

# Admission and Discharge Following Ambulance Transport to the Emergency Department

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**Abstract.** Emergency ambulance use is deemed necessary for the transport of acutely ill patients to hospital emergency departments (ED). However, some patients are discharged as they present low acuity or chronic problems and should receive primary healthcare services, while the most severely ill are admitted. In the present study, we examined the descriptive epidemiology of ambulance transports for emergencies in the ED by utilizing the data of the information systems of a public tertiary general hospital in Greece. More than half of the patients transferred to the ED by an ambulance were finally admitted to the hospital (52.25%), whereas only one-third (33.74%) of those transferred by other means. A statistically significant association was detected between ambulance use and hospital admission. Age was also statistically significantly higher in the ambulance group. Higher mean values of creatinine, CRP, LDH, urea, white-blood-cell count, and neutrophils were detected in the ambulance group, in contrast to hemoglobin and lymphocyte count which were higher in the non-ambulance group.

**Keywords:** emergency medical services, ambulances, hospital information systems

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## 1. Introduction and Background

Emergency ambulance use is usually reserved for transporting acutely ill patients to hospital emergency departments (ED). However, a substantial proportion of ambulance users are discharged as they present low acuity or chronic problems and could benefit from primary healthcare services, while the most severely ill are admitted to hospitals [1-3]. A significant increase in ambulance demand has been observed worldwide, reaching 29.2%, in a recent 8-year observational study in Melbourne, Australia [4]. Several articles in the literature have tried to elucidate the phenomenon of increased use of emergent care services by patients with non-acute situations [5-7]. Factors as older age, low socioeconomic status, and homelessness have been suggested [6,7]. Similarly, non-emergent ambulance calls by patients with minor illnesses may have severe implications regarding medical resources adequacy for those who really need them [8]. Moreover, increased ambulance transport of patients with primary care medical problems leads to the overcrowding of hospital emergency departments and potentially to the provision of lower quality healthcare services [5]. The aim of this study was to compare the characteristics of patients visiting the ED in relation to the use of ambulance transport and the ED outcome (admission or discharge).

## 2. Materials and Methods

This research is an observational retrospective statistical analysis conducted in the ED of a public tertiary care hospital in Greece that has been approved by the Institutional Review Board of Sismanogleio General Hospital (Ref. No 15177/2020, 5969/2021). Between 14 March and 4 May 2019, 2903 ED visits were recorded (missing values of the Ambulance variable were excluded from the statistical analysis). We investigated biochemical markers and coagulation tests that are routinely checked in patients visiting the ED, in relation to the use of ambulance transport and the ED outcome (admission or discharge). Raw data were retrieved from a standard Laboratory Information System (LIS) and a hospital information system (HIS). The data were analyzed by using IBM SPSS Statistics version 27.0 [9]. The data set includes the following variables: ambulance use (Ambulance), serum levels of Urea (UREA), Creatinine (CREA), Lactate Dehydrogenase (LDH), Creatine Kinase (CPK), C-Reactive Protein (CRP), Complete Blood Count with differential, including white blood cells (WBC), neutrophil count (NEUT%), lymphocyte count (LYM%), hemoglobin (HGB), and platelets (PLT), Activated Partial Thromboplastin Time (aPTT), D-Dimer, International Normalized Ratio (INR), age, gender, and triage disposition to ED unit.

The descriptive statistics of the data for the variables Age, Gender, Ambulance use, and Admission are presented in the following table (Table 1).

**Table 1.** Summary of descriptive statistics for variables Age, Gender, Ambulance use, and Admission

Age		Gender		Ambulance use		Admission	
Mean	61.17	Male	1453	Yes	511	Yes	1074
Standard deviation	20.82	Female	1450	No	2392	No	1829
Range/IQR	86/33	Total	2903	Total	2903	Total	2903



## 4. Discussion

The emergency medical service (EMS), worldwide, is ruled from several life-threatening level protocols of time response. This is a useful tool when the demand for services exceeds resource availability, and it is therefore vital that the appropriate transport request is made. In Greece, the public ambulance service covers the transportation of acutely ill patients to hospitals, as well as scheduled local and interregional urgent and non-urgent inter-hospital patient transfers. The present study examined the descriptive epidemiology of EMS ambulance transports in the ED by utilizing the HIS and LIS from a public tertiary general Greek hospital. Demographic inpatient data were merged with patients' laboratory data of the emergency department, elaborating information on whether the patient arrived by ambulance or not. Older patients and those with more deranged laboratory exams had a greater possibility to use an ambulance service as a life-threatening medical emergency code. However, only half of the patients transported by an ambulance were admitted to the hospital, whereas only one-third of those were not transported by an ambulance. Nevertheless, a medical fast-track service is available in the triage room, permitting patients with minor medical issues to avoid unnecessary laboratory or imaging tests, therefore diminishing their discharge time. From the total number of patients visiting the ED, nearly two-thirds were discharged, meaning that they presented with mild problems, which could be initially managed at primary healthcare services. Although ambulance users are more frequently older, with more severe illness and greater need for admission, in approximately half of the cases, EMS ambulance call was actually unnecessary, and patients were discharged, possibly due to minor or chronic problems. Our results are in accordance with similar studies [1,3,5]. The optimal use of public, pro bono emergency ambulance services by the citizens is desirable as it could help alleviate ED crowding and improve the quality of emergency hospital services. An association between poor patient outcomes and ED overcrowding has been suggested [5]. The role of primary healthcare services should also be strengthened as it is fundamental in achieving better health care services in general.

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