Research Square

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Strengthening Anesthesia Practice in Uganda: The Important Role of Regional Anesthesia

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Abstract

Background

Regional anesthesia is a cornerstone of modern perioperative care, offering safe, cost-effective solutions that expand surgical access and improve patient outcomes. In Uganda, where anesthesia workforce and infrastructure are limited, strengthening regional anesthesia capacity represents a strategic opportunity to advance surgical care and health equity. In January 2024, Uganda participated in the 1st World Day of Regional Anesthesia & Pain Medicine, hosted at Kabale University School of Medicine, providing a platform for capacity building, advocacy, and assessment of national readiness.

Methods

A nationwide capacity-building initiative featuring lectures, workshops, and advocacy sessions was held at Kabale University in southwestern Uganda, coordinated through the African Society for Regional Anesthesia (AFSRA). A cross-sectional survey was administered to 84 in-person and virtual participants to assess training backgrounds, clinical practices, and access to essential equipment for regional anesthesia. Descriptive statistics were used to analyze responses.

Results

The majority of respondents (68%) were male, and 76% were in training. Spinal anesthesia was widely practiced (93% performed it more than once weekly), while other regional techniques were less frequently utilized. Major opportunities for equipment enhancement were identified: 90% lacked dedicated ultrasound machines for anesthesia, 87% lacked peripheral nerve stimulators, and 80% lacked nerve block needles. Knowledge assessments showed variable familiarity with toxicity risks and procedural nuances. Importantly, advocacy efforts resulted in tangible institutional commitment, with Kabale University procuring its first ultrasound machine dedicated to regional anesthesia training within six months of the event.

Conclusion

Uganda has made significant strides in recognizing the value of regional anesthesia, with strong institutional commitment and growing workforce enthusiasm. Strategic investments in equipment, training, and infrastructure will further strengthen these foundations. Capacity-building initiatives like the World Day campaign serve as powerful catalysts for systems change, advancing equitable access to safe, pain-free surgical care across Uganda and beyond.

Introduction

Safe anesthesia is an essential component of universal health coverage and quality surgical care. Yet for decades, access to basic anesthesia services in low- and middle-income countries (LMICs) has been severely constrained, contributing to preventable morbidity and mortality [1–4]. In sub-Saharan Africa, an estimated 93% of the population lacks timely access to safe surgical or anesthesia care when needed [5]. This gap represents not only a clinical challenge but a profound equity issue that demands context-appropriate, scalable solutions.

Regional anesthesia—encompassing spinal, epidural, and peripheral nerve block techniques—offers an exceptionally promising pathway for expanding access to safe, cost-effective surgical care. Compared to general anesthesia, regional techniques require fewer airway interventions [6], provide superior postoperative pain control [7], reduce perioperative complications [8, 9], and can be safely delivered in settings with limited critical care infrastructure [10, 11]. In rural or resource-constrained environments where access to opioids is limited and intensive care resources are scarce, regional anesthesia is particularly advantageous [11, 12].

Despite these compelling benefits, regional anesthesia has historically been underutilized across much of sub-Saharan Africa [13]. Systemic barriers—including limited training opportunities, equipment shortages, and insufficient institutional investment—have constrained its adoption [12]. Additionally, public awareness of the role of anesthesiologists and the benefits of regional anesthesia remains low, affecting resource allocation and prioritization [14, 15].

However, the landscape is shifting. Across the continent, growing recognition of regional anesthesia's potential is driving new initiatives to strengthen capacity. The Africa Society for Regional Anesthesia (AFSRA) has been at the forefront of this movement, fostering collaboration, knowledge exchange, and professional development among anesthesia practitioners across the continent.

In January 2024, Uganda joined 24 other African cities and over 100 cities worldwide to commemorate the 1st World Day of Regional Anesthesia & Pain Medicine [16]. At Kabale University School of Medicine in southwestern Uganda, local faculty from the Department of Anesthesia, in partnership with AFSRA and international collaborators from Harvard University, delivered lectures, workshops, and advocacy events designed to raise awareness, build clinical capacity, and catalyze institutional commitment. This timely initiative served as a platform to assess national readiness, identify opportunities for growth, and take concrete steps toward strengthening regional anesthesia services.

