Module

INTRODUCTION

The primary aim of this QI project is to increase providers awareness of the use and effectiveness of Sphenopalatine Ganglion block as a first-line treatment option for PDPH and the different treatment options.

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 on PDPH and Sphenopalatine Ganglion block for a treatment option.

PERSONAL INFORMATION

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

Appendix H: Citi Training Certificate Investigator

CITI PROGRAM

Completion Date 19-Feb-2021
Expiration Date 19-Feb-2024
Record ID 41060453

This is to certify that:

ERICK ZUNIGA MEJIA

Not valid for renewal of certification through CME.

Has completed the following CITI Program course:

Basic/Refresher Course - Human Subjects Research
(Curriculum Group)
Biomedical Human Research Course
(Course Learner Group)
1 - Basic Course
(Stage)

CITI
Collaborative Institutional Training Initiative

Under requirements set by:

Florida International University

Verify at www.citiprogram.org/verify/ ?w77fcf70d-b623-449d-9f45-41ecfc8357bd-41060453

Appendix I: Citi Training Certificate Supervisor

CITI PROGRAM

Completion Date 09-Feb-2023
Expiration Date 09-Feb-2026
Record ID 32187494

This is to certify that:

Fernando Alfonso

Not valid for renewal of certification through CME.

Has completed the following CITI Program course:

Basic/Refresher Course - Human Subjects Research
(Curriculum Group)
Biomedical Human Research Course
(Course Learner Group)
2 - Refresher Course
(Stage)

CITI
Collaborative Institutional Training Initiative

Under requirements set by:

Florida International University

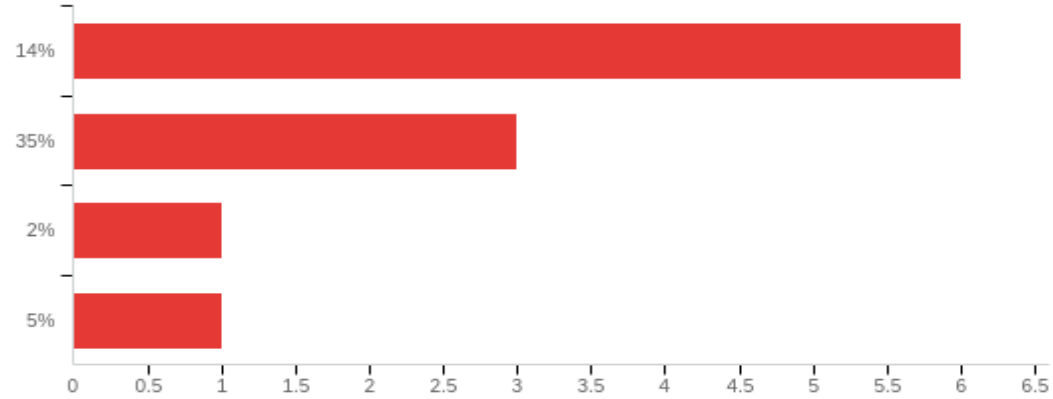
Verify at www.citiprogram.org/verify/?w62d4d185-762f-418d-aac2-c8738864cd27-32187494

Appendix J: SWOT Chart

Strengths	Weakness
• Safety • Minimal side effects • Rapid action • Facility acceptance	• Limited data and randomized control trials • Staff unfamiliarity • Limit patient numbers • No previous protocol
Opportunities	**Threats**
• Noninvasive treatment • Patient improvement of pain and increase satisfaction. • Reduced need for EBP • Change in current practice	• Patient perceived lack of efficacy • Reimbursement

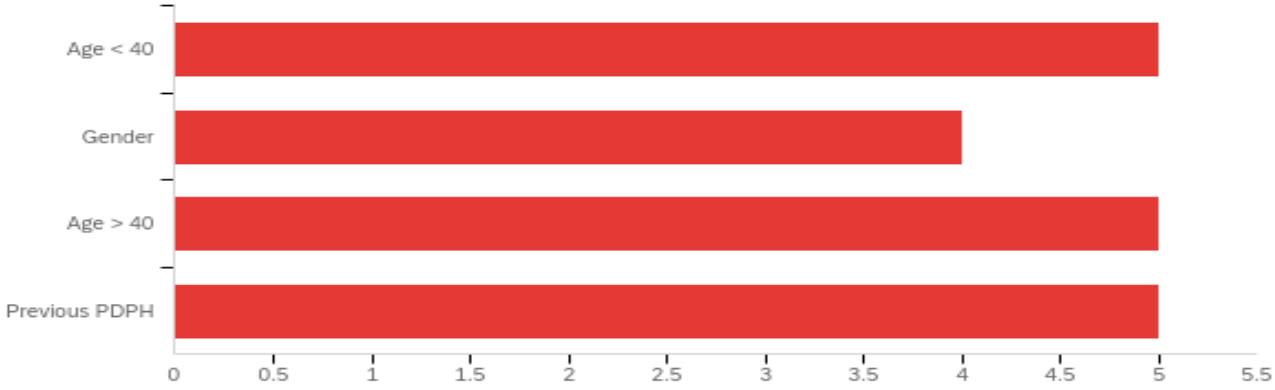
Appendix K: Pretest Results

Pre_Q1 - PDPH is considered a “minor complication” of dural puncture, and it’s the cause of _____ % of obstetrics claims.



