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Current Practiceof Spinal Anesthesia Among Anesthetists working in Injibara General Hospital North west Ethiopia 2026 Quality improvement Clinical Audit

Belete Destaw*, Temesgen Misganaw, Ezra Ejigu, Robel Asegid, Mekuanint Asmare, Zemenu Muluken, Melese Tadele

Department of Anaesthesia, College of Medicine & Health Sciences, Injibara University, Injibara, Ethiopia

Correspondence: Belete Destaw, Department of Anaesthesia, College of Medicine & Health Sciences, Injibara University, Injibara, Ethiopia, Email: baleanst@gmail.com

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Abstract

Background: Spinal anesthesia is a type of regional anesthesia where a small dose of local anesthetic is injected into the subarachnoid space to produce rapid, dense sensory and motor block.
Aim: To improve patient safety by evaluating the compliance of current practice of spinal anesthesia with NYSORA standard at IGH, 2026.
Method: A cross-sectional study design was conducted in Injibara General Hospital from December 2025 to January 2026. 14 anesthesia professionals who are working in the study hospital were surveyed by the total population sampling technique. A standardized structured checklist prepared from recommendations of NYSORA guideline regarding the current Practice of spinal anesthesia was used to collect the data. Descriptive statistics were employed to summarize the results.
Result: Overall compliance with NYSORA standards for spinal anesthesia practice was 70.8%. it ranges from excellent compliance (100%) was observed up to Poor compliance (0%) was identified including; hand hygiene and use of sterile drapes.
Conclusion: Even though Anesthetists in Injibara general hospital had excellent adherence to the technical components of spinal anesthesia, compliance with several key NYSORA recommended non-technical standards remains substandard. It would be better considering training and enforcement of standard.

Introduction

Spinal anesthesia is one of the most frequently performed regional anesthesia techniques worldwide and is a cornerstone of anesthesia practice in obstetrics, general surgery, orthopaedics, urology, and lower abdominal procedures. It involves the injection of a local anesthetic into the subarachnoid space, producing rapid, profound sensory and motor blockade. Since its first clinical application by August Bier in 1898, spinal anesthesia has evolved into a highly reliable technique due to advancements in needles, local anesthetics, and monitoring standards [1]. Compared with general anesthesia, spinal anesthesia offers advantages such as reduced airway manipulation, decreased blood loss, improved postoperative pain control, and lower rates of thromboembolic complications [2].

Despite these advantages, the effectiveness and safety of spinal anesthesia heavily depend on the technical proficiency of the anesthetists and adherence to evidence-based standards. Inconsistent practice, inadequate technique, and deviation from guidelines increase the risk of complications, block failure, and adverse maternal or surgical outcomes. As a result, evaluating current practice through a structured clinical audit is critical for ensuring high-quality patient care [2,3].

The success of spinal anesthesia depends on several key steps, including proper patient assessment, correct identification of anatomical landmarks, aseptic preparation, appropriate needle selection, correct dosing, and effective monitoring. Optimal patient positioning either sitting or lateral ensures accurate midline or para-median needle insertion. Ultrasound guidance, although increasingly recommended, is still underutilized in many low-resource settings [3].

Standard practice guidelines emphasize the importance of the following technical elements: aseptic technique to reduce infection risk, appropriate needle choice (e.g., 25G pencil-point) to minimize post-dural puncture headache, correct level of insertion, commonly at L3–L4 or L4–L5, accurate drug dosing based on procedure type, patient height, assessment of sensory and motor block height, continuous hemodynamic monitoring, proper documentation of technique, complications, outcomes and failure to consistently perform these steps contributes to preventable complications and practice variation among anesthetists [4].

The most common complication is maternal hypotension, with an incidence between 30–80%, depending on adherence to prophylactic vasopressor protocols [5].

Other complications include high spinal block, failed block, post-dural puncture headache (PDPH), nerve injury, infection and cardiovascular collapse [6]. Failed or inadequate spinal anesthesia occurs in 3–13% of cases globally and up to 15% in low-income settings. Failures may require repeat injection or conversion to general anesthesia both associated with increased complications, anxiety, and medico-legal risks [7].

Evidence from multiple regions shows that spinal anesthesia techniques vary widely across institutions and among anesthetists, affecting patient outcomes. In high-income countries, despite standardized guidelines, practice variation persists regarding needle choice, dosing, monitoring, and documentation [8]. In low- and middle-income countries (LMICs), this variation is even more pronounced due to resource limitations, limited access to training, and lack of institutional protocols [9].

