# The Canadian C-spine rule versus NEXUS: which is better?

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**Clinical Scenario:** You are dispatched "Code 1" to a multi-vehicle accident (MVA) on a busy suburban highway with peak hour traffic present. Once at the scene, you attend the car where the patient hasn't self-extricated unlike the surrounding cars involved. On inspection, you notice the airbags have deployed and the driver complains of neck pain from whiplash he sustained from being rear-ended and then ramming the car in front. The patient appears to be bleeding from the right side of his temple and the inside of the car is littered with empty beer bottles. With these conditions, you and your partner decide to follow the Canadian C-spine rule (CCSR), however a supporting ambulance officer in attendance argues that the NEXUS criteria is easier and should be used to clear cervical spine injuries (CSI) instead.

**PICO (Population – Intervention – Comparison – Outcome) Question:** In a patient suspected of suffering a spinal cord injury and complaining of midline cervical spine tenderness among other presenting factors, is the Canadian C-spine rule more accurate than the NEXUS criteria in clearing cervical spine injuries prehospitally?

**Search strategy:** (Nexus) AND ("Canadian c-spine") AND ("prehospital"). Limitations were placed including a search age range of 5 years before being extended to 7 years due to lack of relevant articles. Databases searched were Pubmed, Medline Ovid, PLOS, Griffith Library and Google Scholar.

**Search outcomes:** 218

**Relevant Papers:** 6

| Author/s, Publication Date and Country | Participants | Type | Findings | Location | Strengths & Limitations |
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| Stein D & Knight W, 2017, United States. | Adult and paediatric patients requiring CSI clearance using CCSR and NEXUS criteria | Scientific publication | CCSR includes both low and high risk criteria thus clearing more patients of CSI than NEXUS<br><br>NEXUS does not include rotation of | Prehospital | (+) Identifies both strengths and weaknesses of NEXUS and CCSR.<br><br>(+) Explores use of c-spine clearance in both adults and paediatrics<br>(+) Extensively referenced and peer |

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| | | | head which is deemed the final step by CCSR in conducting a full assessment<br><br>CCSR is more complex to perform and remember | | reviewed to avoid any bias<br><br>(-) No studies or statistics showing evidence for which criteria was more accurate was recorded in this publication<br><br>(-) Publication doesn't focus solely on c-spine precautions and the pros and cons of each guideline |
| Caltili C., et al., 2017, Turkey. | 724 patients requiring CSI clearance | Retrospective Study | Sensitivity & Specificity of CCSR was 99.7% and 17.9%. Sensitivity & specificity of NEXUS was 97.6% and 27.2%.<br><br>Positive predictive value (PPV) and negative predictive value (NPV) of CCSR were 16.3% and 99.7% while the PPV and NPV of NEXUS was 17.7% and 98.6%.<br><br>CCSR is more sensitive and accurate than NEXUS<br><br>CCSR was shown to be more diagnostically superior to NEXUS | Prehospital | (+) Specifically outlined the sensitivity and accuracy of each c-spine clearance protocol<br><br>(+) Reports on multiple worldwide studies of CCSR and NEXUS criteria and discusses the findings<br><br>(+) Features statistically significant & large sample size of patients.<br><br>(-) Is only a retrospective cross-sectional study and therefore cannot be guaranteed to be representative of future studies |
| Sundstrøm T., et al., 2014, Norway | Adult & paediatric patients requiring CSI clearance using NEXUS and CCSR | Critical Review Study/Journal Article | CCSR is shown to be more sensitive and specific than NEXUS criteria<br><br>CCSR results in lower rate of radiological examinations | Prehospital | (+) Explores use of c-spine clearance in both adults and paediatrics<br><br>(+) Analyses the use and accuracy of C-spine clearing in conscious and unconscious patients |

