

Perspectives on Analgesia in Patients with Nerve Blocks: A Pilot Survey of Perioperative Nurses

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Background: The influence of nerve blocks on treatment bias, a form of implicit bias where patient characteristics lead to unequal treatment, remains unexplored.

Methods: This was a pilot study that utilized a survey to collect data from nurses at a single academic medical center. The following information was collected from the respondents: age (years); gender (male, female, other); nursing experience (years); specialization (surgery, medicine, emergency, perioperative, other); prior formal training on pain management in patients with or without nerve blocks; and how frequently they encounter patients with nerve blocks. Hypothetical clinical scenarios were presented to investigate pain medication dosing strategies that were rated with a 3-point Likert scale (more, equal, or less medication). Impacts of various patient conditions (alcohol abuse, anxiety, depression, marijuana use, nerve block, opioid abuse, and substance abuse) on pain medication and opioid dosing strategies were further investigated with a 5-point Likert scale (ranging from strongly disagree to strongly agree).

Results: Overall, the survey had a 32.59% response rate. Treatment bias towards patients with nerve blocks was evident in 21.43% (9/42) and 11/30 (36.67%) of respondents for pain medications and opioids, respectively.

Conclusion: This pilot study suggests that patients with nerve blocks may be treated differently than those without blocks, regardless of their reported pain. However, given the study's exploratory design, these findings should be interpreted as hypothesis-generating.

Keywords: treatment bias, analgesia

Introduction

Treatment bias, a form of implicit bias where patient characteristics lead to unequal treatment, is a major problem in pain research.¹ Prior literature has focused on treatment bias stemming from racial or ethnic differences.^{1–4} The influence of nerve blocks on treatment bias (administration of more or less medications to patients with nerve blocks) remains unexplored.

Patients with nerve blocks commonly require fewer opioids.⁵ Therefore, nurses may dose opioids more conservatively for patients with nerve blocks. While this dosing strategy may seem consistent with multimodal analgesia, it may also undertreat pain if the nerve block is partially or completely ineffective and may also disregard rebound pain.⁶ Therefore, the patient's subjective report of pain is critical to differentiate multimodal analgesia from treatment bias. For example, if two patients report the same pain score, but only one patient has a nerve block, then any variability in treatment between these patients would signify a treatment bias. If, however, the patients reported different pain scores and their pain was treated relative to the number reported, then this would signify multimodal analgesia.

Beyond the blatant inequality of treatment, treatment bias may decrease patient satisfaction if pain is not adequately addressed.⁷ Research investigating the utility of nerve blocks commonly report cumulative opioid doses administered to patients with nerve blocks compared to patients without them.^{8,9} However, opioid consumption is an unreliable outcome measure in the setting of treatment bias since opioids may have been inappropriately withheld. Therefore, the impact of treatment bias towards patients with nerve blocks is important from clinical and research perspectives.

To address the paucity of research investigating treatment bias in the setting of nerve blocks, perioperative nurses were surveyed on their clinical practices as well as perceived barriers to delivering effective pain management. This pilot study was designed to generate hypotheses to guide future research about treatment bias in patients with nerve blocks.

Methods

The University of North Carolina at Chapel Hill Institutional Review Board determined this study to be exempt as it presented no more than minimal risk to study participants (IRB number: 24-0404). Consent to participate in the study was implied upon the survey's completion and "prefer not to answer" was an allowable answer choice for all questions. Identifiable information was not collected from the respondents, and hypothetical clinical scenarios were not based on actual patient cases.

This survey's intent was a pilot to collect data that could generate hypotheses for further research and a sample size calculation was not performed. All perioperative nurses at our institution were invited to participate with the survey distributed via emails by nursing leadership. Multiple reminder emails were sent over the course of 6 months following the initial invitation. No incentive was offered to complete the survey.

Qualtrics (Qualtrics, Provo, UT) software was used to create the survey. The following information was collected from the respondents: age (years), gender (male, female, other), nursing experience (years), and specialization (surgery, medicine, emergency, perioperative, other). Prior formal training of the respondents was queried with the following questions: "Have you received specific training on pain management, nerve blocks, or pain management in patients with nerve blocks?" Respondents were also asked to estimate how frequently they encounter patients with nerve blocks: never, rarely (one every two to three months), occasionally (one per month), frequently (one per week), always (daily), and prefer not to answer.

