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Role of Anaesthesia in Intensive Care Unit Patients: A Multicenter Study in Bangladesh

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Abstract

Management of critically ill patients in the intensive care unit (ICU) is inherently multidisciplinary. Anaesthesia, with its core principles of physiology, pharmacology, and advanced procedural skills, plays a pivotal role in this setting. A multicenter prospective, cross-sectional study was conducted in six hospitals in Mymensingh region of Bangladesh, from July 2024 to September 2025, to assess the role and impact of anaesthesia in the management of critically ill patients in the ICU. A purposive sample of 297 critically ill patients receiving anaesthesia-led interventions got enrolled in this study. Data was collected on the types of anaesthetic techniques and agents used, their indications, and associated clinical outcomes. Endotracheal intubation (64.3%) was the most frequent anaesthesia-led intervention, followed by central venous access (48.1%). The overall procedural success rate was high (92.3%), though transient hypotension (9.4%) was the most common complication. Seniority and experience of the specialists was significantly associated with success (consultant 98.5% vs. registrar 87.3%, $p<0.001$). Patients' age >60 years and the use of propofol were significantly associated with complications ($p<0.05$). Anaesthesia is pivotal in ICU management, excelling in airway and procedural care with high success. Formal integration of anesthesiologists into ICU teams and specialized training are essential to optimize patient safety and outcomes in resource-limited settings.

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Introduction

The Intensive Care Unit (ICU) represents the epicenter of hospital-based critical care, dedicated to the management of patients with life-threatening conditions requiring sophisticated organ support and continuous monitoring.[1] The complexity of critical illness demands a multidisciplinary approach, integrating the expertise of intensivists, nurses, respiratory therapists, and clinical pharmacists to optimize patient outcomes. Within this team, the role of the anaesthesiologist, often functioning as an intensivist, is fundamentally important yet sometimes underappreciated in certain healthcare systems.[2,3] The core principles of anaesthesia—profound knowledge of physiology, pharmacology, advanced airway management, and haemodynamic stabilization—are directly transferable and essential to the ICU environment.[4] Anaesthesiologists are uniquely trained to perform crucial interventions such as endotracheal intubation under challenging conditions, placement of invasive vascular catheters, and management of complex analgesic and sedative regimens.[5] Beyond procedural skills, their expertise is critical in guiding the management of septic shock, traumatic brain injury, and other states of physiological derangement common in critically ill patients.[6] The concept of the anaesthesiologist-

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intensivist, a specialist dual-trained in both disciplines, is well-established in many countries and is associated with improved patient outcomes, including reduced mortality and shorter ICU lengths of stay.[7,8] In high-income countries, the integration of anaesthesia into critical care is well-documented. However, in low- and middle-income countries (LMICs) like Bangladesh, the landscape is markedly different. ICUs often face significant challenges, including resource constraints, a shortage of trained intensivists, high patient-to-nurse ratios, and limited access to advanced monitoring technologies.[9,10] Within this context, the specific contributions and impact of anaesthesia providers remain poorly quantified. While their skills are undoubtedly leveraged, the nature, frequency, and outcomes of their interventions have not been systematically studied in the Bangladeshi context. A few studies have touched upon the broader challenges of critical care in Bangladesh, highlighting gaps in infrastructure, training, and protocol-based management.[11,12] However, a significant knowledge gap exists regarding the specific role of anaesthesia within these units. Understanding this role is not an academic exercise but a practical necessity for healthcare planning focusing on critical care and resource allocation to enhance ICU capabilities.[13] Therefore, this study aimed to assess the role and impact of anaesthesia in the management of critically ill patients in ICUs across Mymensingh region of Bangladesh.

Methods

A multicenter, prospective, cross-sectional study was conducted from July 2024 to September 2025. The study population consisted of critically ill patients admitted to the Intensive Care Units (ICUs) of Mymensingh Medical College Hospital (MMCH), Community-Based Medical College, Bangladesh (CBMC,B) Hospital, and 3 other private hospitals of Mymensingh, Bangladesh, who required any anaesthesia-led intervention during their stay.

