

**ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ ΥΓΕΙΑΣ  
ΤΜΗΜΑ ΙΑΤΡΙΚΗΣ**

**ΠΡΟΓΡΑΜΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ  
« ΔΙΑΧΕΙΡΙΣΗ ΚΑΙ ΑΠΟΚΑΤΑΣΤΑΣΗ ΒΑΡΕΩΣ ΠΑΣΧΟΝΤΑ »**

**ΔΙΠΛΩΜΑΤΙΚΗ ΕΡΓΑΣΙΑ**

**Εθνικό Κέντρο Άμεσης Βοήθειας: Χρησιμοποιείται για κλινικούς λόγους που δικαιολογούν την κλήση ή ξεκάθαρη εκμετάλλευση της υπηρεσίας από τους πολίτες?**

Κόκκινου Ευτυχία- Ελένη

**ΤΡΙΜΕΛΗΣ ΣΥΜΒΟΥΛΕΥΤΙΚΗ ΕΠΙΤΡΟΠΗ**

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**Emergency Ambulance Service: Used for justified clinical reasons or pure abuse by the Public?**

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## **Abstract**

**Introduction:** The Greek EMS is known as EKAB. Its purpose is to offer immediate assistance, in emergency cases, and emergency medical care and transport citizens to health care facilities. People call the number 166 to arrange patient transport. Each call is evaluated by qualified employees who follow a methodology to determine needs and dispatch options. In the industrialized world, the number of calls to emergency medical communication centers (EMCCs) was classified by them that about 50% of ambulance missions are non-urgent. The following research is about those cases whose call might be classified as inappropriate and leads to the service being misused.

**Methods:** In a period of 3 months, we performed a prospective study including 150 patients who were presented to the ED by ambulance. (Only for the departments of internal medicine and cardiology). The initial screening was performed at the triage area. Afterwards, we asked the ED physicians if they believed the use of an ambulance was necessary and, the patient must also meet the inclusion criteria. In order to do the statistical analysis, qualitative variables were expressed as absolute and relative frequencies (N, %). All statistical analyses were performed by IBM SPSS Statistics version 25.0.

**Results:** From the total of the patients who participated 29.3% were 80-87 years. Of the 150 cases which came to our Emergency Department (ED) by ambulance, a percentage of 75.3% had made a justified call (according to the doctors), which means that 24.7% made an unjustified call to EMS. And this proves that there is misuse of the service. Also, 91.9% of the patients with an unjustified call were not admitted in the hospital. In contrast, 78.8% of the patients with a justified call were admitted in the ward.

**Conclusion:** You should always think of the possible misuse that affects not only you but also the EMS and the ED staff. More research is needed to gain more knowledge about this subject and understand how the misuse might affect us all.

**Keywords:** EMS, misuse, unjustified call, diagnosis, symptom.

## **Abstract (Greek)**

**Εισαγωγή-Σκοπός:** Το ελληνικό EMS είναι γνωστό ως ΕΚΑΒ. Σκοπός του είναι να προσφέρει άμεση βοήθεια, σε περιπτώσεις έκτακτης ανάγκης, και επείγουσα ιατρική περίθαλψη και να μεταφέρει τους πολίτες σε εγκαταστάσεις υγειονομικής περίθαλψης. Οι άνθρωποι καλούν τον αριθμό 166 για να κανονίσουν τη μεταφορά του ασθενή. Κάθε κλήση αξιολογείται από εξειδικευμένους υπαλλήλους που ακολουθούν μια μεθοδολογία για τον προσδιορισμό των αναγκών και των επιλογών αποστολής ασθενοφόρων. Στον βιομηχανοποιημένο κόσμο, ο αριθμός των κλήσεων σε κέντρα ιατρικής επικοινωνίας έκτακτης ανάγκης παρατηρήθηκε από αυτούς ότι περίπου το 50% των αποστολών ασθενοφόρων δεν είναι επείγουσες. Η ακόλουθη έρευνα αφορά εκείνες τις περιπτώσεις των οποίων η κλήση μπορεί να χαρακτηριστεί ως ακατάλληλη και να οδηγήσει σε κατάχρηση της υπηρεσίας.

**Μέθοδος:** Σε διάστημα 3 μηνών, πραγματοποιήσαμε μια προοπτική μελέτη που περιλάμβανε 150 ασθενείς που παρουσιάστηκαν στο ΤΕΠ με ασθενοφόρο. (Μόνο για τα τμήματα παθολογίας και καρδιολογίας). Ο αρχικός έλεγχος πραγματοποιήθηκε στο χώρο διαλογής. Στη συνέχεια, ρωτήσαμε τους γιατρούς των επειγόντων αν πιστεύουν ότι η χρήση ασθενοφόρου είναι απαραίτητη και επίσης, αν ο ασθενής πληροί τα κριτήρια ένταξης. Για να γίνει η στατιστική ανάλυση, οι ποιοτικές μεταβλητές εκφράστηκαν ως απόλυτες και σχετικές συχνότητες (N, %). Όλες οι στατιστικές αναλύσεις πραγματοποιήθηκαν από την IBM SPSS Statistics έκδοση 25.0.

**Αποτελέσματα:** Από το σύνολο των ασθενών που συμμετείχαν το 29,3% ήταν 80-87 ετών. Από τα 150 περιστατικά που προσήλθαν στο Τμήμα Επειγόντων Περιστατικών (ΤΕΠ) με ασθενοφόρο, ποσοστό 75,3% είχε κάνει δικαιολογημένη κλήση (σύμφωνα με τους γιατρούς), πράγμα που σημαίνει ότι το 24,7% έκανε αδικαιολόγητη κλήση προς το ΕΚΑΒ. Και αυτό αποδεικνύει ότι υπάρχει κατάχρηση της υπηρεσίας. Επίσης, το 91,9% των ασθενών με αδικαιολόγητη κλήση δεν εισήχθησαν στο νοσοκομείο. Αντίθετα, το 78,8% των ασθενών με δικαιολογημένη κλήση εισήχθησαν στις κλινικές.

**Συμπέρασμα:** Θα πρέπει πάντα να σκεφτόμαστε την πιθανή κατάχρηση που επηρεάζει όχι μόνο τους ασθενείς αλλά και το ΕΚΑΒ και το προσωπικό του ΤΕΠ. Απαιτείται περισσότερη έρευνα προκειμένου να αποκτήσουμε περισσότερες γνώσεις σχετικά με αυτό το θέμα και να κατανοήσουμε πώς η κατάχρηση μπορεί να μας επηρεάσει όλους.

