

Nine of ten trauma calls avoidable

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Abstract

Background

Our aim was to estimate the degree of overtriage of trauma call patients in our hospital. Overtriage was the proportion of trauma call patients with Injury Severity Score ≤ 15 . We also wanted to determine the transportation time from injury to hospital admission.

Methods

We used data from our Acute Medical Information System (AMIS), ambulance records and in patient charts relating to Injury Severity Score and estimation of response and transport times. Data were collected for all trauma call patients in the period from the establishment of the trauma call system in June 2008 until the 31st of December 2010.

Results

In this time period we identified 421 out of 458 possible trauma call patients with sufficient clinical information available for ISS-scoring. Of these had 385 an Injury Severity Score ≤ 15 . Overtriage was thus 91.5% (95% CI 88.8% - 94.2%). Median time from injury to the arrival of transport, and from injury to arrival in hospital respectively, was 36 mins and 1 hour and 27 min.

Conclusions

To our knowledge 91.5% is the highest overtriage ever published. There is a need for narrowing the trauma call criteria. This could be achieved by implementing clinical observations from the long transportation time.

Background

When a trauma call is activated in our hospital, a trauma team is scrambled. The criteria for activation are shown in table 1. The trauma team consists of physicians, nurses and allied health personnel. The implementation of a trauma call system is an important and life saving measure in the treatment of severely injured patients [1], but is resource intensive, placing a great strain on on-call resources, and increasing waiting times for other service users. It is therefore essential to use the trauma team on injuries where it is really needed. We wanted to find out how often our trauma call patients had minor injuries, defined as those with Injury Severity Scores (ISS) of 15 or lower, and to compare our results with reports from other centres [2].

Northern Norway is sparsely populated and the distances are vast, therefore we also wanted to find the time use from when the accident occurred to when the patient arrived at the hospital. Do we have time to make use of clinical observations during long transports, in order to minimize overtriage?

Methods

This study was performed at Nordland Hospital, Bodø, a regional hospital providing secondary care. Nordland Hospital is one of eleven acute care hospitals in Northern Norway. The hospital admits trauma patients, predominantly from road traffic accidents (Data not shown), via thirty ambulances, five sea ambulances and a SeaKing rescue helicopter with a fully trained anaesthetist based in Bodø.

The majority of trauma patients are treated in Nordland Hospital Bodø. Neurosurgical injuries and severe thoracic injuries, however, are sent via air ambulance to a tertiary-level of care hospital in Tromsø.

We acquired information from the acute medical information system AMIS (Akuttmedisinsk Informasjonssystem, Nirvaco, Norway), ambulance charts and the digital in-hospital patient chart system DIPS (Distribuert Informasjons og Pasientdatasystem, DIPS ASA, Norway). From AMIS we extracted data on all 458 trauma call patients in the period from when the trauma call system was started in June 2008 and until 31st December 2011. The data were anonymised and transferred to an Excel file for autofilter search and pivot tables. Two doctors experienced in treating trauma, one anesthetist and one surgeon, independently scored the patients using the ISS and Abbreviated Injury Score (AIS).

AIS classifies the patient's injury in a numerical scale from 1 to 6 where 1 represents the mildest form of injury and 6 represents a lethal injury. The ISS is calculated by summing the squares of the three highest AIS scores in different body regions. The two doctors used the AIS© 2005, Update 2008 as a guideline for scoring the patients. Like Uleberg et al. we defined overtriage as 1 minus the positive predictive value, where the positive predictive value was the probability of serious injury conditional on trauma team activation [2].

The time intervals between the report of an accident and the start of transport and between the report of an accident and arrival at the hospital were obtained from ambulance charts and the Emergency Medicine Communication Central (EMCC).

Ethical approval was given (projectnumber 28997)

Results

We identified 421 trauma call patients with sufficient clinical information available for ISS-scoring out of 458 possible (Fig. 1). Of these patients 385 had an ISS ≤ 15 on admission, which means the overtriage was 91.5%. Median time from injury to transportation and from injury to admission with 25-75 percentile range are presented in figure 2.

