Section: Anaesthesiology

Original Research Article

SAFETY PRECAUTIONS AND PRACTICES OF ANESTHESIOLOGISTS OF INDIA – A CROSS-SECTIONAL STUDY

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Received : 10/04/2025
Received in revised form : 03/06/2025
Accepted : 20/06/2025

Keywords:
Anesthesiology [MeSH], Patient Safety [MeSH], Burnout, Professional [MeSH], Adverse Event Reporting [MeSH], India [MeSH], Capnography, Intralipid, Practice Standards

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DOI: 10.47009/jamp.2025.7.4.106

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (4); 556-562

ABSTRACT

Background: Anaesthesiology is a critical field where patient safety is paramount. This study aims to assess the safety precautions and practices of anaesthesiologists in India, highlighting adherence to established guidelines amidst diverse training backgrounds. **Materials and Method:** A cross-sectional survey was conducted using a questionnaire distributed via Google Forms to members of the Indian Society of Anaesthesiologists. The final analysis included responses from 190 anaesthesiologists, with sample size calculated to ensure statistical validity. The questionnaire covered demographics, preparation for anaesthesia, procedural practices, and attitudes towards patient care. **Result:** The survey revealed a balanced gender distribution, with more younger professionals. Key findings indicated that while most anaesthesiologists adhere to safety protocols, significant gaps exist, such as 7.9% not using capnography and 46.3% lacking Intralipid for emergency situations. Additionally, 85.2% reported work-related stress, and 25.8% never reported adverse events, raising concerns about patient safety and professional well-being. **Conclusion:** The results underscore the need for improved adherence to safety practices, enhanced training opportunities, and better support systems for anaesthesiologists. Recommendations include implementing duty-hour regulations, mandatory skill refreshers, and standardized documentation protocols. Addressing the identified gaps in safety practices and professional support can significantly enhance patient safety and overall quality of anaesthetic care in India.

INTRODUCTION

India is a nation which is developing at a fast pace. In many fields, our quality of work is at par with international standards. Anaesthesiology is a specialized branch in which professionals are expected to always provide care of the highest quality. Safety of the patient is of paramount importance, as even a small error or a lapse on the part of the attending anesthesiologist can have grave consequences.[1]

Our country has a diverse population and we pride on our Unity in Diversity. Even though the Anaesthesiology course syllabus is the same throughout the country, the method by which it is being taught and practiced might differ drastically in many states of India. We have many international and national guidelines for the safe practice of Anaesthesia.[2] But the question is how far an individual anaesthesiologist adheres to these guidelines. This survey is a humble attempt to throw light on this ambiguous side.

MATERIALS AND METHOD

Our study was a questionnaire based cross sectional survey study which was done online with the help of Google forms after obtaining necessary research and ethical committee clearances. The study was registered with Clinical Trial Registry of India CTRI (CTRI trial registry number CTRI/2023/11/059443). The questionnaire was prepared after literature search and discussion between the investigators. The content validation of the questions was done by five senior anaesthesiologists. Then a pilot study was conducted on a convenience sample of thirty practicing anaesthesiologists of our nearby hospitals and their responses were excluded from the final analysis. Some changes were made in the questions for clarity and a final draft of 30 questions was formatted on Google form. The Google form was emailed to all the participants.

Sample size: The population is all the Anaesthesiologists of India. The targeted population was all the Anaesthesiologists who are members of

the Indian Society of Anaesthesiologists (ISA). The sample population was taken as those who responded to the online Google form questionnaire.

Any Anaesthesiologist of India who was a member of the Indian Society of Anaesthesiologists was included in the study. Anyone who did not give consent to the study was excluded.

Sample size calculation

Considering a confidence interval of 95% (Z alpha= 1.96), a power of 80% (Z beta= 0.84), and a margin of error of 9% (d=0.09)

As per the pilot study conducted by us, P is found to be 0.8%. So, 1-P=0.2

Therefore, Sample size =

$$\frac{(Z_\alpha + Z_\beta)^2 \times P(1 - P)}{d^2}$$

$$= \frac{(1.96 + 0.84)2\ x\ (0.8x0.2)}{.09\times.09}$$

=155.

Adding 10 % to account for any confounder, this will be 16. The minimum sample size required will be 155+16= 171.

