

What's New in the Patient Safety World

March 2017

Update on CT Scanning after Minor Head Trauma

We've done numerous columns on the need to reduce the number of unnecessary CT scans. Not only do unnecessary scans expose patients to ionizing radiation but they add expense and often uncover incidental findings that trigger the "diagnostic cascade" or "investigation momentum" where one test leads to another and on and on.... Of course, there is probably an excess performance of CT scans for most body parts but CT scans of the head are high on the list of CT scans that are overused. So there have been numerous attempts to develop ways of minimizing the ordering of unnecessary head CT scans.

One of the ways we've attempted to optimize the use of head CT scans is using clinical decision rules. There's no shortage of clinical decision rules guiding the ordering of CT scans in patients with minor head trauma. We have the Canadian CT Head Rule ([Stiell 2001](#)), the New Orleans Head CT Rule ([Haydel 2000](#)), and the NICE guideline ([NICE 2014](#)) in adults. And for children we have CHIP ([Smits 2007](#)), CATCH ([Osmond 2010](#)), and the NICE guideline ([NICE 2014](#)).

A recent study looked at the appropriateness of head CT scans for minor head trauma using the Canadian CT Head Rule (CCHR) as the guideline ([Klang 2017](#)). The authors retrospective reviewed 955 head CT scans and found 10.9% were not indicated according to the CCHR. However, for patients under the age of 65, 37.3% of scans ordered were not indicated according to that rule. Looking at factors associated with inappropriate ordering of head CT scans they found that neurologists (present company, of course, excluded!) were 3.5 times more likely to order them. Surgeons were statistically less likely to order. They did not find any significant difference by seniority of the ordering physician. Also, regarding injury mechanism, four-wheel motor vehicle accidents and being hit on the head with an object were associated with higher rates of non-indicated CT scans. Interestingly, motor vehicle accident as a pedestrian and two-wheel vehicle driver were associated with lower rates of non-indicated CT scans. The study did confirm that the CCHR had 100% sensitivity and 100% negative predictive value for either brain hemorrhage or fractures. The authors do note that its possible those cases where a neurologist was involved may have been more complicated and perhaps could have had other indications for CT scanning. The authors suggest that interventions to reduce the frequency of non-indicated head CT scanning might include targeted education of staff members, protocol implementation, and implementation of computerized decision rules.

A previous study had compared compare the cost-effectiveness of using selective CT strategies with that of performing CT in all patients with minor head injury ([Smits 2010](#)). Five strategies were evaluated (1) CT performed in all patients with minor head injury (2) selectively according to the New Orleans criteria (NOC) (3) selectively according to the Canadian CT head rule (CCHR) (4) selectively according to the CT in head injury patients (CHIP) rule or (5) in no patients. A Markov model was used to analyze long-term costs and effectiveness. Results showed that performing CT selectively according to the CCHR or the CHIP rule could lead to substantial U.S. cost savings (\$120 million and \$71 million, respectively), and the CCHR was the most cost-effective at reference-case analysis. When the prediction rule had lower than 97% sensitivity for the identification of patients who required neurosurgery, performing CT in all patients was cost-effective. The CHIP rule was most likely to be cost-effective. The authors concluded that selecting patients with minor head injury for CT renders cost savings and may be cost-effective, provided the sensitivity for the identification of patients who require neurosurgery is extremely high. But uncertainty regarding long-term functional outcomes after minor head injury could justify the routine use of CT in all patients with these injuries.

But there are numerous scenarios where these clinical decision rules cannot be applied. For example, all those rules basically do not apply to patients who are on anticoagulants. We've discussed CT scanning in patients on anticoagulants (see the full list of prior columns below). But two other scenarios not covered are: (1) the patient who is intoxicated and (2) the patient first presenting to the ED beyond 24 hours.

Regarding the alcohol-intoxicated patient presenting to the ED with altered mental status, a recent study provides some reassuring evidence about timing of CT scanning ([Granata 2017](#)). The authors did a retrospective review of patients presenting to the emergency department (ED) with altered mental status and alcohol intoxication who had CT scanning at varying times after presentation. Of the 5943 patients included in the study none of those scanned in less than 3 hours had intracranial findings on imaging requiring neurosurgery, whereas 1 patient with a deferred CT scan required a neurosurgical intervention (which was not emergently performed). The authors conclude that CT scanning of alcohol-intoxicated patients with altered mental status is of low clinical value and that deferring CT imaging while monitoring improving clinical status appears to be a safe practice.

Another recent study looked at CT scanning in those patients with head injury presenting more than 24 hours after the injury ([Marincowitz 2016](#)). They compared how the NICE guideline ([NICE 2014](#)) predicted intracranial injuries in those patients presenting within or after 24 hours from the injury. They found that 8.4% of CT scans had traumatic abnormalities in those presenting within 24 hours and 9.9% in those presenting after 24 hours. The sensitivity of the guidelines for intracranial injuries was 98% for those presenting within 24 h and 70% for those presenting after 24 h of injury. The presence of a guideline indication did predict significant injury and this was unaffected by time of presentation. The authors conclude that existing guidelines appear to predict traumatic CT abnormalities irrespective of timing of presentation but that their sole use in patients presenting after 24 hours may result in significant injuries not being identified.

Some of our previous columns on head trauma in the anticoagulated patient:

April 16, 2007 “[Falls With Injury](#)”

July 17, 2007 “[Falls in Patients on Coumadin or Heparin or Other Anticoagulants](#)”

June 5, 2012 “[Minor Head Trauma in the Anticoagulated Patient](#)”.

July 8, 2014 “[Update: Minor Head Trauma in the Anticoagulated Patient](#)”

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