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Are triage tools effective for detecting cervical spine injury in paediatric trauma patients? – A Cochrane Review summary with commentary

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Abstract.
BACKGROUND: Pediatric cervical spine injuries (CSIs) from blunt trauma carry a high risk of neurological damage. Accurate diagnosis is vital for preventing harm and aiding recovery, yet the diagnostic accuracy of clinical decision rules (CDRs) remains unclear.
OBJECTIVE: To assess the effectiveness of triage tools for detecting CSI in pediatric trauma patients.
METHODS: A summary of the Cochrane Review by Tavender et al. (2024), with comments from a rehabilitation perspective.
RESULTS: Five studies with 21,379 participants assessed seven CDRs. Direct comparisons showed high sensitivity but low specificity across different CDRs. Indirect comparison studies also demonstrated varying sensitivities and specificities.
CONCLUSIONS: Insufficient evidence exists to determine the best tools for deciding if imaging is necessary for diagnosing potential CSI in children. Better quality studies are needed to assess the accuracy of CDRs for cervical spine clearance in this population.

Keywords: Cervical spine injury, triage tool, pediatric trauma

The aim of this commentary is to discuss from a rehabilitation perspective the Cochrane Review "Triage tools for detecting cervical spine injury in paediatric trauma patients" (Tavender et al., 2024) by Tavender et al.[1], published by Cochrane Back and Neck Group. This Cochrane Corner is produced in agreement with NeuroRehabilitation by Cochrane Rehabilitation with the views[**] of the review summary author in the "implications for practice" section.

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[**]The views expressed in the summary with commentary are those of the Cochrane Corner author (different than the original Cochrane Review authors) and do not represent the Cochrane Library or Wiley.

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1. Background

Pediatric cervical spine injuries (CSIs) resulting from blunt trauma, though uncommon, pose a significant risk of neurological damage (Luckhurst et al., 2023). Accurate and timely diagnosis is crucial to prevent further harm and optimize recovery. Clinical decision rules (CDRs) help streamline decision-making, reducing unnecessary tests and radiation exposure (Leonard et al., 2019). The accuracy of pediatric-specific CDRs is unclear. Incorrect diagnoses may delay treatment and worsen outcomes, while excessive imaging raises radiation exposure and costs (Luckhurst et al., 2023). Understanding the effectiveness of current CDRs and areas for improvement is essential for improving care and safety in pediatric patients with suspected CSI.

Triage tools for detecting cervical spine injury in paediatric trauma patients

(Tavender E, Eapen N, Wang J, Rausa VC, Babl FE, Phillips N, 2024)

2. Objective

The aim of this Cochrane review was to assess the effectiveness of triage tools for detecting CSI in paediatric trauma patients.

2.1. What was studied and methods

The population addressed in this review was children under 18 years of age who had blunt cervical trauma. This review examined studies comparing the diagnostic accuracy of CDRs or clinical criteria for evaluating CSI in children following blunt trauma. Eligible study designs included randomized controlled trials, cross-sectional or cohort studies. Case-control studies and predictor finding models were excluded. To enhance index test eligibility, previously excluded studies were reviewed, and field experts consulted for ongoing or overlooked studies. CENTRAL, MEDLINE Ovid, Embase Ovid, ProQuest, PubMed, OpenGrey, ClinicalTrials.gov, Science Citation Index, and WHO ICTRP were searched. Reviewers evaluated the methodological quality of selected studies using the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) tool to achieve the most effective evidence synthesis.

3. Results

The review included five studies with 21,379 participants published between 2001 and 2021, that evaluated the effectiveness of seven CDRs [National Emergency X-Radiography Utilization Study (NEXUS), Canadian C-Spine Rule, Pediatric Emergency Care Applied Research Network (PECARN) retrospective criteria, National Institute for Health and Care Excellence (NICE) clinical guideline 56 (CG56) and 176 (CG176), Leonard de novo model and PEDSPINE].

Due to the diverse inclusion criteria and outcomes, a meta-analysis was not conducted. Instead, sensitivity and specificity were interpreted separately from each primary study.