The questions were divided into four sections. First section dealt with demography questions. The second, third and fourth sections dealt with preparation for Anaesthesia, procedure of Anaesthesia and attitude and care of Anaesthesiologist respectively. Responses to each question were given points (3,2,1) with respect to the quality of safety practice. A total of thirty questions were included. The points scored by each respondent were estimated and were categorized to three grades namely excellent, average, and poor safety standards by a three-tier grading system. The first tier comprised of those with 70-90 points, second tier 50-69 and third one 30-49 points respectively. We also analysed each respondent's total points with respect to their age, years of experience nature of practice, sector of working and qualification. In our period of study, we got about 191 responses from more than 2000 emails sent.

RESULTS

The responses to all the questions of 190 subjects were analysed. Results are given in tables below.

Table 1: Demographic data

S No	Parameter	Response in percentage
1	Gender	
	Male	52.1
	female	47.9
2	Age Distribution	
	26-40 years	43.7
	41-55 years	38.4
	56 and above	17.9
3	Years of experience	
	Less than or equal to 10 years	43.7
	11- 20 years	22.1
	More than 20 years	34.2
4	Nature of practice	
	Institutional	86.3
	Free- lancing	13.7
5	Sector of working	
	Government	30.5
	Private	69.5
6	Qualification	
	MD/DNB *	79.5
	DA ‡	15.8
	DM/PDCC†	4.7

*Doctor of Medicine/ Diplomate of National board

‡ Diploma in Anaesthesiology

† Doctorate of Medicine / Post Doctoral Certificate Course

Table 2: Preparation.

S No	Parameter	Response in percentage
1	When do you conduct the pre anaesthesia check-up (PAC)?	
	From one week before to the day of surgery	64.7
	The day before surgery	27.4
	On the day of the surgery in the theatre	7.9
2	When you are planning to do a case for which PAC was done by your colleague, do you discuss about the case with your colleague?	
	Always	37.4
	Sometimes	61.1
	Never	1.5
3	After evaluating the patient do you make an anaesthetic plan?	
	Always	93.2

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	Sometimes	6.8
	Never	0
4	Do you explain the risks involved to the bystanders and get informed consent?	
	Always	80
	Sometimes	20
	Never	0
5	Before taking up a high-risk case do you make sure that you will be getting help from your colleague if needed?	
	Always	73.2
	Sometimes	25.8
	Never	1
6	Before taking up a high-risk case, do you make sure that adequate staff, monitors, and other supportive facilities are available at your centre?	
	Always	93.7
	Sometimes	6.3
	Never	0
7	Who will be assisting you while providing Anaesthesia?	
	Qualified Anaesthesia technician	81.1
	Trained nurse	15.8
	No one	3.1
8	Do you have any modern anaesthesia workstation and multipara monitor at the operation theatres of your centre ?	
	Always	78.9
	Sometimes	18.4
	Never	2.7
9	Do you have a difficult intubation crash cart at your operation theatre?	
	Always	80
	Sometimes	16.3
	Never	3.7
10	Do you make sure that you have a working defibrillator at your operation theatre?	
	Always	76.8
	Sometimes	18.9
	Never	4.3

Table 3: Procedure

S No	Parameter	Percentage Response
1	Will you be providing anaesthesia to more than one patient at a time?	
	Never	34.2
	Sometimes	62.1
	Always	3.7
2	Will your surgeon force you to change your anaesthetic plan?	
	Never	36.3
	Sometimes	63.7
	Always	0
3	Who will be taking up the responsibility for anaesthesia machine check up?	
	Myself	61.1
	Anaesthesia technician	36.8
	Trained nurse	2.1
4	Who will be preparing the anaesthetic drugs?	
	Myself	51.6
	Anaesthesia technician	46.3
	Trained nurse	2.1
5	Do you confirm endotracheal intubation with waveform capnogram?	
	Always	71.6
	Sometimes	20.5
	Never	7.9
6	Do you select beep source to SPO_2© to take advantage of pitch tone variation (to easily detect desaturation)?	
	Always	85.8
	Sometimes	12.1
	Never	2.1
7	Do you set appropriate alarm limits for a particular patient?	
	Always	55.8
	Sometimes	38.9
	Never	5.3
8	Do you record basal heart rate, blood pressure, oxygen saturation etc before starting a case?	
	Always	93.7
	Sometimes	5.3
	Never	1
9	Do you insist on recording SPO2 on room air before beginning anaesthesia and putting on oxygen mask?	
	Always	85.8
	Sometimes	13.2

