CJEM Journal Club

The ABCD2 score: a poor predictor of stroke risk in the emergency department

Laurie Robichaud, MDCM; Sanjeet Singh Saluja, MDCM, CCFP-EM

Clinical question
In patients presenting with transient ischemic attack in the emergency department, what is the accuracy of the ABCD2 score for predicting stroke?
Article chosen
Perry JJ, Sharma M, Sivilotti ML, et al. Prospective validation of the ABCD2 score for patients in the emergency department with TIA. *CMAJ* 2011;183:1137-45.
Objective
The study collaborators sought to externally validate the ABCD2 score as a tool for identifying patients seen in the emergency department with transient ischemic attack who are at high risk for stroke within 7 (primary outcome) and 90 (one of the secondary outcomes) days.

Keywords: ABCD2 score, stroke, transient ischemic attack

BACKGROUND

The socioeconomic burden of stroke is immense. Stroke continues to be the third leading cause of death and the leading cause of disability in Canada.[1] It costs the Canadian economy $3.6 billion a year in physician services, hospital costs, lost wages, and decreased productivity.[2] Diagnosing transient ischemic attack (TIA) in the emergency department identifies a patient who might be at risk for imminent stroke within the first days of the first event.[3] Given that the large majority of patients presenting with a TIA will not go on to have a stroke,[4,5] risk stratification is required to rationalize resource allocation and prioritize those patients at high risk for stroke within the next few days for immediate investigations. The ABCD2 (Age, Blood pressure, Clinical features, Duration of symptoms, and Diabetes) score is a unified score for prediction of early risk of stroke after TIA. It was derived from a combination of two prognostic scores: the California and ABCD scores.[6–8] The ABCD2 score was shown to be more accurate than other existing prognostic scores at identifying high-risk patients who needed immediate evaluation to optimize stroke prevention.[8] It has been validated both retrospectively and prospectively in numerous cohorts.[9–12] Although widely implemented, the ABCD2 score had not yet been validated prospectively in the emergency department setting.

STUDY DESIGN AND SETTING

This study is a validation, prospective cohort study. It was conducted in eight Canadian emergency departments between 2007 and 2010.

PATIENT POPULATION

Adults (18 years of age or older) who had received a final diagnosis of TIA or minor stroke in the emergency department were enrolled. Exclusion criteria included confirmed stroke (i.e., neurologic deficit $>$ 24 hours), Glasgow Coma Scale score $<$ 15, documented alternate cause for the deficits, or presentation $>$ 7 days after onset of symptoms.

OUTCOME MEASURES

The primary outcome of this study was to assess the accuracy of the ABCD2 score for predicting stroke

From the Department of Emergency Medicine, McGill University, Montreal, QC.

Correspondence to: Dr. Laurie Robichaud, Royal Victoria Hospital, 687 Pine Avenue West, Room A4.62, Montreal, QC H3A 1A1; laurie.robichaud@mail.mcgill.ca.

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within 7 days of the patient's visit to the emergency department. Secondary outcomes included stroke within 90 days and recurrent TIA within 7 or 90 days of the visit to the emergency department. Outcomes were assessed using hospital records and telephone follow-up. Positive outcomes were established by a neurologist or adjudication committee.

DATA COLLECTION

ABCD2 scores were calculated from explicit data forms completed by enrolling emergency physicians, before patients were discharged or referred to specialists. After their calculation of the total score, emergency physicians classified patients as being at high (score > 5) or low (score ≤ 5) risk for subsequent stroke. ABCD2 scores were also calculated by a trained research nurse (coordinating centre score), blinded to outcomes.

MAIN RESULTS

Among the 2,056 enrolled patients, 38 patients had a stroke within 7 days of the index visit, whereas an additional 27 patients had a stroke between 7 and 90 days. Overall, the high-risk ABCD2 score cutpoint of 5 (defined by the original derivation study by Johnston and colleagues[13]) was insensitive for predicting stroke at 7 days (15 of 38 ABCD2 score > 5 and 23 of 38 ABCD2 score ≤ 5, sensitivity = 31.6%, 95% CI 19.1–47.5). Using the optimal cutpoint of 2 (American Heart Association recommendation) was highly sensitive (94.7%, 95% CI 82.7–98.5) but not specific (12.5%, 95% CI 11.2–14.1) for predicting stroke at 7 days. Performances for scores predicting stroke at 90 days were very similar in terms of specificity and sensitivity.