This paper describes the capacity-building efforts undertaken as part of this global campaign and presents findings from a national survey of anesthesia providers. We highlight the progress achieved, identify opportunities for continued strengthening, and offer recommendations for advancing equitable access to regional anesthesia across Uganda.

Methods

Initiative Design and Implementation

The 1st World Day of Regional Anesthesia & Pain Medicine was commemorated at Kabale University School of Medicine on January 27th, 2024. The event was coordinated through the African Society for Regional Anesthesia (AFSRA) in partnership with Kabale University Department of Anesthesia and visiting faculty from Harvard University. The initiative featured a comprehensive program designed to address both clinical education and systems advocacy:

Institutional Engagement: The day commenced with addresses from the Kabale University Vice Chancellor and the Dean of the School of Medicine, who highlighted the importance of regional anesthesia in contemporary medical practice and pledged institutional support for strengthening anesthesia training and services.

Didactic Sessions: Lectures were delivered by AFSRA leadership, Kabale University faculty, and visiting international experts, covering regional anesthesia techniques, safety protocols, complication management, and the role of regional anesthesia in expanding surgical access.

Workshops and Breakout Sessions: Interactive sessions provided participants with hands-on exposure to regional anesthesia techniques, ultrasound guidance, and nerve stimulation.

Advocacy and Community Awareness: Media engagement and public discussions helped raise community awareness of the critical role anesthetists play in alleviating pain and suffering.

The event included both in-person attendees at Kabale University and virtual participants from across Uganda, maximizing geographic reach and inclusivity.

Survey Design and Data Collection

A cross-sectional survey was administered to all in-person participants and shared via online links for virtual attendees. The self-administered questionnaire (Sup File 1.) collected data on:

- Demographics: Age, sex, professional role, training level
- Workplace Context: Hospital level (national referral, regional referral, district/general, other)
- Clinical Practice: Frequency of various regional anesthesia techniques (spinal, epidural, truncal, upper limb, lower limb)
- Equipment Access: Availability of dedicated space, ultrasound machines, peripheral nerve stimulators, and nerve block needles
- Knowledge Assessment: Questions on local anesthetic toxicity and procedural indications

Participants provided informed consent prior to survey completion. Responses were anonymized and analyzed using descriptive statistics.

Ethical Considerations

This initiative was conducted as a participatory capacity-building and quality improvement effort. The study was conducted in accordance with the Declaration of Helsinki. All participants provided informed consent for survey participation. The study was approved by the Kabale University Research Ethics Committee - KABREC-2024-337.

Results

Participant Characteristics

A total of 84 anesthetists and anesthesia trainees completed the survey. Respondents represented a diverse range of healthcare settings: 14% from National Referral Hospitals, 60% from Regional Referral Hospitals, 14% from District/General Hospitals, and 12% from other facilities. The majority (68%) were male, and 76% were in training (enrolled in Bachelor or Master of Anesthesia programs). This broad representation provides a comprehensive snapshot of anesthesia practice across Uganda's health system.

Equipment and Infrastructure Assessment

Survey responses revealed both challenges and opportunities for strengthening regional anesthesia capacity:

- Dedicated Regional Anesthesia Room: Only 10% of respondents reported access to a dedicated space for regional anesthesia procedures, indicating a significant opportunity for infrastructure development.
- Ultrasound Access: While 90% lacked a dedicated anesthesia ultrasound machine, institutional advocacy following the event led to the acquisition of the first such machine at Kabale University—demonstrating the catalytic impact of awareness campaigns.
- Peripheral Nerve Stimulators: 87% lacked access to these essential tools, highlighting a priority area for equipment investment.
- Nerve Block Needles: 80% lacked appropriate needles, representing another key opportunity for equipment strengthening.

These findings are summarized in Table 1.

Table 1
Hospital Readiness for Regional Anesthesia Services (N = 84)

Equipment/Resource	No (%)	Unsure (%)	Yes (%)
Dedicated regional anesthesia room	74 (88%)	2 (2%)	8 (10%)
Dedicated ultrasound machine in OR	76 (90%)	2 (2%)	6 (7%)
Peripheral nerve stimulator	73 (87%)	8 (10%)	3 (4%)
Peripheral nerve block needles	67 (80%)	6 (7%)	11 (13%)

Clinical Practice Patterns

Spinal anesthesia emerged as the most widely practiced regional technique, with 93% of respondents performing it more than once per week. This widespread competency in spinal anesthesia represents a strong foundation upon which to build more advanced regional techniques.