#	Answer	%	Count
1	14%	54.55%	6
2	35%	27.27%	3
3	2%	9.09%	1
4	5%	9.09%	1
	Total	100%	11

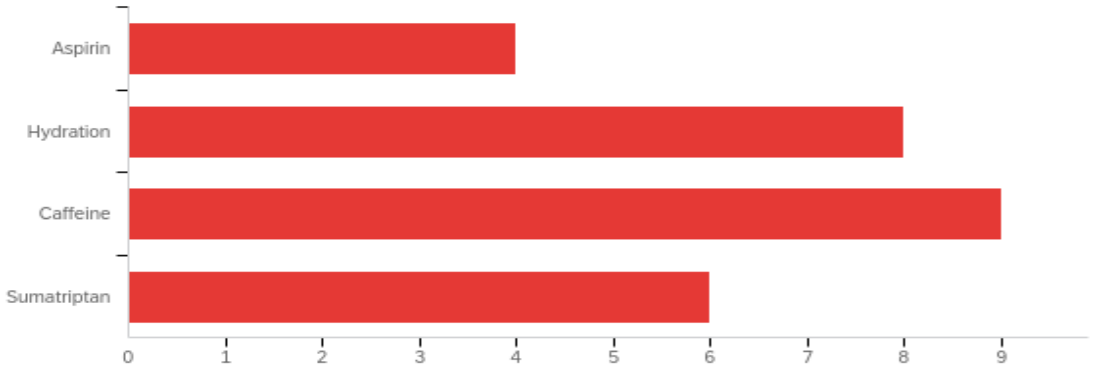
Pre_Q2 - What are the risk factors for post-surgical puncture headaches? Select 2



#	Answer	%	Count
1	Age < 40	26.32%	5
2	Gender	21.05%	4

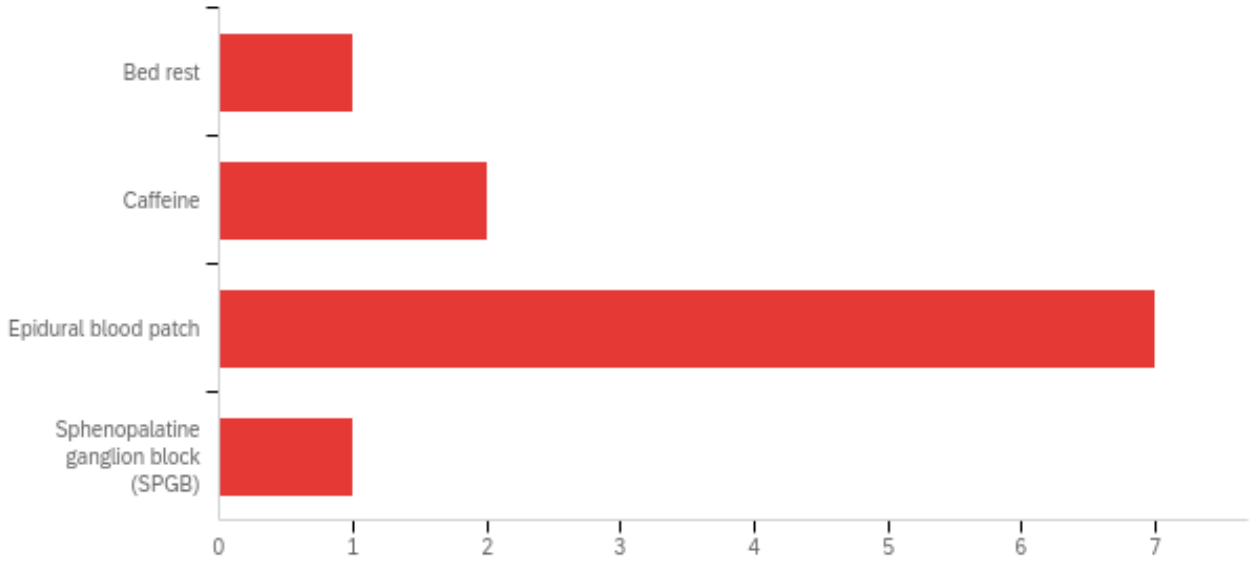
3	Age > 40	26.32%	5
4	Previous PDPH	26.32%	5
	Total	100%	19

Pre_Q3 - What are some non-invasive treatment options for postural puncture headache? Select 3



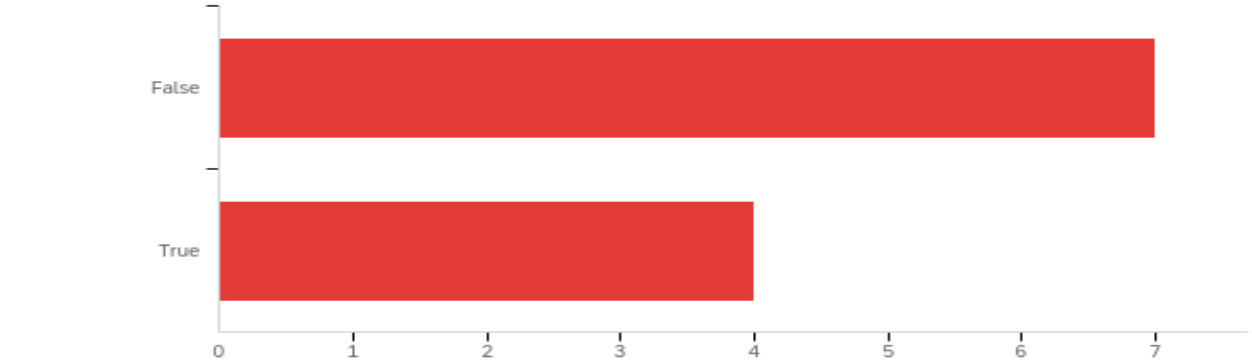
#	Answer	%	Count
1	Aspirin	14.81%	4
2	Hydration	29.63%	8
3	Caffeine	33.33%	9
4	Sumatriptan	22.22%	6
	Total	100%	27

Pre_Q4 - What is the definitive treatment for postural puncture headache?