STUDY CONCLUSION

The ABCD2 score is inaccurate, at any cutpoint, as a predictor of imminent stroke in patients seen in the emergency department with TIA.

COMMENTARY

Clinical prediction rules are clinical tools that can be very useful in the emergency department. Wells Criteria, Ottawa Ankle Rules, NEXUS, and Canadian C-Spine Rules are great examples of validated diagnostic prediction rules commonly used by emergency physicians.[14] The ABCD2 score is a clinical prognostic prediction rule that was developed to identify patients having a TIA who are at high risk for subsequent stroke. Although widely implemented, the ABCD2 score had not yet been validated prospectively in the undifferentiated emergency department setting. In their study, Perry and colleagues sought to externally validate the ABCD2 score as a tool for identifying patients seen in the emergency department with TIA who are at high risk for stroke within 7 (primary outcome) and 90 (one of the secondary outcomes) days.

Perry and colleagues' prospective multicentre study is the largest validation study of the ABCD2 score performed thus far. Investigators conducted a rigorous study, closely following recommended methodological standards for validation studies.[15] It attempted to prospectively validate the ABCD2 score with a large cohort. Eligibility criteria were well defined, so enrolled patients were chosen in an unbiased fashion and represented a fairly wide spectrum of TIA severity. Although the article does not mention if neurologists assessing outcome events were blinded to patients' documentation from the index visit, study collaborators report blinded assessment of outcomes by the adjudication committee. All ABCD2 score calculations and patients' information were collected independently from the assessment of outcome, and follow-up was achieved for 91.1% of the total enrolled patients. There was explicit interpretation of the rule on the data forms, with clear listing of each component of the ABCD2 score and indications on how to classify patients as high or low risk according to the calculated score. Data forms were independently completed by the enrolling emergency physician, a trained research nurse (coordinating centre score), and, when available, a second emergency physician. All parties were blinded to outcomes. Interpretation and calculation of the scores were reasonably accurate, with a calculated intraclass correlation (ICC) coefficient of 0.61 between the enrolling physician and the second reviewing physician and 0.76 between the enrolling physician and the coordinating centre score.

This is overall a substantial and carefully performed prospective validation cohort study. Clinically, it demonstrates the importance of the validation step in the implementation of a clinical prediction rule. As

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shown by the results of Perry and colleagues, the ABCD2 score criteria are not sensitive enough to classify patients as being at low risk for imminent stroke. Such low sensitivities are not clinically acceptable; a significant number of patients identified at low risk for subsequent event are actually at high risk for having bad outcomes. On the other hand, a lower high-risk cutpoint classifies almost all patients as requiring immediate imaging or hospital admission for investigation. The ABCD2 score has been evaluated in several settings and has been shown to be useful as a prognostic indicator for a certain population of patients.[16] Nonetheless, the results of this validation study demonstrate well the poor external generalizability of the rule in the undifferentiated emergency department TIA population. Furthermore, despite calculating the score on a form that explicitly listed each component of the rule, enrolling emergency physicians frequently miscalculated the ABCD2 score and misclassified patients' risks. Even if the rule was accurate, its calculation and clinical application seem problematic. Although the purpose of this study was not to do an impact analysis, we can appreciate how the ABCD2 score could fail us in our emergency medicine practice.

CONCLUSION

This prospective multicentre study is the largest and best validation study of the ABCD2 score performed thus far. As it has insufficient sensitivity and specificity to be of use in the urgent evaluation of patients with TIA, the ABCD2 score appears to have no clinical utility for our practice in the emergency department. Further studies are needed to identify and validate an accurate clinical decision-making rule to risk-stratify patients with TIA so that appropriate, cost-effective decisions regarding management and treatment can be made.

Competing interests: None declared.

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