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Glasgow Coma Scale

The Glasgow coma scale (GCS) estimates coma severity based on eye, verbal, and motor criteria.

Points & Pearls

- The Glasgow coma scale (GCS) allows providers in multiple settings and with varying levels of training to communicate succinctly about a patient's mental status.
- The GCS has been shown to have a statistical correlation with a broad array of adverse neurologic outcomes, including brain injury, need for neurosurgery, and mortality.
- The GCS has been incorporated into numerous guidelines and assessment scores (eg, ACLS, ATLS, APACHE I-III, TRISS, and the WNS SAH grading scale).
- In some patients, it may be impossible to assess 1 or more of the 3 components of the GCS. The reasons for this include, but are not limited to:
 - » **Eye:** local injury and/or edema
 - » **Verbal:** intubation
 - » **All (eye, verbal, motor):** sedation, paralysis, and ventilation that eliminates all responses
- If a component of the GCS is untestable, a score of 1 should not be assigned (Teasdale 2014). In this circumstance, summation of the components for a total GCS score is invalid.
- The 3 parts of the GCS are charted independently, and a component can be recorded as *NT* (not testable), with an option of indicating the reason (eg, *C* for eye closure and *T* for intubation).

Points to keep in mind:

- Correlation with outcome and severity is most accurate when applied to an individual patient over time; the patient's trend is important.
- A GCS score of 8 should not be used in isolation to determine whether or not to intubate a patient, but does suggest a level of obtundation that should be evaluated carefully.
- Reproducibility is usually good (Reith 2016). If individual institutions have concerns about agreement among providers, training and education are available from the GCS creators at www.glasgowcomascale.org.
- Simpler scores that have been shown to perform as well as the GCS in the prehospital and emergency department setting (for initial evaluation); these are often contracted versions of the GCS itself. For example, the Simplified Motor Score (SMS) uses the motor portion of the GCS only. The SMS and other contracted scores are less well studied than the GCS for outcomes like long-term mortality, and the GCS has been studied as trended over time, while the SMS has not.

Critical Actions

Although it has been adopted widely and in a variety of settings, the GCS score is not intended for quantitative use. Clinical management decisions should not be based solely on the GCS score in the acute setting.

Evidence Appraisal

The modified GCS (the 15-point scale that has been widely adopted, including by the original unit in Glasgow, as opposed to the 14-point original

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GCS) was developed to be used in a repeated manner in the inpatient setting to assess and communicate changes in mental status and to measure the duration of coma (Teasdale 1974).

The evidence presented in 53 published reports on the reproducibility of the GCS was synthesized in a systematic review by Reith et al in 2016. Eighty-five percent of the findings in the studies identified as high quality showed substantial reliability of the GCS as judged by the standard criterion of a kappa statistic > 0.6 . Reproducibility of the total GCS score was also high, with kappa > 0.6 in 77% of the observations. Education and training on usage of the GCS resulted in a clear beneficial effect on reliability (Reith 2016).

In its most common usage, the 3 sections of the scale are often combined to provide a summary of severity. The authors themselves have explicitly objected to the score being used in this way, and analysis has shown that patients with the same total score can have huge variations in outcomes, specifically mortality. A GCS score of 4 predicts a mortality rate of 48% if calculated $1 + 1 + 2$ for eye, verbal, and motor

components, respectively, and a mortality rate of 27% if calculated $1 + 2 + 1$, but a mortality rate of only 19% if calculated $2 + 1 + 1$ (Healey 2014).

The modified GCS provides a nearly universally-accepted method of assessing patients with acute brain damage. Summation of its components into a single overall score loses information and provides only a rough guide to severity. In some circumstances, such as early triage of severe injuries, assessment of only a contracted version of the motor component of the scale (as in the SMS) can perform as well as the GCS and is less complicated. However, the scores like the SMS may be less informative in patients with lesser injuries.

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Why to Use

The GCS score is an adopted standard for mental status assessment in the acutely ill trauma and nontrauma patient and assists with predictions of neurological outcomes (complications, impaired recovery) and mortality.

