

## Improving Outcomes and Reducing Mortality in Patients that Undergo Non-Cardiac Surgery Through Novel Pathways and Biomarkers of Myocardial Ischemia

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**E**ach year, more than 200 million people worldwide experience complications as a result of non-cardiac surgery, including over one million deaths within 30 days of surgery. Recognizing risk and mitigating complications is essential for optimal patient outcomes.



From left to right: Peter Kavsak, PhD; P.J. Devereaux, MD, PhD and Matthew McQueen MB, ChB, PhD.

A multi-disciplinary and innovative team in Canada sought to determine if systematic monitoring of troponin levels after surgery would facilitate identification of patients with prognostically important heart injuries. Troponin is a group of proteins found in heart muscle and these investigators determined that elevated values after surgery indicate myocardial injury, which is a leading cause of post-surgical complications and unanticipated patient death. The impetus for the team's hypothesis was a patient who had elevated troponin levels following orthopedic surgery but had no symptoms of a heart attack or a history of heart issues, said P.J. Devereaux, MD, PhD, director of the division of perioperative care at McMaster University.

"The patient was having a heart attack, yet he looked okay and wasn't complaining of chest pain," Devereaux said. "It made us think there might be more people with similar injuries, but they potentially go undetected because we're not systematically measuring troponin after surgery."

The team launched an international study of over 40,000 patients that lasted six years. The findings determined that among patients undergoing non-cardiac surgery, peaks in troponin levels during the first three days after surgery were significantly associated with patient death within 30 days of the procedure. As a result of the two JAMA-published studies, it's now recommended that providers make it a standard of care to measure troponin for the first three days after non-cardiac surgery.

An economic study determined that cost of troponin monitoring to detect myocardial ischemia was about \$1,632 CAD (roughly \$1,273 USD) per patient in 2015. These costs pale in comparison to the impact of 30-day mortality and the costs of avoiding

a single case of breast or cervical cancer, which is over ten times higher. The cost-effectiveness of troponin monitoring is further increased for patient subgroups at higher risk, such as geriatric patients or those at risk for atherosclerosis or diabetes.

When there's a demonstrated need for a test or standard, clinicians and the lab are more likely to succeed in gaining buy-in from fellow clinicians

and administrators. Biomarkers like troponin are widely known to be effective, but the implementation of a new test and/or new indication for an existing test must be driven by clinicians who will order it and use it appropriately, said Peter Kavsak, PhD, a clinical biochemist at the Juravinski Hospital and Cancer Centre and the Hamilton Regional Laboratory Medicine Program.

"When clinicians approach the lab, we jump at it," Kavsak said. "It's a no-brainer for the lab to get involved when there's an important clinical question that has to be addressed."

The wide breadth of the study also assured laboratorians that its conclusion is accurate even as labs use different generations of troponin, said Matthew McQueen, MB ChB, PhD, a professor emeritus of pathology and molecular medicine at McMaster University.

Ultimately, the team's goal is to use these findings to leverage the power of laboratory medicine to improve perioperative care and allow more patients to be eligible for the benefits of surgery. The Hamilton Health Sciences Perioperative Cardiovascular Service has served as a conduit through innovation and teamwork to put research into practice for valued outcomes such as improved diagnoses, patient wellness, heightened safety and an enhanced patient experience. The collaboration across disciplines—coupled with the strategic use of laboratory data—enabled these extraordinary outcomes. Their success and measurably better performance enabled recognition of distinction in association with the UNIVANTS of Healthcare Excellence Program while also being an inspiration to thousands of healthcare professionals across the globe.

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