Baseline perception of postoperative pain was assessed with the following statements, which were rated with a 5-point Likert scale (strongly agree, agree, neutral, disagree, or strongly disagree): (1) postoperative pain can be adequately managed with no or minimal opioids in most patients; (2) nerve blocks effectively reduce pain in most patients; and (3) nurses should limit opioid doses in patients with nerve blocks. Next, hypothetical clinical scenarios were prefaced with the following instructions: "You are taking care of two patients: Patient A and Patient B. They each had surgery yesterday but DIFFER ONLY IN ONE WAY as each cartoon will demonstrate. Patient A and Patient B both report 7/10 acute postsurgical pain. Physician orders allow for pain medication to be given over a wide range of dosages. The dose chosen is AT YOUR DISCRETION". Nurses then filled in the following statement with a 3-point Likert scale (less than, equal to, or more than): "Patient A should receive a dose (less than, equal to, or more than) the dose given to patient B".

An example of the cartoon depicting Patients A and B is shown in Figure 1. These clinical vignettes served as simplifications of complex, real-world scenarios.

Opioid dosing strategies of nurses were characterized with the following statement:

The following elements of a patient's history should impact opioid dosing: substance abuse other than opioids; opioid abuse; alcohol abuse; marijuana; anxiety; depression; and nerve block.

The nurses rated their agreement with each statement using a 5-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, or strongly disagree). Opioid dosing strategies were further clarified with the following statement, which respondents rated using a 3-point Likert scale:

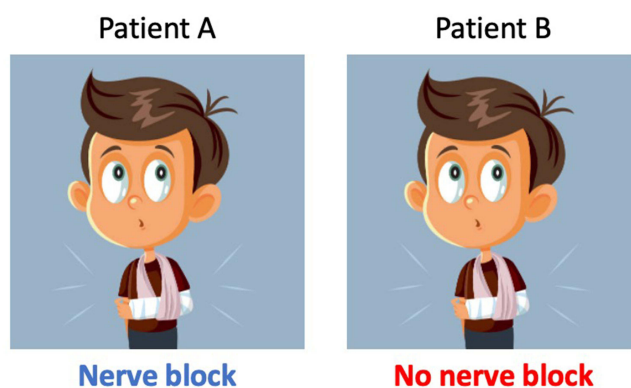


Figure 1 Survey Cartoon Showing Patient A with a Nerve Block and Patient B without a Nerve Block.

The following elements of a patient's history should lead to which opioid dosing strategy (less opioids, no change in opioids, or more opioids): substance abuse other than opioids; opioid abuse; alcohol abuse; marijuana; anxiety; depression; and nerve block.

Barriers to effective pain management in patients with nerve blocks were investigated with the following statements rated with a 4-point Likert scale (not a barrier, somewhat of a barrier, moderate barrier, or significant barrier): (1) lack of sufficient knowledge about expected analgesia from different nerve blocks; (2) pressure to keep opioid doses low; and (3) pressure to treat pain with opioids. The survey ended with an opportunity for respondents to free-text additional comments regarding "additional thoughts or experiences related to pain management and opioid use in patients with nerve blocks". The complete survey was uploaded as [Supplemental File 1](#).

This was a pilot study; thus, no hypothesis was tested. Furthermore, because of its exploratory nature as a pilot study, sample size calculations were not conducted a priori. Nonetheless, this study sought to characterize the possible treatment bias of nurses for patients with nerve blocks. All statistical analyses were conducted with STATA/SE 17.0 software (StataCorp, College Station, TX). Population details were described using mean (standard deviation (SD)) for continuous measures and percentages for categorical measures. Wilcoxon signed rank test was used to compare the statistical significance of differences in Likert scale ratings. Additional results were presented with percentages and two-sample test of proportions.

Results

Of the 135 nurses (25 nurses at Hillsborough Medical Center; 31 nurses at the Ambulatory Surgery Center; and 79 nurses in the Chapel Hill Medical Center) who received the survey, 44 nurses completed at least a portion of it for a response rate of 32.59%. Among the nurses who participated, most were female with a mean age of 41 years (SD 10 years), had specialization in perioperative services, and 61% of respondents frequently (one patient per week) care for patients with nerve blocks. Complete demographic information is presented in [Table 1](#).

Table 1 Demographic Information of Survey Respondents

Population Characteristic	Value
Age	41 (10)
Gender	
Female	98%
Male	2%
Experience (years)	
< 5	16%
5–9	18%
10–19	25%
20–29	23%
> 29	18%
Specialization	
Perioperative	82%
Surgery	11%
Post-anesthesia care unit/pain management	7%

(Continued)

Table 1 (Continued).

Population Characteristic	Value
Prior Formal Training	
Pain management	15.9%
Nerve blocks and pain management	6.8%
Pain management and pain management in patients with nerve blocks	4.5%
Nerve blocks, pain management, and pain management in patients with nerve blocks	65.9%
Frequency caring for patients with nerve blocks	
Rarely (one every 2–3 months)	2%
Occasionally (one per month)	9%
Frequently (one per week)	61%
Always (daily)	27%

Note: Data are presented as mean (standard deviation) for continuous measures and % for categorical measures.