When to Use

- The GCS is designed for use in serial assessments of patients with coma from either medical or surgical causes and is widely applicable.
- The GCS is commonly used in the prehospital and acute care setting as well as over a patient's hospital course to evaluate for mental status assessment in both traumatic and nontraumatic presentations.
- In the care of an individual patient, the scoring for each of the 3 components of the GCS (eye, verbal, motor) should be assessed, monitored, reported, and communicated separately.
- The combined GCS score is an index of the net severity of impairment and is useful as a summary of a patient's condition, in classifying groups of different severity, for triage, and in research. A GCS score should not be calculated if 1 or more of the components cannot be assessed.

Next Steps

- The GCS can indicate the level of critical illness.
- Trauma patients presenting with a GCS score < 15 warrant close attention and reassessment.
- A declining GCS score is concerning in any setting, and should prompt airway assessment and possible intervention.
- Conversely, a GCS score of 15 should not be taken as an indication that a patient (trauma or medical) is not critically ill. Decisions about the aggressiveness of management and treatment plans should be made based on clinical presentation and context, and should not be overridden in any way by the GCS score.
- Clinical management decisions should not be based solely on the GCS score in the acute setting.
- If a trauma patient has a GCS score < 8 and there is clinical concern that the patient is unable to protect his/her airway or there is an expected worsening clinical course based on exam or imaging findings, then intubation can be considered.
- In any patient, a rapidly declining or waxing and waning GCS score is concerning and intubation should be considered in the context of the patient's overall clinical picture.

Abbreviation: GCS, Glasgow coma scale.

References

Original/Primary Reference

- Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale. *Lancet*. 1974;2(7872):81-84.
DOI: [https://doi.org/10.1016/s0140-6736\(74\)91639-0](https://doi.org/10.1016/s0140-6736(74)91639-0)

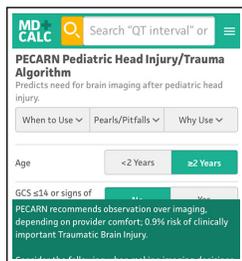
Validation References

- Moore L, Lavoie A, Camden S, et al. Statistical validation of the Glasgow Coma Score. *J Trauma*. 2006;60(6):1238-1243.
DOI: <https://doi.org/10.1097/01.ta.0000195593.60245.80>
- Reith FC, Van den Brande R, Synnot A, et al. The reliability of the Glasgow Coma Scale: a systematic review. *Intensive Care Med*. 2016;42(1):3-15.
DOI: <https://doi.org/10.1007/s00134-015-4124-3>

Other References

- Teasdale G, Jennett B. Assessment of coma and severity of brain damage. *Anesthesiology*. 1978;49(3):225-226.
DOI: <https://doi.org/10.1097/0000542-197809000-00023>
- Teasdale G, Jennett B, Murray L, et al. Glasgow coma scale: to sum or not to sum. *Lancet*. 1983;2(8351):678.
DOI: [https://doi.org/10.1016/s0140-6736\(83\)92550-3](https://doi.org/10.1016/s0140-6736(83)92550-3)
- Healey C, Osler TM, Rogers FB, et al. Improving the Glasgow Coma Scale score: motor score alone is a better predictor. *J Trauma*. 2003;54(4):671-678.
DOI: <https://doi.org/10.1097/01.TA.0000058130.30490.5D>
- Green SM. Cheerio, laddie! Bidding farewell to the Glasgow Coma Scale. *Ann Emerg Med*. 2011;58(5):427-430.
DOI: <https://doi.org/10.1016/j.annemergmed.2011.06.009>
- Middleton PM. Practical use of the Glasgow Coma Scale; a comprehensive narrative review of GCS methodology. *Australas Emerg Nurs J*. 2012;15(3):170-183.
DOI: <https://doi.org/10.1016/j.aenj.2012.06.002>