**Λέξεις- κλειδιά:** EMS, κατάχρηση, αδικαιολόγητη κλήση, διάγνωση, συμπτώματα.

## **Introduction**

EKAB was established as a legal entity under public law in 1985 (Law 1579/85) and is under the supervision of the Ministry of Health and Social Solidarity. Its purpose is to coordinate the provision, in emergency cases, of immediate assistance and emergency medical care to citizens and to transport them to health care facilities. It is the only official state provider offering emergency pre-hospital medical and nursing care services. This agency studies, proposes and develops programs related to Emergency Medicine. In the same field of Emergency Prehospital Medicine and Nursing Care, it is the only official agency that undertakes the handling and response to Massive Health Losses by developing the Special Department of Medicine for Natural Disasters. Every day, EKAB receives thousands of calls for medical assistance and according to the Greek legislation in force until today, it is obliged to respond to each of these calls. The purpose of Emergency Pre-Hospital Medicine is the immediate provision of on-site specialized medical and nursing care in every emergency case, as well as ensuring the timely and safe transport of the patient to the most appropriate and closest health care facility. To do all this the system had to evolve over time, just like any other EMS in the world [1].

The evolution of the emergency medical services (EMS) system has been a slow process according to the American Journal of Public Health. Although modern EMS was originally developed during the Napoleonic era to help injured soldiers, few major changes occurred in EMS until the 1960s. Between 1960 and 1973, medical, historical, and social forces converged and led to the development of a more structured EMS system in the United States. These forces had a tremendous impact on the structure and way the EMS system operates, this has resulted in profound effects on public health today. Modern EMS is thought to have begun with Jean Dominique Larrey, who was Napoleon's chief physician. He organized a system to treat, and transport injured French soldiers [2].

Larrey first discovered that the wounded were left in the firm until the battle was over, and then assembled at a suitable point, but the number of wagons interposed between them and the army and many other difficulties delayed their progress so much that they never arrived in less than twenty-four or thirty-six hours, with the result that most of the wounded died for want of help. This gave me the idea of constructing an ambulance in such a way as to provide an easy conveyance for the wounded during battle [3].

Larrey developed a plan for the rapid removal of wounded soldiers from the battlefield during an engagement, using flexible medical units that he called ambulances volantes ('flying ambulances'). Each ambulance section consisted of twelve spring-loaded light carts to transport the wounded, some with two wheels and others with four wheels. The floor was mobile and a mattress of hair and a cushion of it, covered with leather, were placed on it. This floor was easily moved on either side of the body, by means of four small rollers. There were also four iron handles on the sides, through which the soldiers' belts were passed when placing the wounded on the sliding floor. These belts were used instead of stretchers for carrying the wounded [3].

Finding the right way to transport the patient was the greatest achievement for the historical start of the ambulance service in general. But for modern times a major funding proved to be just what EMS needed. The Robert Wood Johnson Foundation, realizing the importance of EMS, and in 1973 announced funding for 44 EMS-related demonstration projects [2].

The program was aimed at developing the areas of technology, education, and interagency coordination. In January of that year, senators including Cranston & Kennedy reintroduced EMS legislation. Supporting arguments were also made for the EMS Systems Development Act. In addition, data was presented showing that only 7% of EMS vehicles met design standards and 35% of EMS personnel had low-level and barely acceptable training. The US EMS system was compared to the Moscow EMS system, which was at a very high level and provided care within 7 minutes [2].

The EMS system must not only provide a high level of care but also deliver it within minutes. And then get to the hospital as quickly as possible, because a stroke patient depends on how long it takes for treatment to begin. Many of the cases that reach the medical department of the ambulance are related to a possible stroke. Stroke care is emphasized when it is an emergency. Rapid care not only increases eligibility for alteplase treatment, but also increases the chances of better recovery after treatment. In order to, respond to the narrow treatment window available for acute stroke treatment, stroke centers and communities have developed strategies to reduce the time required to initiate treatment. These include hospital- and ambulance-based rapid care protocols, community education, and ambulance staff training programs [4].

In Australia, the rate of alteplase administration remains low because of the delay in patients seeking help after the onset of symptoms and the limited number of hospitals with acute stroke resources and staff with expertise in the field. Only 20% of Australians who have a stroke are admitted to a stroke unit and not many of these units provide alteplase. There is no national or state coordination related to acute stroke care. Instead, stroke patient care procedures are determined at a local hospital without specific guidelines [4].

However, a local hospital without specific guidelines is not what a stroke patient needs. What is needed is an appropriate acute care unit for the stroke and a pre-briefing at the hospital for the arrival of the ambulance. This practice can reduce the time to initiation of treatment and improve the care of the stroke patient in integrated stroke centers with acute care protocols. Studies in the past have indicated that ambulance transport reduces prehospital and hospital times. Evidence from previous community comparisons of pre- and post-intervention studies has shown that multilevel interventions can reduce delays and increase eligibility for acute stroke treatment [4].

Because we aim to reduce the delays, the staff receiving a call uses the medical priority dispatch system and each call received is recorded. And so, they assign a priority code to each case. Ambulance priority codes allocate a degree of priority and responsiveness to patients. Priority code 1 (lights and sirens) is the most urgent requiring immediate response. Triage nurses in the EDs use the Australasian Triage Scale to rate patients on what level of clinical urgency they are at. A classification code of 1 means that immediate response is required (e.g., cardiac arrest) and a classification code of 2 indicates that medical assessment should be carried out within 10 minutes of arrival [4].

This prospective open observational study showed that, in an urban Australian setting, the time from call to hospital arrival (ambulance service time) is relatively standard with narrow interquartile ranges across patients, sites and hospitals. However, the fastest times were associated with ambulances dispatched with 'lights and sirens'. Overall ambulance times were quite close to those reported by other emergency medical services worldwide. Although there was no formal policy during this study, paramedics triaged patients to one of the hospitals that offered an acute stroke service (93% of all stroke prompts). Transfer times were shorter for patients within the study area who were transferred to Austin Hospital after in-field stroke recognition and had the correct stroke prognosis [4].



## **A. Theoretical Background**

### **1. History of EKAB**

The EKAB is a component of the modernization of the Greek health system by the National Health System. According to the health policy objectives pursued during each of the four different periods, the effort to shape the current NHS can be divided. Each period is said to have begun with the passage of legislation that set the policy framework. Specifically:

-The first period runs parallel to the efforts to create an integrated health system, which began with the passage of Law 1397/1983, the legislation that established the National Health System [5].

