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Appraisal Clinimetrics

The Canadian C-Spine Rule

Summary

Description: The Canadian C-Spine Rule was designed in 2001 to assist clinicians assess the need for imaging in people who present to the emergency department with a cervical spine injury following blunt trauma. Specifically, this clinical decision rule was developed for use in adults who are alert (score of 15 on the Glasgow Coma Scale), stable and in whom a clinically important cervical spine injury is a concern (eg, unstable fracture, dislocation).[1] **Instructions and scoring:** The Canadian C-Spine Rule is based on three high-risk criteria (age $\geq$ 65 years, dangerous injury mechanism, paresthesia in extremities), five low-risk criteria (simple rear-end motor vehicle collision, sitting position in the emergency department, ambulatory at any time, delayed onset of neck pain; absence of midline cervical-spine tenderness), and the ability of the person to rotate their neck.[2] **Reliability, validity and sensitivity to change:** The Canadian C-Spine Rule has good-to-excellent inter-rater reliability when applied by physicians (kappa = 0.63), nurses (kappa = 0.80) and paramedics (kappa = 0.93).[2,3] The sensitivity of the Canadian C-Spine Rule has been reported to range from 90 to 100%, whereas specificity has ranged from 1 to 77%.[4] The large range in specificity reflects the heterogeneity between studies in the number of people who unnecessarily receive imaging (ie, people who do not have a serious cervical spine injury but are still referred for imaging). However, the rule itself errs on the side of caution, as clinicians will not miss a clinically important cervical spine injury. In the only direct comparison, the Canadian C-Spine Rule was found to have better diagnostic accuracy than the National Emergency X-Radiography Utilization Study (NEXUS) criteria,[5] which form another widely used clinical decision rule.[4]

Commentary

Approximately 2% of people who present to the emergency department will be diagnosed with a clinically important cervical spine injury following blunt trauma (eg, a fall or motor vehicle accident).[6–8] Despite the low prevalence, a delayed or missed diagnosis can lead to severe and catastrophic consequences, including spinal cord injury and death.[9]

The Canadian C-Spine Rule is the most rigorously evaluated clinical decision rule, to date, with which to assess the need for cervical spine imaging in adults who present with cervical spine injury following blunt trauma. As such, the Canadian C-Spine Rule is recommended in many international guidelines for routine use in emergency departments because it is highly reliable, valid and sensitive. The high sensitivity means that clinicians who use the rule in its entirety can be confident that they will not miss a clinically important cervical spine injury. Application of the Canadian C-Spine Rule has been found to reduce the rate of cervical spine imaging by approximately 14%, as it reserves these investigations for those patients with a higher likelihood of a clinically important cervical spine injury.[10]

The low specificity of the Canadian C-Spine Rule is a reflection of the high false positive rate and means that up to 56% of patients will unnecessarily receive imaging. The Canadian C-Spine Rule therefore mirrors the aims of the clinician (ie, to not miss a clinically important cervical spine injury) by recommending imaging in more cases than the actual probability of a person having a serious cervical spine injury. Even with a high false positive rate, the Canadian C-Spine Rule reduces the rate of imaging when compared to routine or unstructured physician assessment.

There are a number of avenues for further work. Currently, there is limited evidence as to the diagnostic accuracy of the Canadian C-Spine Rule when applied to children, with available studies suggesting that the performance of the rule is reduced in this population.[11] The Canadian C-Spine Rule identifies age as a high risk factor and mandates imaging in those $\geq$ 65 years, regardless of what other criteria are met. This would suggest that there is an excessive use of imaging in this population and an additional stepwise decision rule may be beneficial. There is also the need to evaluate the performance of the rule when applied by other health professionals (eg, physiotherapists who assess acute injuries on the sporting field and in practice). Lastly, to further reduce the rates of imaging and contain costs, there is a need to improve the degree to which the rule is implemented worldwide.

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