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	Never	1
10	Do you place or exchange the vaporizer after the anaesthesia machine leak test is over?	
	Never	60
	Sometimes	36.3
	Always	3.7
11	While doing a peripheral nerve blockade, which safest facility is available for you to confirm accurate needle tip placement	
	USG® with or without peripheral nerve locator	76.3
	Peripheral nerve locator	10
	Eliciting paraesthesia	13.7
12	Do you keep ready 'INTRALIPID' to treat accidental local anaesthetic toxicity before conducting nerve blocks?	
	Always	27.4
	Sometimes	26.3
	Never	46.3
13	Do you personally cross check and verify patient identifying data before transfusing blood?	
	Always	89.5
	Sometimes	9.5
	Never	1
14	Do you meticulously record the case details on a standard anaesthesia chart?	
	Always	83.2
	Sometimes	15.8
	Never	1
15	Do you have a good post anaesthesia recovery room with adequate qualified staff and monitoring?	
	Always	76.3
	Sometimes	18.9
	Never	4.8

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® Ultrasonography

Table 4: Attitude and care

S No	Parameter	Response Percentage
1	Have you ever felt being forced to do a case which you are not confident to do?	
	Never	54.2
	Sometimes	44.7
	Always	1.1
2	Have you ever felt you are stressed out and not getting enough rest and leisure time?	
	Never	14.7
	Sometimes	76.8
	Always	8.4
3	Is there any incident reporting and auditing of adverse events at your institution?	
	Always	38.9
	Sometimes	35.3
	Never	25.8
4	Do you think it is important to be a member of Professional Protection Scheme of IMA/ ISA≠?	
	Always	86.3
	Sometimes	13.7
	Never	0
4	Do you think it is important to update your knowledge and skills by attending CMEs≠≠, conferences, and workshops regularly?	
	Always	87.9
	Sometimes	11.6
	Never	0.5

≠ Indian Medical Association/ Indian Society of Anaesthesiology
≠≠ Continuing Medical Education

DISCUSSION

Demographic data analysed showed us that the gender distribution of our survey subjects was 52.1% males and 47.9% females. The gender ratio is nearly balanced, indicating good gender representation in the field of anaesthesiology. This is like gender distribution in Matot I, De Hert S et al,[3] and like Haldar R, Shamim R et al,[4] where majority of the respondents were male .43.7% are between 26-40 years, 38.4% are 41-55 years, and 17.9% are 56+ years. A younger workforce dominates, suggesting a good influx of new professionals. However, only 17.9% are in the senior category, which could mean a lack of highly experienced specialists. 43.7% have ≤10 years of experience, 22.1% have 11-20 years, and 34.2% have over 20 years. This aligns with the age distribution—there is a good mix of junior, mid-career, and experienced professionals. Institutional practice dominates (86.3%), which suggests stable job opportunities. However, freelancers may have different challenges, such as lack of job security.

A major share (69.5%) respondents were from private sector, which may indicate better financial

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incentives compared to government. Very few (4.7%) have super-specialty (DM/PDCC) degrees which could indicate a lack of advanced training opportunities.

64.7% respondents conduct PAC (Pre-Anaesthetic Checkup) from one week before to the day of surgery, 27.4% conduct PAC the day before surgery. Conducting PAC earlier allows time for optimization of the patient's condition. 7.9% respondents conducting PAC on the day of surgery is concerning, as it may not allow sufficient time to identify and manage potential risks. Institutions should aim to minimize same-day PAC.

While most respondents discussed cases and PAC findings with colleagues, 1.5% never do, which can lead to miscommunication and compromised patient safety. Encouraging mandatory case discussions, especially for complex cases, would improve decision-making and teamwork.

93.2% always formulate an anaesthetic plan after PAC. The high percentage of anaesthesiologists who always plan is reassuring. The 6.8% who only "sometimes" plan may benefit from structured protocols to ensure every patient receives individualized pre-operative planning.

80% always explained risks and obtained informed consent. Study results showed that 20% sometimes omitted this critical step. Standardized protocols should ensure that risk discussions happen consistently to enhance patient trust and legal protection.

While administering anaesthesia,73.2% always ensure help from colleagues. 25.8% sometimes ensure help.1% never ensure help. This 1% is a concern, as high-risk cases demand backup personnel. Encouraging a culture of teamwork and institutional policies requiring backup in high-risk cases can enhance safety.

93.7% always ensure adequate staff and facilities. The 6.3% who "sometimes" check should be encouraged to verify resources consistently, as equipment failure or shortages can impact patient outcomes.

81.1% work with a qualified anaesthesia technician.15.8% work with a trained nurse. 3.1% respondents working alone is a safety concern, especially in complex cases. Institutions should ensure that trained personnel are always available.

