

## Commentary: A Systematic Review of the Risk of Intra-Cranial Haemorrhage in those Presenting Late to the ED Following Head Injury

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### Article Info

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### ABSTRACT

**Background:** Head injury represents an extremely common presentation to Emergency Departments (ED), but not all patients present immediately after injury. There is evidence that clinical deterioration following head injury will usually occur within 24 hours. It is unclear whether this means that head injury patients that present in a delayed manner, especially after 24 hours, have a lower prevalence of significant traumatic injuries.

**Methods:** This is a commentary on a systematic review that we conducted with the aim of identifying all studies that assess the risk of significant injuries in delayed ED presentation head injury populations. We postulated that the risk of injury may be different in this group compared to patients that present immediately.

**Results:** Three studies were eligible for inclusion. They were all of poor methodological quality, and heterogeneity prevented meta-analysis. The reported prevalence of traumatic intra-cranial injury on CT was between 2.2% and 6.3%.

**Conclusion:** Available evidence suggests that head injury patients who present in a delayed fashion to the ED may have lower rates of intra-cranial injury compared to non-delayed head injury patients. However, the evidence is sparse and it is of too low quality to guide clinical practice. Further research is required to help the clinical risk assessment of this group.

## Background

Much research into the Emergency Department (ED) management of minor head injury patients has been directed at deriving decision rules in order to risk stratify this group<sup>1</sup>. The Canadian CT Head Rule (CCHR) is the most widely validated decision rule and forms the basis of the National Institute for Health and Care Excellence (NICE) head injury guidelines used in the UK<sup>2</sup>. It allows minor head injury patients to be divided into those that require CT imaging and those that can be discharged safely with advice.

The CCHR, and other commonly used decision rules, was derived and validated in patients presenting within 24 hours of injury<sup>1,3</sup>. Patients presenting after this may differ. They may be at lower risk as there is evidence that minor head injury patients with intra-cranial haemorrhage will clinically deteriorate within 24 hours of injury<sup>4,5</sup>. However, Australian head injury guidelines state that head injury patients that present after a delay should be treated as a high risk group as they may be presenting due to ongoing, or worsening, symptoms due to their injury<sup>6</sup>.

In the UK, the authors have observed variation in the CT imaging of Glasgow Coma Scale (GCS) 15 head injury patients that present after a delay, especially after 24 hours of injury. Some clinicians will image any symptomatic patients that present after a delay. However, other clinicians do not image this group despite the presence of guideline indications. There is some consensus that patients taking warfarin, or that have a severe headache, presenting after a delay should undergo CT imaging.

## Methods

We undertook a systematic review to assess whether head injury patients (both adult and paediatric) that present after a delay have a different risk of serious injuries compared to patients that present immediately. Relevant terms related to delayed diagnosis and intracranial pathology was identified after reviewing both the PubMed Pubreminer service (<http://hgserver2.amc.nl/cgi-bin/miner/miner2.cgi>) and Medical Subject Headings (MESH – via the US National Library for Medicine MESH browser at (<http://www.nlm.nih.gov/mesh/MBrowser.html>)). From this, an electronic search strategy was devised. Articles of potential interest were identified from searches in MEDLINE (Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present) and EMBASE (1974 to 2015 January 23) (Wolter Kluwers Health at <http://ovidsp.uk.ovid.com/sp-3.13.1a/ovidweb.cgi>). The bibliographies of head injury guidelines used in the UK and Australia, and any article that matched the inclusion criteria, were also interrogated.

The search strategy, results and study selection process are available in the full article<sup>7</sup>. All study types, except

isolated case studies, were considered for inclusion. Studies had to be conducted in ED populations who had sustained a head injury, and presented after a delay. Articles were considered for inclusion by two independent reviewers through a title and abstract review of studies identified by the search strategy.

Only a narrative data synthesis was undertaken due to the paucity, heterogeneity and poor quality of identified studies. The primary outcome of interest was prevalence of significant traumatic pathology identified by CT imaging, including intra-cranial haemorrhage, cerebral contusions and skull fractures.

## Results

Only three poor quality studies were identified that estimated the prevalence of significant injury in head injury patients that presented after a delay<sup>8,9</sup>. The reported prevalence of injury in the studies was 2.21%<sup>8</sup>, 3.1%<sup>10</sup> and 6.3%<sup>9</sup>. They defined delay in presentation as 4, 12 and 24 hours after injury respectively. A large systematic review found the median prevalence of intracranial injury in patients with minor head injury (GCS 13-15 patients) to be 7.2 % in studies almost exclusively conducted in patients presenting within 24 hours of injury<sup>1</sup>.

All the identified studies had significant weaknesses. None of the studies compared the risk of significant injury in patients that presented immediately to those that presented after a delay. This makes it difficult to assess whether head injury patients that present after a delay have a different risk profile. The most contemporary study defined delay in presentation as 4 hours<sup>9</sup>. This is arguably too short a period for factors such as clinical deterioration, or persistence of symptoms to significantly differentiate this population from patients that present immediately.

The paper by Hemphill et al was published in 1999 and pre-dates current guidelines. It has a high CT head scan rate. This reflects practice at the time in the USA, but makes it difficult to generalize the findings to current practice. Poor follow up of patients that did not undergo CT imaging, coupled with the low rate of pathology, makes the study susceptible to attrition and outlier bias.

Borcuk et al is present an abstract of a case series. It includes no exclusion criteria or attempt to measure the number of patients who presented after 24 hours and did not have scans. Multiple attempts to contact the authors for further information were unsuccessful. The lack of information presented makes it difficult to draw meaningful conclusions from the study.

## Limitations

The search strategy of this systematic review could have been more comprehensive. This systematic review was completed without external funding. Due to limitations in

resources only two electronic databases were searched and the “grey literature” was not searched comprehensively. This means that unpublished and poorly indexed studies may not have been identified. Hand searching of specific journals related to head trauma and emergency medicine research could have also been undertaken to identify non-indexed studies. This may have been useful as the nature of the research area makes both the study design and topic difficult to categorise.

## Conclusions

The most important finding of the completed systematic review is that there is currently insufficient high quality research to aid the clinical risk assessment of head injury patients that present after a delay to the emergency department. This is especially true of patients that present after 24 hours of injury where the most used clinical decision rules are not validated. That being the case, it seems likely that pathology will still be found in this group, and they may constitute an important group to consider given how common head injury is.

The authors of this systematic review feel that further high quality research is required to assess which factors predict significant injuries in this group. This includes validation studies of existing decision rules in this group, or the derivation of new clinical decision rules specifically for patients presenting after 24 hours of injury. The application of existing decision rules to this group may risk over investigation or conversely mean that significant injuries are not identified.

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## Conflicts of interest

There were no conflicts of interest in the conduct of this systematic review.

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