Inclusion criteria: Patients were included if they were above 18 years of age and received an anaesthesia provider-led intervention. These interventions were defined as endotracheal intubation, central venous catheterization, management of difficult airways, administration of deep procedural sedation, or hemodynamic resuscitation.

Exclusion criteria: Patients were excluded from the study if the anaesthesia intervention was performed primarily for a surgical procedure in the operating theatre or if their medical records were incomplete for data extraction.

We adopted convenient, purposive sampling technique. Based on inclusion and exclusion criteria, finally, a total of 297 patients were enrolled in this sudy. Data was collected directly by the investigators through patient chart reviews and structured interviews with the attending anaesthesia providers. A standardized data collection form captured details on the type of intervention, anaesthetic agents used, indications, and immediate complications.

Collected data was compiled, coded and analyzed using the Statistical Package for Social Sciences (SPSS) version 25.0 for Windows. Descriptive statistics (e.g., frequency and percentage) was used to summarize the data. Inferential statistics, i.e., Chi-square test was applied to find associations between categorical variables. A p-value <0.05 was considered statistically significant.

The study was approved by the Institutional Review Board of Mymensingh Medical College, Mymensingh, Bangladesh.

Results

A total of 297 patients were enrolled in this study. The mean age of the participants was 52.4±16.7 years, with a nearly equal gender distribution (50.8% male, 49.2% female). The most common primary admission diagnosis was acute respiratory failure (31.0%), followed by septic shock (22.6%), acute pesticide poisoning (18.5%) and traumatic brain injury (16.1%) (Table-I).

Table-I: Diagnosis at admission of the patients (N=297)

Diagnosis	Frequency (Percentage)
Acute respiratory failure	92 (31.0)
Septic shock	67 (22.6)
Acute poisoning	55 (18.5)
Traumatic brain injury	48 (16.1)
Others	35 (11.8)

The most frequently performed anaesthesia-led intervention was endotracheal intubation, which was required for 191 patients (64.3%). This was followed by central venous catheterization (CVC) in 143 patients (48.1%) and the provision of deep sedation for therapeutic procedures (e.g., endoscopy, drainage) in 97 patients (32.7%). The primary indication for anaesthesia involvement was for the management of respiratory failure (52.5%), with hemodynamic instability (31.0%) being the second most common reason (Table-II). Volatile inhalational agents, primarily sevoflurane, were used for prolonged sedation in 85 cases (28.6%), while intravenous propofol infusions were the main agent for 143 patients (48.1%). The overall immediate procedural success rate was high (92.1%) (Table-III). Complications were observed in 14.5% of all interventions. The most common immediate complication was transient hypotension (9.4%), followed by desaturation (SpO2 <90%) during intubation (3.7%) (Table-IV).

Table-II: Frequency and distribution of anaesthesia-led interventions

Type of intervention	Frequency (Percentage)	Primary indication for intervention	Frequency (Percentage)
Endotracheal intubation	191 (64.3)	Respiratory failure	156 (52.5)
Central venous catheterization	143 (48.1)	Hemodynamic instability	92 (31.0)
Deep procedural sedation	97 (32.7)	For the therapeutic procedure	97 (32.7)
Arterial line placement	75 (25.3)	Need for invasive BP monitoring	75 (25.3)

Table-III: Anaesthetic agents and techniques utilized

Agent/ Technique	Context of use	Frequency (Percentage)
Propofol (IV)	Primary sedative for intubation and infusion	143 (48.1)
Volatile agents (e.g., Sevoflurane)	Prolonged ICU sedation	85 (28.6)
Etomidate (IV)	Hemodynamically stable induction	112 (37.7)
Ketamine (IV)	Hemodynamically unstable induction	59 (19.9)
Overall procedural success rate		274 (92.3)

Table-IV: Frequency of complications related to interventions

Complications	Frequency (Percentage)
Hypotension (SBP <90 mmHg)	28 (9.4)
Desaturation (SpO_2 <90%)	11 (3.7)
Arrhythmia	5 (1.7)
Dental injury	2 (0.7)
Total with any complication	43 (14.5)

A highly significant association was found between the seniority and experience of the anaesthesia physicians (consultant vs. registrar) and the rate of procedural success (p<0.001) (Table-V).