- Yeh DD. Glasgow Coma Scale 40 years later: in need of recalibration?. *JAMA Surg*. 2014;149(7):734.
DOI: <https://doi.org/10.1001/jamasurg.2014.47>
- Teasdale G. Forty years on: updating the Glasgow Coma Scale. *Nurs Times*. 2014;110(42):12-16.
<https://www.nursingtimes.net/clinical-archive/accident-and-emergency/forty-years-on-updating-the-glasgow-coma-scale-10-10-2014/>
- Gill M, Windemuth R, Steele R, et al. A comparison of the Glasgow Coma Scale score to simplified alternative scores for the prediction of traumatic brain injury outcomes. *Ann Emerg Med*. 2005;45(1):37-42.
DOI: <https://doi.org/10.1016/j.annemergmed.2004.07.429>
- Haukoos JS, Gill MR, Rabon RE, et al. Validation of the Simplified Motor Score for the prediction of brain injury outcomes after trauma. *Ann Emerg Med*. 2007;50(1):18-24.
DOI: <https://doi.org/10.1016/j.annemergmed.2006.10.004>
- Thompson DO, Hurtado TR, Liao MM, et al. Validation of the Simplified Motor Score in the out-of-hospital setting for the prediction of outcomes after traumatic brain injury. *Ann Emerg Med*. 2011;58(5):417-425.
DOI: <https://doi.org/10.1016/j.annemergmed.2011.05.033>
- Teasdale G, Maas A, Lecky F, et al. The Glasgow Coma Scale at 40 years: standing the test of time. *Lancet Neurol*. 2014;13(8):844-854.
DOI: [https://doi.org/10.1016/S1474-4422\(14\)70120-6](https://doi.org/10.1016/S1474-4422(14)70120-6)



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PECARN Pediatric Head Injury/Trauma Algorithm

The PECARN pediatric head injury prediction rule is a well-validated clinical decision aid that allows physicians to safely rule out the presence of clinically important traumatic brain injuries.

Points & Pearls

- The Pediatric Emergency Care Applied Research Network (PECARN) consortium produced the largest study, to date, aiming to derive and validate clinical prediction rules to identify children with very low risk of clinically important traumatic brain injury (ciTBI) following blunt head trauma, who would not require imaging. ciTBI was chosen as the primary outcome because it is clinically driven and accounts for the imperfect test characteristics of computed tomography (CT).
- In the group of patients aged < 2 years, the PECARN rule was 100% sensitive.
- In the group of patients aged > 2 years, the PECARN rule had 96.8% sensitivity.
- In patients aged < 2 years with a Glasgow coma scale (GCS) score of 14, altered mental status, or palpable skull fracture, risk was 4.4%, and CT imaging is recommended.
- Risk with any of the remaining predictors was 0.9%, and < 0.02% with no predictors.
- In patients aged > 2 years with GCS score of 14, altered mental status, or signs of basilar skull fracture, risk was 4.3%, and CT imaging is recommended.
- Risk with any of the remaining 4 predictors was 0.9%, and < 0.05% with no predictors. The PECARN rule outperformed both the CHALICE and CATCH clinical decision aids in external validation studies.
- Although it was the largest trial of its kind, the PECARN rule study had low rates of traumatic brain injury (TBI) on head CT (5.2%) and even lower rates of ciTBI (0.9%), suggesting that overall TBI in children is rare. Head CTs were obtained in approximately 35% of patients, lower than the average estimate of 50%.

Critical Actions

ciTBI was a rare event (0.9%) and neurosurgical intervention was even more rare (0.1%). Over 50% of each age cohort did not meet any predictors, and CT imaging is not indicated for the vast majority of these patients, as risk of ciTBI was exceedingly low. Risk of ciTBI was > 4% with either of the 2 higher-risk predictors in each age cohort, and imaging is recommended.

For the remaining 4 lower-risk predictors in each cohort, the risk of ciTBI is approximately 0.9% per predictor, and CT imaging is indicated rather than observation. Judgment may be based on clinical experience, single versus multiple findings, signs of clinical deterioration during the observation period, patient age, and/or parental preference.

