Development of a Risk Prediction Tool for Surgical Complications after Urgent and Emergent Surgery (Assessment of Geriatric Emergency Surgery – AGES Score)

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| Challenge | Current external risk scores being used to estimate risk for patients undergoing urgent and emergency surgery may not provide enough accuracy, especially for older patients. |
| Existing Evidence | Urgent and emergency surgery, despite accounting for only 10% of surgical cases, represent a disproportionate number of postoperative complications, and geriatric patients are at a greater risk of poor outcomes due to a higher burden of comorbid diseases and higher level of frailty. An accurate risk score better informs clinical decision making by surgeons and physicians involved in a patient’s perioperative care and can help frame the discussion of expectations for acute surgery between the surgeons, patients, and patients’ families. |
| Target Population | Patients 65 years and older who undergo urgent and emergency surgery |
| Intervention or Exposure | a risk stratification tool for geriatric patients under consideration for urgent and emergency surgery using EHR at the time of perioperative decision-making |
| **Outcomes/Key Findings** | **A model was developed that accurately predicts major postoperative complications in geriatric patients undergoing urgent or emergency surgery using existing EHR data.**   * We found discrimination ability for predicting 30-day risk of major postoperative complications (AUCROC range 0.796 – 0.804) among the machine learning models developed. We selected XGBoost, which had the highest AUCROC, as the final model. * We built separate models for each individual type of major postoperative complications using XGBoost. The AUCROC was 0.823 for 30-day postoperative sepsis, 0.781 for 30-day postoperative progressive renal insufficiency or acute renal failure, and 0.839 for 30-day postoperative mortality. * The model performed well across different race and ethnicity groups, sex, and surgical services, increasing generalizability and reducing concerns of bias that may be seen in some machine learning models. |
| **Resulting Action/Change** | **The results support the next steps of integrating the KP-specific AGES risk stratification tool within the EHR and pilot testing the impact on clinical workflows and patient outcomes.** |
| Additional Recommendations | The risk prediction model provides a significant and reproducible improvement in predictive information, one which can help address the issue of a readily available, automated, multispecialty, pre-operative risk assessment tool specific to the geriatric population for emergency surgeries. |
| Implementation Tools | Health Connect Embedded Risk Prediction Calculator |
| Implementation Measurement | Pilot testing and utilization of risk score within clinical workflows and an effectiveness measure for post-implementation improvements/changes in clinical outcomes predicted |
| Reference | Yap E; Huang J; Chiu J; Chang R; Cohn B; Hwang J; Reed M. *Development and Validation of an EHR-based Risk Prediction Model for Geriatric Patients Undergoing Urgent and Emergency Surgery.*Manuscript under review.  Lei MK; Reed M; Huang J; Yap E. *Physician Perspectives on the Implementation of the Assessment of Geriatric Emergency Surgery (AGES) Score: A New Perioperative Risk Assessment Tool.* Manuscript under review. |