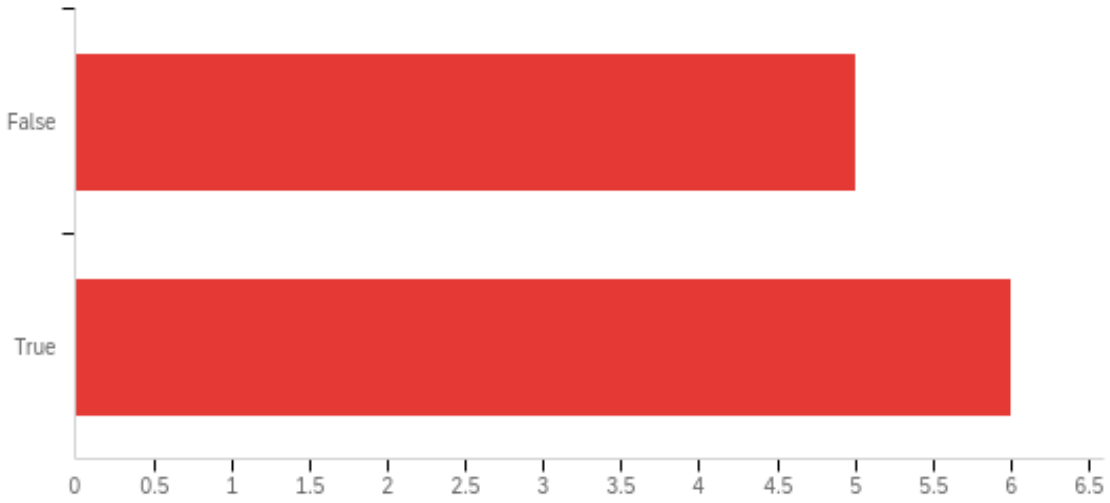
#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What is the definitive treatment for Post-Dural Puncture headache?	1.00	4.00	2.73	0.75	0.56	11

Pre-Q5 - Is sphenopalatine ganglion block an invasive treatment modality for Post-Dural Puncture Headache?



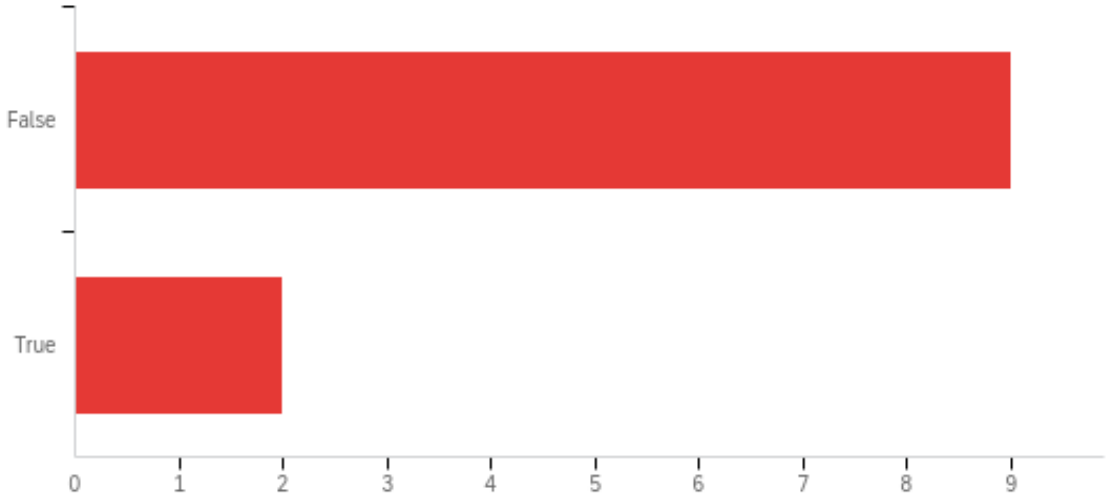
#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Is sphenopalatine ganglion block an invasive treatment modality for Post-Dural Puncture Headache?	1.00	2.00	1.36	0.48	0.23	11

Pre_Q6 - The larger the needle diameter, the higher the incidence of PDPH.



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	The larger the needle diameter the higher the incidence of PDPH?	1.00	2.00	1.55	0.50	0.25	11

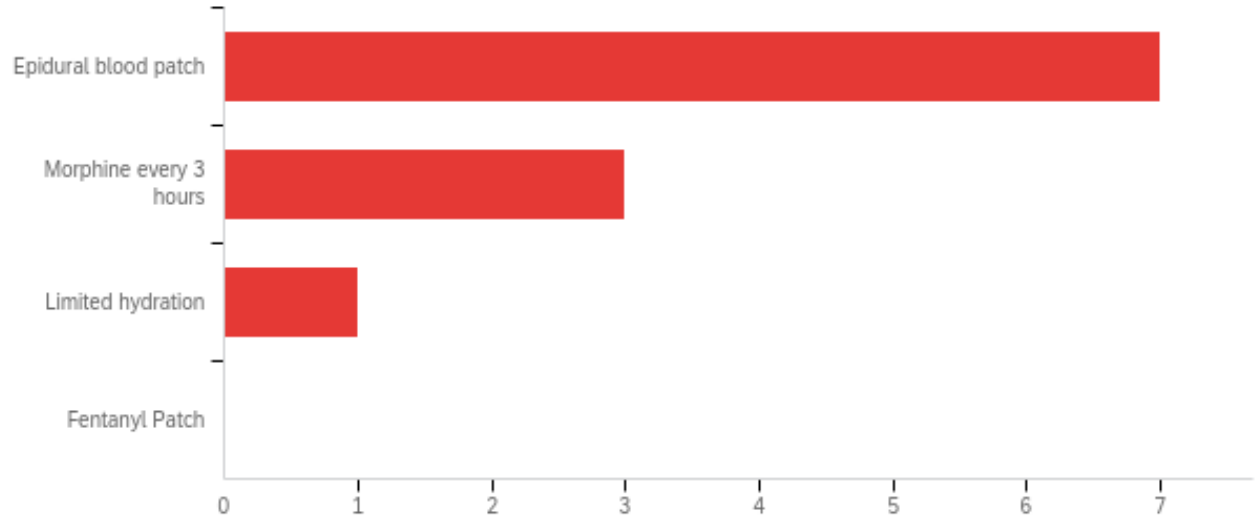
Pre_Q7 - The onset of PDPH is not immediate and does not have a postural component:



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	The onset of PDPH is not immediate and does not have a postural component:	1.00	2.00	1.18	0.39	0.15	11