Other regional techniques were less frequently utilized, reflecting opportunities for expanded training and practice:

- Epidural Anesthesia: Only 5% performed epidurals more than once weekly; 57% had never performed one.
- Truncal Blocks: 79% had never performed these blocks.
- Upper Limb Peripheral Nerve Blocks: 57% had never performed them.
- Lower Limb Peripheral Nerve Blocks: 50% had never performed them.

These findings (detailed in Table 2) highlight the considerable potential for expanding the regional anesthesia skill set among Ugandan anesthesia providers.

Table 2
Regional Anesthesia Practice Patterns (N = 84)

Procedure	> Once/Week (%)	Never (%)	Rarely (%)	Once/Month (%)	Once/Week (%)
Spinal Anesthesia	78 (93%)	1 (1%)	5 (6%)	-	-
Epidural Anesthesia	4 (5%)	48 (57%)	24 (29%)	4 (5%)	4 (5%)
Truncal Blocks	3 (4%)	66 (79%)	10 (12%)	4 (5%)	1 (1%)
Upper Limb Blocks	4 (5%)	48 (57%)	24 (29%)	4 (5%)	4 (5%)
Lower Limb Blocks	8 (10%)	42 (50%)	29 (35%)	2 (2%)	3 (4%)

Knowledge Assessment

Interactive quiz results revealed areas of both strength and opportunity for knowledge enhancement:

- Local Anesthetic Toxicity: 71.6% correctly identified bupivacaine as highly cardiotoxic, demonstrating solid foundational knowledge (Fig. 1).
- Pharmacokinetics: 34.6% correctly identified interscalene blocks as associated with the highest systemic absorption of local anesthetic, indicating an opportunity for targeted education (Fig. 2).
- Indications: Respondents primarily used regional anesthesia for intraoperative pain control; fewer utilized it as a primary anesthetic or for postoperative analgesia (Fig. 3), suggesting potential for broader clinical applications.

Institutional Impact and Early Achievements

The advocacy component of the World Day initiative yielded immediate, tangible results. Within six months of the event, through concerted advocacy by the Department of Anesthesia at Kabale University, the university leadership procured an ultrasound machine dedicated specifically to regional anesthesia training and practice—marking the beginning of ultrasound-guided regional anesthesia in southwestern Uganda.

This achievement demonstrates the catalytic potential of awareness campaigns when coupled with institutional engagement and evidence-based advocacy. It also underscores the importance of educating policymakers about regional anesthesia's value in improving surgical care and patient outcomes.

Discussion

A Moment of Opportunity

The 1st World Day of Regional Anesthesia & Pain Medicine arrived at a pivotal moment for anesthesia services in Uganda. The event successfully brought together nearly 70 in-person participants and many more virtual attendees, creating a national platform for knowledge exchange, skill development, and advocacy. The enthusiastic participation and institutional engagement reflect a growing recognition of regional anesthesia's potential to transform surgical care across Uganda.

Our survey findings reveal a picture of both foundation and opportunity. The widespread practice of spinal anesthesia—performed by 93% of respondents weekly—demonstrates that Ugandan anesthesia providers possess strong core competencies in regional techniques. This foundation provides an excellent launching point for expanding the regional anesthesia skill set to include epidurals, truncal blocks, and peripheral nerve blocks. The challenge lies not in building from nothing, but in scaling and diversifying existing capabilities.

Addressing Equipment Gaps

The equipment deficits identified in our survey—particularly the absence of dedicated ultrasound machines, nerve stimulators, and block needles—represent concrete opportunities for targeted investment. Importantly, these are not insurmountable barriers. Low-cost, high-impact solutions exist, and advocacy efforts have already shown that institutional commitment can translate into action.

The acquisition of Kabale University's first dedicated anesthesia ultrasound machine within six months of the World Day event is emblematic of the progress that can be achieved when advocacy is sustained and evidence-based. This tangible outcome demonstrates that awareness campaigns, when coupled with institutional engagement, can catalyze meaningful systems change.

Strengthening Training and Education

The knowledge assessment results indicate that while foundational knowledge is solid, there is room for enhanced training on pharmacology, technique selection, and complication management. Structured educational programs—including workshops, simulation training, and mentorship—can address these gaps effectively.

