ICU
MANAGEMENT & PRACTICE

Artificial Intelligence in the ICU

The paucity of positive multicentre prospective randomised control trials in ICU settings serves to highlight the challenge of running studies in such environments, where multiple treatments are given simultaneously to individuals who respond in variable ways based on their individual physiology. Consequently, without established guidelines, ICU clinician decision-making is driven largely by experience and instinct, resulting in significant variability amongst clinicians.

Artificial intelligence (AI), which is now increasingly used in healthcare, has the potential to reduce this inter-clinician variability and offer other benefits. AI's notable advantage is its ability to find complex relationships in large volumes of data, as well as to analyse many variables to predict outcomes of interest, such as sepsis or mortality.

There are many potential applications for AI in the intensive care unit (ICU), particularly given the large amounts of data collected routinely. However, there are some important considerations for ensuring successful implementation.

Predictive models and decision support tools

In the ICU settings, scoring systems have been generated to record severity of illness and predict probability of mortality. Such systems can assist in clinical decision-making, comparisons of quality of care, and stratification for clinical trials. However, they do not incorporate variations between departments, regions and countries and perform better on entire ICU populations than on individuals or subsets.

AI is well suited for developing algorithms which overcome these limitations and also increase prediction accuracy. The AI model developed by Nemati et al., for example, predicted sepsis 12 hours before onset with an area under the curve (AUC) of 0.83. Also, the AI algorithm of Prasad et al., used to advise when to wean from mechanical ventilation, outperformed clinical practice in terms of number of re-intubations.

Important considerations for wider use

The use of AI tools must follow careful consideration of real-world clinical utility, efficiency and existing workflows. AI models should be validated by well-designed prospective studies before widespread implementation.

Training AI algorithms requires integrated, well-structured data. Many ICUs use a combination of paper and electronic data and do not electronically link together data collected from multiple sources. Data are often incomplete or incorrectly entered. However, many AI models have achieved accuracy despite these factors.

In healthcare, data security and patient privacy are important considerations. Appropriate consent must also be obtained for data collection, yet many ICU patients lack sufficient capacity until recovery.

Reducing physician burden

ICU doctors are often required to analyse large volumes of complex, heterogeneous data to make life-critical decisions. AI, if used effectively, could reduce this burden by transforming data into more actionable information.

In summary, AI can be used to predict adverse outcomes before they happen, better manage highly complex situations, and ultimately allow clinicians to spend less time analysing data and more time harnessing their experience and human touch in delivering care.

Source: Critical Care
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