#	Answer	%	Count
1	False	81.82%	9
2	True	18.18%	2
	Total	100%	11

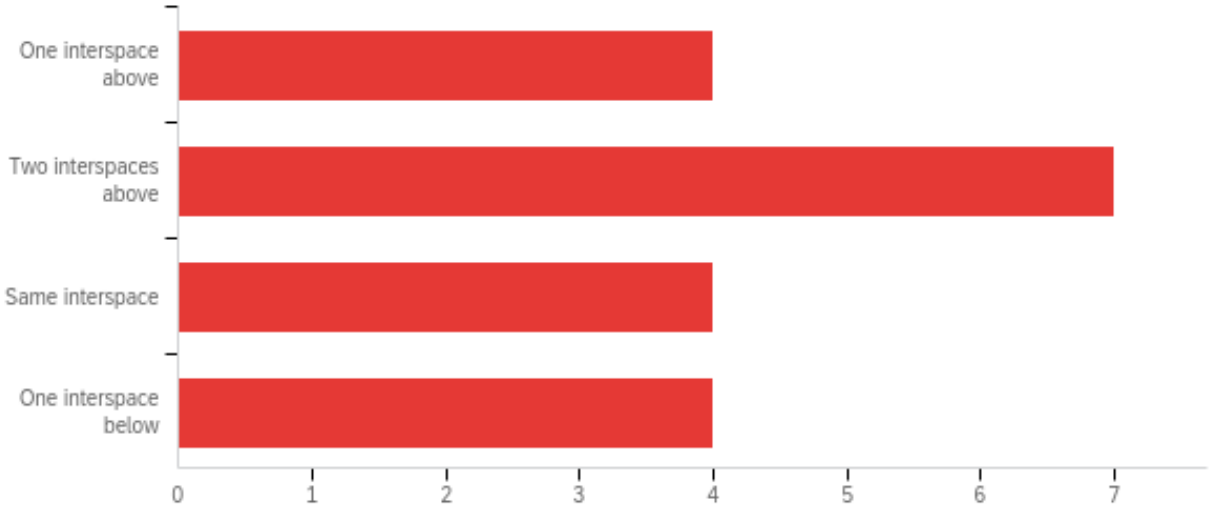
Pre_Q8 - How should PDPH unresponsive to other measures be treated?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How should PDPH unresponsive to other measures be treated?	1.00	3.00	1.45	0.66	0.43	11

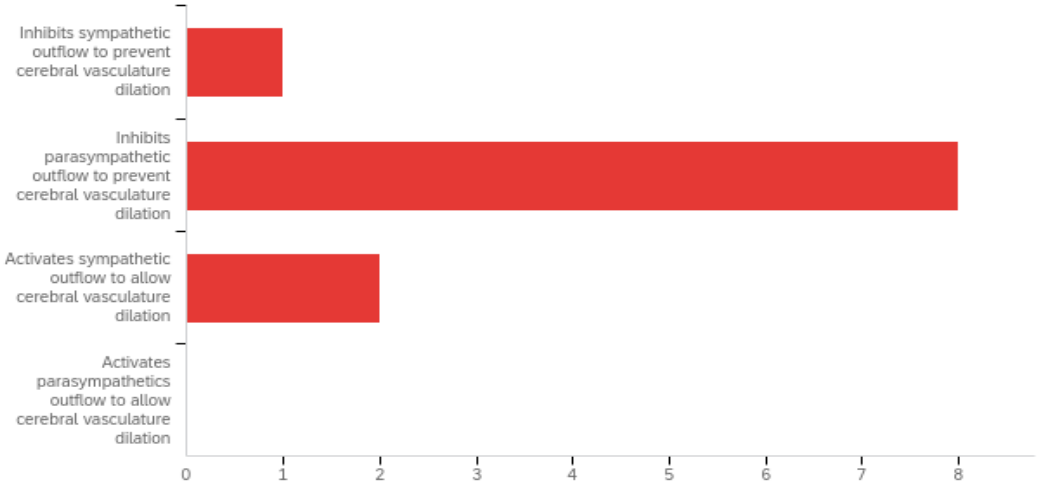
#	Answer	%	Count
1	Epidural blood patch	63.64%	7
2	Morphine every 3 hours	27.27%	3
3	Limited hydration	9.09%	1
4	Fentanyl Patch	0.00%	0
	Total	100%	11

Pre_Q9 - Where should an Epidural blood patch be placed for the treatment of PDPH? Select 2



#	Answer	%	Count
1	One interspace above	21.05%	4
2	Two interspaces above	36.84%	7
3	Same interspace	21.05%	4
4	One interspace below	21.05%	4
	Total	100%	19

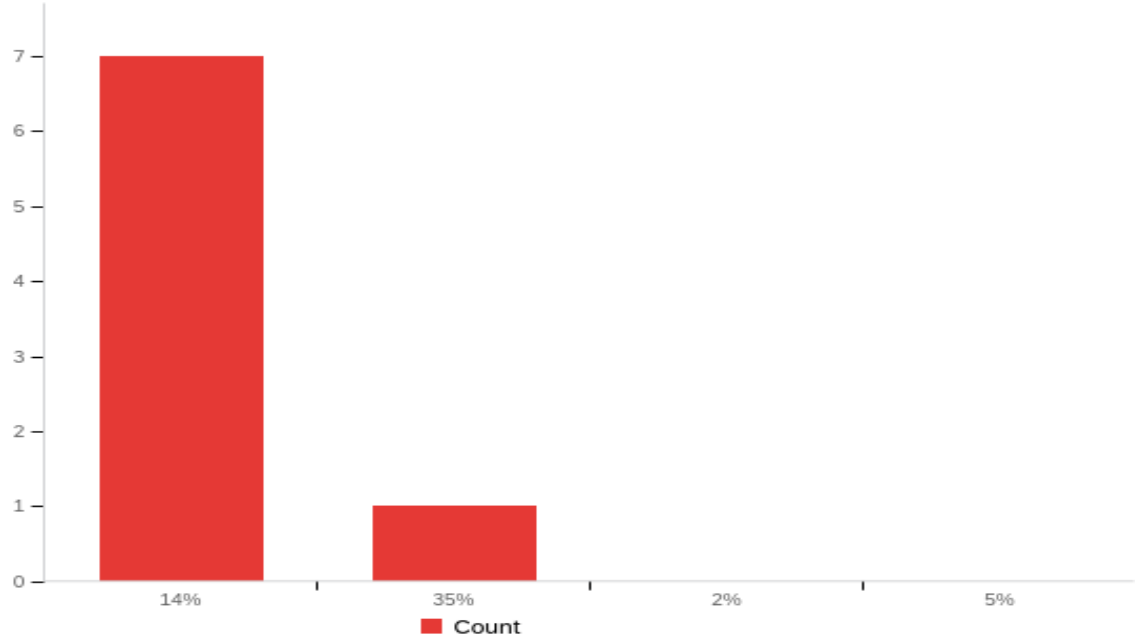
Pre_Q10 - Mechanism of action of Sphenopalatine ganglion block:



#	Answer	%	Count
1	Inhibits sympathetic outflow to prevent cerebral vasculature dilation	9.09%	1
2	Inhibits parasympathetic outflow to prevent cerebral vasculature dilation	72.73%	8
3	Activates sympathetic outflow to allow cerebral vasculature dilation	18.18%	2
4	Activates parasympathetics outflow to allow cerebral vasculature dilation	0.00%	0
	Total	100%	11

Appendix L: Posttest Results

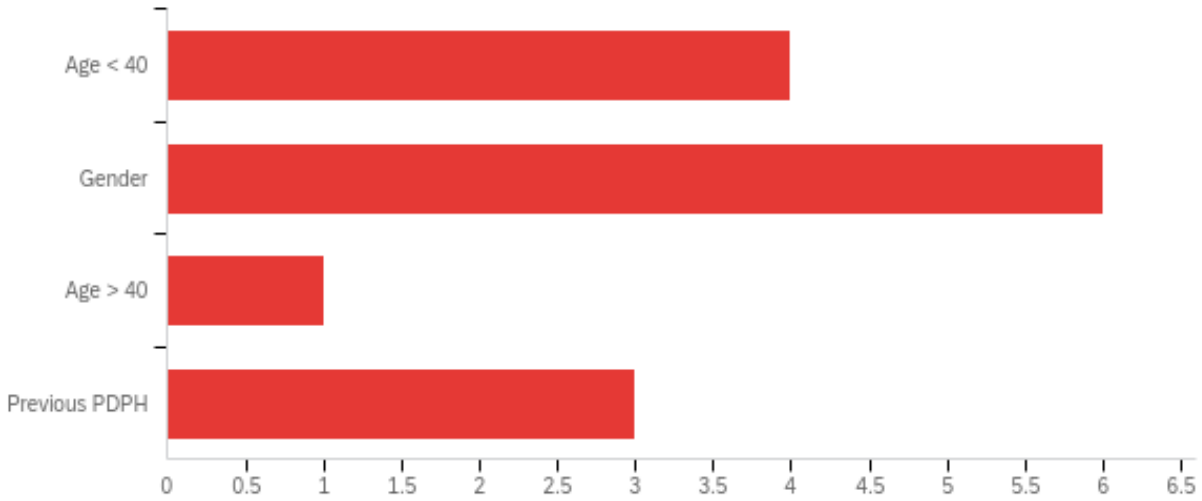
Q1 - PDPH is consider a “minor complication” of dural puncture and it’s the cause of _____ % of obstetrics claims?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	PDPH is consider a “minor complication” of dural puncture and it’s the cause of _____ % of obstetrics claims?	1.00	2.00	1.13	0.33	0.11	8

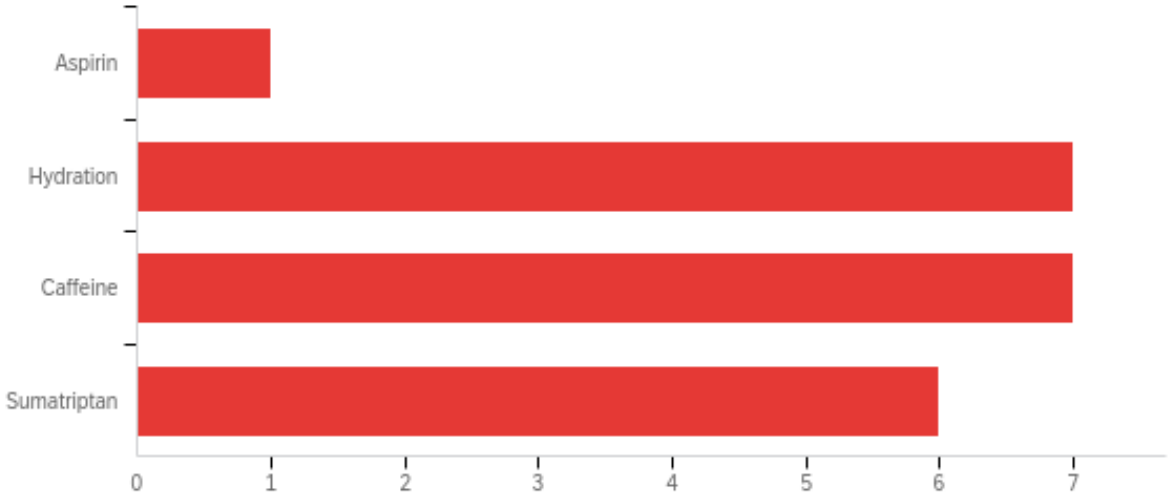
#	Answer	%	Count
1	14%	87.50%	7
2	35%	12.50%	1
3	2%	0.00%	0
4	5%	0.00%	0
	Total	100%	8