Survey Descriptive Data

Most (90.9% or 40/44) respondents “agree” or “strongly agree” that “nerve blocks effectively reduce pain in most patients”. However, there was considerable disagreement among respondents answering the following statement: “Postoperative pain can be adequately managed with no or minimal opioids in most patients”. While 50% (22/44) of respondents “disagree” or “strongly disagree” with that statement, 36.4% (16/44) of respondents “agree” or “strongly agree”, and 13.6% (6/44) of respondents were unsure. There was also considerable variability in responses to the following statement: “Nurses should limit opioid doses in patients with nerve blocks”. While 34.1% (15/44) of respondents “disagree” or “strongly disagree” with that statement, 43.2% (19/44) of respondents “agree” or “strongly agree”, and 22.7% (10/44) of respondents were unsure. These results are presented in [Figure 2](#).

Survey Question Categories

Patient Factors

There was no consensus in with the following statement: “[Nerve block] should impact opioid dosing”. While 29.73% (11/37) of respondents “disagree” or “strongly disagree” with that statement, 45.95% (17/37) of respondents “agree” or “strongly agree” with it. Two-sample test of proportions did not indicate a difference ($P = 0.1503$) among the proportion of respondents who selected “agree” or “strongly agree” compared to the proportion of respondents who selected “disagree” or “strongly disagree”. A consensus was also not seen for the impacts of anxiety, depression, and marijuana on opioid dosing. While 35.14% (13/37) respondents “agree” or “strongly agree” that anxiety should impact opioid dosing, 40.54% (15/37) “disagree” or “strongly disagree” with that statement ($P = 0.6320$). Similarly, there was a lack of statistically significant difference between respondents who “agree” or “strongly agree” and those who “disagree” or “strongly disagree” that depression and marijuana should impact opioid dosing ($P = 0.0853$ and $P = 0.6320$, respectively). Most respondents “agree” or “strongly agree” that prior abuse of alcohol, opioids, or other substances should impact opioid dosing: 52.78% (19/36); 78.34% (29/37); and 59.46% (22/37), respectively. These results are graphically presented in the bar chart in [Figure 3](#).

Hypothetical Clinical Scenarios

In a hypothetical clinical scenario in which two patients report 7/10 pain but only one patient has a nerve block, 21.43% (9/42) of respondents stated that the patient with the nerve block should receive a dose of pain medication “less than” the dose given to the patient without the nerve block. Two-sample test of proportions indicated a statistically significant ($P < 0.0001$) difference among the frequency of respondents selecting “less than” (9/42) compared to the frequency of respondents