Evidence Appraisal

The original PECARN rule trial included 42,412 children aged < 18 years presenting to one of the 25 North American PECARN-affiliated emergency departments. There were 33,785 patients in the derivation cohort (8502 of whom were aged < 2 years) and 8627 in the validation cohort (2216 of whom were aged < 2 years).

CT scans were performed at the physician's discretion in 35.3%, while medical records, telephone surveys, and county morgue records were used to assess for cases of missed ciTBI in those discharged without imaging. The potential for CT reduction quoted above is likely underestimated, given that CT utilization in this study (35.3%) was significantly lower than the estimated average in North American emergency departments (50%).

TBI occurred in 5.2% of patients. Nine percent of patients were admitted to the hospital. ciTBI occurred in 0.9% of the cohort, neurosurgery was performed in 0.1% of the overall cohort, and 0 patients died. In patients aged < 2 years who were negative for any PECARN risk factor, the aid was 100% sensitive (95% confidence interval [CI], 86.3-100) with a negative predictive value (NPV) of 100% (95% CI, 99.7-1000) for ruling out ciTBI in the validation cohort. In patients aged > 2 years who were negative for any PECARN risk factor, the aid was 96.8% sensitive (95% CI, 89.0-99.6) with 99.95% NPV (95% CI, 99.8-99.99) for ruling out ciTBI in the validation cohort.

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External validation studies have demonstrated sensitivity of 100% for ciTBI and any injury requiring neurosurgery. The algorithm has reasonable specificity (53%-60%), considering its extremely high sensitivity.

Sixty of 376 patients (15.9%) with ciTBI underwent neurosurgery, 8 patients (2.1%) with ciTBI were intubated > 24 hours, and 0 patients died.

As a result of the infrequency of ciTBI, the lower bounds of the CIs of sensitivity started at 86% and 89%, respectively, for the cohorts aged < 2 years and > 2 years. The NPV CIs very closely approximated 100%.

The PECARN rule has now been externally validated in 2 separate studies. One trial of 2439 children in 2 North American and Italian centers found the PECARN rule to be 100% sensitive for ruling out ciTBI in both age cohorts. The rates of 0.8% (19/2439) of patients with ciTBI and 0.08% (2/2439) of patients requiring neurosurgery were similar to the rates in the PECARN trial.

A second trial at a single United States emergency department of 1009 patients aged < 18 years prospectively compared the PECARN rule to 2 other pediatric head CT decision aids, CHALICE and CATCH, as well as to physician estimates and physician practice. In this sample, 2% (21/1009) of

patients had ciTBI and 0.4% (4/1009) of patients needed neurosurgery. Again, the PECARN rule was found to be 100% sensitive for identifying ciTBI.

The PECARN rule outperformed both the CHALICE and CATCH decision aids, which were 91% and 84% sensitive for ciTBI, respectively). Although the goal was to rule out those with very low risk of ciTBI, the PECARN rule also performed well to rule out TBI on head CT. In patients aged < 2 years, sensitivity and NPV were 100% for TBI on CT, with narrow CIs. In patients aged > 2 years, sensitivity was 98.4% and NPV was 94% for TBI on CT, with relatively narrow confidence intervals.

Two PECARN rule subgroup analyses attempted to further risk-stratify patients with single predictors (eg, isolated scalp hematoma in patients aged < 2 years). ciTBI was too uncommon to apply age, hematoma size, or hematoma location predictors. There were several non-statistically significant trends for higher rates of TBI on head CT that may affect imaging tendencies (eg, age < 3 months, nonfrontal hematoma, and large size).

Another subanalysis of those with isolated vomiting (eg, no other PECARN predictors) reiterated the parent study results. In the cohort of patients aged > 2 years, there was a low rate of TBI on head CT (3.2%, 26 of 806 patients) and an even lower

Why to Use

Unlike in the adult population, CT imaging of the head in pediatric patients is believed to be associated with an increased risk of lethal malignancy over the life of the patient, with the risk decreasing with age. The estimated lifetime risk of lethal malignancy from a head CT for a 1-year-old patient is 1 in 1000 to 1500, with risk decreasing to 1 in 5000 for a 10-year-old patient.