Regional anesthesia training programs in Uganda should prioritize:

1. Hands-on workshops with ultrasound guidance and nerve stimulation
2. Simulation-based training for rare but critical complications
3. Mentorship and knowledge exchange through partnerships with regional and international experts
4. Curriculum integration to ensure regional anesthesia is systematically taught at all training levels

Advancing Health Equity

The infrastructure and training gaps identified in our study disproportionately affect rural and lower-tier healthcare facilities, where access to safe surgical care is already most limited. By investing in regional anesthesia capacity, Uganda can simultaneously advance clinical quality and health equity—ensuring that patients in underserved areas can access safe, pain-free surgical care close to home.

Regional anesthesia is particularly well-suited to rural settings: it requires fewer resources than general anesthesia, reduces the need for postoperative critical care, and provides excellent analgesia without relying on opioids. For rural populations that might otherwise be excluded from surgical services, strengthening regional anesthesia capacity can meaningfully expand access to life-saving care.

A Model for Systems Strengthening

The 1st World Day of Regional Anesthesia & Pain Medicine initiative exemplifies a promising model for systems strengthening in LMICs. Key success factors included:

1. Local ownership: The event was hosted and coordinated by Kabale University, ensuring sustainability and local relevance.

2. Regional and international partnerships: Collaboration with AFSRA and Harvard University brought expertise and credibility while respecting local leadership.
3. Institutional engagement: Participation by university leadership signaled institutional commitment and facilitated policy action.
4. Measurable outcomes: The survey provided baseline data to track progress and guide resource allocation.
5. Advocacy integration: The event was not merely educational but explicitly designed to catalyze systems change.

This model can be adapted and replicated across Uganda and the broader region to strengthen anesthesia services and expand access to safe surgical care.

The Path Forward

Building on the momentum generated by the 1st World Day of Regional Anesthesia & Pain Medicine, we recommend the following priorities for strengthening regional anesthesia in Uganda:

For Government and Policymakers:

- Allocate dedicated funding for anesthesia equipment and training
- Include regional anesthesia in national surgical and anesthesia plans
- Support decentralized training programs to reach rural providers

For Health Facilities:

- Prioritize procurement of essential regional anesthesia equipment
- Establish dedicated spaces for regional anesthesia procedures
- Support ongoing education and skills maintenance for providers

For Training Institutions:

- Integrate comprehensive regional anesthesia training into curricula
- Invest in simulation facilities and faculty development
- Establish partnerships for knowledge exchange and mentorship

For Professional Organizations:

- Sustain advocacy efforts to raise awareness of regional anesthesia's value
- Develop continuing professional development programs in regional anesthesia
- Foster regional collaboration and knowledge sharing

Conclusion

Uganda has demonstrated strong commitment to strengthening anesthesia services, with the 1st World Day of Regional Anesthesia & Pain Medicine serving as a catalyst for awareness, advocacy, and action. The widespread practice of spinal anesthesia provides a solid foundation for expanding regional anesthesia services, while institutional engagement has already translated into tangible equipment investments.

The challenges identified—equipment gaps, training needs, and limited practice of advanced regional techniques—represent opportunities for targeted strengthening rather than insurmountable barriers. Strategic investments in training, equipment procurement, and institutional support can rapidly accelerate progress.

Capacity-building initiatives like the World Day campaign, when embedded within local institutions and supported by committed leadership, serve as powerful catalysts for systems change. By continuing to invest in regional anesthesia, Uganda can expand equitable access to safe, pain-free surgical care, advancing both clinical quality and health equity for all Ugandans.

Declarations

Ethics Approval and Consent to Participate

This initiative was approved by the Kabale University Research Ethics Committee - KABREC-2024-337. The study was conducted in accordance with the Declaration of Helsinki. All participants provided informed consent prior to survey participation.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

Dr. Isabella Epiu and Dr. James K. Tumwine are staff at Kabale University. All other authors declare no competing interests.

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Authors' Contributions

IE and CK conceived the study. IE and RD collected the data. IE and OA wrote the report. FN, HB, MM, ESA, and JKT reviewed the report. All authors approved the final manuscript.