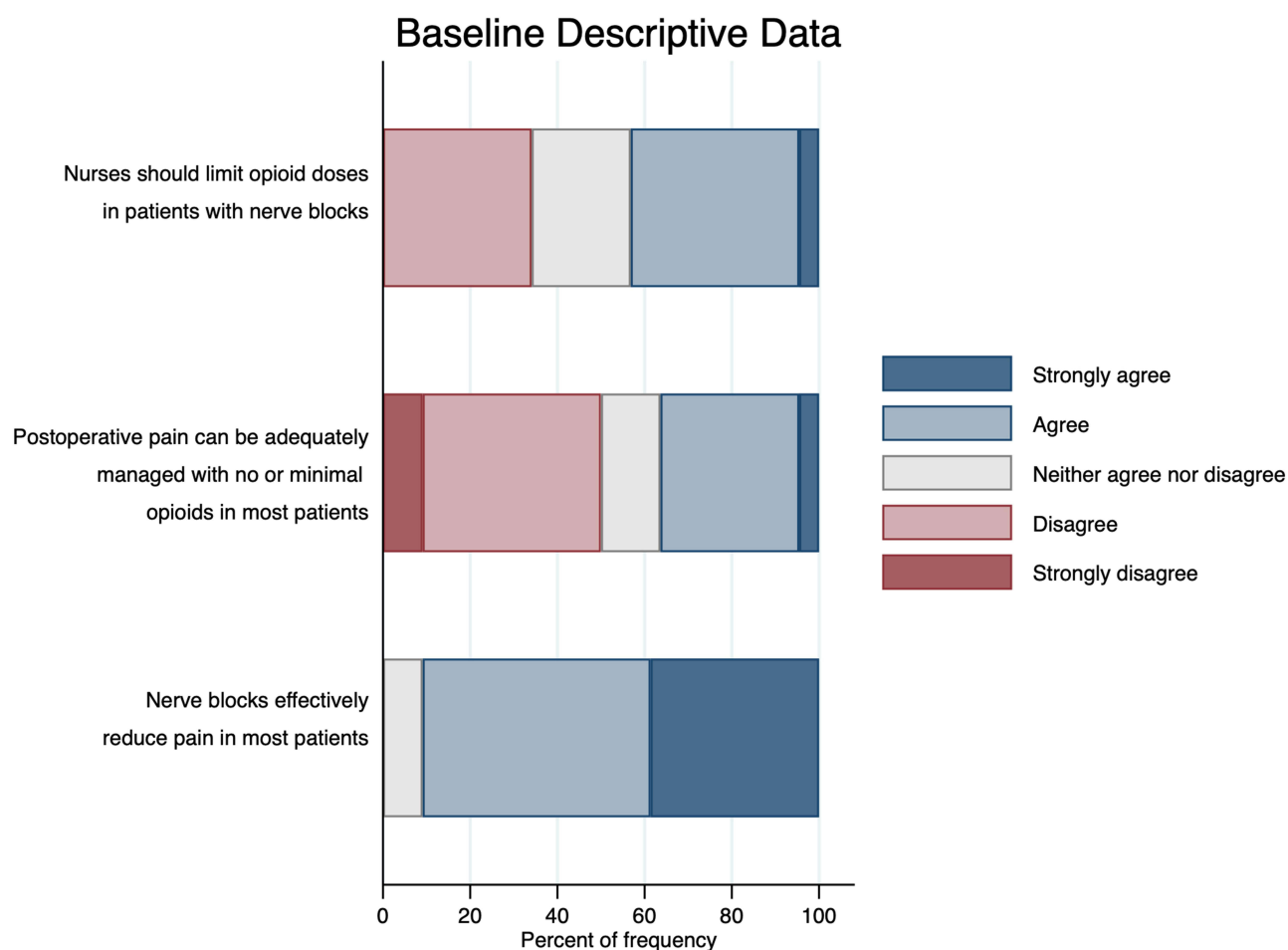


Figure 2 Baseline Descriptive Data from Survey Respondents.

selecting “more than” (1/42) or “equal to” (32/42). The majority of respondents indicated that alcohol (29/42 or 69.05%), anxiety (37/41 or 90.24%), depression (37/41 or 90.24%), substance abuse (26/42 or 61.90%), and marijuana use (31/41 or 75.61%) should not impact opioid dosing in this hypothetical clinical scenario. Conversely, 60.98% (25/41) of respondents selected that, if the patients were to differ by a history of prior opioid abuse, the patient with prior opioid abuse should receive “more opioids” and this was statistically significant ($P = 0.0467$) with two-sample test of proportions.

Results of one-sided Wilcoxon signed rank tests indicated more frequent selection by nurses to administer fewer pain medications to patients with nerve blocks as well as patients with prior opioid abuse ($P < 0.0001$), alcohol abuse ($P = 0.007$), substance abuse ($P < 0.0001$), marijuana ($P = 0.0001$), anxiety ($P = 0.0107$), or depression ($P = 0.0195$). These results are graphically presented as bar charts in Figure 4A.

Opioid Dosing Strategy

While the majority of respondents selected “no change in opioids” as the most appropriate opioid dosing strategy for patients with nerve blocks, 11/30 (36.67%) of respondents indicated that “less opioids” should be used when treating these patients. Overall, two-sample test of proportions indicated no statistically significant difference in these two responses ($P = 0.1205$). An error with the survey inappropriately presented the answer choices as number values ranging from 1–4 instead of the desired Likert scale (less opioids, no change in opioids, more opioids, and prefer not to answer). This error led to 8 responses being removed from analysis.

Results of one-sided Wilcoxon signed rank tests indicated more frequent selection by nurses to administer fewer opioids to patients without nerve blocks as well as patients with prior opioid abuse ($P = 0.0039$), alcohol abuse ($P = 0.0020$),