Spinal anesthesia remains a fundamental part of the modern practice of anesthesia because of its proven success, predictability, increased patient satisfaction, and low complication rate [10]. Advancements in technology in terms of spinal needle diameter and tip designs have been responsible for a reduction in complications such as post-dural puncture headaches (PDPHs) [11]. New imaging modalities are available to assist with difficult spinal placement [12]. Subspecialty practices such as cardiac anesthesia have incorporated regional techniques into the practice to adapt to changing trends of fast-tracking cardiac patients for early tracheal extubation. A number of ambulatory surgical procedures are well suited for spinal anesthesia [13].

The combined spinal-epidural (CSE) technique has been incorporated into the practice of obstetrical anesthesia, both for labor analgesia and surgical cesarean section. Local anesthetic agents, doses and agent baricity are selected based on specific surgical procedures [14-19]. Guidelines for patients taking anticoagulant or anti-fibrinolysis medications are reviewed. The practice of spinal anesthesia continues to adapt in response to new equipment, techniques, local anesthetics and adjuvants, and clinical indications [13].

Methods

Study Design, Area and Period

A prospective cross-sectional study was conducted from December 2025 to January 2026 at Injibara General Hospital (IGH), located in Injibara town, Awi Zone, Amhara National Regional State, Ethiopia, approximately 447 km northwest of Addis Ababa. IGH is a public referral hospital serving a catchment population of about 1.2–1.32 million people in the Awi Zone and surrounding areas. The hospital has four operating rooms, including two major operating rooms, one orthopedic room, and one designated for emergency procedures.

Sample Size and Sampling procedure

A survey (total population) sampling technique was employed, whereby 14 anesthesia professionals available and practicing spinal anesthesia during the study period at Injibara General Hospital were included in the audit.

Audit Standards

The audit standards used in this study were derived from the recommendations of the New York School of Regional Anesthesia (NYSORA), an internationally recognized authority in regional anesthesia practice. NYSORA provides comprehensive, evidence-based guidance on the safe performance of spinal anesthesia, encompassing pre-procedural assessment and informed consent, preparation of equipment, aseptic technique, patient positioning, technical execution of the block, continuous monitoring, and post-procedural assessment. These standards emphasize that strict adherence to each step is essential to minimize complications, improve patient safety, and ensure high-quality anesthesia care. For this reason, NYSORA recommendations were used with a target compliance of 100% set for all assessed standards [Table 1].

Operational Definitions

Informed consent obtained: giving information explaining about risks, benefits of spinal anesthesia, other options of spinal anesthesia sign taken [20].
Patient monitored: SA given patient monitored with a pulse oximeter, BP, and ECG [20].
Anesthesia equipment Prepare and check all necessary: ETT, LMA, Laryngoscope, and monitoring before SA prepare and checked [20].
Equipment for the spinal blockade ready: spinal needle, gauze, artery and disinfectant solutions) should be ready for use [20].

Data Collection Method

Data were collected prospectively using a structured audit checklist (proforma) adapted from New York School of Regional Anesthesia (NYSORA) guidelines. The proforma was designed to assess the practice of anesthetists during the administration of spinal anesthesia, including patient preparation, aseptic technique, positioning, drug selection and dosing, monitoring, and post-procedure care. Observations were conducted in real time during spinal anesthesia procedures by trained data collectors to ensure accurate assessment of clinical practice. Data collectors were oriented on the audit tool to maintain consistency and minimize observer variation. Completed checklists were reviewed daily for completeness and accuracy, and any unclear observations were clarified immediately [Table 1]. Audit Proforma.

No.	Standards	Yes	No
1	Does informed consent was obtained after explaining about risks and		
2	Does wide bore (16 or 18 G) intravenous cannula secured before		
3	Does prepare and check all necessary anesthesia equipment (ETT, LMA,		
4	Does the patient should be monitored during the placement of the SA with		
5	Does skilled assistance should available in the operation room?		
6	Does patient places in a lateral or sitting position by flexing the neck		
7	Does equipment for the spinal blockade (spinal needles, gauze,		
8	Does anesthetist should wash his/her hands and wear sterile gown and		

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9	Does anesthetist should wear caps, face mask and surgical gloves?		
10	Does patient back should be cleaned with skin preparation solution such as iodine and		
11	Does the skin preparation solution allowed to dry?		
12	Does the area draped with fenestrated drapes in a sterile fashion?		
13	Does appropriate land mark for injection site identified?		
14	Does draw up the local anesthetic solution to be used for skin infiltration?		
15	Does insertion of spinal needle at the appropriate land mark?		
16	Does after free flow of CSF is established, inject … [text cut off in source image]		

Table 1: Audit proforma

Data Quality Control Management

To ensure the reliability and validity of the audit, the data collectors were thoroughly trained and well suited for the job. There was also be daily supervision of data collection and completed questionnaires were checked at random.

