The Canadian C-Spine Rule more accurately identified cervical-spine injury in trauma than the NEXUS Low-Risk Criteria

Stiell IG, Clement CM, McKnight RD, et al. **The Canadian C-spine rule versus the NEXUS low-risk criteria in patients with trauma.** N Engl J Med. 2003;349:2510-8.

QUESTION

In patients with trauma who are alert and stable, how do the Canadian C-Spine Rule (CCR) and National Emergency X-Radiography Utilization Study (NEXUS) Low-Risk Criteria (NLC) compare for identifying acute cervical-spine injury?

DESIGN

Blinded comparison of the CCR and NLC with radiography or the Proxy Outcome Assessment Tool (POAT).

SETTING

Emergency departments (EDs) of 9 tertiary care hospitals in Canada.

PATIENTS

8283 patients ≥ 16 years of age (mean age 38 y, 52% men) with acute trauma to the head or neck who were in stable condition and alert, and had either neck pain or no neck pain but had a visible injury above the clavicles with a dangerous mechanism of injury, a Glasgow Coma Scale score of 15, stable vital signs, and injury in the previous 48 hours. Exclusion criteria included penetrating neck trauma, acute paralysis, vertebral disease, and previous evaluation for the same injury.

DESCRIPTION OF TESTS AND DIAGNOSTIC STANDARD

394 physicians assessed the patients before radiography. The CCR is based on 3 high-risk criteria, 5 low-risk criteria, and the ability of patients to actively rotate their necks. The NLC includes 5 criteria that an eligible patient must meet for cervical-spine injury to be ruled out. The diagnostic standard was radiography or, for patients who did not have radiography, the POAT.

MAIN OUTCOME MEASURES

Sensitivity and specificity of the 2 rules for identifying clinically important cervical-spine injury.

MAIN RESULTS

169 patients (2%) had cervical-spine injuries. In 845 patients (10%), physicians did not evaluate range of motion, which is required by the CCR algorithm; thus, these CCR assessments were indeterminate. Test characteristics for the 2 rules are in the Table (based on the remaining 7438 patients).

CONCLUSION

In patients with trauma who were alert and stable, the Canadian C-Spine Rule more accurately identified cervical-spine injury than the National Emergency X-Radiography Utiliza-tion Study Low-Risk Criteria.

Sources of funding: Canadian Institutes of Health Research and Ontario Ministry of Health Emergency Health Services Committee.

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Diagnostic characteristics of the Canadian C-Spine Rule (CCR) and National Emergency X-Radiography Utilization Study (NEXUS) Low-Risk Criteria (NLC) for identifying clinically important cervical-spine injury in trauma*

Test	Sensitivity (95% CI)	Specificity (CI)	+LR	–LR
CCR	99.4% (96 to 100)	45.1% (44 to 46)	1.8	0.013
NEXUS NLC	90.7% (85 to 94)	36.8% (36 to 38)	1.4	0.25

*Diagnostic terms defined in Glossary; LRs calculated from data in article.

COMMENTARY

More than 1 million patients with possible cervical spine injury secondary to recent blunt trauma present to North American EDs annually (1). Most are immobilized with board and cervical collar, necessitating a prompt decision about the need for cervical spine imaging to avoid prolonged iatrogenic pain (2). Only 1% have cervical spine injury (1). ED practitioners usually consider a negative clinical evaluation with a negative plain cervical spine radiographic series to be adequate. A validated clinical guideline could avoid unnecessary imaging, shorten ED time, and decrease pain consequent to spinal immobilization.

Stiell and colleagues' multicenter validation study describes the performance of their previously derived prediction instrument (1), and of a second rule developed and validated by a multicenter collaboration in the United States (3). The Canadians enjoyed a methodological advantage over their U.S. counterparts, using a clinical follow-up protocol to include a subgroup of nearly 30% of the eligible population for whom imaging was deemed unnecessary. The NEXUS investigators excluded such patients. The NEXUS criteria were already known and widely used throughout the United States, making it likely that these criteria were used to guide those exclusions. This would be expected to decrease the percentage of both false-negative and true-negative patients, resulting in a falsely elevated sensitivity and a falsely lower specificity. The lower sensitivity and higher specificity for the NEXUS rule reported by Stiell and colleagues is consistent with a correction for this source of bias.

The CCR is accurate but requires a 3-step procedure and access to ancillary lists of specified injury mechanisms. It also requires active neck rotation, a maneuver that the practitioners in the validation study were unwilling to do for 10% of their patients. The NEXUS rule involves the application of 5 criteria that are already familiar to most ED clinicians. In low-risk practice settings where the prevalence of cervical fractures is < 2% (1), the likelihood ratio of 0.25 observed by Stiell and colleagues for a negative assessment of a characteristic patient using the 5 NEXUS predictors would lower the likelihood of a clinically important fracture to < 0.5%. Although the corresponding likelihood ratio of 0.013 for the CCR would reduce this chance further, many ED practitioners would probably be more comfortable in continuing the use of the more familiar NEXUS rule in these settings. The study by Stiell and colleagues implies that use of the CCR could avoid radiography in an additional 12.8% of patients, whereas the NEXUS rule could do so only for an additional 4.9%. In addition to the validation studies reported by Stiell, studies of clinical effect of the 2 prediction instruments are needed to determine their actual efficiency in safely avoiding radiographs and their appeal and acceptability to clinicians in practice. Stiell and colleagues are currently doing such a multicenter implementation trial in 12 hospitals.

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