Q2 - What are risk factors for Post-Dural Puncture headaches? **Select 2**



#	Answer	%	Count
1	Age < 40	28.57%	4
2	Gender	42.86%	6
3	Age > 40	7.14%	1
4	Previous PDPH	21.43%	3
	Total	100%	14

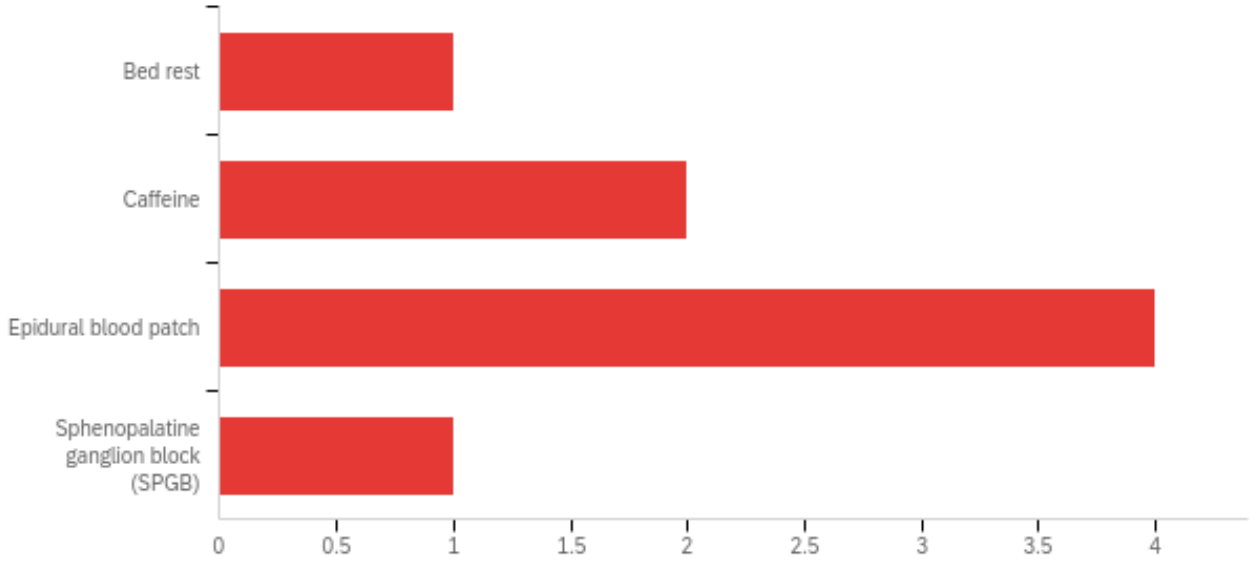
Q3 - What are some non-invasive treatment options for Post-Dural Puncture headache? **Select 3**



#	Answer	%	Count
1	Aspirin	4.76%	1

2	Hydration	33.33%	7
3	Caffeine	33.33%	7
4	Sumatriptan	28.57%	6
	Total	100%	21

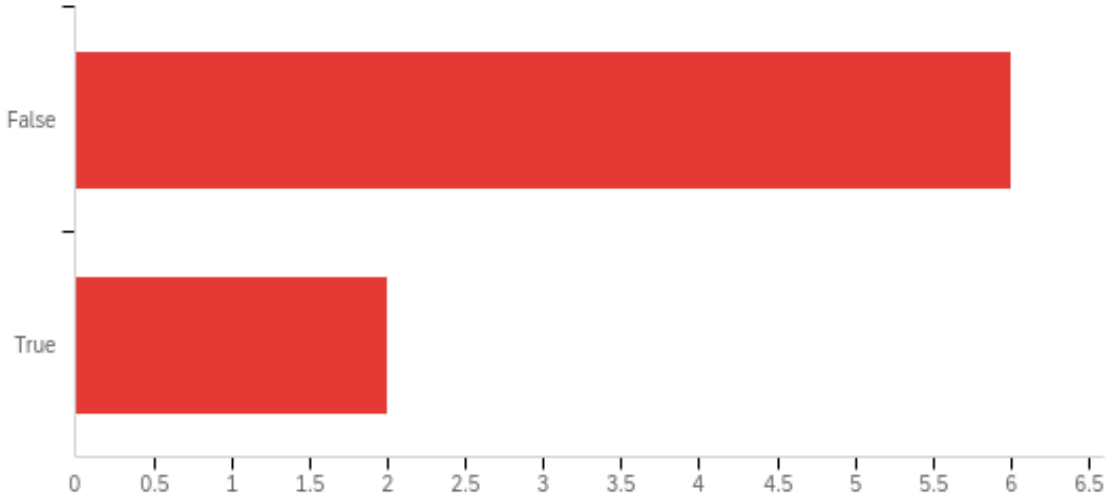
Q4 - What is the definitive treatment for Post-Dural Puncture headache?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What is the definitive treatment for Post-Dural Puncture headache?	1.00	4.00	2.63	0.86	0.73	8

#	Answer	%	Count
1	Bed rest	12.50%	1
2	Caffeine	25.00%	2
3	Epidural blood patch	50.00%	4
4	Sphenopalatine ganglion block (SPGB)	12.50%	1
	Total	100%	8