-The second period was dominated by liberal ideology with the passing of Law 2071/1992, which aimed to strengthen the private sector and deregulate the NHS. The next period marks the return of the basic essential ideals of the system of social solidarity, as stated in Law 2194/1994 [5].

-Law 2519/1997, which marks the shift to more technocratic methods throughout the fourth period as emphasis was placed on the introduction of modern principles and methods of health service management.

The EKAB is a Public Legal Entity established in 1985 by Law 1579 and is administered by the Ministry of Health, Welfare and Social Insurance, which is based in Athens. This law also defined the role of the EKAB, which is to organize the provision of immediate assistance, emergency medical care and the transport of citizens to medical institutions in case of emergency.

More specifically, Law No 2071 sets out the objectives of the EKAB, which are:

-To provide people in danger with health and life-saving procedures and to transport them to the appropriate medical institution with additional care [5].

-Transporting cases that are not considered emergencies but need to be moved in one way or another.

-Teaching the general public, EMS personnel and other community groups first aid and emergency pre-hospital care.

-Direct involvement and coordination of medical assistance during large-scale accidents or disasters.

The ECDC was established by Presidential Decree No 376. This decree was revised by Decree No 348 in 1996. The organizational structure of the ECDC referred to in these Regulations is described in the following part [5].

The EKAB is a component of a modern pre-hospital emergency care system that helps:

- Improving the quality of all health care services offered.
- To reduce mortality, length of hospitalization and the incidence of temporary or long-term disability and invalidity.
- To reduce the price of health care.
- In increasing the sense of security of local people, which will reduce the rate of migration to large cities.
- reducing the number of deaths that could be avoided.

## **2. Organizational Structure of the EKAB**

The Minister of Health, Welfare and Social Insurance has the power to appoint the Chairman and Vice-Chairman of the Board of Directors of EKAB, which is composed of seven members and has a two-year term of office.

By virtue of Ministerial Decision Y4b/9919/F25, the Board of Directors of EKAB:

- It is the highest level of government [6].
- It makes decisions and takes all legal actions necessary to achieve the objectives of the organization.
- It takes decisions on all matters relating to the management of the EKAB's property.
- Completes all steps required for the purchase of fixed and mobile equipment.
- Approves all initiatives aimed at expanding and organizing the services of the EKAB throughout Greece.
- Oversees all procedures concerning the hiring, promotion or dismissal of employees of any kind [6].
- It has the power to impose discipline on the employees of the EKAB.
- Approves the budget and any amendments that may be required.
- Calls for tenders, establishes tender and bid evaluation committees and approves the award of tenders.

-decides whether to accept donations and legacies.

-refers to the parties accountable for unauthorized expenditure, property damage and losses relating to EKAB.

According to the following three basic frameworks, the ECSC is constituted:

#### SECURITY SERVICE:

It is headquartered in Athens and is responsible for the implementation of the objectives of the EKAB so that services are offered uniformly throughout the country. In accordance with Government Decree 229 of 1996, the following services, departments and offices constitute the Central Service of the EKAB:

The Departments of Organization and Planning, Coordination, Information Technology, Public Relations and the Technical Department are part of the Directorate of Organization and Coordination [6].

The Department of Emergency Response and the Department of Special Units form the Directorate of Nursing.

Department of Special Mobile Units: this department draws up the action plans of the special mobile units and ensures their proper functioning. It also develops the work program for the staff concerned, draws up action plans and programs for dealing with mass accidents or disasters, ensures that staff are prepared for immediate mobilization and ensures the supply and ongoing maintenance of the medical, sanitary and other equipment required to deal with major emergencies.

The following divisions constitute the Directorate of Administrative and Financial Services, each with its own set of tasks [6]:

The Personnel Administration Division manages all matters relating to the status of personnel and collects, organizes and processes information on staffing numbers and changes. The training departments conduct research and keep records of staff training needs, organize specialized training seminars and libraries and promote cooperation with relevant public services on training-related issues [6].

The Department of Financial Administration and Procurement is responsible for the preparation of the budget, expenditure, the settlement of salaries and other compensation of employees, the maintenance of accounting records and the collection of revenues, the preparation of the balance sheet and the processing of the procurement of transport equipment, communication equipment, machinery and other supplies required for the operation of the EKAB. It also takes care of the accommodation of the services of the EKAB, the maintenance and use of all its assets [7].

The Secretariat Department manages correspondence, prepares and copies documents and forms, keeps the protocol, takes care of the cleanliness of the premises of the service, certifies copies, attests the authenticity of staff signatures, compiles statistics on the activity of the EKAB and takes care of monitoring the regular and overtime working hours of the staff. He/she shall also be responsible for drawing up the daily report on staff attendance.

Office of the President: The office of the Chair of the Board of Directors is responsible for taking minutes, managing the Chair's communications and generally providing administrative support to the Chair and the Board of Directors.

Legal Services Office: It goes without saying that this office oversees all matters relating to legal assistance [7].

### **3. EKAB'S duty**

The Greek Ambulance Service has been providing pre-hospital emergency medical care since its establishment. Use the three-digit national telephone number 166 to arrange the evacuation of a patient. Each call is evaluated by qualified employees who follow a methodology to determine needs and dispatch options. In 90% of the cases, a simple ambulance crew is all that is needed; the remaining 10% request the assistance of a mobile medical unit [8].

According to Karoutsos, Lamproousis and Konstantinidis (2007), the ambulance system and the entire operation of the EKAB depends on the following factors:

- There are several lines in the 166-call center.
- 166 call center with several telephone lines and numbers
- All ambulances in Athens have a wireless digital tracking and navigation system
- the wired communication network of the emergency rooms of the hospitals.
- the computers for processing and recording information.
- modern methods of transmitting medical data, such as the telemedicine technology of the air ambulance department [8].

## 4. EKAB's operation globally

### 4.1 EUROPE

The organization and structure of ambulance services at national, local and regional level is comparable at European level. For example, the ambulance service has been established at local level in Croatia and Lithuania. Services are organized at local and regional level in Germany, the Czech Republic and Belgium. In Turkey there are both national and local organizations. Apart from Dublin, ambulance services in Ireland are regulated at the federal level. While the public and commercial sectors cooperate in many nations, ambulance services are entirely public in Croatia, the Czech Republic, Latvia, the Czech Republic and the United Kingdom. Ambulances are available worldwide for both emergency and non-emergency transport. The table below presents aggregated information from 2010 on budget, emergency telephone numbers, calls and ambulances, as well as the number of people working in ambulance services in a few different EU countries [9].

