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ORIGINAL ARTICLE

The association between hospital arrival time, transport method, prehospital time intervals, and in-hospital mortality in trauma patients presenting to Khayelitsha Hospital, Cape Town

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A B S T R A C T

Introduction: Trauma is a leading cause of unnatural death and disability in South Africa. The aim of the study was to determine whether method of transport, hospital arrival time or prehospital transport time intervals were associated with in-hospital mortality among trauma patients presenting to Khayelitsha Hospital, a district-level hospital on the outskirts of Cape Town, South Africa.

Methods: The Khayelitsha Hospital Emergency Centre database was retrospectively analysed for trauma-related patients presenting to the resuscitation area between 1 November 2014 and 30 April 2015. Missing data and additional variables were collected by means of a chart review. Eligible patients' folders were scrutinised for hospital arrival time, transport time intervals, transport method and in-hospital mortality. Descriptive statistics were presented for all variables. Categorical data were analysed using the Fisher's Exact test and Chi-square, continuous data by logistic regression and the Mann Whitney test. A confidence interval of 95% was used to describe variance and a p-value of < 0.05 was deemed significant.

Results: The majority of patients were 19–44 year old males (n = 427, 80.3%) and penetrating trauma the most frequent mechanism of injury (n = 343, 64.5%). In total, 258 (48.5%) patients arrived with their own transport, 254 (47.7%) by ambulance and 20 (3.8%) by the police service. The arrival of trauma patients peaked during the weekend, and was especially noticeable between midnight and six a.m. In-hospital mortality (n = 18, 3.4%) was not significantly affected by transport method (p = 0.26), hospital arrival time (p = 0.22) or prehospital transport time intervals (all p-values > 0.09).

Discussion: Method of transport, hospital arrival time and prehospital transport time intervals did not have a substantially measurable effect on in-hospital mortality. More studies with larger samples are suggested due to the small event rate.

African relevance

- Trauma is a leading cause of death and a healthcare burden in Africa.
- Prehospital factors may impact mortality.
- The results can help explore prehospital care prior to district level care.

Introduction

Trauma is a leading cause of death worldwide and accounts for almost 50% of the injury-related mortality in persons between the ages of 15 and 44 years [1]. Traumatic brain injury and hypovolaemia following haemorrhage seems to be the foremost causes of death [2].

Various theories have been proposed to reduce the morbidity and mortality related to trauma. One such theory is that the method of transportation to hospital might influence trauma patients' outcome. Recent studies comparing Emergency Medical Service (EMS) transport

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to non-EMS transport failed to show any differences in severity-adjusted mortality [3,4]; while some even show a survival benefit in privately transported patients [5,6].

Trauma is known to peak outside office-hours and this phenomenon has been documented across the world [7–9]. The arrival time of trauma patients might also play a role in the mortality rate. Patients arriving during the early morning hours tend to have a higher mortality compared to other times [10]. However, this theory has been challenged by studies indicating that time of arrival had no influence on the risk for adverse outcomes [7,11].

It has long been suggested that trauma-related mortality improves with shorter out-of-hospital times [12]. One variable affecting the total prehospital time is the amount of time EMS personnel spend at the scene of the incident. The two major strategies regarding on-scene time are "load-and-go/scoop-and-run" versus "stay-and-play/treat-then-transfer". These strategies differ regarding how much diagnostics, treatment and stabilisation should be performed before leaving the scene, with the "load-and-go/scoop-and-run" strategy aiming to leave the scene as soon as possible. A systematic review has failed to show consensus or significant results regarding which technique improves mortality [13].

South Africa is a country with a large trauma burden, straining the resources of the healthcare system [14]. To decrease mortality, South Africa has prehospital EMS to treat and transport acutely sick or injured patients to hospital. The aim of the study was to determine whether method of transport, hospital arrival time or prehospital transport time intervals were associated with in-hospital mortality among trauma patients presenting to Khayelitsha Hospital in South Africa.

Methods

A retrospective analysis of an observational database was performed. Missing data and additional variables were collected by means of a chart review. A waiver of informed consent was approved by the Stellenbosch University Human Research Ethics Committee (Ref: N14/08/102).

Khayelitsha is one of many townships in and around Cape Town. Many inhabitants living in townships are typically either low-income workers or unemployed. There are approximately 400,000 inhabitants in Khayelitsha, 74% earning less than 2500 USD per year and 19% declaring no income at all. In total, 80% of the inhabitants are aged under 40 years. The main means of heating and lighting is by paraffin [15].