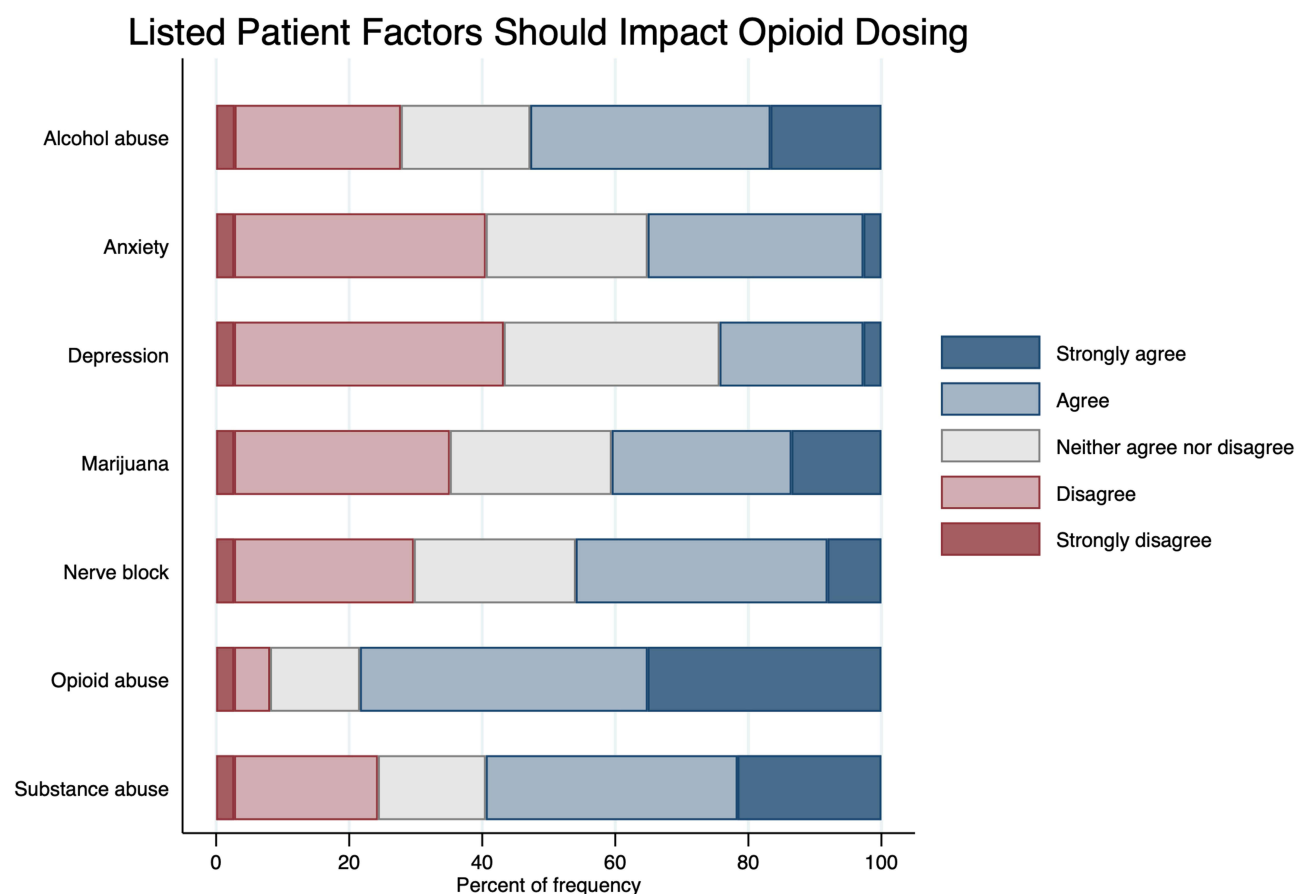


Figure 3 Survey Responses Regarding Impact of Patient Factors on Opioid Dosing.

substance abuse ($P = 0.0020$), anxiety ($P = 0.0020$), depression ($P = 0.0010$), and marijuana use ($P = 0.0020$). These results are graphically presented in the bar chart in Figure 4B.

Barriers to Effective Pain Management

“Lack of sufficient knowledge about expected analgesia from different nerve blocks” was selected as a “moderate barrier” (10/36) or “significant barrier” (8/36) in 50% of respondents. Conversely, “pressure to keep opioid doses low” and “pressure to treat pain with opioids” were selected as moderate to significant barriers in only 25% (9/36) and 30.36% (11/36) of respondents, respectively. These results are graphically presented in the bar chart in Figure 5.

Discussion

This study assessed the opinions of nurses at a major academic medical center regarding the impact of various patient characteristics on the dosing of opioids and other pain medications. While this pilot study did not test a hypothesis, it sought to compare the dosing strategies of nurses based on patient characteristics so that hypotheses could be generated and guide future research.

Baseline descriptive data revealed that nurses agree or strongly agree that nerve blocks effectively reduce pain in most patients, but opinions varied widely when asked if opioids should be limited in patients with nerve blocks and whether pain could be adequately treated with minimal or no opioids. Most respondents felt that substance abuse, opioid abuse, and alcohol abuse should impact opioid dosing, but were unsure with regard to the impact of anxiety, depression, and marijuana.