Discussion

We found a very high proportion of unnecessary trauma calls in our hospital. Although the numerous smaller hospitals receive most trauma call patients in Norway, these hospitals publish few studies on trauma call triage. If our findings from a smaller hospital are representative, a substantial national overtriage exists. Also studies from larger tertiary level of care hospitals have shown a large proportion of patients are overtriaged [3,2]. A trauma call usually occupies a large amount of the on-call staff. In smaller hospitals, almost all on call staff will be involved in a trauma call. In our hospital this accounts for a minimum of 11. In the mean time other patients, including other emergencies, will have their diagnostic procedures, radiology investigations, blood samples or operations postponed. If the emergency room is full during a trauma call, many patients will be sent to a medical or surgical ward before they have been fully examined and had their treatment plan made up in the emergency room. This is done so that there is enough space for the trauma team. The overuse of trauma calls is often considered a good training situation for the trauma team. Medical training on patients, however, should only be performed after informed consent has

been obtained. It is also a legitimate concern that continuous overtriage will impact negatively on the trauma team's responsiveness and motivation.

The majority of trauma call patients undergo a full body CT scan that will give them a radiation dose of more than 20 millisivert. That single dose of ionizing radiation is twice as high as the national academy of Science's Seventh Assembly of the Committee on Biologic Effects of Ionizing Radiation says will give a 40 year old adult a 1/1000 chance of future cancer [4]. The radiation dose alone is therefore a valid reason to limit the amount of trauma call patients with low ISS scores routinely undergoing CT scans. The radiologist, and the counter signing radiologist is also given a substantial extra workload examining the CT scans.

Our study has revealed that in the majority of cases, no trauma call criteria is registered. If a criterion *is* registered, it is usually "mechanism of injury" (MOI). It is well known that MOI as trauma team activation criteria will give a high overtriage rate [5,2,3]. By using only MOI-criteria Uleberg et al. found the same overtriage rate in Trondheim as we did [2]. MOI was employed by 38 hospitals (83%) in Norway in 2008 as a reason for activation of the full trauma team [6]. We believe new criteria for full trauma team activation must be based on vital parameters and clinical findings. This might be possible without unacceptable increase in undertriage [2,3,5]. We also think it is important that the EMCC hits the call based on these criteria, without conference with inhospital doctors on-call.

Compared to our findings of 1 hour and 27 minutes median prehospital time use, the tertiary level of care Ullevål University Hospital in Oslo had 44 minutes, including both ambulance and helicopter (NO Skaga, personal communication, Feb 2013). The trauma call system in Norway was first introduced at tertiary level of care university hospitals with shorter transport distance and transport time. Today, however, the

majority of trauma call patients are admitted to hospitals with longer prehospital time use. The trauma center at St. Olavs University Hospital in Trondheim had in 2009 a median transport time of 1 hour and 16 minutes from the accident occurred until arrival at the hospital. This is only 11 minutes shorter than our transport time. Therefore, it is reasonable to believe that the great majority of trauma call considerations in Norway have time to make use of clinical observations during long transports in order to minimize overtriage. This possibility has not been studied in Norway so far, even though several authors have concluded that a patient without any clinical symptoms involved in a high-energy accident does not necessitate the use of trauma team activation [2].

Conclusions

An overtriage of 91.5% is, as far as we know, the highest reported to date. The trauma call criteria must focus more on clinical findings and less on mechanism of injury. Clinical observations from the long transport time could be used to narrow down overtriage.

Competing interests

None

Authors' contributions

Erik Waage Nielsen (EWN) and Eva Hellas Passas (EHP) designed the study. EHP included the patient information. EHP, Harald Stordahl (HS) and Andreas Hopland (AH), carried out the ISS scoring. All authors participated in the drafting of the manuscript. All authors has read and approved the final manuscript.

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Figure legends

Figure 1 - Flow chart over patient inclusion and ISS-scoring

Figure 2 – Prehospital time use

Minutes from time of injury to start of transport and from injury to hospital admittance. Horizontal bars are median with 25-75 percentile range.

