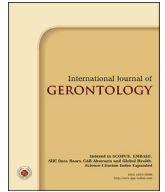


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Original Article

Unnecessary Emergency Medical Services Transports of Geriatric Patients in a Tertiary Hospital in South Korea

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SUMMARY

Background: This study investigated unnecessary emergency medical services (EMS) transports by comparing geriatric patients treated and not treated at the emergency department (ED) after EMS transports, and factors associated with lack of treatment at the ED of geriatric patients after EMS transports.

Methods: A retrospective review of EMS run sheets was conducted for geriatric patients (\geq age 65) admitted by EMS. Study subjects were divided in two groups according to if they were treated at the ED (ED treatment group) or not treated (non-ED treatment group). General demographics, clinical demographics and prehospital treatment were compared between groups.

Results: Of the total of 1251 EMS run sheets, non-ED treatment group comprised 49 (3.9%) of patients. Elapsed time from scene to ED was longer with the non-ED treatment group. Oxygen saturation was lower in the ED treatment group than the non-ED treatment group and wound care was more frequently conducted in the non-ED treatment group. Causes of not receiving treatment at the ED were against medical advice (37%) and based on doctors' suggestion (67%).

Conclusion: The non-ED treatment group consisted of more patients with alcohol intake, higher oxygen saturation, alert mentality and wound care than the ED treatment group. Prehospital wound care was the risk factor for not receiving ED treatment after EMS transports in geriatric patients.

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1. Introduction

Emergency department (ED) care is critical in providing emergency treatment for patients with acute or chronic illnesses.¹ Some patients that arrive at the ED are transported by public ambulance or emergency medical services (EMS). However, medically unnecessary EMS transports can lead to waste of hospital and EMS resources. Misuse of EMS transports include unmet need (EMS transports not used even though medically necessary) and inappropriate use (use of EMS transports when medically unnecessary). Inappropriate EMS use may be used to evaluate equity of medical use and efficiency of medical resources². Unnecessary EMS transports of geriatric patients requiring more diagnostic examinations

and lengthier stays at the ED than younger patients³ burden the EMS system and medical institution⁴.

Unnecessary EMS transports have been investigated based on hospital diagnosis or results of ED treatment^{1,5–8}. Until now no study has investigated unnecessary EMS transports of patients not treated at ED although transported by EMS. This study examined unnecessary EMS transports by comparing geriatric patients treated and not treated at the ED after EMS transports, and factors associated with lack of treatment at the ED of geriatric patients after EMS transports.

2. Materials and methods

2.1. Study design & setting

This retrospective study involved geriatric patients (\geq age 65) admitted by EMS at one training hospital ED on the southeast coast area of South Korea during for one-year August 2014–July 2015. This study was reviewed by the relevant institutional review board.

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EMS run sheets submitted to the study hospital ED after EMS transports were analyzed and data was excluded if a run sheet was not readable. Study subjects were divided in two groups according to if treated at the ED (ED treatment group) or not treated (non-ED treatment group). The non-ED treatment group was defined as patients that had no further medical treatment and diagnostic tests at the ED, and that did not pay for the ED regardless of history-taking and physical examinations conducted after arrival at the ED.

2.2. Data collection

General demographics, clinical demographics and prehospital treatment were compared between groups. General demographics included age, sex, day of EMS use, time of EMS use, season of EMS use, elapsed time from EMS call to scene, elapsed time from scene to ED arrival, occupation and place of call for EMS use. Three age groups were used: 65–74, 75–84 and ≥ 85 . Day of EMS use was determined as weekday (Monday–Friday) and holidays (Saturday, Sunday and national holidays). Seasons comprised spring (March–May), summer (June–August), fall (September–November) and winter (December–February). Occupation was designated as employed or unemployed, including stay-at-home wives. Clinical characteristics of patients in prehospital setting included symptoms, medical history, alcohol intake, blood pressure, pulse rate, oxygen saturation, glucose test, level of consciousness and pupil light reflex that were investigated. Symptoms were recorded based on the EMS run sheet and characteristics of symptoms were categorized as disease related or non-disease related, such as trauma or intoxication. Frequent causes of non-disease related symptoms were examined and level of consciousness was classified as alert and non-alert, that included verbal response, pain response and unresponsiveness. Airway management, oxygen administration, electrocardiogram (ECG) monitoring, intravenous line, immobilization, wound care, warming or cooling, automated defibrillator (AED) monitoring and direct medical control contact for prehospital treatment were evaluated. Numbers and certificates of responding firefighters were investigated because the fire department is responsible for prehospital EMS transports in South Korea. Airway management was defined as manual manipulation or use of equipment and immobilization were determined if immobilization for spine or extremities was conducted. Direct medical control was defined as telephone communication of EMS personnel with the medical director or medical doctor.