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| | | | compared to the use of NEXUS | | (-) May potentially be biased as no evidence is presented or stated against the use of CCSR or for the use of NEXUS criteria |
| Tat S., et al., 2014, United States. | 3000 patients under the age of 18 requiring CSI clearance using NEXUS and CCSR | Critical Review Study | CCR had superior sensitivity and specificity when compared with NEXUS criteria for detecting cervical spine injury<br><br>In high risk trauma patients NEXUS criteria is only 83% sensitive compared to 100% in CCSR.<br><br>CCSR results in many false-positive findings and eliminates very few CT scans.<br><br>Neither NEXUS nor CCSR specifically address C-spine clearance in paediatrics<br><br>This study states NEXUS use in children under the age of 9 is not sufficiently sensitive enough to detect CSI's and therefore the ability to generalise the use of NEXUS in younger children is limited. | Prehospital | (+) Explores use of c-spine clearance in both young adults and paediatrics<br><br>(+) Accurately identifies pros and cons of both cervical spine interventions without the presence of bias material.<br><br>(+) Evidence surrounding the choice of CCSR or NEXUS is thoroughly supported and referenced<br><br>(-) Only studies patients under the age of 18 which limits sample size<br><br>(-) There are limited studies on the use of NEXUS and CCSR in paediatrics. |
| Michaleff Z., et al., 2012, Canada. | A comparative review of previous articles & studies NEXUS and CCSR use in | Comparative Study | CCSR sensitivity ranged from 0.90 to 1.00 with specificity ranging from 0.01 to 0.77.<br><br>NEXUS sensitivity ranged from 0.83 to | Prehospital | (+) This article supports the majority of articles as CCSR has been proved to be more accurate and specific than the use of NEXUS in identifying CSI's. |

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| | patients requiring CSI clearance. | | 1.00 with specificity ranging from 0.02 to 0.46.<br><br>CCSR was found to have better accuracy and appeared to have better diagnostic accuracy than the NEXUS criteria | | (+) Accurately identifies positives and negatives in the use of CCSR and NEXUS without the presence of bias studies and material.<br><br>(-) This study is older than the initial search range and therefore is potentially outdated as it is not current. |
| Ala A., et al., 2018, Iran. | 200 trauma patients requiring CSI clearance using NEXUS or CCSR guidelines | Prospective Analytical Study | Both guidelines appear to have the same sensitivity and effectiveness for evaluating whether radiography for possible CSI's is required or not.<br><br>This study argues that NEXUS performs better than CCSR guidelines. | Prehospital | (+) Compares the use of both CCSR and NEXUS on each patient to determine the accuracy of each criteria on CSI clearance<br><br>(+) Identifies that both NEXUS and CCSR are effective in determining whether trauma patients require radiography<br><br>(-) Relatively small sample size used in study thus limited evidence to support the study's claims<br><br>(-) Contradicts all other articles claims about CCSR being superior to NEXUS but lacks sufficient references and large enough sample size to prove otherwise |

**Comments:**

- The majority of the articles sourced stated that CCSR is superior to NEXUS as it has a higher sensitivity, effectiveness and accuracy as well as includes high and low risk criteria, however CCSR leads to more false-positive findings and fails to decrease the amount of CT scans required.
- There are minimal studies on the use of CCSR and NEXUS in paediatrics, however the few studies that are available indicate a lack of sufficient sensitivity, thus limiting the ability to generalise the use of C-spine clearance guidelines in younger paediatrics.
- The only negatives that were accurately identified and supported in the majority of articles was that CCSR is difficult for emergency personnel to remember and complete in highly pressurised and time critical situations.
- It should be noted that head rotation is the final step in accurately clearing a suspected CSI according to CCSR which NEXUS fails to include.
- NEXUS was consistently deemed to be less accurate and less specific than CCSR in the majority of articles.

**Consider:** *How do the results relate to current practice and how might they influence current practice?*

Based on the relevant articles identified in this search, a change in practice is highly recommended as the majority of studies and research revealed the Canadian C-spine rule to be far superior in accurately identifying and clearing cervical spine injuries compared to the current NEXUS criteria used by emergency personnel. More studies should be conducted into the use of CCSR and NEXUS in paediatric patients to ascertain the better guideline, however according to the articles located, CCSR is more effective and accurate. NEXUS criteria is still considered to be a sufficient alternative however CCSR should be prioritised.

**Clinical Bottom Line:**

The use of Canadian C-spine rule in trauma patients with a suspected cervical spine injury should be prioritised over the use of NEXUS despite being difficult to remember or perform in high pressure situations. Ensure that head rotation is performed, unless impossible as it is the final step in the assessment to ensure accurate and full clearance of any cervical spine injuries. Paramedics and emergency personnel should use the most accurate and sensitive cervical spine clearance procedure when assessing and treating patients.

**References:**

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