78.9% always have modern anaesthesia workstations and multiparameter monitors. 18.4% sometimes have access. 2.7% never having modern equipment indicates gaps in infrastructure that need to be addressed. Hospitals should prioritize upgrading old anaesthesia machines and monitoring systems to improve patient safety.

80% always have a difficult intubation crash cart available. 3.7% never having a crash cart is a significant safety concern. Hospitals should ensure that every operating room is equipped with a difficult airway cart to prevent airway emergencies.

76.8% always ensure a working defibrillator.18.9% sometimes check. 4.3% of anaesthesiologists never check defibrillator availability and this is risky in case of cardiac arrest. Regular defibrillator checks should be mandatory to ensure functionality during emergencies. Only 34.2% never provide anaesthesia to multiple patients simultaneously. 62.1% sometimes managing multiple cases poses risks, particularly in high-risk surgeries or emergencies. 3.7% always handling multiple cases is alarming—this practice should be avoided to ensure proper monitoring and immediate response to complications. Hospitals should maintain adequate staffing to prevent anaesthesiologists from managing multiple patients simultaneously.

While collaboration between anaesthesiologists and surgeons is important, a majority 63.7% sometimes feeling pressured to change their anaesthetic plan raises ethical and safety concerns. Institutional protocols should ensure anaesthesiologists have full authority over anaesthesia management, guided by patient safety rather than external pressure.

While most anaesthesiologists (61.1%) check their own machines, relying on others (38.9%) may lead to errors if proper protocols are not followed. Hospitals should implement mandatory anaesthesia machine checks by the anaesthesiologist before every procedure to prevent equipment-related mishaps.

Nearly half (51.6%) prepare drugs themselves while the remaining rely on others. While it is common for anaesthesia technicians to assist, anaesthesiologists should verify all medications before administration to prevent drug errors. Double-checking protocols and standardized labelling should be implemented to minimize drug-related mistakes.[5,6]

In relation to the use of capnography for intubation, an overwhelming majority use it regularly. 7.9% never using capnography is a serious safety concern, as it is the gold standard for confirming airway placement [Figure 2]. Hospitals should mandate waveform capnography as a standard practice for every intubation to reduce misplacement risks.

The majority utilize SpO2 beep with pitch tone for monitoring Oxygen saturation. Training should reinforce the importance of auditory monitoring cues with pitch tone variation in intraoperative safety.

While 55.8% always set patient-specific appropriate alarm limits, 38.9% sometimes do it while 5.3% never set limits, thus they risk missing critical warning signs. Institutions should implement a checklist requiring customized alarm settings for each patient.[7]

- An overwhelming majority (93.7%) always record baseline vitals before surgery. The remaining responses 5.3% sometimes and 1% never is unacceptable, as preoperative vitals are crucial for detecting intraoperative complications. Strict preoperative documentation protocols should be enforced
- Even though a major chunk of respondents (85.8%) always records pre-oxygenation SpO2 in room air,1% responded in the negative which may overlook undiagnosed hypoxia. Routine documentation of this should be mandatory.

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- 60% never exchanging the vaporizer post machine leak test is appropriate, as vaporizers should typically remain unchanged unless faulty. 36.3% skip it sometimes, and the 3.7% who always replace it might be introducing unnecessary variability, which can lead to incorrect calibration.

The high use of ultrasound guidance (76.3%) for peripheral nerve blocks is encouraging, as it reduces complications.10% using peripheral nerve locator might be in centres with no USG facilities. However, 13.7% relying solely on paraesthesia is outdated and riskier. Institutions should prioritize ultrasound-guided techniques as the gold standard for peripheral nerve blocks.

Only a minority of 27.4% respondents always keep Intralipid ready.26.3% sometimes have it available while 46.3% lacking intralipid [Figure 3] is similar to Gupta A, Krishna B et al,[8] and is a serious safety issue—it is a life-saving antidote for local anaesthetic systemic toxicity (LAST), which can happen with any surgeries including ophthalmology and other local cases .Hospitals should mandate Intralipid availability in all operating rooms performing regional anaesthesia. It is reassuring to note that 89.5% always cross-check patient identity. 9.5% who sometimes do it and the 1% never verifying identity before transfusion increases the risk of fatal mismatched transfusions. Strict blood verification protocols should be there to eliminate errors.

Majority of respondents document case details on an Anaesthesia chart. It is disheartening to see nearly 20% of study subjects not doing so, especially 1% never documenting anaesthesia records is a serious issue. Mandatory electronic anaesthesia records (EARs) should be implemented to ensure compliance.[9]

Availability of Post-Anaesthesia Recovery Rooms should be a standard of care across all surgical centres. Here a majority do have a good recovery room, but the results show that infrastructure improvement is required across many hospitals.