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Figures

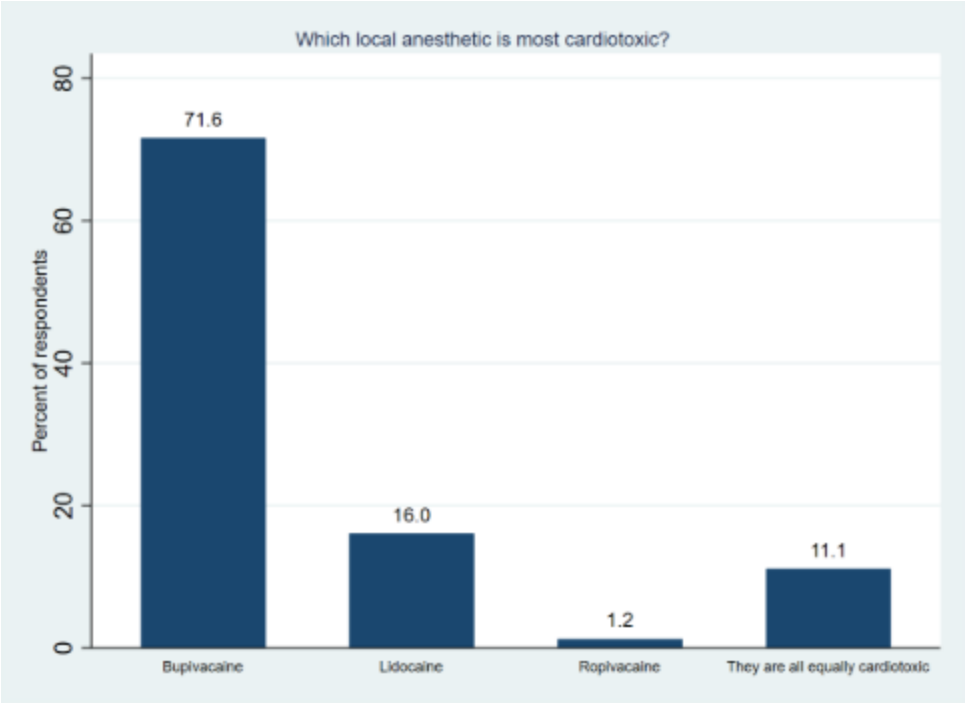


Figure 1

Knowledge of Local Anesthetic Toxicity
[Graph showing 71.6% awareness of bupivacaine cardiotoxicity]

