

## Simulation, artificial intelligence and technology

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### BACKGROUND

This issue of the Indian Journal of Anaesthesia is dedicated to the role and advancements in simulation, artificial intelligence and technology in anaesthesiology (including perioperative medicine), critical care and pain medicine. The essence of medical education undergoes a paradigmatic shift by introducing novel teaching–learning and assessment tools tailored to complement the exigencies of competency-based medical education in postgraduate training in anaesthesiology. This themed issue encapsulates a diverse range of scientific contributions aimed at exploring the transformative impact of the domains of simulation, artificial intelligence and technology on education, training and clinical practice [Figure 1]. From advancing teaching–learning paradigms to leveraging cutting-edge technologies, these contributions epitomise the spirit of innovation and collaboration that defines our discipline.<sup>[1]</sup>

#### Simulation and competency-based education

The cornerstone of this issue lies in novel approaches to teaching and learning, reflecting the evolving nature of postgraduate training. Manuscripts dedicated to novel teaching–learning and assessment tools exemplify a paradigm shift towards competency-based education. The pedagogical landscape of anaesthesiology is undergoing a profound metamorphosis, notably marked by the integration of simulation-based methodologies. The manuscripts in this issue unfold a comprehensive

narrative, elucidating its multifaceted applications, emphasising enhanced learning environments, reinforcing crisis resource management and covering diverse facets of simulation-based education and training for anaesthesia professionals. A detailed analysis of simulation in airway management training and its role in thoracic anaesthesia underscores the pivotal position of simulation-based methodologies in shaping procedural expertise within the anaesthesiology spectrum. Immersive simulated patient programmes emerge as a cornerstone in enhancing healthcare communication education, fostering a holistic approach to honing patient interaction skills.<sup>[1]</sup>

Furthermore, examining the establishment of simulation centres outlines the challenges faced and solutions employed, providing a comprehensive overview of the current landscape. The discussion on faculty development programmes in simulation-based teaching reinforces the necessity of empowering educators with comprehensive training to optimise the pedagogical value of simulations. The manuscript exploring faculty development programmes serves as a guiding light, highlighting the need for robust training to enable educators to harness the full potential of simulation methodologies.

#### Artificial intelligence in perioperative, critical care and pain medicine

Concurrently, the surge in artificial intelligence applications reshapes the landscape of perioperative



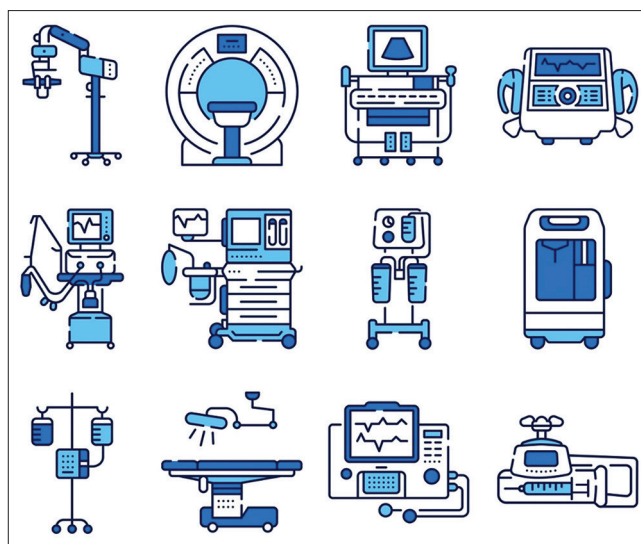
**Figure 1:** Various domains necessitating the need for simulation, artificial intelligence and technology in clinical practice

medicine and clinical decision-making. The infusion of artificial intelligence into perioperative medicine is a focal point of this issue, with diverse applications elucidated. The role of artificial intelligence in perioperative monitoring, airway management, haemodynamic monitoring and regional blocks portrays the immense potential to revolutionise decision-making and patient care paradigms [Figure 2].<sup>[2,3]</sup>

#### Approaches for inclusive education

In line with our commitment to inclusive and accessible education, this issue explores innovative approaches to address resource constraints in healthcare education. The strides made in leveraging technology to address disparities in healthcare education are equally significant.<sup>[4]</sup> Low-cost seizure simulation in low-technology manikins exemplifies resourceful ingenuity while digitising the simulation landscape for low-resource settings reflects a commitment to inclusivity and accessibility.

Simulation's integration into various facets of perioperative medicine is a recurrent theme in this issue. The integration into anaesthesiology curricula and the challenges present a comprehensive overview of the current landscape and future trajectory. Examining postgraduate education trajectories in anaesthesiology and delineating



**Figure 2:** Role of artificial intelligence in perioperative monitoring, airway management, haemodynamic monitoring and regional blocks

frameworks for creating simulation scenarios substantiate the holistic approach adopted within this compilation.<sup>[5]</sup>

#### Precision medicine, individualised medicine and tailored patient care

The convergence of medical simulation and artificial intelligence enhances training methodologies and propels us towards precision medicine and tailored patient care [Figure 3].<sup>[6]</sup> The endeavour to develop mathematical models for analysing the pharmacokinetics of morphine and fentanyl underscores precision medicine's potential within anaesthesiology, paving the way for tailored therapeutic interventions.

#### CONCLUSIONS

The convergence of medical simulation, artificial intelligence and technology heralds an era of unparalleled innovation and refinement within anaesthesiology. This collection of scientific contributions represents a comprehensive journey into the expanding realms of medical simulation, artificial intelligence, and technology in anaesthesiology. It is our fervent hope that this particular issue ignites further exploration, research, and implementation, fostering advancements that resonate throughout our discipline and ultimately contribute to improved patient outcomes.

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**Figure 3:** Precision medicine, individualised medicine and tailored patient care

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