Χώρα	Προϋπολογισμέ	Τηλεφωνικός Αριθμός αριθμός έκτακτι κλήσεων ανάγκης	Αριθμός ασθενοφόρων	Αριθμός απασχολούμενου προσωπικού	
Αυστρία	400 εκ. ευρώ	144 & 112	-	2.500	59.000
Βουλγαρία	74.962.610 λέβα	112 & 100	866.678	1.020	7.113
Εσθονία	27 εκ. ευρώ	112	250.000	90	1.336
Φιλανδία	85 εκ. ευρώ	112	900.000	800	2.000
Λιθουανία	33 εκ. ευρώ	112	-	256	2.350
Πολωνία	200 εκ. ευρώ	112 & 999	-	1.400	-
Ην. Βασίλειο	89.568 εκ. λίρες	999	7.000.000	1.721	-

Table 1: Ambulances in the European Union 2010. Source.

As it turns out, Austria spent the most on ambulance services based on the data made available. According to the information in the table, this is apparently supported by the fact that this is a nation with a significant number of ambulances and people working in them. More detailed details on ambulance services in different nations around the world are provided below [10].

## 4.2 BRITAIN

NHS Trusts are associations of public hospitals in the United Kingdom. The first NHS Trust was established in 1991. These associations are a group of hospitals in a region whose managements independently decide how to allocate their funds within the parameters set by the Department of Health and Human Resources Management at the beginning of the year [8]. In the UK, there are two main sectors that make up healthcare delivery: the sector that deals with strategy, policies and administration and the sector that deals with healthcare itself, which is broken down into primary, secondary and tertiary care [11].

Unless there is an exception allowed by a resolution of Parliament, the National Health Service in Great Britain offers its services free of charge.

The initial offerings of the system, which focused on the diagnosis and treatment of disease, are now essential both for the prevention of disease and for enhancing the physical and mental well-being of the population. The NHS consists of numerous organizations specializing in various patient care services. Over 1 million patients are managed by all services in a 36-hour period. The organizations in the UK healthcare system each have their own ambulances to deal with emergencies and transport patients [10].

In Great Britain, these services were valued at £2.2 billion in 2015-2016, of which £1.7 billion was allocated to emergencies. In that period the emergency call center received 9.4 million emergency calls and 1.3 million patient transfers were made. Red calls and green calls are categories used by the UK's emergency call center to track the issues for which it receives telephone calls. Red calls are made when a patient's life is considered to be in danger. In fact, red calls 1, which are for patients who have had a heart attack, are not breathing or have no pulse, and other similar conditions such as airway obstruction, are considered the most serious. On the other hand, 2 red calls are characterized by comparatively minor illnesses, such as heart attack or stroke. In both of the aforementioned situations, in 75% of cases, ambulances arrive at the patient 8 minutes after the call. Green calls are made in cases where the patient's health is not considered to be at risk. Depending on the severity of the incident, these calls are divided into different categories [11].

### **4.3 NETHERLANDS**

Ambulance-based medical services in the Netherlands are divided into 25 regions. The obligation to provide ambulance services within its region is the responsibility of each regional ambulance service. It is possible for this service to be entirely public or to combine public and private initiatives. 725 ambulances are on duty 7 days a week, 24 hours a day in the Netherlands. Over 1 million calls are received by call centers every year, which trigger the dispatch of an ambulance. In addition, in the Netherlands, calls are divided according to how serious the incident was. Since category A1 calls are considered most dangerous and threatening to the patient, the ambulance is obliged to reach the patient within 15 minutes of receiving the call. A2 cases are those in which the patient is not in danger of losing consciousness and the ambulance must be there in less than 30 minutes. In addition, there are cases where patients need to be transported on a scheduled basis, such as when cancer patients go to radiotherapy facilities, and there are cases where patients need to be transported from regular hospitals to special healthcare facilities. In the Netherlands, 5,040 people work for the ambulance service, of which 4,430 are either licensed nurses and drivers or employees of ambulance dispatch centers [11].

### **4.4 SWEDEN**

In Sweden, all aspects of healthcare are organized, managed, financed and legitimized by a single organization. Ownership of infrastructure, program funding, auditing and recruitment of doctors are all included in this. Three major changes in the organizational structure of health care delivery involving care for the elderly, the disabled and the mentally ill occurred between 1992 and 1995. Municipal hospitals now take on patients with serious medical needs that were previously taken on by district hospitals. Different political and administrative levels, including central government, county councils and local authorities or municipalities, organize and supervise the Swedish health care system. Directly elected local political officials from 290 municipalities, 18 county councils and 2 regions oversee healthcare [12]. In Sweden, the financing and provision of healthcare is considered a public responsibility. 23 regional councils and 3 large municipal councils oversee the management of healthcare issues within their respective regional boundaries. All levels of service delivery are organized and regional councils are democratically elected authorities [12].

The National Health and Welfare Council and the Ministry of Health and Social Affairs are the only government agencies that provide advisory services. The main responsibilities of the Council include monitoring the regional councils, conducting surveys and evaluating progress related to social welfare and health [13].

It also serves as a national hub of health-related expertise. City councils are responsible for organizing ambulance services, either on their own or in partnership with for-profit providers. There are about 700 ambulances in Sweden, 71 of which are located in the capital Stockholm. One ambulance is staffed by a doctor during the day. There are 2.2 million people living in the capital and the ambulance service makes 187,000 trips per year [14].

#### **4.5 TURKEY**

Turkey has a population of more than 71 million people and spends more than 340 million euros on ambulance services annually. This amount covers the cost of personnel, maintenance and medical equipment. The public can call 112. This number is used to dispatch ambulances. For example, while in 2008 there were 1 208 ambulance stations and 1 829 ambulances in Turkey, in 2009 there were 1 314 stations, 2 129 ambulances and 30 motorcycles to serve and transport patients. 90% of the time, the ambulance responds to a call in less than 30 minutes and each station is responsible for 50,000 residents [15].

#### **4.6 AUSTRALIA**

According to Eburn & Bendall (2010), both pre-hospital emergency care and transport of the sick and injured are included in ambulance services in Australia. In this situation, these services are required by law to:

- Respond quickly to the call for assistance.
- Provide specialist services to those in need in order to preserve life and minimize injuries in emergency situations.
- providing appropriate transportation of injured persons to locations where specialized medical services are offered [15].



