Navigating the Implementation of AI in Intensive Care Medicine

Intensive care medicine is recognised as a promising field for implementing artificial intelligence (AI) due to the abundance of data generated in intensive care units (ICUs). However, despite the potential benefits, there is a significant gap between developed AI models and their actual clinical use. Challenges include technological issues in data quality, ethical and regulatory concerns, lack of robustness in AI models, and gaining acceptance from clinicians. Recent studies have shown positive attitudes towards AI among ICU professionals but have also identified technical and non-technical barriers to implementation. However, existing research is limited to a few high-income countries (HICs), neglecting perspectives from lower-to-middle-income countries (LMICs). A recent study published in BMJ Health & Care Informacits aims to address this gap by exploring the views of intensive care professionals from both HICs and LMICs regarding the use and implementation of AI in ICUs.

Insights into Data Utilisation Challenges in Intensive Care Units

The study included 59 intensive care professionals, primarily physicians (69.5%), followed by nurses (18.6%), pharmacists (6.8%), and physical therapists (3.4%). Participants were from various regions, with the majority from Europe, Asia, and North America. Most participants were male (66.1%). Findings revealed a widespread lack of digital data collection and underutilization of patient data in ICUs across both high-income and low-to-middle-income countries. While some ICUs used electronic monitors for data collection, documentation was mostly paper-based or partially digitalized, limiting the availability of digital data. Additionally, secondary use of patient data was reported to be minimal in most ICUs, except for a few large tertiary hospitals in high-income countries where data collection and documentation were fully digitalized and extensively used for secondary purposes. However, even in fully digitalized ICUs, manual verification of data was often required due to regulatory requirements, although some participants suggested that detailed verification was not always practiced.

ICU Professionals' Perceptions and Concerns on AI Integration

Intensive care professionals, regardless of their location in high-income or low-to-middle-income countries, displayed a positive attitude towards AI technology, envisioning its potential to enhance patient outcomes and alleviate workload burdens. They highlighted AI's capability to serve as an early warning system for patient deterioration, predict high-risk cases, and streamline workflows, such as managing bed capacity and improving documentation accuracy. Despite this optimism, participants expressed several concerns about AI implementation in clinical practice. One prominent concern was the validity of AI models, with worries about biases and their applicability to diverse patient populations, particularly minorities and disadvantaged groups. Another concern focused on the explainability of AI systems, with some advocating for transparency to maintain clinician and patient trust, while others prioritised evidence of effectiveness over understandability. Participants also debated the issue of responsibility, pondering who would be accountable if AI made autonomous decisions in patient care. While some believed in maintaining human oversight, others viewed AI as a supplementary tool rather than a replacement for clinical judgement. Moreover, there were concerns about dependency on AI, fearing that over-reliance could lead to deskilling of staff and a decline in personalised patient care. Lastly, participants highlighted potential disparities in AI adoption, which could exacerbate inequalities between affluent and underserved healthcare settings. Overall, while intensive care professionals recognised AI's potential benefits, they underscored the importance of addressing these concerns to ensure ethical and equitable integration into clinical practice.

Overcoming Barriers to AI Implementation in Intensive Care Units

Implementing AI in ICUs faces three primary barriers: digital infrastructure, knowledge and understanding, and regulatory challenges. Digital Infrastructure: Participants noted the inadequate digital infrastructure in both high-income and low-to-middle-income countries as a major hindrance. Many institutions lacked the necessary technical capabilities, including hardware, software, and skilled staff, to capture and utilise data for AI algorithms. Additionally, some participants from LMICs highlighted challenges such as unstable electricity supply. Limited funds and competing priorities in healthcare systems were cited as underlying issues, with decision-makers often failing to recognise the value of digital technologies for patient care. Knowledge and Understanding: A significant barrier identified was the lack of knowledge and understanding about AI among healthcare professionals and patients. This gap impeded acceptance and willingness to use AI tools, leading to suboptimal outcomes. Participants emphasised the importance of aligning AI development with clinical needs and fostering collaboration between clinicians and technical experts. Concerns were also raised about data ownership and competition among colleagues, hindering data sharing and cooperation essential for effective AI implementation. Regulatory Challenges: Participants highlighted variations in regulations regarding data protection

across countries as a significant barrier. Differences in data sharing and secondary use regulations posed challenges for AI implementation. While protecting patient privacy was recognised as crucial, overly stringent regulations were seen as potentially detrimental to research and innovation, limiting improvements in patient care.

Strategies for Advancing AI Adoption in Intensive Care

To enhance the acceptance and utility of AI applications in ICUs, participants emphasized the importance of clear and consistent evidence from robust research studies validating the effectiveness and reliability of AI. They highlighted the need for comprehensive explanations detailing the strengths, weaknesses, advantages, and disadvantages of each application. To bridge the understanding gap between clinicians and technical partners, participants proposed two main strategies:

Training and Education: Many advocated for improved training and education for both clinicians and data scientists. This would empower clinicians to grasp AI concepts better and enable data scientists to understand the clinical context. While participants recognised the need to enhance the knowledge and skills of all intensive care professionals, some suggested the possibility of a new specialty or subspecialty focused on AI training for clinicians.

Increased Inclusion of Clinicians: Participants stressed the importance of involving clinicians in the design and development of AI applications from the outset. They believed that greater consultation and collaboration between clinicians and developers would lead to more effective products tailored to clinical needs.

Moreover, participants highlighted the need to improve the wider ecosystem surrounding AI implementation in ICUs. This includes establishing proper systems for data collection and documentation, directing funding towards efforts to translate research into practice, ensuring grant panels possess the necessary expertise to evaluate multidisciplinary research, and fostering academic/commercial partnerships to enhance innovation and implementation.

Overcoming Barriers and Building Foundations for AI Integration

Participants generally held positive views on AI's potential in ICUs but identified significant technical and non-technical barriers to implementation. A key finding was the disparity in ICU readiness for AI implementation, with a few large tertiary hospitals in high-income countries possessing the necessary digital infrastructure, while most other ICUs lacked the technical capability and staff expertise. The study emphasises the importance of building digital and knowledge infrastructure foundations before widespread AI implementation, cautioning against investing in AI development without addressing these prerequisites. The authors call for international intensive care societies to establish consensus on the preconditions for AI use in ICUs.

While the study lacks statistically representative data and may be subject to biases and regional differences, it offers valuable insights into the challenges and considerations surrounding AI implementation in ICUs. The absence of a standardised definition of AI in medicine and variations in participants' AI knowledge may have influenced the study's findings. Additionally, the study predates the surge of interest in large language models and chatbots, thus not encompassing these advancements in AI technology.

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Published on : Mon, 22 Apr 2024