Khayelitsha Hospital was built in 2012 and houses 240 beds, an emergency centre, operating theatres, radiology department and laboratory. Khayelitsha Hospital provides inpatient services for surgical, medical, psychiatric, paediatric and obstetric patients. At the time of the study, there was no permanent qualified surgeon working at the hospital. Qualified emergency physicians head the emergency centre which manage around 30,000 patients per year with a 30% admission rate (personal communication: Dr. S. Lahri, 2013). The resuscitation area within the emergency centre has five monitored beds (four beds and a paediatric cot). Patients with a high acuity score according to the South African Triage Scale are managed within the resuscitation area until their condition has stabilised [16]. An EMS station is situated on the hospital premises [17].

The electronic Khayelitsha Hospital Emergency Centre database is an observational database capturing all patients managed within the resuscitation area since 1 November 2014 and has been described elsewhere [18].

All trauma-related patients presenting to the resuscitation area at Khayelitsha Hospital from 1 November 2014 to 30 April 2015 were eligible for inclusion. A filtered dataset was obtained from the database for this purpose. Exclusion criteria were patients who presented dead on arrival, patients incorrectly labelled as trauma cases and those with missing files from the Electronic Content Management system. The study was part of a six month master project and the amount of patient files captured during a scheduled 3-week data collection period (1–19 March 2016) determined the sample size. Eligible patients were randomised by use of Microsoft Excel™ prior to starting data collection.

Patient demographics (age, gender), date and time of arrival, patient acuity (according to the South African Triage Scale [19]), diagnostic tests performed, interventions received while in the resuscitation area, time spent in the resuscitation area, and disposition from the resuscitation were already captured on the database. Additional variables collected included patients' vital parameters, mechanism of injury, injuries sustained, injury distribution, transport method to the hospital, prehospital time intervals, patient location and in-hospital mortality. Injury distribution was divided into four groups; head, neck and face, thoraco-abdominal, extremity and polytrauma, also taking injury mechanism into account. Overlap between the groups was inevitable since the population might have several injuries. Polytrauma signifies the total population with injuries in two or more of the injury distribution groups.

Prehospital time intervals calculated were total prehospital time (time of incident to arrival at hospital), prehospital EMS time (time of dispatch to hospital arrival), EMS patient time (arrival on scene to arrival at hospital), EMS scene time (arrival on scene to departure from scene), and EMS transport time (scene departure time to hospital arrival) (Fig. 1). All time variables were collected as stated in the EMS reports. Times were captured as hours and minutes, were calculated in Excel using subtraction formulas and were checked for errors.

In-hospital mortality describes patients who arrived at the hospital, received treatment and died whilst still in hospital for their index admission. Patients declared dead on arrival to Khayelitsha Hospital were excluded. If patients were referred to another healthcare facility, the data on in-hospital mortality was collected by accessing the relative hospital's electronic record system. The data was anonymised before analysis by removing folder numbers and all identifiable information.

Summary statistics were used to describe all variables. Time intervals were analysed as continuous variables. The association between hospital arrival (time and date) and in-hospital mortality, as well as transport method and in-hospital mortality, was analysed using the Fisher's Exact Test. Transport times were analysed using the Mann-Whitney test for significance and by logistic regression. A 5% significance level was used. STATA 14 was used for all statistical analyses. A consultant at the Biostatistics Unit within the Centre for Evidence Based Health Care at Stellenbosch University assisted with the analysis of this through support from the Faculty of Medicine and Health Science's dean's fund.

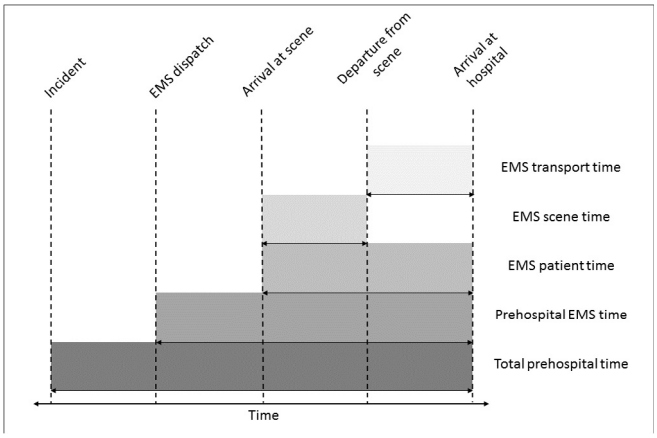

Fig. 1. Prehospital time intervals. EMS, Emergency Medical Services.