## **5. Misuse of EMS by patients**

### **5.1 Overcrowding & responsibilities**

In the industrialized world, the number of calls to emergency medical communication centers (EMCCs) and visits to emergency rooms (EDs) is gradually rising. On the other hand, a sizable portion of patients seen by ambulance services have non-urgent medical needs. Although EMCCs<sup>2</sup> classify about 50% of ambulance missions as non-urgent, a review of the first patient assessments made by ambulance clinicians (ACs) has revealed that these clinicians believe that over two-thirds of all patients assessed need to be transported to an ED [16].

An ED served as the standard end destination for patients treated by Swedish ambulance services up to the first decade of the twenty-first century. Alternative care paths, such as "see and convey elsewhere" (transporting patients to primary healthcare facilities or minor injury care facilities) and "non-conveyance" (see and treat, see and refer), have been adopted in the past ten years, in part as a response of ED overcrowding. This has put new and difficult demands on ACs and, consequently, ambulance services. The need for in-depth understanding of the judgments that result in non-conveyance decisions is being highlighted by accumulating research [16].

ED overcrowding is a sign that a hospital is operating at or above capacity, which limits its capacity to handle ED activity. Hospital-wide flow disruptions are far more severe than the inherent ED problems. Early 2000s research explicitly identified ED boarding of inpatients as a major cause of congestion and shown a correlation between ED crowding and bottlenecks in hospital flow [17].

In the emergency department, crowding leads to operational inefficiencies and has particularly alarming effects on severely ill patients, whose compliance with sepsis bundles has been negatively impacted. It has been linked to increase in-hospital mortality, inadequate analgesic management in patients with acute pain, and delays (or failures) in the administration of antibiotics for community-acquired pneumonia. Mortality seems to be correlated with the length of ED boarding. ED boarding lengthens patients' stays (LOS), which decreases staff and patient satisfaction. Low satisfaction scores for ED care are caused by boarding in ED hallways, and they are a strong indicator of low satisfaction for the entire hospital stay [17].

Additionally, overcrowding restricts access to emergency services, increasing the likelihood that people may leave without being seen (LWBS), as well as the frequency of ambulance divert incidents. When money from potential patients is lost due to a shortage of space or an inadequate bed turnover rate, there are significant opportunity costs [18].

A focus was placed on "avoidable" ED visits, which were visits that were later determined to be unnecessary or visits for diseases that could, theoretically, be treated at the primary care/ambulatory care level. The initial causes of crowding included fewer ED beds and increased ED traffic. Prospectively, it would be challenging to distinguish between patients with an emergency medical condition and those presenting with acute chest discomfort who have "avoidable" conditions (such as acid reflux or gastritis) (e.g., acute coronary syndrome or cholecystitis). There have been numerous, but fruitless, attempts over the past 20 years to "keep patients out of the ED" through increasing access to general care. The ED still provides a unique opportunity for fast, on-demand access to a thorough evaluation that includes laboratory tests and imaging that would otherwise be fragmented within the ambulatory care paradigm; therefore, these efforts have only yielded moderate advances. It is a patient-flow issue that requires a hospital-wide solution; the ED is not the primary source of ED crowding [19].

While inaccurate assessments can have a negative impact on patients' health and even result in death, they can also help patients get the care they need in a timely manner and keep them out of the emergency department. Making decisions that meet patients' demands for appropriate care is a difficult process that should be taken into account the needs and views of patients, families, ACs, and the larger healthcare system. Additionally, ACs might employ triage tools and medical criteria when doing assessments. However, valid non-conveyance guidelines are not widely available or used by EMS services around the world. ACs may struggle and become frustrated while conducting non-conveyance assessments due to varying expectations, competing viewpoints, and demands [20].

A considerable degree of responsibility may likewise be placed on ACs in such circumstances. Non-conveyance is a complicated condition that patients may find to be of existential importance. The lived experiences of ACs with relation to non-conveyance assessments and associated decisions, however, are still not well understood [20].

It is stressed how crucial it is for the ACs, patients, and their families to agree on non-conveyance decisions. Patients are seen as being helpless and reliant on ACs. Avoiding rash assessment judgements is regarded as essential for resolving this imbalance. The ACs also emphasize the significance of keeping assessments' consequences in mind while you discuss and think about your choices. Furthermore, from a consensus and power viewpoint, it is also highlighted as critical to strive to foster a compassionate discussion that takes into account patients' and their family members' expectations. Finding common ground with the patient when trying to start a caring conversation involves emotional traits including resolve, patience, and composure [21].

When team members dispute on assessments and non-conveyance decisions, the power imbalance in the ambulance team that exists over the formal competencies and responsibilities of the team members can become apparent. This disparity affects decision-making, and thus, patient safety.

Ambulance clinicians (ACs) can conduct on-site evaluations of patients' needs for hospital transportation to reduce the overcrowding in emergency rooms. Patients with non-urgent medical requirements make up a sizable portion of the population. The classification of non-urgent in ambulance trips is around 50% [21].

For ACs to undertake safe non-conveyance assessments, it's critical to get a complete picture of the patients' circumstances. The patient's past, present, and future should be covered in this. Nevertheless, completing the picture is referred to as a "utopia" because at least one component is constantly absent. Building trust between ACs, patients, and their families is a requirement for getting the most complete picture possible. However, no matter how much trust is established, there will always be a component missing from the difficult, intricate puzzle of non-conveyance assessment. The ACs point out that it's crucial to carefully listen to the patient to get a complete picture. Patients may experience validation and a sense of care through this.

Inability to schedule follow-up appointments through primary care facilities or home care is cited as problematic and can create dangerous situations. The absence of access to patients' prior medical records is listed as one of the aggravating factors along with this. Furthermore, even when coworkers are physically present, test-takers still report feeling lonely. The ACs deal with this issue to some part by getting other viewpoints from people like primary care units, home care units, coworkers, and EMCC doctors (however, the latter can reinforce this loneliness through showing disinterest during telephone consultations). However, when a positive discourse is developed, one's vulnerability and loneliness might be diminished [21].

The primary cause of the responsibility paradox is the lack of necessary organizational support for the greater accountability that results from non-conveyance evaluations. This makes it more difficult for ACs to handle non-conveyance circumstances and causes dissatisfaction. Our study provides fresh perspectives on the increasing responsibility-related risks that ACs encounter because of non-conveyance assessments. These assessments must be carried out with more responsibility than transport since the patient risk is larger.

The fact that the ACs believed there were organizational requirements for the conduct of these assessments further complicates the situation. Alternative care delivery methods, such non-conveyance, are supported by Sweden's health policy as ways to provide care closer to patients' homes; however, ACs reported that the organizational support was insufficient. In contrast to, say, Great Britain, Swedish health policy does not prioritize national standardization of ambulance service practices.