Causes of not receiving ED treatment in the non-ED treatment group were classified as patient-oriented (against medical advice) and physician-oriented (based on doctors' suggestions) causes. Details of patient-oriented causes were classified into denial of treatment after EMS use, uncooperative towards ED healthcare providers, desire for transfer to another hospital and desire for treatment at outpatient department (OPD). Details of physician-oriented causes were classified as no symptoms at ED arrival, drunken state without medical problem or trauma, patients can be treated in OPD and other hospital treatment and repeat visit to study hospital with the same symptoms.

2.3. Statistical analyses

Student t-test, chi-square test and Fisher's exact test were used to compare general demographics, clinical demographics and prehospital treatment between ED treatment and non-ED treatment groups. Multivariate regression with forward stepwise method after adjusting for age and sex was conducted using significant factors ($p < 0.1$) from univariate comparison to identify factors associated with non-ED treatment in patients with EMS transports.

IBM SPSS 20.0 (IBM Inc., Somers, NY, USA) was used for analyses and statistical significance was defined as $p < 0.05$.

3. Results

3.1. General demographics

The 1251 EMS run sheets overwhelmingly involved the ED treatment group ($n = 1202$, 96.1%) versus the non-ED treatment group ($n = 49$, 3.9%) (Fig. 1). There was no difference in mean age between groups, with patients age 65–74 being the most common in both groups. There was no difference in gender, or day and season of EMS use between groups. The most common time of EMS use was between 0600 and 1200 (33%) in the ED treatment group and between 1800 and 2400 (35%) in the non-ED treatment group. There was no difference in elapsed time from EMS call to scene between groups, however the time from scene to ED was lengthier in the non-ED treatment group (22 min vs 25 min, $p = 0.043$). Most frequent location of EMS calls was at home in both groups (Table 1).

3.2. Clinical demographics

Common symptoms were general weakness (9.6%), abdominal pain (8.8%) and nausea/vomiting (6.3%) in the ED treatment group, and general weakness (14.3%) and nausea/vomiting (6.1%) in the non-ED treatment group. Medical history was not different between groups. Disease related symptoms were present in 73% and 69% of patients in the ED treatment group and non-ED treatment group, respectively. There was no difference in blood pressure, pulse rate and glucose between groups, however oxygen saturation was lower in the ED treatment group (95% vs 98%, $p < 0.001$). All patients in the non-ED treatment group had alert mental status and 11% were not alert in the ED treatment group. Pupil light reflex was intact in patients in the non-ED treatment group, but 4% of the ED treatment group had abnormal pupil light reflex (Table 2).

3.3. Prehospital care

There was no difference in airway manipulation between groups. Oxygen was administered most frequently via nasal prong in both groups. Bag valve masks for oxygen supply was used for 9% of patients in the ED treatment group and none in the non-ED treatment group. More oxygen was administered in the ED treatment group than the non-ED treatment group (7 L/minutes vs 4 L/minutes). There was no difference in ECG monitor, intravenous line,

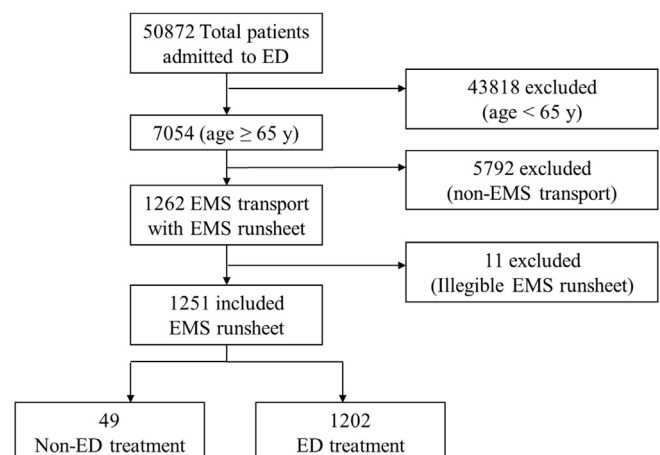


Fig. 1. Study subjects.

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