Predicting COPD one year mortality using prognostic predictors routinely measured in primary care

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Introduction and objectives

COPD is a major cause of mortality. Patients with advanced disease often have a poor quality of life, such that guidelines recommend providing palliative care in their last year of life. We have recently shown that palliative care is only provided to one in five patients. This lack of provision maybe related to the difficulty in predicting 12-month mortality due to the irregular disease trajectory of COPD. Current index scores predict mortality over several years and often require specialist disease knowledge not available within primary care. We sought to devise a 12-month all-cause mortality prediction model only using routinely recorded information.

Methods

We randomised a primary care COPD cohort, identified using UK electronic healthcare records (Clinical Practice Research Datalink) between 2010 and 2015, into training and test datasets. A predictive model (PI) was developed using the training set, adopting backwards elimination Cox regression of putative prognostic indicators; variables previously shown to be associated with COPD mortality and that are routinely collected in primary care records, including demographics, respiratory variables, comorbidities and blood results. The test set was used to externally validate predictive performance, by measuring the calibration slope and discrimination performances (Harrell's C-index and D-statistic). The model was compared, calculating the Area Under the Curve (AUC) in the test set, to all established index scores that do not require specialist information, BODEx, DOSE and ADO.

Results

58,056 patients were eligible. Eighteen variables were included in the model, including age, FEV_1, BMI, smoking, hospitalised exacerbations, blood tests (haemoglobin, creatinine, albumin, platelets) and comorbidities (lung cancer, lung fibrosis, atrial fibrillation, asthma, chronic kidney disease, stroke, and dementia). Predictive performance was good (C-index=0.8, 95%CI 0.79-0.81; D-statistic=1.93, 95%CI 1.84-2.02, calibration slope=0.92, 95%CI 0.88-0.97) and the model compared favourably to existing index scores (AUC: PI=0.81, 95%CI 0.79-0.82; BODEx=0.48, 95%CI 0.45-0.52; DOSE=0.6, 95%CI 0.57-0.63; ADO=0.69, 95%CI 0.67-0.71; see Figure).

Conclusions

Our model performs better than existing tools in predicting 12-month mortality and only requires routinely collected non-specialist information. This model could help identify patients that would

benefit from palliative care. This model also demonstrates the complexity of COPD mortality, and influence of comorbidities.

Comparison of 1 year mortality prediction capabilities of PI, ADO, BODE and DOSE