This may account for the disparity between the perceived societal and organizational expectations on non-conveyance and the actual absence of organizational support. The least risky alternative is typically to transport patients to the ED, which entails risk awareness and management [21].

A perceived lack of specific education addressing non-conveyance assessments and judgments is at the heart of the education dilemma. Our findings demonstrate the necessity for educational initiatives that are in line with the change in ambulance treatment. More and more ambulance missions are being labeled as non-urgent. Regarding non-conveyance, it is believed that the current educational emphasis during specialty nursing training is outdated and only adequately prepares ACs for one specific aspect of their impending clinical reality: caring for critically ill patients. Similar outcomes, though not explicitly from a non-conveyance situation, have been reported in the past.

The limited opportunity ACs must learn from previously completed non-conveyance evaluations is a crucial component of the feedback dilemma. This is an interesting discovery because it suggests a certain level of vulnerability among ACs in non-conveyance situations. It is accompanied by a sense of loneliness that has not been previously documented in the literature. ACs can acquire a clearer overview and satisfy certain assessment-based knowledge needs by incorporating other viewpoints in their assessments [21].

## 5.2 Chest pain

A whopping 700,000 visits per year, or 6% of all ED visits in England and Wales, are for patients with chest pain, and this number is steadily rising. In spite of the fact that 80% of patients with chest discomfort were hospitalized, a 2011 study revealed that less than 25% of them ultimately had their myocardial infarction diagnosed (MI). Historically, a 12-lead electrocardiogram has been performed after the initial history and physical examination to risk-stratify individuals with chest discomfort (ECG). Myocardial infarction with ST-elevation (STEMI) patients were referred for urgent percutaneous revascularization. In order to, further stratify into a cohort with non-ST elevation MI (NSTEMI) versus unstable angina (UA), which is collectively known as acute coronary syndrome (ACS), those who did not have apparent ST-elevation underwent troponin testing at presentation and again after 12 hours [22].

Usually, the medical or cardiology team admitted these patients from the ED to facilitate the 12-hour Troponin sample as well as for further risk classification. As we now know, the classic Troponin T and I assays were not very sensitive (approximately 70-80%), with the potential for early erroneously encouraging results, yet being moderately specific for MI. This highlighted the importance of admission and repeat sampling to find any possible biomarker late rises. Even though the serum troponin level was normal, we classified patients with other risk indicators, such as an elevated GRACE or TIMI score, as high-risk patients who could need prompt intervention [22].

Even in the absence of an elevated troponin level, individuals with high-risk characteristics as determined by GRACE or TIMI (such as persistent pain, biochemical abnormalities, or surrogate signs of ischemia or heart failure) comprised a group with a poor prognosis. With the introduction of high-sensitivity troponin tests, further advancements in biomarker technology have changed the scene [22].

With the use of proper cut-off values, timing, and with a few minor differences between assays, the high-sensitivity assay can diagnose MI with a sensitivity of almost 100%. Patients in this cohort who may have previously been identified as high-risk UA are likely to exhibit an elevated level of high-sensitivity troponin, leading to an accurate MI diagnosis and course of treatment [22].

The high-risk, poor-prognosis patients who were previously classified as UA likely only served as a reflection of the shortcomings in our earlier generation of troponin testing as we now know that those with a normal high-sensitivity troponin do quite well. Therefore, it can be argued that the diagnostic of UA is not very useful for risk stratifying today's patients [22].

There has been a great deal of interest in creating a single test that is readily available acutely to safely discharge patients in such settings due to the substantial burden that chest discomfort places on emergency care facilities in the UK and internationally. The use of a single negative high-sensitivity troponin value as a strategy to safely release patients with a suspected ACS directly from the ED was tested in two recent landmark trials. Both researchers discovered that a single negative troponin value at presentation is associated with an extremely high negative predictive value of >99.6% for MI when using a low cut-off value for the assays, and that with a normal value, a patient who is discharged is likely to have a fantastic outcome for up to a year. One- to two-thirds of all chest pain presentations can be successfully discharged from the ED with this method. According to a recent validation study, the troponin value must be interpreted in the context of the patient's clinical history, and an irregular ECG, unstable symptoms, or other indicators must also be taken into account [22].

Due in part to recent reductions in social care funding, the National Health Service (NHS) in England and Wales is under unprecedented pressure to locate hospital beds. Over the past year, there has been a noticeable 15% increase in the number of patients who are ready for medical release but are still sleeping in a hospital bed. These so-called "delayed transfers of care" are a major factor in hospitals having high bed occupancies. For those who work directly in emergency and acute medical settings, the news that we may soon be able to discharge up to two-thirds of all chest pain patients from the ED after a history, physical, and single blood test is a remarkable development. Reduced admissions to medical and cardiology bed bases should result from this, which would have major downstream benefits [22].

The ED 4-hour target (4 hours from patient presentation to discharge or transfer) is a crucial criterion by which NHS Trusts are monitored and, accordingly, rewarded or penalized. Nevertheless, EDs are subject to severe performance monitoring. As a result, this culture filters all the way down to the clinical level, where quick decisions are highly valued. Studies on this target revealed that while initially it did speed up the flow of patients through the emergency room, there were reports of inappropriate patient transfers, even threats to patient safety, and a bullying culture when these targets were implemented. The majority of patients were admitted still in the 30 to 60 minutes prior to breaching.

With rising pressure came less time for patient-doctor engagement in the ED and a diminished sense of patient ownership, even while there were unquestionably improvements to the patient experience and shorter ED wait times as a result of this aim. Medical admission has been viewed by some as the "way of least resistance" because to the heavy pressure to fulfill these targets because there is less chance of the patient breaching than if they are fully worked up and discharged directly from the ED [22].

In the past, individuals who complained of chest pain frequently belonged to a relatively simple patient cohort for whom automatic admission would be warranted in the event that an ACS was detected. High-sensitivity troponin's introduction now makes it possible to risk-stratify, make decisions, and discharge these patients from the ED rather than farther down under medical or cardiology teams. With large recent increases in the total number of ED attendances as well as 4-hour target violations, EDs in England and Wales are under unprecedented pressure, despite a potential for better patient care and fewer unnecessary hospitalization. Emergency physicians may believe they lack the time or the training to make such decisions due to staffing shortages and a surge in temporary or locum personnel. They may also be concerned about making mistakes or prolonging the patient's stay in the ED [22].