There are over 600,000 emergency department visits annually in the United States for head trauma among patients aged ≤ 18 years. Applying the PECARN Pediatric Head Injury Prediction Rule allows providers to determine which pediatric patients they can safely discharge without obtaining a head CT.

When to Use

- The PECARN is a well-validated clinical decision aid that allows physicians to safely rule out the presence of clinically important traumatic brain injuries among pediatric head injury patients without the need for CT imaging, including those that would require neurosurgical intervention.
- The PECARN rule only applies to children with GCS scores ≥ 14.

Next Steps

- In patients with suspected or radiologically confirmed TBI, first assess ABCs and consider neurosurgical and/or intensive care unit consultation or local policies for fluid management, seizure prophylaxis, hypertonic saline/mannitol, disposition, etc.
- Consider observation for 4 to 6 hours for patients who do not have imaging, in order to assess for changes in clinical status.
- Reassurance, education, and strict return precautions are warranted for patients discharged without imaging, including direction to follow up with a primary care provider or neurologist, and anticipatory guidance on return to play/school if concussion is suspected.

Abbreviations: ABCs, airway, breathing, circulation; CT, computed tomography; GCS, Glasgow coma scale; TBI, traumatic brain injury.

rate of ciTBI (0.7%, 10 of 1501 patients), so observation rather than emergent imaging is indicated in the majority of these patients. Number of vomiting episodes and timing of episodes was not helpful in predicting ciTBI or TBI on head CT, as there was a non-statistically significant counterintuitive trend towards less ciTBI/TBI on CT with more episodes.

Selected Abbreviations

CATCH	Canadian Assessment of Tomography for Childhood Head injury [Rule]
CHALICE	Children's Head injury ALgorithm for the prediction of Important Clinical Events [Rule]
ciTBI	Clinically-important traumatic brain injury
PECARN	Pediatric Emergency Care Applied Research Network
TBI	Traumatic brain injury

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References

Original/Primary Reference

- Kupperman N, Holmes JF, Dayan PS, et al. Identification of children at very low risk of clinically-important brain injuries after head trauma: a prospective cohort study. *Lancet*. 2009;374(9696):1160-1170.

DOI: [https://doi.org/10.1016/S0140-6736\(09\)61558-0](https://doi.org/10.1016/S0140-6736(09)61558-0)

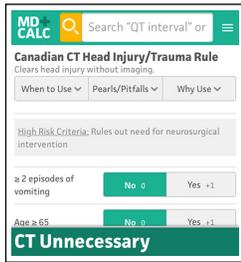
Validation Reference

- Schonfeld D, Bressan S, Da Dalt L, et al. Pediatric Emergency Care Applied Research Network head injury clinical prediction rules are reliable in practice. *Arch Dis Child*. 2014;99(5):427-431.

DOI: <https://doi.org/10.1136/archdischild-2013-305004>

Other References

- Easter JS, Bakes K, Dhaliwal J, et al. Comparison of PECARN, CATCH, and CHALICE rules for children with minor head injury: a prospective cohort study. *Ann Emerg Med*. 2014;64(2):145-152. DOI: <https://doi.org/10.1016/j.annemergmed.2014.01.030>
- Brenner D, Elliston C, Hall E, Berdon W. Estimated risks of radiation-induced fatal cancer from pediatric CT. *AJR Am J Roentgenol*. 2001;176(2):289-296. DOI: <https://doi.org/10.2214/ajr.176.2.1760289>
- Dayan PS, Holmes JF, Atabaki S, et al. Association of traumatic brain injuries with vomiting children with blunt head trauma. *Ann Emerg Med*. 2014;63(6): 657-665. DOI: <https://doi.org/10.1016/j.annemergmed.2014.01.009>
- Dayan PS, Holmes JF, Schutzman S, et al. Risk of traumatic brain injuries in children younger than 24 months with isolated scalp hematomas. *Ann Emerg Med*. 2014;64(2):153-162. DOI: <https://doi.org/10.1016/j.annemergmed.2014.02.003>
- Hess EP, Wyatt KD, Kharbanda AB, et al. Effectiveness of the head CT choice decision aid in parents of children with minor head trauma: study protocol for a multicenter randomized trial. *Trials*. 2014;15:253. DOI: <https://dx.doi.org/10.1186%2F1745-6215-15-253>