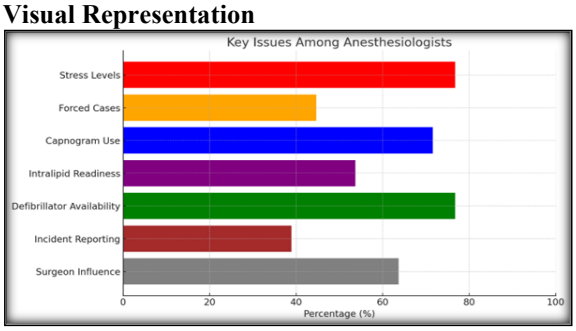
While most respondents (54.2%) have autonomy in their practice, 44.7% sometimes felt pressured and this is a significant concern and is like findings of Sinha S, Adhikari D et al,[10,11] who noted that majority of the anaesthesiologists (89%) felt that they are dominated and dictated by surgeons, at least on occasions.

1% always being forced into cases beyond their confidence level is alarming—it can compromise patient safety. Institutions should reinforce ethical decision-making and provide support systems for anaesthesiologists to decline unsafe cases. An overwhelming 85.2% experienced work-related stress, with 8.4% always being stressed—indicating potential burnout.[12] Hospitals should implement workload management policies, including adequate rest periods, structured breaks, and psychological support programs.

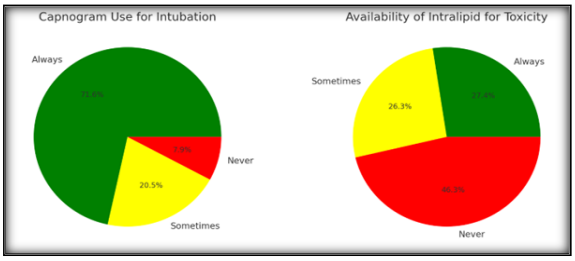
25.8% never reporting adverse events is concerning, as reporting is essential for improving safety protocols. Hospitals should adopt a non-punitive, anonymous reporting system to encourage transparency.

86.3% recognizing the importance of Professional Protection (IMA/ISA) is encouraging, as legal protection is essential in high-risk medical fields. All anaesthesiologists should be encouraged to enrol in professional indemnity schemes. 87.9% always believe in regular skill updates and CMEs and only 0.5% disregarding CME is a positive sign [Figure 4]. Hospitals should provide financial and logistical support for regular CME participation to ensure up-to-date practice.

Visual Representation

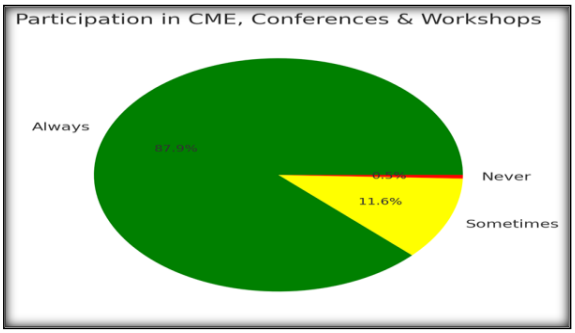


Here is a horizontal bar chart highlighting key issues faced by anaesthesiologists. The highest concerns include stress levels (76.8%), influence from surgeons (63.7%), and a lack of incident reporting (38.9%).



Here are two pie charts:

1. Capnogram Use for Intubation – 71.6% always use it, but 7.9% never do, posing a patient safety risk.
2. Intralipid Availability for Local Anaesthetic Toxicity – 46.3% never keep it ready, a serious gap in emergency preparedness.



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This pie chart shows participation in CME(Continuing Medical Education), conferences, and workshops. While 87.9% of anaesthesiologists regularly update their skills, 11.6% do so only sometimes, and 0.5% rarely engage in continuous learning.

CONCLUSION

Recommendations based on our survey study.

- Implement duty-hour regulations to prevent burnout.
- Provide mental health support and stress management programs.
- Encourage mandatory skill refreshers and CME participation to stay updated with best practices.
- More fellowship programs and incentives should be introduced for specialized anaesthesiology training
- Implement strict incident reporting systems.
- Enforce standardized documentation of all cases.
- Regular checks and documentation of defibrillator functionality.
- Make waveform capnography mandatory for all intubations.
- Ensure all centres have Intralipid stocked as a safety measure.
- Establish clear protocols to prevent undue influence on anaesthetic decisions.

By addressing these areas, patient safety, efficiency, and compliance can be significantly improved.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556