Treatment bias towards patients with nerve blocks was evident in 21.43% (9/42) and 11/30 (36.67%) of respondents for pain medications and opioids, respectively. This bias’s presence in a minority of the respondents should not be interpreted as a non-significant result, for a substantial fraction of nurses exhibited this bias. Furthermore, a bias does not

Directional Impact on Pain Management Dosing Strategies by Patient Factors

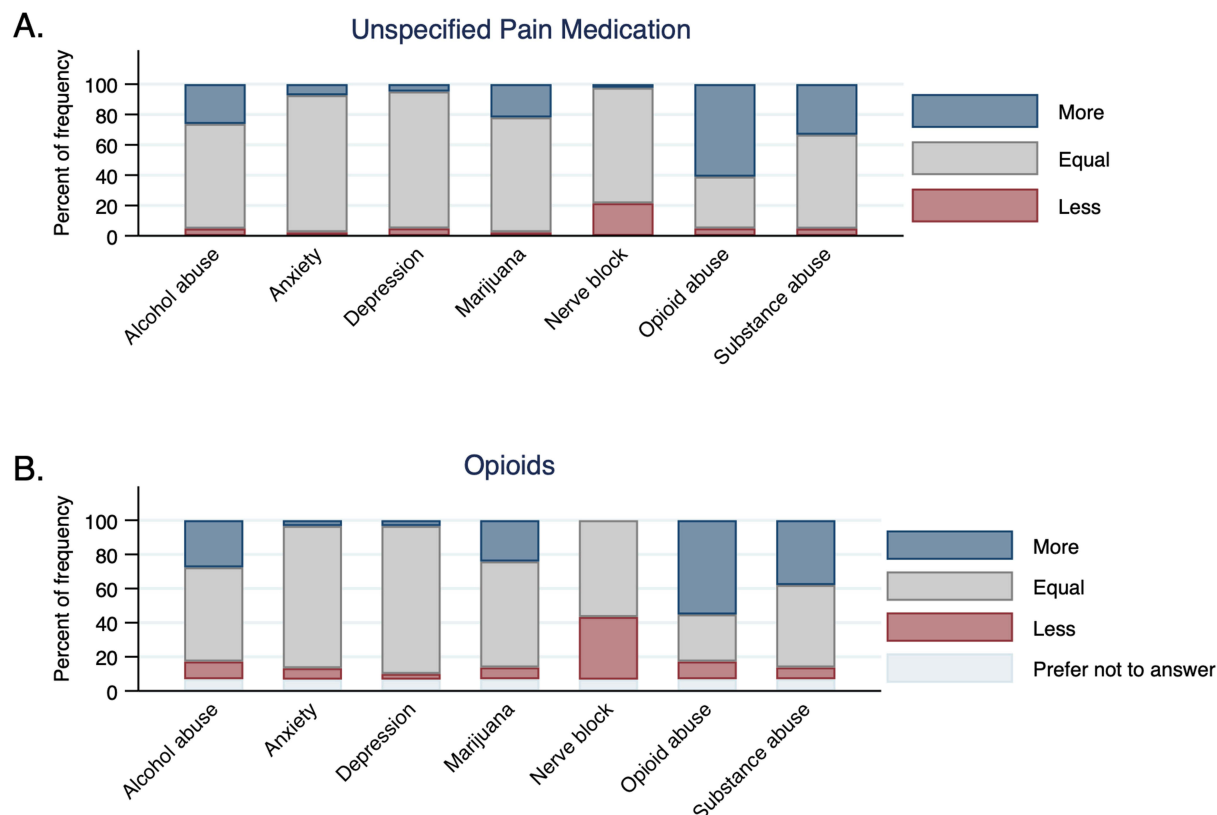


Figure 4 Survey Responses Regarding Directional Impact of Patient Factors on Pain Management Dosing Strategies. **(A)** Impact of patient factors on unspecified pain medication. **(B)** Impact of patient factors on opioids.

need to be present in a majority of the participants to be relevant and is present when “systemic error [is] introduced into sampling or testing by selecting or encouraging one outcome or answer over others”.¹⁰ Therefore, the current study results meet the definition for bias.

The presence of this bias is further supported by results of one-sided Wilcoxon signed rank tests, which indicated more frequent selection to administer fewer pain medications to patients with nerve blocks compared to patients without nerve blocks as well as patients with prior opioid abuse ($P < 0.0001$), alcohol abuse ($P = 0.007$), substance abuse ($P < 0.0001$), marijuana ($P = 0.0001$), anxiety ($P = 0.0107$), or depression ($P = 0.0195$). These results were confirmed with additional one-sided Wilcoxon signed rank tests, which indicated more frequent selection to administer fewer opioids to patients without nerve blocks as well as patients with prior opioid abuse ($P = 0.0039$), alcohol abuse ($P = 0.0020$), substance abuse ($P = 0.0020$), anxiety ($P = 0.0020$), depression ($P = 0.0010$), and marijuana use ($P = 0.0020$). Therefore, the treatment of patients with nerve blocks is not only different from the treatment of patients without nerve blocks but also significantly different from the treatment of patients with anxiety, depression, marijuana use, opioid abuse, substance abuse, and alcohol abuse.