Data Analysis and Processing

Data was checked manually for completeness and then by using Descriptive statistic Microsoft Excel 2016; tables, graphs of sums and percentages of items identified study for this audit.

Result

Overall compliance with NYSORA standards for spinal anesthesia practice was 70.8%. Excellent compliance (100%) was observed in equipment preparation, patient positioning, technical execution of spinal anesthesia, availability of skilled assistance, and intra-operative monitoring. Moderate compliance was noted in intravenous access, patient monitoring during spinal placement, assessment of sensory and motor block, and post-procedural vital sign monitoring. Poor compliance was identified in aseptic practices, including hand hygiene and use of sterile drapes, as well as in obtaining and documenting informed consent [Table 1] and [Figure 1].

No.	Standards	No. of audited	No. of Anesthesia	Percentage of
1	Informed consent was obtained after explaining about risks and benefits of spinal anesthesia.	14	3	21.40%
2	A wide bore (16 or 18 G) intravenous cannula secured before administration spinal anesthesia.	14	10	71.50%
3	Prepare and check all necessary anesthesia equipment (ETT, LMA, laryngoscope, and monitoring) before SA.	14	14	100%
4	The patient should be monitored during the placement of the SA with a pulse oximeter, BP, and ECG.	14	10	71.40%
5	Skilled assistance should be available in the operation room.	14	14	100%
6	Patient placed in a lateral or sitting position by flexing the neck and pushing out the lower back.	14	14	100%
7	Equipment for the spinal blockade (spinal needles, gauze, antiseptic and disinfectant solutions) should be ready for use.	14	14	100%
8	Anesthetist should wash his/her hands and wear sterile gown and gloves/surgical gloves.	14	0	0%
9	Anesthetist should wear caps, face mask, and surgical gloves.	14	14	100%
10	Patient's back should be cleaned with skin preparation solution such as iodine and alcohol.	14	12	85.70%
11	The skin preparation solution allowed to dry.	14	4	28.50%
12	The area draped with fenestrated drapes in a sterile fashion. (The end of this text is cut off in the image.)	14	0	0%

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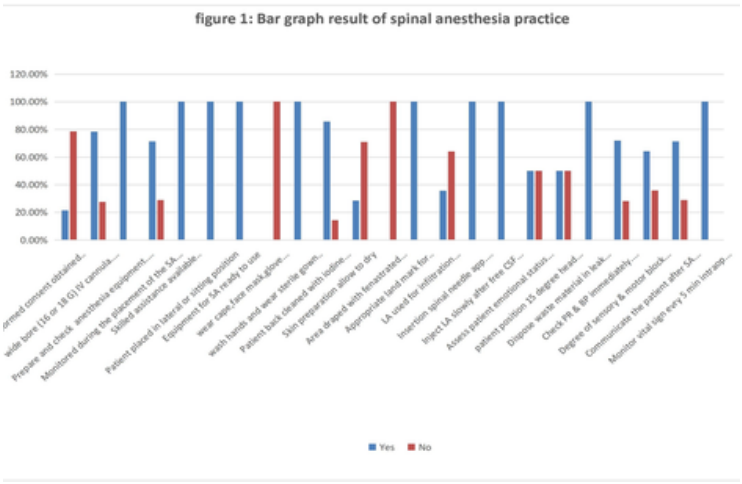


Figure 1: Result of Spinal Anesthesia Practice at IGH

Discussion

This clinical audit evaluated the compliance of spinal anesthesia practice among anesthetists at Injibara General Hospital against NYSORA-recommended standards. The overall compliance rate was 70.8%, indicating good practice with significant areas requiring improvement. While several technical components of spinal anesthesia demonstrated excellent adherence to guidelines, important deficiencies were identified in aseptic technique, informed consent, and patient-centered care.

Areas of Excellent Practice

Excellent compliance (100%) was observed in several core technical aspects of spinal anesthesia practice. All anesthetists consistently prepared and checked essential anesthesia equipment, ensured the availability of skilled assistance in the operating room, positioned patients appropriately, identified correct anatomical landmarks, inserted the spinal needle correctly, injected local anesthetic slowly after confirmation of free cerebrospinal fluid flow, and monitored patients intraoperatively at five-minute intervals.

These findings reflect strong technical competence and procedural familiarity among anesthetists. NYSORA emphasizes that meticulous preparation, correct technique, and continuous intraoperative monitoring are critical determinants of spinal anesthesia success and patient safety. Sustaining these high-performing practices is essential to maintaining quality care and minimizing block failure and intraoperative complications.