Figures

Figure 1

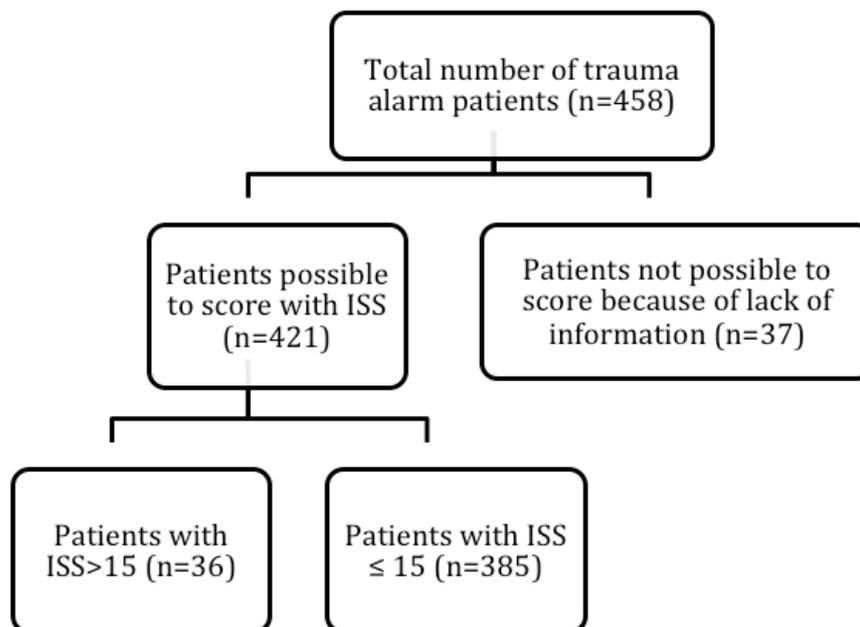
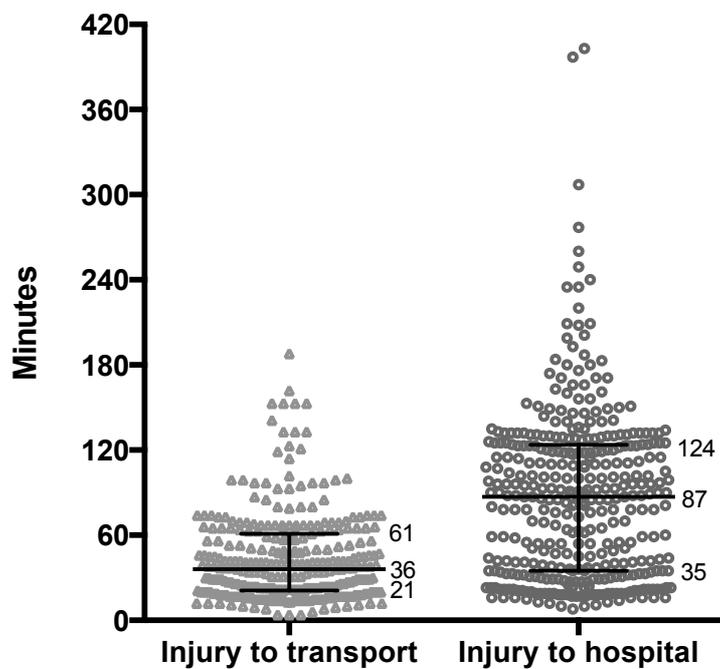


Figure 2



Tables

Table 1
Trauma team activation criteria at Nordland Hospital Bodø

Criteria category	Criterion
Mechanism of injury	Co passenger dead Trapping in wreck Wreck deformity Ejected from vehicle Pedestrian thrown upon car, or through air Children hit by car with speed exceeding 30km/h Fall from > 5 m Motorcycle accident
Extent of injury	Shot or stab wounds Large bleeding Large crush injury Suspected pelvic injury Two large fractures Burn injury > 15% body surface Burn injury with inhalational injury
Vital parameters	Disturbed respiration Tachycardia > 120 Loss of consciousness Hypotension
