

# New scoring system may help identify surgical patients at risk for pulmonary complications

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Physicians at Thomas Jefferson University Hospital, Philadelphia, Penn., have developed an analytical tool to identify surgical patients at risk for costly respiratory complications. This tool may help hospitals avoid those complications and their related costs as Medicare and commercial payers exert increasing pressure on them by eliminating payment for patient complications that occur after operations and may extend hospital stays.

The investigators developed a scoring system to identify [risk factors](#) for ventilator dependence after major operations by using data from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP). Study coauthor Adam P. Johnson, MD, MPH, presented their findings today at the 2015 American College of Surgeons National Surgical Quality Improvement Program Conference. NSQIP is the leading nationally validated, risk-adjusted, outcomes-based program to measure and improve the quality of surgical care in hospitals.

Mechanical ventilation can cost up to \$1,522 per day per patient in the intensive care unit.<sup>1</sup> "The need for artificial mechanical ventilation after operations is infrequent, but when it happens it does carry high costs," Dr. Johnson explained. "Ventilator dependence is highly associated with mortality, and in and of itself is a morbidity."

According to the study authors, the need for ventilation is not

widespread. Previous reports have estimated approximately one to three percent of [patients](#) who have non-emergency surgical procedures require ventilation afterward. But the consequences are nonetheless significant, according to coauthor Scott W. Cowan, MD, FACS. "Even one percent of 220,000"—the incidence reported in a 2011 University of Michigan study<sup>2</sup>—"is still a significant number of patients who develop postoperative respiratory failure," Dr. Cowan said. "This outcome is a very big expense for our health care system."

The Jefferson researchers analyzed ACS NSQIP data on 7,473 patients who had elective general or vascular operations at the institution between 2006 and 2013. The scoring system assigned points for different factors, such as current smoker (1 point), age older than 60 years (2 points), and esophagus procedures (3 points). Total risk scores ranged from 0 to 7 for study subjects. The median [risk score](#) for patients who did not need the ventilator after operations was 2, while that for patients who did need the ventilator was 3. Those with a score above 3 comprised the 20 percent of patients who experienced 70 percent of adverse events.

Other risk factors for postoperative ventilator dependence were a diagnosis of severe chronic obstructive pulmonary disease; signs of active infection or inflammatory response; and low albumin counts, a sign of malnutrition. "Our goal was to quantify how each factor affects the risk of ventilator dependence," Dr. Johnson said.

"Once we identify this smaller set of high risk patients, the goal then is to optimize them before and during their hospital stay," Dr. Johnson said.

The risk factors and scoring system the study used is specific to the institution with its unique patient population which, at Thomas Jefferson, includes many patients with advanced gastrointestinal cancers. However, other institutions may be able to use the framework to identify

ventilator dependence risks in their own populations, Dr. Johnson said. "Our institution's risk score may not be generalizable, but the methodology of how we developed and then implemented the risk score may be used at other hospitals when looking at their own patients," he said.

Using the ACS NSQIP database proved a significant benefit to developing the [scoring system](#). "Having access to NSQIP allows us to do our own personalized evaluation of what the causes of postoperative intubation and respiratory failure are and address these in a more specific fashion than what national postoperative predictors allow," said Dr. Cowan, Jefferson's NSQIP Surgeon Champion. "It allows us to look internally and ask how we can help our patients the most."

Future steps involve using the risk score in the preadmission testing of every patient undergoing elective general surgery or vascular operations, said Dr. Johnson. "With advances in health information technology and medical records, we're looking at ways to automate this risk score and use it for every patient," Dr. Johnson said. "If someone has a risk score that's above a certain level, they are entered into a pulmonary optimization pathway. The pathway might be resource intensive for all patients, but we might be able to hone in and use it more effectively for those patients at greatest risk."

**More information:** 1. Dasta JF, McLaughlin TP, Mody SH, Piech CT. Daily cost of an intensive care unit day: the contribution of mechanical ventilation. *Crit Care Med*. 2005 Jun;33(6):1266-71.

2. Ramachandran SK, Nafiu OO, Ghaferi A, Tremper KK, Shanks A, Kheterpal S. Independent predictors and outcomes of unanticipated early postoperative tracheal intubation after nonemergent, noncardiac surgery. *Anesthesiology*. 2011 Jul;115(1):44-53.

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