

# The Canadian CT Head Rule was as sensitive as, but more specific than, the New Orleans Criteria for identifying minor head injury

Stiell IG, Clement CM, Rowe BH, et al. Comparison of the Canadian CT Head Rule and the New Orleans Criteria in patients with minor head injury. JAMA. 2005;294:1511-8.

**Clinical impact ratings:** Emergency Med ★★★★★☆ GIM/FP/GP ★★★★★☆ Neurology ★★★★★☆

**QUESTION**

In patients with minor head injury, how do the Canadian Computed Tomography (CT) Head Rule (CCHR) and the New Orleans Criteria (NOC) compare for predicting the need for neurosurgical intervention and clinically important brain injury?

**METHODS**

**Design:** Prospective validation cohort study to compare 2 previously developed clinical prediction guides (CCHR and NOC).

**Setting:** Emergency departments (EDs) of 9 tertiary care teaching hospitals in Canada.

**Patients:** 2707 patients ≥ 16 years (mean age 38 y, 70% male) with blunt head trauma resulting in witnessed loss of consciousness, definite amnesia, or disorientation; initial ED Glasgow Coma Scale (GCS) score ≥ 13; and injury within the previous 24 hours. Exclusion criteria were no clear history of trauma, obvious penetrating skull injury or depressed skull fracture, focal neurologic deficit, unstable vital signs associated with trauma, seizure before the ED assessment, bleeding disorder or use of oral anticoagulants, reassessment of the same injury, and pregnancy.

**Description of prediction guide:** The CCHR included 5 high-risk features (GCS score < 15 at 2 h after injury, suspected open or depressed skull fracture, any sign of basal skull fracture, ≥ 2 episodes of vomiting, and age ≥ 65 y) and 2 medium-risk features

(amnesia before impact ≥ 30 min, and dangerous mechanism). It was assessed in all 2707 patients with a GCS score ≥ 13. The NOC included 7 items (headache, vomiting, age ≥ 60 y, drug or alcohol intoxication, persistent anterograde amnesia, visible trauma above the clavicle, and seizure) and was assessed in 1822 patients with a GCS score of 15.

**Outcomes:** Need for neurosurgical intervention and clinically important brain injury.

**MAIN RESULTS**

To assess outcomes, 80.2% of patients had a CT scan and 19.8% had a structured 14-day follow-up telephone interview. Among 2707 patients, 41 (1.5%) needed neurosurgical intervention and 231 (8.5%) had clinically important brain injury, compared with 8 (0.4%) and 97 (5.3%), respectively, of the

1822 patients with a GCS score of 15. Both of the CCHR and the NOC had 100% sensitivity, but the CCHR had higher specificity to detect outcomes (Table).

**CONCLUSIONS**

In patients with minor head injury, the Canadian CT Head Rule (CCHR) and the New Orleans Criteria (NOC) had high sensitivity for predicting the need for neurosurgical intervention and clinically important brain injury. The CCHR had higher specificity than the NOC.

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**Canadian CT Head Rule (CCHR) vs New Orleans Criteria (NOC) for predicting outcomes in minor head injury\***

GCS score (n)	Outcomes	Clinical prediction guide	Sensitivity (95% CI)†	Specificity (CI)†	+LR
13 to 15 (2707)	Need for neurosurgical intervention	CCHR	100% (91 to 100)	66% (64 to 67)	2.9
	Clinically important brain injury	CCHR	100 (98 to 100)	41 (39 to 43)	1.7
15 (1822)	Need for neurosurgical intervention	CCHR	100% (63 to 100)	76% (74 to 78)	4.2
		NOC	100% (63 to 100)	12% (11 to 14)	1.1
	Clinically important brain injury	CCHR	100% (96 to 100)	51% (48 to 53)	2.0
		NOC	100% (96 to 100)	13% (11 to 14)	1.1

\*Diagnostic terms defined in Glossary; LRs calculated from data in article. †CIs provided by author.

**COMMENTARY**

Minor head injury is a common and challenging problem faced by physicians in EDs. CT scan ordering practices for such patients vary widely.

In this prospective comparison of the NOC and CCHR, which were developed and validated independently, Stiell and colleagues evaluated the ability of these 2 rules to accurately predict clinically important neurologic sequelae and need for neurosurgical intervention. They followed the same rigorous methodological approach that they used to compare 2 previous decision rules for management of cervical spine injury (1).

In this study, Stiell and colleagues found that both clinical decision rules for minor closed head injury were 100% sensitive. However, the CCHR was more specific than the NOC (76% vs 12% for need for neurosurgical intervention, and 51% vs 13% for clinically important brain injury). The higher specificity of the CCHR will, all else being equal, result in less CT ordering if the rule is applied to the same head injury population. In the analysis, 80.2% of patients had a CT scan and 19.8% were evaluated using proxy outcome measurement tools. Applying the CCHR rule would theoretically decrease CT scan order-

ing to 62.4% and probably consume fewer health care resources.

Using the CCHR decision rule may reduce prognostic uncertainty. However, in this study, physicians were uncomfortable applying the CCHR in 9.5% of cases and the NOC in 11.7% of cases, even after receiving an educational session about the rules. Thus, the consequences of applying these decision rules based on this carefully conducted and important study may also be influenced by clinician thresholds, prevailing ED practices, and propensity to litigate in different health care systems.

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**Reference**

1. Stiell IG, Clement C, McKnight RD, et al. N Engl J Med. 2003;349:2510-8.