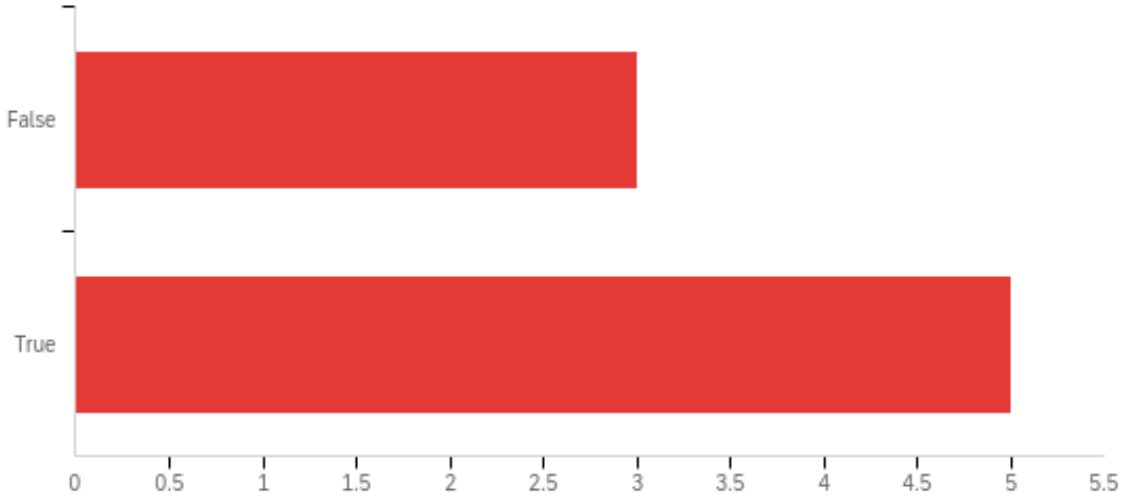
Q5 - Is sphenopalatine ganglion block an invasive treatment modality for Post-Dural Puncture Headache?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Is sphenopalatine ganglion block an invasive treatment modality for Post-Dural Puncture Headache?	1.00	2.00	1.25	0.43	0.19	8

#	Answer	%	Count
1	False	75.00%	6
2	True	25.00%	2
	Total	100%	8

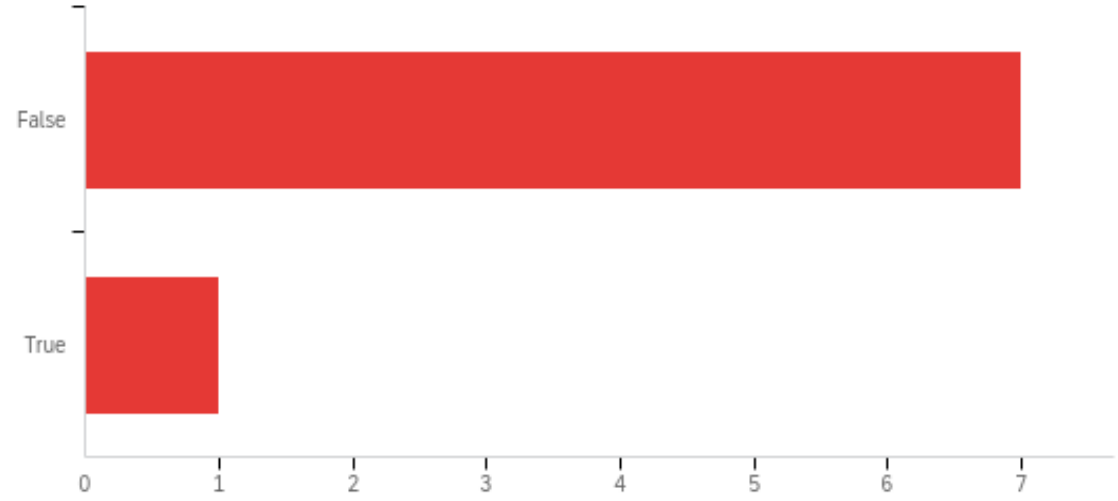
Q6 - The larger the needle diameter the higher the incidence of PDPH?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	The larger the needle diameter the higher the incidence of PDPH?	1.00	2.00	1.63	0.48	0.23	8

#	Answer	%	Count
1	False	37.50%	3
2	True	62.50%	5
	Total	100%	8

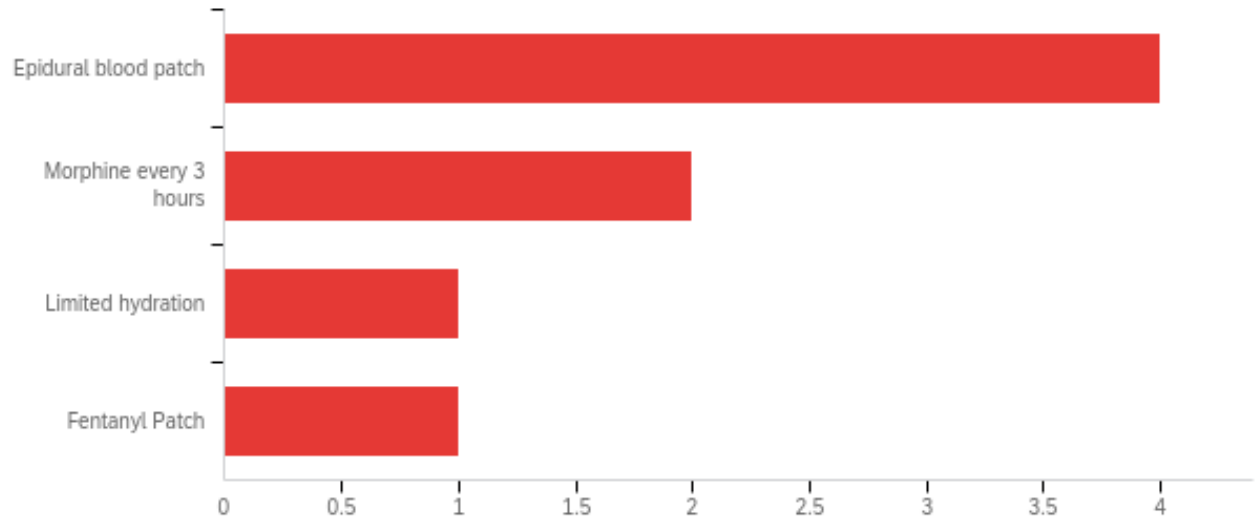
Q7 - The onset of PDPH is not immediate and does not have a postural component:



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	The onset of PDPH is not immediate and does not have a postural component:	1.00	2.00	1.13	0.33	0.11	8

