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Machine Learning to Enhance Prediction of Postoperative Death and Acute Kidney Injury by Anesthesiology Clinicians

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Each year, more than four million people die following surgery, and many more experience complications like acute kidney injury (AKI). Early identification of at-risk patients can facilitate intraoperative risk mitigation. Machine learning (ML) predictive models may facilitate improved identification of at-risk patients, especially when deployed in a telemedicine setting. The central hypothesis of this proposal is that anesthesiology clinicians can predict postoperative death and AKI more accurately with ML assistance than without assistance. This hypothesis builds on the candidate's preliminary work demonstrating the training and validation of ML models to predict these outcomes. Aim 1 is to utilize a user-centered design framework to create a user interface for displaying the ML output to anesthesiology clinicians in a telemedicine setting. This will be achieved through focus groups and simulated chart review sessions with prototype user interfaces. Aim 2 is to determine whether anesthesiology clinicians in a telemedicine setting can predict postoperative death and AKI more accurately with ML assistance than without assistance. Clinicians will review ongoing cases and predict how likely the patient is to experience 30-day in-hospital postoperative death and AKI. These reviews will be randomized to be completed with or without access to ML model output. The difference in prediction accuracy between the two groups will be determined. This work is significant because improved risk assessment will enable clinicians to focus their attention on patients who have the greatest potential to benefit from clinical interventions, maximizing the likelihood of successfully reducing morbidity and mortality through risk mitigation.