



# Calculated Decisions

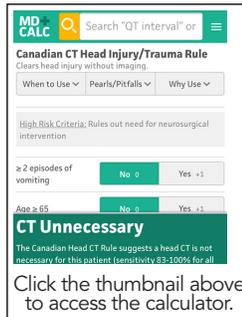
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## Canadian CT Head Injury/Trauma Rule

**Introduction:** The Canadian CT Head Rule (CCHR) was developed to help physicians determine which patients with minor head injury need head CT imaging.



### Points & Pearls

- The original validation trial and multiple subsequent studies (Stiell 2001, Stiell 2005, Stiell 2010) each found the high-risk criteria of the Canadian CT (computed tomography) Head Rule (CCHR) to be 100% sensitive for injuries requiring neurosurgical intervention. The CCHR has an 87% to 100% sensitivity for detecting “clinically important” brain injuries that do not require neurosurgery.
- The rule excluded patients who were taking oral anticoagulants and antiplatelet agents, so no data are available for these patients.
- Patients with minimal head injury (ie, no history of loss of consciousness, amnesia, and confusion) generally do not need a CT scan. For example, patients aged > 65 years may not need a CT scan just based on age if they do not have the history mentioned above.
- When a patient fails the CCHR, use clinical judgment on whether a CT scan is necessary.
- One study (Harnan 2011) found the CCHR to be the most consistent, validated, and effective clinical decision rule for minor head injury patients.
- While there is only 1 United States validation study for the CCHR, it was 100% sensitive for clinically important injuries and injuries requiring neurosurgery. A retrospective study in the

United Kingdom found that applying the CCHR would have actually resulted in an increase in the number of patients undergoing CT scans in that particular practice setting. There is debate about whether the goal should be to find all intracranial injuries or to find patient-important ones that would require neurosurgical intervention.

### Critical Actions

The CCHR has been validated in multiple settings and has been consistently demonstrated to be 100% sensitive for detecting injuries that will require neurosurgery. Depending on practice environment, it may not be considered acceptable to miss any intracranial injuries, regardless of whether they would have required intervention.

Providers may want to consider applying the New Orleans Criteria for head trauma, as there has been at least 1 trial finding it to be more sensitive than the CCHR for detecting clinically significant intracranial injuries (99.4% vs 87.3%), though this comes at the price of markedly decreased specificity (5.6% vs 39.7%). Furthermore, there are other trials in which the CCHR was found to be more sensitive than the New Orleans Criteria for detecting clinically important brain injuries.

### Evidence Appraisal

The validation study (Stiell 2005) included a convenience sample of 2702 patients aged ≥ 16 years, who presented to 9 Canadian emergency departments with blunt head trauma resulting in witnessed loss of consciousness, disorientation, or definite amnesia and a Glasgow Coma Scale score of 13 to 15. Within the sample, 8.5% (231/2707) of the patients had a clinically important brain injury, and

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## Why to Use

There are more than 8 million patients who present annually to emergency departments in the United States for evaluation of head trauma. The vast majority of these patients have minor head trauma that will not require specialized or neurosurgical treatment. At the same time, rates of CT imaging of the head more than doubled from 1995 to 2007.

## When to Use

- Apply the CCHR only to patients with GCS scores of 13-15 with loss of consciousness, amnesia to the head injury event, and confusion.
- Do not use in patients aged < 16 years, patients on blood thinners, or patients with seizure after injury.
- The CCHR is a well-validated clinical decision aid that allows physicians to safely rule out the presence of intracranial injuries that would require neurosurgical intervention, without the need for CT imaging.
- The CCHR has been found to be 70% sensitive for “clinically important” brain injury in alcohol-intoxicated patients (Easter 2013).

## Next Steps

- Remember to always discuss postconcussive symptoms and management with the patient, especially if he or she is being discharged without a head CT. Otherwise, a patient who feels postconcussive symptoms may worry that a CT was needed.
- Educating patients on the symptoms of injuries that require neurosurgical intervention versus postconcussion symptoms can help them feel empowered and reassured.

1.5% (41/2707) of the patients had an injury that required neurosurgical intervention. In the validation trial, the CCHR was 100% sensitive for both clinically important brain injuries and injuries that required neurosurgical intervention, and was 76.3% and 50.6% specific, respectively, for these injuries.

Subsequent studies have all found the CCHR to be 100% sensitive for identifying injuries that require neurosurgical intervention. Applying the CCHR would allow physicians to safely reduce head CT imaging by around 30% (range of 6%-40%, with most studies showing an estimated 30% reduction). In most studies, 7% to 10% of patients had positive CTs, considered “clinically important” brain injuries, but typically, < 2% of patients required neurosurgical intervention. The high-risk criteria have consistently shown 100% sensitivity at ruling out the latter group.

## Use the Calculator Now

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## Calculator Creator

Ian Stiell, MD, MSc, FRCPC

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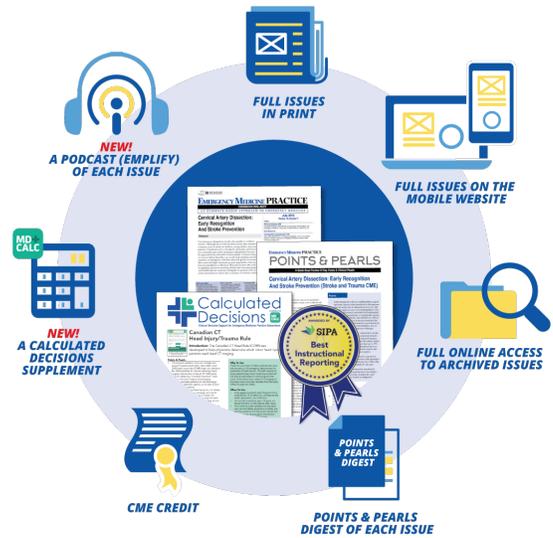
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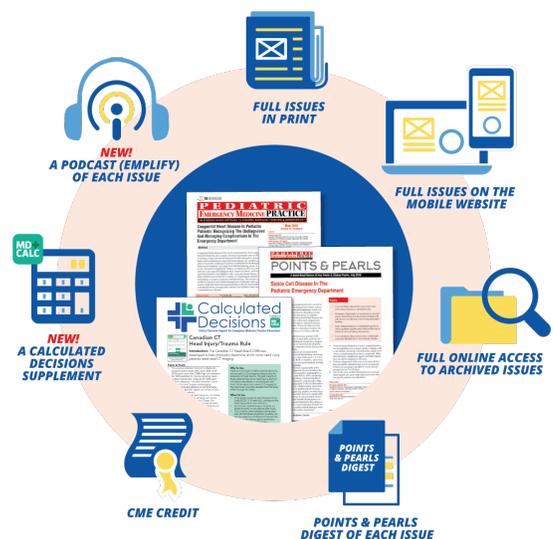
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