We opine that nurses treat patients holistically and consider objective signs and symptoms of pain in addition to the pain score while considering other analgesic medications and therapies. Given this, treatment bias towards patients with nerve blocks may originate from a desire to minimize opioids. The survey attempted to explore the origins of this bias further with baseline descriptive data and perceived barriers to effective pain management. However, nurses answered equivocally to questions that may hint at the origins of this bias, such as their agreement with the following statement: “Nurses should limit opioid doses in patients with nerve blocks”. Furthermore, nurses responded equivocally in their rating of the following barriers to effective pain management: “Pressure to keep opioid doses low” and “Pressure to treat pain with opioids”. Additional high-quality research is required to identify the origins of this potential bias.

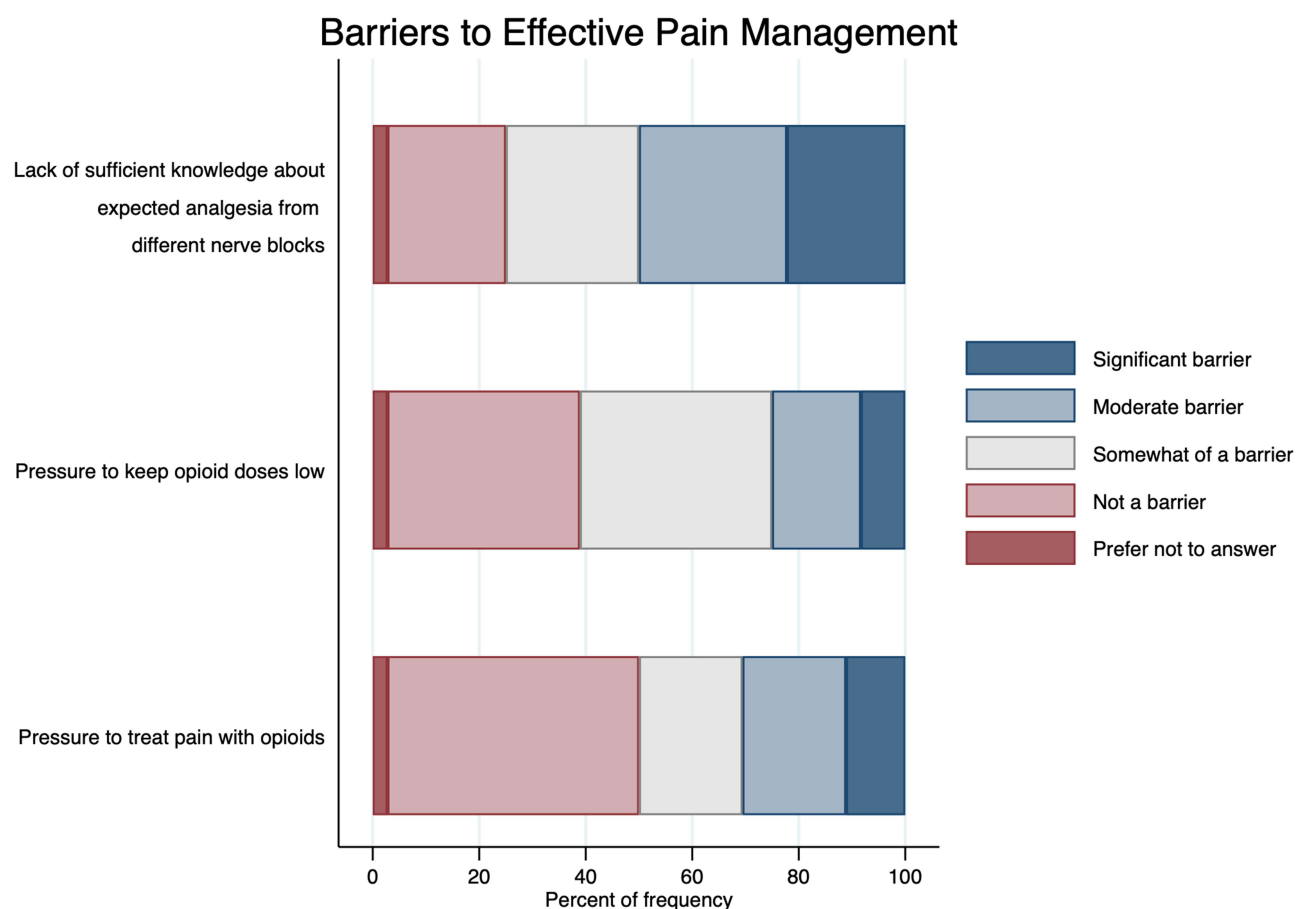


Figure 5 Barriers to Effective Pain Management Identified by Survey Respondents.