With just one presentation blood test, low-risk chest pain patients may now be evaluated quickly and discharged from the ED thanks to recent developments in high-sensitivity troponin testing. We must make sure that our emergency physician colleagues have enough resources to put such innovations into practice to take advantage of them. The use of this new strategy will be encouraged by the presence of chest pain nurses in the ED and other training offered by cardiology departments, with advantages for patients and professionals alike likely [22].

### **5.3 Misuse globally**

The improper use of emergency medical services (EMS) transport is still a problem that is getting worse in the US. Due to the fact, that socialized healthcare does little to successfully deter unnecessary ambulance use, it is also a big problem globally. Patients who are able to get themselves to the hospital but do not have an actual emergency frequently dial 9-1-1 instead [23].

Therefore, ineffective EMS transport is a costly issue for society. Numerous patients often and without consequence use EMS transport for non-emergencies. There isn't much of an option but to send these patients to the ED due to limits on EMS providers' capacity to triage patients on the scene. Patients who have severe medical conditions or major traumatic injuries may need to be sent right away to the ED by qualified EMS personnel. Patients who use EMS for non-urgent medical illnesses are abusing the system, as are those who have other ways to go to the ED but choose not to use them. There are fewer ambulance units available to react to actual emergencies in these conditions. The EMS provider runs the danger of being charged with malpractice if they refuse to transfer non-emergent and perhaps emergent patients to the ED. If their urgent conditions are not identified, it can also put certain people at danger for medical problems. Online medical control and protocol-driven triage criteria for trauma and medical problems have been developed to address this issue and limit the likelihood of potential misuse and mistriage. These guidelines, which have been put to the test in several investigations, stratify patients according to physiologic, mechanistic, and anatomical factors to determine the level of transport required. There is no established set of triage standards. To our knowledge, no study has contrasted patients' and EMS personnel's individual perceptions of the degree to which their medical issues are emergencies. To ascertain and compare the viewpoints of the EMS provider and the patient regarding the appropriateness of ambulance transfer, we prospectively analyzed each EMS transport presenting to the ED during a one-month period.

According to Shull, misuse of 911 can include people who utilize EMS as a ride, people who have mental health problems when they call, or people who frequently call because they're lonely. According to Easton police Capt. David Beitler, misuse of the 911 system is uncommon, but there are currently two incidents in the city where persons are accused of continually dialing 911 for crises that weren't actual emergencies. Not for one or two calls, but for approximately 10 calls spread out over a few days or over 50 calls spread out over a few months [23].

Operationally, the improper utilization of ambulances in cities like London and elsewhere is undoubtedly one of the largest issues. Each year, the London Ambulance Service receives about 500 000 emergency calls. In the Greater London area, one in every 24 people will need to contact an ambulance each year. The issue of unnecessary ambulance use in the UK has been discussed in three earlier studies. Between 38.0% to 51.7% of emergency calls, according to Gardner, Morris, and Cross, are not medically necessary. In Gardner's paper, a single doctor, typically one of lower rank, evaluated the call's appropriateness. Morris and Cross focused primarily on the examination of patient outcomes by medical specialty [23].



Recently, Mann and Guly concluded that although "999" calls in the UK have been rising annually, there hasn't been any increase in the seeming misuse of this service because this rise has been matched by a comparable rise in admissions.

The most trustworthy data to date was obtained for this study employing a prospective three-level assessment of ambulance misuse. The patient has been questioned regarding their need for an ambulance for the first time. Nearly 54% of calls were suitable, which is comparable to previous writers' findings. The inappropriate rate is significantly lower, presumably due to the three independent levels of evaluation being a more accurate way of review. Patients' reasons for dialing 911 point to a lack of knowledge regarding the seriousness of their symptoms and illnesses, as well as a disregard for the repercussions of abusing a public service [23].

Although there are many different theories on why ambulances are misused, the most evident ones involving Medicaid patients are said to be:

- Transportation access that is constrained
- Limited access to healthcare (a consequence of no access to transportation)
- Limited understanding of ambulance services

Over 50% of the population in some suburban and rural areas do not have access to public transportation, according to research. Regular doctor visits are very hard for low-income individuals without access to private transportation, which leads to the usage of emergency services when medical attention is required. However, it is simple to put the improper usage of these services completely on the patients. In order for this misuse to happen, a dispatcher must evaluate the patients' condition before determining whether or not to send an ambulance. The ambulance staff must do additional examinations of the patient before determining whether or not to transport them to the emergency room [23].

Medicaid beneficiaries' inappropriate usage of ambulance services is a long-standing issue. Numerous studies have been conducted on this subject, and numerous initiatives are now underway to try to mitigate the detrimental effects that ambulance usage has on emergency services departments across the United States. The Non-Emergency Medical Transport program (NEMT), which is managed by Medicaid, is one of these initiatives that has had the most success. In essence, this approach entails giving patients who have no other options for transportation other non-emergency medical forms. This service is being used annually by over 400,000 people. However, there are several problems with the program, such as the difficulty in providing transportation after hours and the strong demand for transportation.

Additionally, because transportation must be scheduled in advance, it is impossible to get to the doctor on the spur of the moment for an illness that just came on. Within the numerous types of medical transportation services, each concern relating to the dispatcher and ambulance misjudging the seriousness of the patient would need to be handled separately. But ambulance services must begin investigating and taking this issue more seriously as emergency transport resources become more and more scarce [23].

## **Research Part**

### **Introduction**

The following Research is a prospective study that took place in the Emergency Department of 'Achillopoulio' General Hospital of Volos. This study was about the patients who came by ambulance to the Cardiological and Pathological (General Medicine) department. The service of EMS was used by those patients because of the severity of the symptom they were feeling. And led them to choose the ambulance as their way of transportation to the emergency department. To gather the data of which patients used the ambulance it was necessary to inspect the list from the triage and keep every patient completely anonymous.

The aim of this study is to record and analyze the cases of patients which come to the Emergency Department (Pathological and Cardiological department) by ambulance and if the doctors who examined them believe they made an unjustified call to the ambulance service. This, will be decided after reviewing their symptoms and diagnosis and completing all the examinations needed. This study will show the percentage of the calls which were justified and which unjustified. And there were some questions which were born in our minds like how i. could those people who made an unjustified call avoid using the ambulance and come by car or self-medicate at home? ii. was that case in need of emergency treatment and had symptoms that indicate a bad clinical condition? iii. how many cases that made a justified & unjustified call (number and percentage) admitted on the ward or refused the admission or the condition improved and return home? iv. Do the unjustified ambulance calls possibly mean that someone use the ambulance because it is convenient? v. did the patients that made a justified call had a bigger percentage of admission versus the ones that made an unjustified call?

