A clinical prediction guide

**A risk index with 14 variables predicted 30-day postoperative pneumonia after major noncardiac surgery**


**Question**
In patients who have had major noncardiac surgery, what variables form a risk index to predict 30-day postoperative pneumonia?

**Design**
2 patient cohorts from the Department of Veterans Affairs National Surgical Quality Improvement Program: 1 for derivation and 1 for validation.

**Setting**
100 Veterans Affairs (VA) medical centers.

**Patients**
 Patients who had noncardiac surgery under general, spinal, epidural, local, or monitored anesthesia. Exclusion criteria included preoperative pneumonia, major transplants, and preoperative ventilator dependence. 160 805 patients (mean age 61 y, 95% men) formed the derivation cohort, and 155 266 patients formed the validation cohort.

**Description of prediction guide**
The clinical prediction index grouped patients into 5 risk classes by using the following preoperative risk factors, weighted on the basis of their independent contribution to pneumonia risk by logistic regression and adding their point values: type of surgery (abdominal aortic aneurysm repair [15], thoracic [14], upper abdominal [10], neck [8], neurosurgery [8], vascular [3]); age (≥ 80 y [17], 70 to 79 y [13], 60 to 69 y [9], 50 to 59 y [4]); functional status (totally dependent [10], partially dependent [6]); weight loss > 10% in the past 6 months (7); history of chronic obstructive pulmonary disease (5); general anesthesia (4); impaired sensorium (4); history of cerebrovascular accident (4); blood urea nitrogen level (< 2.86 mmol/L [4], 7.85 to 10.7 mmol/L [2]), ≥ 10.7 mmol/L [3]); transfusion of > 4 units (3); emergency surgery (3); steroid use for a chronic condition (3); current smoker within 1 year (3); and alcohol intake > 2 drinks/d in the past 2 weeks (2).

**Main outcome measure**
Postoperative pneumonia (Centers for Disease Control and Prevention diagnosis).

**Main results**
The incidence of postoperative pneumonia among all patients was 1.6%. In the derivation cohort, 30-day postoperative mortality was 21% among those with pneumonia (n = 2466) and 2% among those without pneumonia (n = 158 339) (P < 0.001). The average predicted probability of postoperative pneumonia for the derivation cohort using a logistic regression model and the rates of pneumonia in both cohorts are shown in the Table.

**Conclusion**
A 14-variable risk index predicted 30-day postoperative pneumonia in patients who have had major noncardiac surgery.

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**Commentary**
Arozullah and colleagues used a database with a large sample size to develop and validate a risk index for postoperative nosocomial pneumonia. The rigor and standardization of the data-collection process are important strengths of the study. Although a major limitation is the well-recognized challenge of establishing a diagnosis of pneumonia in hospitalized patients (1), the authors have convincingly shown that the index is derived from an almost exclusively male patient population for clinical trials to evaluate the efficacy of such strategies. But risk stratification is less useful in making decisions about patient management unless the risk factors can be modified. With the possible exception of transfusion (3), none of the risk factors identified in this study are amenable to therapeutic manipulation, and therefore, the ultimate utility of this index will be its ability to quantify risk to better evaluate clinical outcomes.

The ultimate utility of the reliable, easy-to-use risk stratification index shown in this study will be established as it is used in the design of clinical trials or clinical practice guidelines that seek to reduce the risk for postoperative pneumonia.

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**References**