Half of the respondents indicated that “lack of sufficient knowledge about expected analgesia from different nerve blocks” is a moderate or significant barrier in providing effective pain management. There are several reasons why this is a crucial topic for nursing education and patient comfort. First, objective signs of nerve blockade may be difficult to assess if the nerve does not innervate muscles or testing for sensory loss is confounded by patient factors (such as cognitive disease or language barrier) or surgical factors (such as surgical dressing overlying area of expected sensory loss). The following blocks do not cause motor blockade and are likely to decrease sensation surrounding the surgical incision: transversus abdominis plane (TAP) block, rectus sheath block, pericapsular nerve group (PENG) block, quadratus lumborum block, erector spinae block, and adductor canal block.^{11–14} Second, complete analgesia may not be expected or possible from the block. For example, visceral pain is not reliably controlled with TAP or rectus sheath blocks and medial foot pain is not relieved with common peroneal and/or posterior tibial nerve blocks.^{12,15} Third, a partially failed block would lead to patchy analgesia in an area that is otherwise expected to be covered by the block. For example, local anesthetic spread in a fascia iliaca block is inconsistent and unreliably blocks the obturator, femoral, and lateral femoral cutaneous nerves.¹⁶ Lastly, a completely failed block would lead to no analgesia, which can happen with any block technique. Nursing education should address this knowledge gap through targeted training on peripheral and truncal nerve block anatomy and standardized approaches to assessing block effectiveness, such as dermatomal sensory testing, motor function checks, and documentation of block duration and strength. Composite scales to objectively measure nerve blocks’ effectiveness have been developed and may also serve as useful educational adjuncts.¹⁷

The following null hypotheses were generated after reviewing the results of this survey: there is no difference in the treatment of patients (as measured by oral morphine equivalents) with nerve blocks that cause motor blockade compared to patients with nerve blocks that do not cause motor blockade; there is no difference in the treatment of patients with

nerve blocks that receive the same score on objective scales to measure the blocks' effectiveness; there is no difference in the treatment of patients (as measured by oral morphine equivalents) with nerve blocks that cause decreased sensation to cold/pinprick compared to patients with nerve blocks that do not cause decreased sensation to cold/pinprick.

Limitations

Several limitations are recognized in this study done at a single academic medical center. Although this pilot study did not receive responses from the majority of perioperative nurses at our institution, the survey response rate compares favorably to other anesthesiology studies.¹⁸ The questions utilized in this survey were not validated, and sample size estimations were not performed a priori. Instead, the survey was developed with the goal for its results to generate hypotheses for additional research. The results presented are, therefore, limited by statistical imprecision and limited generalizability.

Despite multiple Email invitations to participate, the response rate remained low and was made lower by a technical error in one of the questions on the survey as described in the "Results" section. Because surveys are commonly sent to nurses, the low response rate may represent survey fatigue. Nonetheless, selection bias is a relevant limitation in this study because the nurses who did participate may feel passionate about this topic. Conversely, we did not analyze the non-responders due to the anonymous survey design, which may also contribute to selection bias. The survey was only sent to nurses because they commonly treat acute pain in patients with nerve blocks and select medication doses over a wide range of acceptable doses as indicated in physician order sets. Therefore, nurses represent the most likely group to express treatment bias in the setting of nerve blocks. The predominance of perioperative nurses in the respondent pool limits the generalizability of the study's findings to broader nursing populations. Including additional care providers may be useful for additional studies on this topic.

The results of this study were not broken down in subgroups. Eighty-two percent of the respondents identified as having a perioperative specialization, while only 11% reported a surgical background. Due to this substantial imbalance between groups, subgroup analyses would provide limited additional insights into patterns of analgesic decision-making. The characteristics included in this study are not balanced among conditions that would reasonably expect to increase or decrease patient tolerance to pain medications. For example, prior substance abuse or opioid abuse would reasonably lead to greater postoperative analgesic requirements. Perhaps, additional characteristics could be added that may reasonably cause a nurse to dose medications more conservatively, such as scheduled oxycodone or continuous ketamine infusion. Additionally, this survey may not reflect clinical decision-making processes, and prospective trials are needed to validate the findings in this study.

Importantly, this pilot study serves as a foundational step to present important questions relating to the treatment of patients with nerve blocks. Additional, more robust, follow-up studies with improved methodology and broader recruitment are necessary to present generalizable results.

Conclusions

This pilot study suggests that patients with nerve blocks may be treated differently than those without blocks, regardless of their reported pain. However, given the study's exploratory design, these findings should be interpreted as hypothesis-generating. Further research using larger, more methodologically rigorous studies is needed to assess whether such treatment patterns reflect a broader, generalizable bias.

Disclosure

Dr Stuart Grant reports personal fees from Fujifilm Sonosite; board of directors of ASRA Pain Medicine, during the conduct of the study. The authors report no other conflicts of interest in this work.

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