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Systematic evaluation and external validation of 22 prognostic models among hospitalised adults with COVID-19: an observational cohort study

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ABSTRACT   The number of proposed prognostic models for coronavirus disease 2019 (COVID-19) is growing rapidly, but it is unknown whether any are suitable for widespread clinical implementation.

We independently externally validated the performance of candidate prognostic models, identified through a living systematic review, among consecutive adults admitted to hospital with a final diagnosis of COVID-19. We reconstructed candidate models as per original descriptions and evaluated performance for their original intended outcomes using predictors measured at the time of admission. We assessed discrimination, calibration and net benefit, compared to the default strategies of treating all and no patients, and against the most discriminating predictors in univariable analyses.

We tested 22 candidate prognostic models among 411 participants with COVID-19, of whom 180 (43.8%) and 115 (28.0%) met the endpoints of clinical deterioration and mortality, respectively. Highest areas under receiver operating characteristic (AUROC) curves were achieved by the NEWS2 score for prediction of deterioration over 24 h (0.78, 95% CI 0.73–0.83), and a novel model for prediction of deterioration <14 days from admission (0.78, 95% CI 0.74–0.82). The most discriminating univariable predictors were admission oxygen saturation on room air for in-hospital deterioration (AUROC 0.76, 95%

CI 0.71–0.81), and age for in-hospital mortality (AUROC 0.76, 95% CI 0.71–0.81). No prognostic model demonstrated consistently higher net benefit than these univariable predictors, across a range of threshold probabilities.

Admission oxygen saturation on room air and patient age are strong predictors of deterioration and mortality among hospitalised adults with COVID-19, respectively. None of the prognostic models evaluated here offered incremental value for patient stratification to these univariable predictors.