ICU
MANAGEMENT & PRACTICE

AI-Powered Prediction Model to Enhance Blood Transfusion Decision-Making

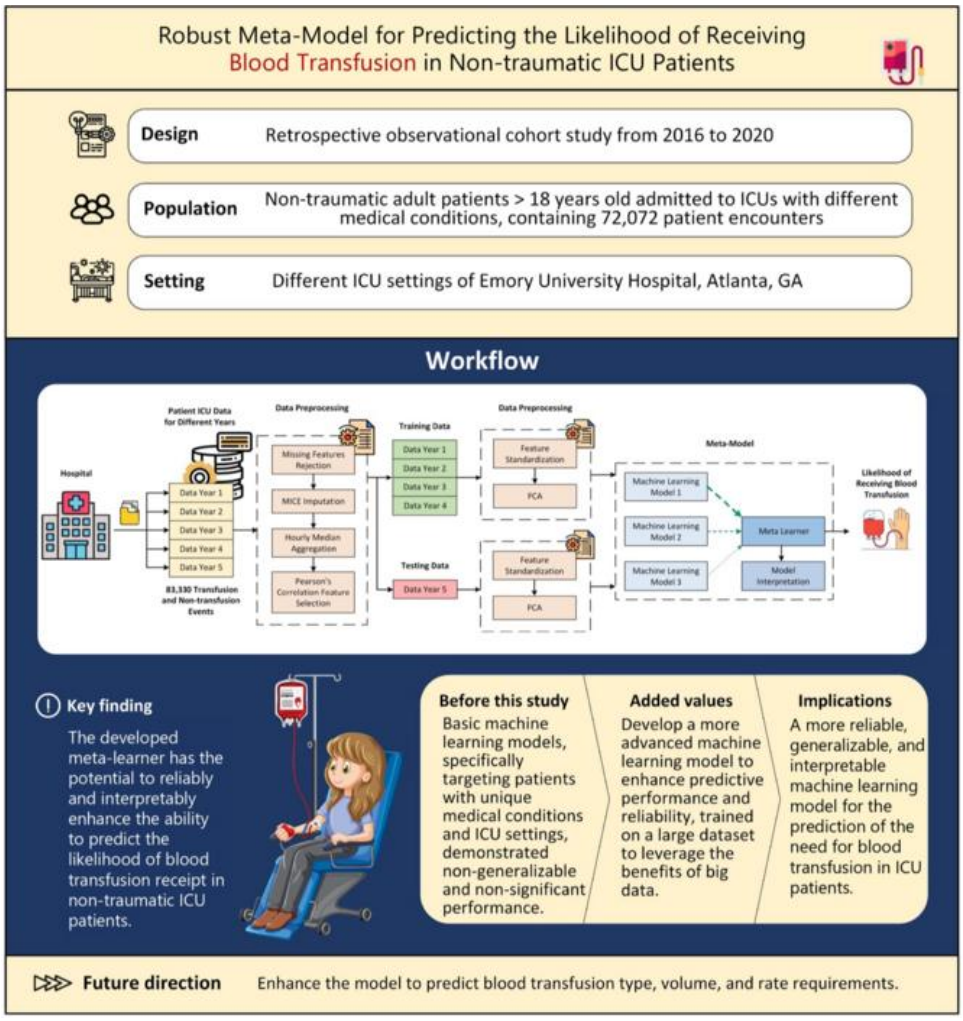
Researchers at Emory University have developed an advanced artificial intelligence (AI) model that accurately predicts the need for blood transfusions in non-traumatic ICU patients. Published in *Health Data Science*, the study tackles longstanding challenges in forecasting transfusion requirements across diverse patient populations with varying medical conditions.

Blood transfusions play a crucial role in managing anaemia and coagulopathy in ICU settings. However, existing clinical decision support systems are often limited to specific patient subgroups or isolated transfusion types, which can impede timely and precise decision-making in high-pressure environments. The newly developed AI model addresses these limitations by analysing a comprehensive range of clinical features, including laboratory results and vital signs, to predict transfusion needs within a 24-hour timeframe.

The research team leveraged a large dataset comprising over 72,000 ICU patient records collected over five years. By employing machine learning techniques and a meta-model ensemble approach, the AI system demonstrated outstanding performance metrics, achieving an area under the receiver operating characteristic curve (AUROC) of 0.97, an accuracy rate of 0.93, and an F1 score of 0.89.

The model not only accurately predicts the need for a blood transfusion but also identifies critical biomarkers, such as haemoglobin and platelet levels, that influence transfusion decisions. This capability provides clinicians with a reliable decision-support tool, potentially improving patient outcomes and optimising resource allocation in ICU settings.

The AI model underwent rigorous evaluation across multiple scenarios to ensure its robustness and reliability in real-world applications. The results demonstrated consistent performance across different ICU cohorts and medical conditions.



Looking ahead, the research team aims to integrate the AI model into clinical workflows for real-time decision support, further validating its effectiveness in practical ICU settings. The ultimate goal is to personalise and optimise transfusion strategies, enhancing patient care and operational efficiency in hospitals.

This study marks a significant advancement in applying AI to critical care medicine, underscoring the potential of data-driven technologies to revolutionise healthcare delivery.

Source: Health Data Science

Graphical Abstract Credit: Alireza Rafiei, Emory University

Published on : Fri, 24 Jan 2025