#	Answer	%	Count
1	False	87.50%	7
2	True	12.50%	1
	Total	100%	8

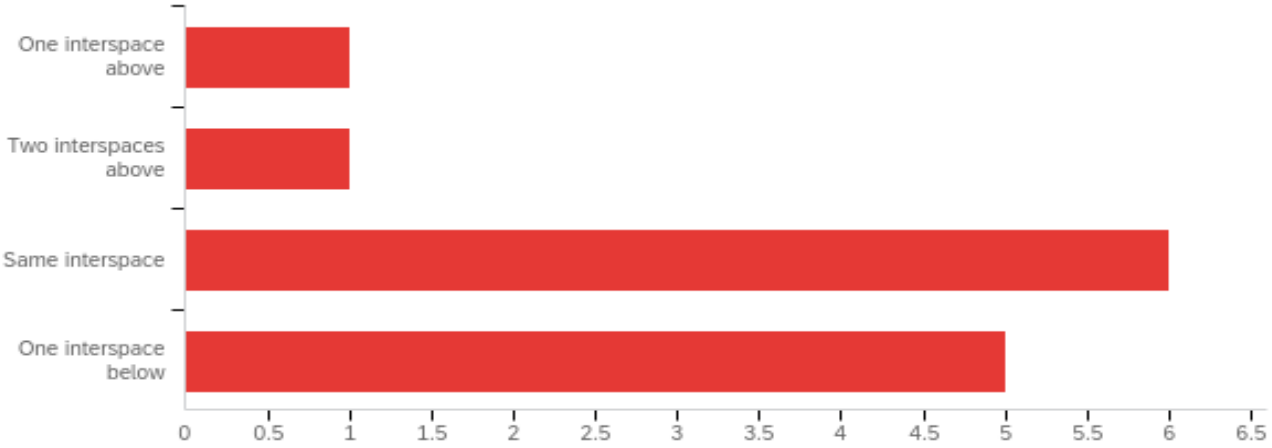
Q8 - How should PDPH unresponsive to other measures be treated?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How should PDPH unresponsive to other measures be treated?	1.00	4.00	1.88	1.05	1.11	8

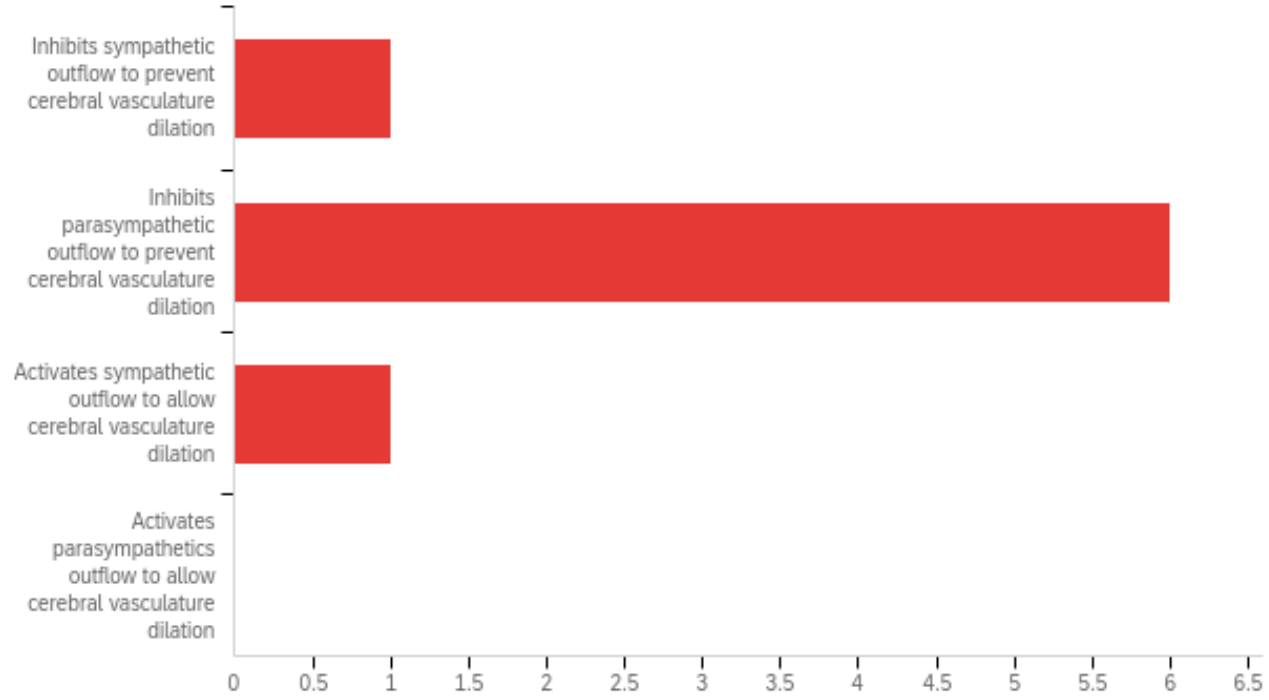
#	Answer	%	Count
1	Epidural blood patch	50.00%	4
2	Morphine every 3 hours	25.00%	2
3	Limited hydration	12.50%	1
4	Fentanyl Patch	12.50%	1
	Total	100%	8

Q9 - Where should an Epidural blood patch be placed for the treatment of PDPH? Select 2



#	Answer	%	Count
1	One interspace above	7.69%	1
2	Two interspaces above	7.69%	1
3	Same interspace	46.15%	6
4	One interspace below	38.46%	5
	Total	100%	13

Q10 - Mechanism of action of Sphenopalatine ganglion block:



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Mechanism of action of Sphenopalatine ganglion block:	1.00	3.00	2.00	0.50	0.25	8

#	Answer	%	Count
1	Inhibits sympathetic outflow to prevent cerebral vasculature dilation	12.50%	1
2	Inhibits parasympathetic outflow to prevent cerebral vasculature dilation	75.00%	6
3	Activates sympathetic outflow to allow cerebral vasculature dilation	12.50%	1
4	Activates parasympathetics outflow to allow cerebral vasculature dilation	0.00%	0
	Total	100%	8

Appendix M: DNP Symposium Presentation