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Integrating Genetics and Electronic Health Records to Predict Myocardial Injury after Noncardiac Surgery

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An estimated 15 million patients have genetic information available at the time they present for surgery and this number is projected to grow exponentially by 2021. Despite this widespread growth, health care providers, especially those in fields like anesthesiology and surgery, have limited exposure to genetic data and are not trained to contextualize or clinically act upon this information. Existing metrics for identifying patients at-risk for perioperative complications, like myocardial injury after non-cardiac surgery, have been either over-simplified to assign risk in a non-physiologic manner or not integrated to process data at the point of clinical need. The expansion of the electronic health record has dramatically increased data types and sources that can be integrated into risk assessment algorithms, yet even relatively complex predictive metrics, such as the American College of Surgeons Surgical Risk Calculator, are limited to 20 variables requiring manual assessment and data entry. Next generation risk assessment tools will incorporate diverse data from laboratory results, diagnoses from previous hospital encounters, vital signs, pharmaceutical records, and genotype to assist perioperative physicians with planning and care.

Our goal is to assist perioperative providers in improving patient outcomes through a unified platform that identifies patient attributes that may affect their care and stratifies the risk of key perioperative complications. Our proposed algorithm will combine available clinical information (divided into preoperative and intraoperative data classifications) with available genetic information to identify patients with greater than baseline population risk for



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developing perioperative complications. We will validate our methodology using clinical and genetic data from our institutional Michigan Genomics Initiative, where we have genetic data on over 70,000 individuals who have had elective surgery at the University of Michigan. We will first develop a polygenic risk score for myocardial injury after non-cardiac surgery, then integrate this risk score with other variables from the electronic health record to provide a comprehensive risk assessment which will be retrospectively and prospectively benchmarked against validated metrics.