

Experts unveil two ways to identify joint replacement patients at risk for complication

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Orthopedic surgeons from the Perelman School of Medicine at the University of Pennsylvania have developed two new prediction tools aimed at identifying total hip and knee replacement patients who are at-risk of developing serious complications after surgery. The first tool identifies patients who have risk factors that should disqualify them from undergoing same-day (outpatient) or short-stay (overnight) total hip and knee replacement procedures, opting instead for traditional recovery pathways in the hospital. The second tool identifies which patients should be preemptively sent to the intensive care unit immediately following surgery rather than standard patient floors. The investigators unveiled the new models, and study findings on which they are based, on Thursday, March 26, 2015, at the American Academy of Orthopaedic Surgeons Annual Meeting in Las Vegas.

"Given the increased national emphasis on quality metrics and the need to ensure patients recover well, without the need for readmissions following joint replacements, there is a need to better identify and predict post-operative complications so we can intervene and provide timely follow-up care," said Gwo-Chin Lee, MD, senior investigator on both studies, and an assistant professor of Orthopaedic Surgery "Total joint replacements are very common procedures, but they can also pose significant health risks to certain populations, such as seniors. These two studies have provided us with better, more systematic and accurate ways of predicting before and after surgery, which patients are at greater risk for complications, allowing us to more accurately assess their conditions, and determine the appropriate course of treatment, care, and rehabilitation."

The first tool identifies patients with conditions such as chronic [obstructive pulmonary disease](#),

congestive heart failure, coronary artery disease, and cirrhosis as those at increased risk for serious complications following surgery. The researchers studied 1,012 patients who underwent primary total hip and [knee replacement](#) over a ten-month period. They found 70 developed serious complications, the majority of which were cardiopulmonary in nature, including pulmonary embolism and cardiac arrhythmia. Of these, 11 suffered setbacks within 24 hours of surgery, and 59 experienced complications more than 24 hours later. If the latter 59 patients had undergone same-day or short-stay surgery, they would have developed a serious complication at home, placing them at greater risk for serious injury.

As a result of the findings, the Penn team developed the six-point scale that orthopedic surgeons can use to determine a patient's candidacy for same-day or short-stay total joint replacement. Using the scale as a benchmark, patients without a history of chronic obstructive pulmonary disease, congestive heart failure, coronary artery disease, or cirrhosis have only a 3.1 percent probability of developing late, serious complications following joint replacement surgery. However, patients with just one risk factor have a nearly a 10 percent risk of complication; this risk is compounded by the addition of other risk factors. Thus, patients with even one of these risk factors should not undergo outpatient or overnight total hip and total knee replacement. Instead they should be admitted to the hospital for traditional-duration surgery and recovery.

"Improved anesthesia and rehabilitation techniques have made outpatient and overnight stay for total hip and total knee replacements more common than ever," said lead investigator P. Maxwell Courtney, MD, a fourth-year orthopaedic surgery resident. "At the same time, pressures on hospitals

to lower costs have led to an across-the-board emphasis on shortening or even eliminating in-hospital stays. While shorter stays are obviously a major overall benefit, we have to make sure that we identify patients who are at greater risk of complications and should thus not have their knee or hip replaced on an outpatient or overnight basis. Our tool provides this guidance."

Provided by University of Pennsylvania School of Medicine

In the second study, doctors Courtney, Lee, and their colleagues, examined a total of 738 patients who underwent total hip and knee replacement. They found that patients from this group who required admission to intensive or critical care units after surgery were more likely to have a history of chronic obstructive pulmonary disease, congestive heart failure, coronary artery disease, chronic kidney disease, or suffering blood loss of more than 1,000 milliliters during surgery or requiring vasopressors (medications that raise low blood pressure) during surgery.

Based on the findings, the investigators developed a weighted Penn Arthroplasty Risk Score to predict which patients would require intensive or critical care intervention after knee or hip replacement. The new Penn-developed model replaces a previous model that only examined pre-operative features such as a history of chronic obstructive pulmonary disease, [congestive heart failure](#), or coronary artery disease.

"Under the previous model, nearly one in four patients undergoing knee or hip replacement were preemptively admitted to the ICU," said Lee. "However, we found that only 22 percent of these patients ultimately required such stepped-up intervention. This resulted in mis-use of bed capacity and unnecessarily higher costs. By incorporating intraoperative factors, such as significant blood loss and the need for medicine to raise the patient's blood pressure, we have refined the selection criteria for post-surgery admission to the ICU. This means fewer patients are routinely being admitted to these units after joint replacement surgery, resulting in lower overall costs without compromising patient safety as well as ensuring that relatively scarce critical care beds are available for those who truly need them."

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