Areas of Good Practice

Moderate to good compliance was observed in several important peri-procedural practices. Securing a wide-bore intravenous cannula prior to spinal anesthesia was achieved in 78.5% of cases, while monitoring during spinal placement and immediate post-procedural blood pressure and pulse rate assessment were each performed in 71.4% of cases. Skin antisepsis using iodine or alcohol was conducted in 85.7% of procedures, and assessment of sensory and motor block was documented in 64.2% of cases.

Although these practices align partially with NYSORA recommendations, none reached the expected target of 100%. Incomplete monitoring and inconsistent block assessment may delay the detection of complications such as hypotension, high spinal block, or inadequate anesthesia. NYSORA guidelines emphasize universal monitoring and systematic assessment of block characteristics to optimize patient safety and surgical conditions. Therefore, focused interventions are required to improve consistency and documentation in these areas.

Practices Requiring Improvement

Several critical components demonstrated poor compliance, raising significant patient safety concerns. Proper informed consent was obtained in only 21.4% of cases, indicating inadequate communication regarding the risks, benefits, and alternatives of spinal anesthesia. Informed consent is an ethical and legal requirement and is strongly emphasized in NYSORA guidance as part of patient-centered anesthesia care.

Aseptic technique showed particularly poor compliance. Hand washing and the use of sterile gowns were not practiced in any observed cases (0%), and sterile fenestrated drapes were also not utilized (0%). Additionally, allowing adequate drying time for antiseptic solutions was observed in only 28.5% of cases. These findings represent serious deviations from established standards and significantly increase the risk of neuraxial infections such as meningitis and epidural abscess. Both NYSORA and ASRA strongly recommend strict aseptic precautions, including hand hygiene, sterile barriers, and proper skin preparation for all neuraxial procedures.

Patient comfort and positioning after spinal anesthesia also require improvement. Assessment of the patient's emotional response and pain during injection, as well as appropriate post-injection positioning, were each performed in only 50% of cases. Failure to address these aspects may contribute to patient anxiety, discomfort, and hemodynamic instability.

Conclusion

This audit demonstrates that while anesthetists exhibit excellent adherence to the technical components of spinal anesthesia, compliance with several key NYSORA-recommended non- technical standards remains substandard. Inadequate aseptic practices, poor documentation of informed consent, and inconsistent patient assessment represent critical gaps in care.

Bridging these gaps requires structured training, standardized protocols, and institutional commitment to evidence-based practice. Strengthening adherence to NYSORA guidelines will improve patient safety, reduce preventable complications, and promote high-quality spinal anesthesia practice.

Recommendation

Based on the audit findings and NYSORA standards for spinal anesthesia, the following recommendations are proposed to improve compliance, patient safety, and quality of care:

1.Strengthening Aseptic Technique

Hand hygiene before spinal anesthesia

Use of sterile gown, sterile gloves, cap, and face mask Allowing adequate drying time for skin antiseptic solutions Routine use of sterile fenestrated drapes

2.Improving Informed Consent and Documentation

Anesthetists should consistently obtain and document informed consent after explaining the risks, benefits, and alternatives of spinal anesthesia, in accordance with NYSORA ethical guidance.

3.Enhancing Patient Monitoring and Assessment

Continuous monitoring during spinal placement and immediate post-procedural monitoring of vital signs should be improved, assessment and documentation of sensory and motor block levels should be standardized using recognized assessment tools.

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4.Development of local guidelines and repeat audit should be conducted
A repeat audit should be conducted after implementation of corrective measures to evaluate improvement and sustain compliance.

List of Abbreviations

Bp: Blood pressure, ECG- Electrocardiography, ETT- Endotracheal tube, IGH- Injibara General Hospital, IV: Intravenous, LA: Local Anesthetics, LMA: Laryngeal Mask Airway, NYSORA- New York School of Regional Anesthesia, OR- Operation Room, PR: Pulse Rate

Declarations

Ethical Approval and Consent to Participate

The ethical approval was obtained from Injibara University college of health science Institutional Review board (IRB). All other relevant ethical considerations were adequately addressed in the investigator's brochure. Permission was obtained from the appropriate administrators. Confidentiality was upheld throughout the study by avoiding the use of identifiers and employing codes to identify participants.

Consent for publication

Not applicable

Availability of Data and Materials

The datasets generated and /or analysed during the current the audit are not publicly available due to preserving participant anonymity, but are available from the corresponding author on reasonable request (Belete Destaw, baleanst@gmail.com).

Competing Interests

All authors assert that they have no competing interests

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Authors' contributions

BD designed the Audit, was involved in data collection, analysis, and interpretation of the results and drafted the manuscript, and participated in preparing all versions of the manuscript. TM, EE, MA, ZM, RA and MT assisted in the design and the Proforma development, monitored data collection, assisted during analysis, and revised subsequent drafts of the paper. All authors read and approved the final manuscript.

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