The findings were as follows:

- Direct comparisons of CDRs:
  - A study with 973 participants compared NEXUS, Canadian C-Spine Rule, and PECARN retrospective criteria tests. All had sensitivities of 1.00 (95% CI 0.48 to 1.00) and specificities of 0.56, 0.52, and 0.32, respectively (moderate-certainty evidence).
  - The PECARN retrospective criteria and Leonard de novo model were tested in a study with 4091 participants. Sensitivities were 0.91 and 0.92, and specificities were 0.46 and 0.50, respectively (moderate- and low-certainty evidence).
  - A study with 270 participants analyzed two NICE head injury guidelines. Both CG56 and CG176 had sensitivities of 1.00 (95% CI 0.48 to 1.00). Specificities were 0.46 and 0.07, respectively (very low-certainty evidence).
- Indirect comparison studies:
  - NEXUS criteria were evaluated in a study with 3065 participants, showing a sensitivity of 1.00 (95% CI 0.88 to 1.00) and a specificity of 0.20 (95% CI 0.18 to 0.21) (low-certainty evidence).
  - PEDSPINE criteria were assessed in a retrospective study with 12,537 participants, showing a sensitivity of 0.93 (95% CI 0.78 to 0.99) and a specificity of 0.70 (95% CI 0.69 to 0.72) (very low-certainty evidence).

4. Conclusions

The authors concluded that there is insufficient evidence to determine the best tools for deciding

if imaging is necessary for diagnosing potential CSI in children. They recommended comprehensive, well-designed studies to better assess cervical spine clearance in children after blunt trauma.

4.1. Implications for practice in neurorehabilitation

The most effective CDR for detecting CSI in children after blunt trauma is currently unclear, as most studies show high sensitivity but low specificity (Luckhurst et al., 2023). There is significant variability in pediatric trauma assessments, with increased use of cervical spine imaging, leading to overdiagnosis, higher costs, and greater radiation exposure (Leonard et al., 2019). The goal is to identify all CSIs while minimizing unnecessary imaging, but no strong evidence supports using CDRs in children under eight (Luckhurst et al., 2023). Newly developed assessment tests may aid in clinical decision-making, reduce the need for imaging, and lower the cost and utilization of hospital resources, ultimately enhancing clinical decision-making and leading to more tailored and effective rehabilitation strategies for young patients recovering from such injuries. Early and accurate identification of CSI is critical for developing appropriate rehabilitation plans and preventing secondary complications.

Conflict of interest

The author declares no conflicts of interest.

References

Leonard, J. C., Browne, L. R., Ahmad, F. A., Schwartz, H., Wallendorf, M., Leonard, J. R., Lerner, E. B., & Kuppermann, N. (2019). Cervical Spine Injury Risk Factors in Children With Blunt Trauma. *Pediatrics*, *144*(1), e20183221. https://doi.org/10.1542/peds.2018-3221

Luckhurst, C. M., Wiberg, H. M., Brown, R. L., Bruch, S. W., Chandler, N. M., Danielson, P. D., Draus, J. M., Fallat, M. E., Gaines, B. A., Haynes, J. H., Inaba, K., Islam, S., Kaminski, S. S., Kang, H. S., Madabhushi, V. V., Murray, J., Nance, M. L., Qureshi, F. G., Rubsam, J., Stylianos, S., . . . Masiakos, P. T. (2023). Pediatric Cervical Spine Injury Following Blunt Trauma in Children Younger Than 3 Years: The PEDSPINE II Study. *JAMA Surgery*, *158*(11), 1126-1132. https://doi.org/10.1001/jamasurg.2023.4213

Tavender, E., Eapen, N., Wang, J., Rausa, V. C., Babl, F. E., & Phillips, N. (2024). Triage tools for detecting cervical spine injury in paediatric trauma patients. *The Cochrane Database of Systematic Reviews*, *3*(3), CD011686. https://doi.org/10.1002/14651858.CD011686.pub3