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Evolution of Making Clinical Predictions in Neurosurgery

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Abstract

Prediction of clinical outcomes is an essential task for every physician. Physicians may base their clinical prediction of an individual patient on their intuition and on scientific material such as studies presenting population risks and studies reporting on risk factors (prognostic factors). A relatively new and more informative approach for making clinical predictions relies on the use of statistical models that simultaneously consider multiple predictors that provide an estimate of the patient's absolute risk of an outcome. There is a growing body of literature in the neurosurgical field reporting on clinical prediction models. These tools have high potential in supporting (not replacing) neurosurgeons with their prediction of a patient's outcome. If used sensibly, these tools pave the way for more informed decision-making with or for individual patients. Patients and their significant others want to know their risk of the anticipated outcome, how it is derived, and the uncertainty associated with it. Learning from these prediction models and communicating the output to others has become an increasingly important skill neurosurgeons have to master. This article describes the evolution of making clinical predictions in neurosurgery, synopsizes key phases for the generation of a useful clinical prediction model, and addresses some considerations when deploying and communicating the results of a prediction model. The paper is illustrated with multiple examples from the neurosurgical literature, including predicting arachnoid cyst rupture, predicting rebleeding in patients suffering from aneurysmal subarachnoid hemorrhage, and predicting survival in glioblastoma patients.

Keywords: Clinical prediction model; Decision-making; Prediction; Risk; Shared decision-making; Validation.

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