

A clinical prediction model was sensitive but not specific for predicting mortality in pulmonary embolism

Aujesky D, Roy PM, Le Manach CP, et al. Validation of a model to predict adverse outcomes in patients with pulmonary embolism. *Eur Heart J*. 2006;27:476-81.

Clinical impact ratings: Hematol/Thrombo ★★★★★☆ Pulmonology ★★★★★☆☆

QUESTION

In patients with acute pulmonary embolism (PE), can a clinical prediction model predict mortality?

METHODS

Design: 2 cohort studies, 1 for derivation and 1 for validation.

Setting: 186 hospitals in Pennsylvania, United States (derivation cohort), and emergency departments of 117 hospitals in France and Belgium (validation cohort).

Patients: 10 534 adults discharged from hospital (53% > 65 y of age, 60% women) with a diagnosis of PE (derivation cohort). 367 patients (69% > 65 y of age, 62% women) with objectively confirmed PE (validation cohort).

Description of prediction guide: The 11 predictors in the model were age (number of points = age); male sex (10 points); presence of cancer (30 points), heart failure (10 points), or chronic lung disease (10 points); pulse \geq 110 beats per minute (20 points); systolic blood pressure < 100 mm Hg (30 points); respiratory rate \geq 30 breaths per minute (20 points); temperature < 36 ° C

(20 points); altered mental status (i.e., disorientation, lethargy, stupor, or coma) (60 points); and arterial oxygen saturation < 90% (20 points). The range of risk scores was divided into quintiles: class I (\leq 65 points, very low risk), class II (66 to 85 points, low risk), class III (86 to 105 points, intermediate risk), class IV (106 to 125 points, high risk), and class V (> 125 points, very high risk).

Outcomes: All-cause mortality at 90 days.

MAIN RESULTS

9.2% of the derivation cohort and 6.3% of the validation cohort died. The clinical prediction model had high sensitivity but low specificity (Table). In the validation cohort,

mortality was 0% in class I, 1% in class II, 3% in class III, 13% in class IV, and 24% in class V.

CONCLUSION

In patients with acute pulmonary embolism, a clinical prediction model featuring demographic characteristics, comorbid conditions, and clinical findings accurately identified patients at low risk for mortality.

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Test features of a clinical prediction model for predicting mortality in low-risk (class I to II) vs high-risk (class III to V) patients with pulmonary embolism*

Cohort	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
Derivation (n = 10 354)	90% (88 to 92)	44% (43 to 45)	1.6	0.2
Validation (n = 367)	96% (78 to 100)	47% (42 to 53)	1.8	0.09

*Diagnostic terms defined in Glossary. The clinical prediction model included age; sex; presence of cancer, heart failure, or chronic lung disease; pulse; systolic blood pressure; respiratory rate; temperature; altered mental status; and arterial oxygen saturation.

COMMENTARY

Aujesky and colleagues examined data from a prospectively enrolled cohort of patients with confirmed PE to externally validate a prognostic model that they had developed previously (1). The model accurately categorized patients with PE into 5 risk classes. Patients in risk classes I and II made up > 40% of the validation cohort and < 1% of these patients died. In comparison, almost 25% of patients in risk class V died within 90 days.

Like any high-quality clinical prediction rule (2), the model was rigorously developed, is easy to use, and has now been validated both internally and externally in 2 separate European cohorts. The risk factors included in the model are similar to predictors that have been identified by others (3).

While the authors recommend that a clinical trial be performed to assess whether outpatient treatment or abbreviated inpatient treatment of persons in risk classes I and II is as safe and effective as inpatient treatment, such an equivalence trial would probably require an impractically large sample. Nevertheless, before the model can be used in

practice as a tool for identifying low-risk patients, it should be validated prospectively in a North American cohort. Patients in higher risk classes (III to V) might benefit most from additional risk stratification with echocardiography and serum biomarkers (4).

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