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Canadian CT Head Injury/Trauma Rule

The Canadian CT head rule 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 (Harman 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 intra-

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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 the CCHR 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

- Postconcussive symptoms and management should always be discussed 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.

Abbreviations: CCHR, Canadian CT head rule; CT, computed tomography; GCS, Glasgow coma scale.

cranial 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 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.

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References

Original/Primary Reference

- Stiell IG, Wells GA, Vandemheen K, et al. The Canadian CT Head Rule for patients with minor head injury. *Lancet*. 2001;357(9266):1391-1396.

DOI: [https://doi.org/10.1016/s0140-6736\(00\)04561-x](https://doi.org/10.1016/s0140-6736(00)04561-x)

Validation Reference

- 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(12):1511-1518.

DOI: <https://doi.org/10.1001/jama.294.12.1511>

Other References

- Stiell IG, Clement CM, Grimshaw JM, et al. A prospective cluster-randomized trial to implement the Canadian CT Head Rule in emergency departments. *CMAJ*. 2010;182(14):1527-1532.
DOI: <https://doi.org/10.1503/cmaj.091974>
- Boyle A, Santarius L, Maimaris C. Evaluation of the impact of the Canadian CT head rule on British practice. *Emerg Med J*. 2004;21(4):426-428.
DOI: <https://www.ncbi.nlm.nih.gov/pubmed/15208223>
- Smits M, Dippel DW, de Haan GG, et al. External validation of the Canadian CT Head Rule and the New Orleans Criteria for CT scanning in patients with minor head injury. *JAMA*. 2005;294(12):1519-1525.
DOI: <https://doi.org/10.1001/jama.294.12.1519>
- Harnan SE, Pickering A, Pandor A, et al. Clinical decision rules for adults with minor head injury: a systematic review. *J Trauma*. 2011;71(1):245-251.
DOI: <https://doi.org/10.1097/TA.0b013e31820d090f>
- Papa L, Stiell IG, Clement CM, et al. Performance of the Canadian CT Head Rule and the New Orleans Criteria for predicting any traumatic intracranial injury on computed tomography in a United States Level I trauma center. *Acad Emerg Med*. 2012;19(1):2-10.
DOI: <https://doi.org/10.1111/j.1553-2712.2011.01247.x>
- Bouida W, Marghli S, Souissi S, et al. Prediction value of the Canadian CT head rule and the New Orleans criteria for positive head CT scan and acute neurosurgical procedures in minor head trauma: a multicenter external validation study. *Ann Emerg Med*. 2013;61(5):521-527.
DOI: <https://doi.org/10.1016/j.annemergmed.2012.07.016>
- Easter JS, Haukoos JS, Claud J, et al. Traumatic intracranial injury in intoxicated patients with minor head trauma. *Acad Emerg Med*. 2013;20(8):753-760.
DOI: <https://doi.org/10.1111/acem.12184>
- Schuur JD, Carney DP, Lyn ET, et al. A top-five list for emergency medicine: a pilot project to improve the value of emergency care. *JAMA Intern Med*. 2014;174(4):509-515.
DOI: <https://doi.org/10.1001/jamainternmed.2013.12688>
- Larson DB, Johnson LW, Schnell BM, et al. National trends in CT use in the emergency department: 1995-2007. *Radiology*. 2011;258(1):164-173.
DOI: <https://doi.org/10.1148/radiol.10100640>

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