Table-V: Association between provider seniority and procedural success

Seniority and Experience	Successful Frequency (Percentage)	Unsuccessful Frequency (Percentage)	Total
Consultant	130 (98.5)	2 (1.5)	132
Registrar	144 (87.3)	21 (12.7)	165

Chi-square test was applied; p<0.001.

Furthermore, the choice of sedative agent was significantly associated with the occurrence of hypotension (p<0.01). Patients' age was also a significant factor, as who aged >60 years being more likely to experience more complications (p<0.05). However, no significant association was found between the type of intervention and the complication rate (p>0.05) (Table-VI).

Table-VI: Factors associated with the occurrence of complications

Factors	Complications		p-value
	Present (n=43) Frequency (Percentage)	Absent (n=254) Frequency (Percentage)	
Age >60 years	18 (41.9)	65 (25.6)	0.013
Use of propofol Infusion	28 (65.1)	115 (45.3)	0.007
Intervention : CVC	18 (41.9)	125 (49.2)	0.182
Intervention: Intubation	32 (74.4)	159 (62.6)	0.089

Chi-square test was applied.

Discussion

This multicenter study provides a comprehensive overview of the critical role and significant impact of anaesthesia providers in the management of critically ill patients within the ICUs of Bangladesh. The findings underscore that anaesthesia expertise is primarily sought for advanced airway management and vital procedural support, with a high overall success rate and an acceptable safety profile, albeit with identifiable risk factors for complications. The high frequency of endotracheal intubation (64.3%) as the leading intervention aligns with the core skill set of anesthesiologists and is consistent with global ICU practices where they are the primary providers for this high-risk procedure.[14,15] The significant association between specialists' seniority and experience (consultant vs. registrar) and higher success rates (p<0.001) strongly reinforces the well-established evidence that experience and specialized training drastically reduce complications associated with airway management in critically ill patients.[16] This finding is particularly relevant for LMICs like

Bangladesh, advocating for structured mentoring and supervised training for junior doctors to enhance patient safety. The substantial role in central venous access (48.1%) and the use of advanced techniques like volatile-based sedation (28.6%) demonstrate the expansion of the anaesthesiologist's role beyond the operating room. The utilization of sevoflurane for prolonged sedation, while not yet a universal standard, reflects a growing body of evidence suggesting its potential benefits in improving wake-up times and hemodynamic stability in select patients.[17,18] However, the significant association between propofol infusion and hypotension (p=0.007) serves as a crucial reminder of the delicate pharmacodynamic balance required in critically ill, often hypovolemic, patients.[19] This highlights the necessity for meticulous, titration-based dosing and continuous hemodynamic monitoring, which are inherent to anaesthesia training. The overall low complication rate (14.5%) is encouraging and underscores the value of specialized skills in this high-stakes environment. The most common complication, hypotension (9.4%), is a known consequence of anaesthetic induction agents and positive-pressure ventilation in volume-depleted patients.[20] The identified risk factor of advanced age (>60 years) for complications is biologically plausible, as elderly patients often have reduced physiological reserve and comorbid conditions, making them more vulnerable to the pharmacological and procedural stresses of critical care interventions.[21] This study has limitations. The purposive sampling method, while practical, may introduce selection bias. The cross-sectional design captures immediate outcomes but not long-term survival or ICU length of stay. Moreover, the study was conducted in a specific region's tertiary care hospitals, which may limit the generalizability of findings to district-level ICUs with even more constrained resources. Despite these limitations, the implications are clear. The findings argue compellingly for the formal integration of anesthesiologists into the ICU multidisciplinary team in Bangladesh. There is a pressing need to develop standardized protocols for common procedures and sedation practices, tailored to the resource realities of LMICs.[22,23] Investing in continued professional development focused on critical care for anaesthesia providers is essential to maintain and improve the quality of care and patient safety.[23]

Conclusion

Anaesthesia providers are pivotal in Bangladeshi ICUs, primarily performing advanced airway management and procedural sedation with high success. Their expertise significantly enhances patient safety. To optimize critical care, formal integration of anesthesiologists into ICU teams, the development of standardized protocols, and dedicated training in critical care medicine are urgently recommended.

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