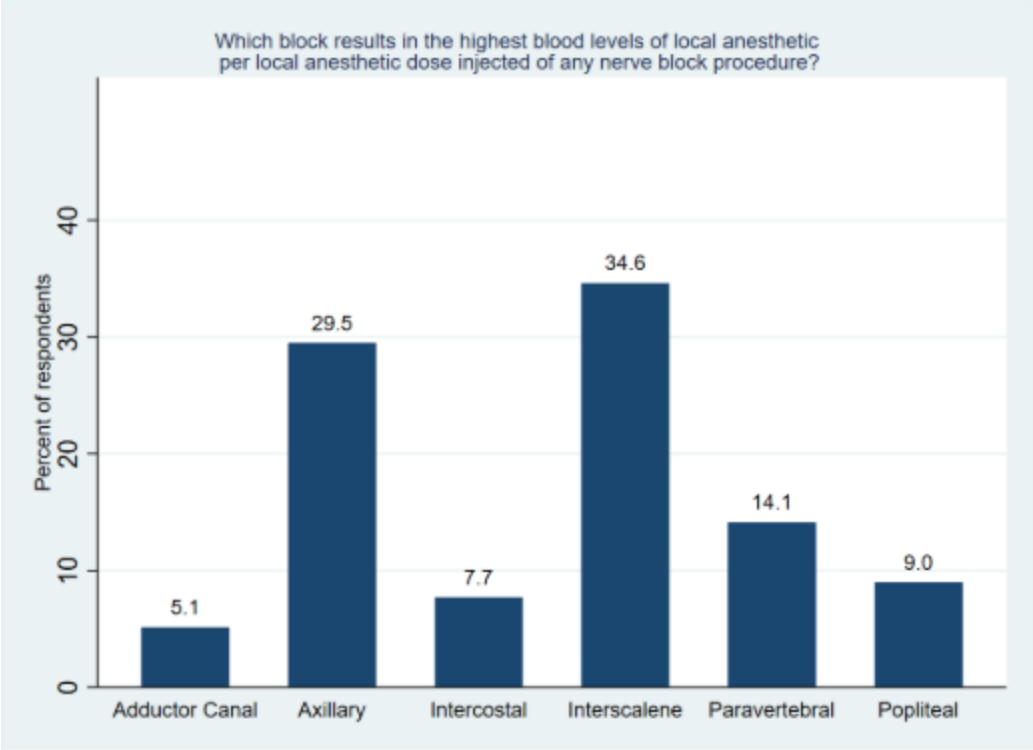


Figure 2

Knowledge of Local Anesthetic Pharmacokinetics
[Graph showing 34.6% correct identification of interscalene block absorption]

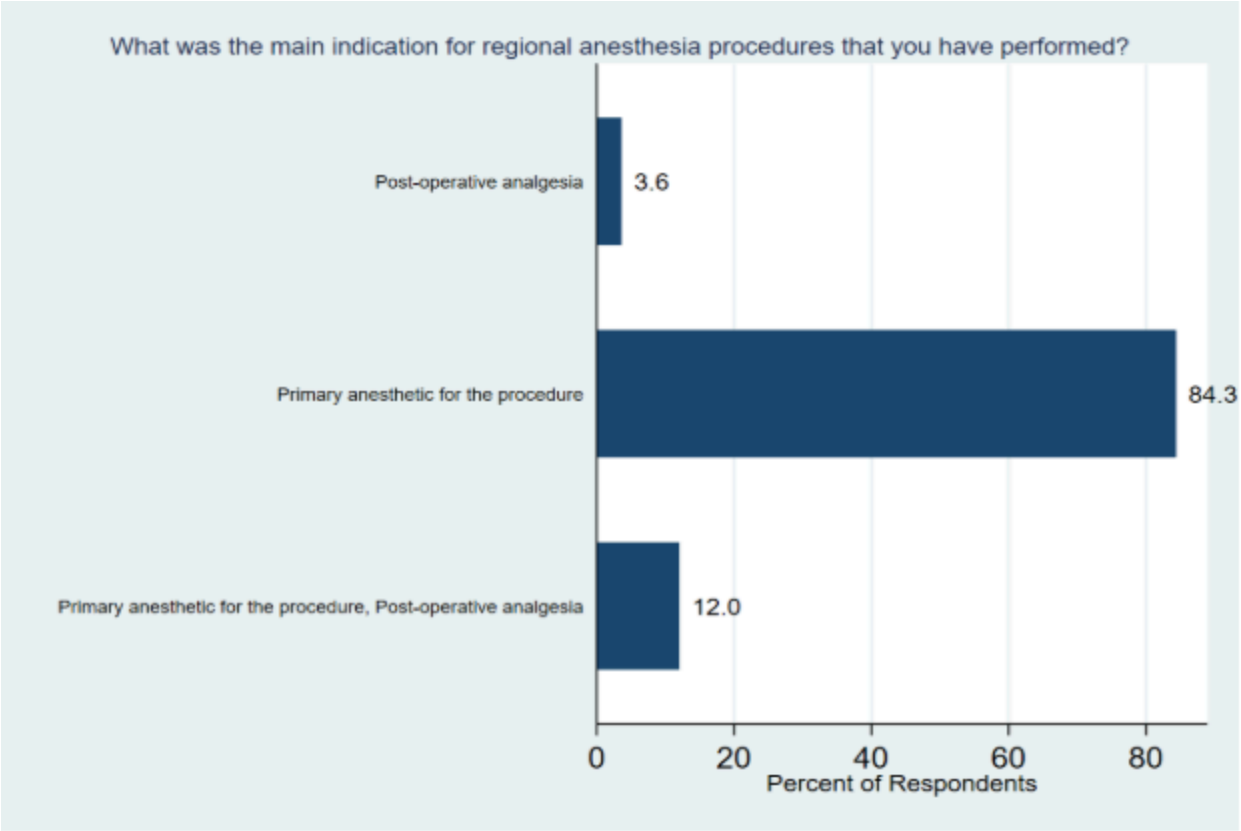


Figure 3

Indications for Regional Anesthesia
[Graph showing primary use for intraoperative pain control, with less frequent use as primary anesthetic or for postoperative analgesia]

Supplementary Files

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- Sup1.docx