And, what can we do to help people make a possibly wiser choice for the system and for their own satisfaction because they will receive the type of care they deserve.

## **Participants**

Within 3 months, from April 1st until June 31st from 09:00 to 18:00 we performed a prospective study including 150 patients who were presented to the ED by ambulance. The patients attended either the department of internal medicine or the department of cardiology.

Patients' written and electronic medical records were reviewed. Data on demographics, principal symptoms, vital signs (BP<90/45mmHg, SpO2 < 90%, Temp> 38.5°C), electrocardiogram, chest X-ray, CT scans, diagnosis, justified or unjustified call to EMS, hospitalization or hospital discharge and hospital discharge transportation were recorded.

The initial screening was performed at the triage area. Afterwards, we asked the ED physicians about whether they believed the use of an ambulance was completely necessary. Before we document their reply, we had to check if the patient met the inclusion criteria. The first, was if the patient was over 18 years old. Second, if the ambulance brought him from home after a call made by him/her or a relative. In order for the patient to be excluded, he must not have come to the ED by ambulance, or not being transferred from other medical facilities. If the patient attended other sections of the ED (Surgical, Ortho, Urology, Pediatric), or he/she was positive with COVID-19, or had a terminal illness / bed bound he/she would be excluded as well.

## **Statistical Analysis**

In order to do the statistical analysis, qualitative variables were expressed as absolute and relative frequencies (N, %). A Pearson Chi-square test was performed to assess possible differences that may exist in two categorical variables. All statistical analyses were performed by IBM SPSS Statistics version 25.0. The aforementioned statistical test was performed at a 0.05 significance level.

## Ethics approval

This study was approved by the Scientific Committee of the General Hospital of Volos with Ref. No.: 5890/30-03-2022. It was not required to obtain informed consent from the patients because their details remained completely anonymous.

## Results

A total of 150 patients participated in the study. Most of the participants were female (56.7%, N=85). Of all the patients who participated 29.3% (N=44) were 80-87 years, followed by those who were 88-99 years old (24.0%, N=36). Between the pathological (general medicine) and the cardiological emergency department, the pathological (general medicine) was the one that most patients attended (87.3%, N=131). A high percentage of the patients had normal blood pressure (98.0%, N=147), oxygen saturation greater than 90% and temperature below 38.5°C (85.3%, N=128).

The patients who presented with normal ECG were almost 85% of the total (84.7%, N=127). All the patients had a chest x-ray, and of those the highest percentage had a normal chest x-ray and no CT was required (71.3%, N=107). From those patients, some had a normal chest x-ray and a CT which was also required that was normal as well (10.0%, N=15). The socio-demographic and clinical characteristics of the people mentioned above are shown in [Table 1](#). Of the 150 cases which came to our Emergency Department (ED) by ambulance, a percentage of 75.3% (N=113) had made a justified call (according to the doctors) and a few of those who came (60.7%, N=91) needed to be admitted to the hospital. Also, every information about the above percentages is shown in [Table 1](#).

**Table 1.** Socio-demographic and clinical characteristic

	N	%
<b>Sex</b>		
Female	85	56.7
Male	65	43.3
<b>Age</b>		
>30	2	1.3

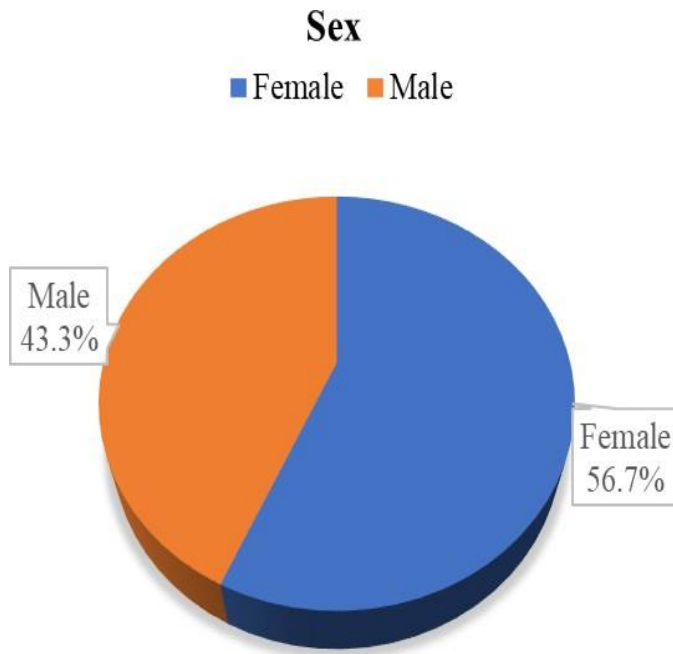
30-39	2	1.3
40-49	8	5.3
50-65	25	16.7
66-70	7	4.7
71-79	26	17.3
80-87	44	29.3
88-99	36	24.0
<b>ED Section</b>		
Department of General Medicine (Patholo gical)	131	87.3
Department of Cardiology	19	12.7
<b>Blood pressure &lt; 90/45mmHg</b>		
No	147	98.0
Yes	3	2.0
<b>Oxygen level &lt;90%/ Temperature &gt;38.5°C</b>		
None	128	85.3
Only temperature > 38.5 °C	10	6.7
Only oxygen level < 90%	11	7.3
Yes, both	1	0.7
<b>ECG</b>		
Normal	127	84.7
Possible myocardial infarction	6	4.0

Possible acute myocardial infarction	2	1.3
Atrioventricular abnormality or aortic abnormality	3	2.0
Atrial fibrillation monitoring	2	1.3
Sinus node	1	0.7
Bradycardia	1	0.7
Atrial Fibrillation	8	5.3
<b>Chest x-ray &amp; CT-scan</b>		
Normal chest x-ray & No CT-scan	107	71.3
Abnormal chest x-ray & No CT-scan	12	8.0
Normal chest x-ray & Abnormal CT-scan with stroke findings	14	9.3
Normal chest x-ray & Normal CT-scan	15	10.0
Abnormal chest x-ray & Abnormal CT-scan	1	0.7
Normal chest x-ray & Abnormal CT-scan	1	0.7
<b>Justified call to EMS</b>		

Yes	113	75.3
No	37	24.7
<b>Hospital admission</b>		
No	50	33.3
Clinic	91	60.7
Coronary care unit	6	4.0
Refusal of admission	3	2.0
<b>Transportation after hospital discharge</b>		
By patient's car	52	34.7
With emergency ambulance	1	0.7
No, hospital admission	97	64.7

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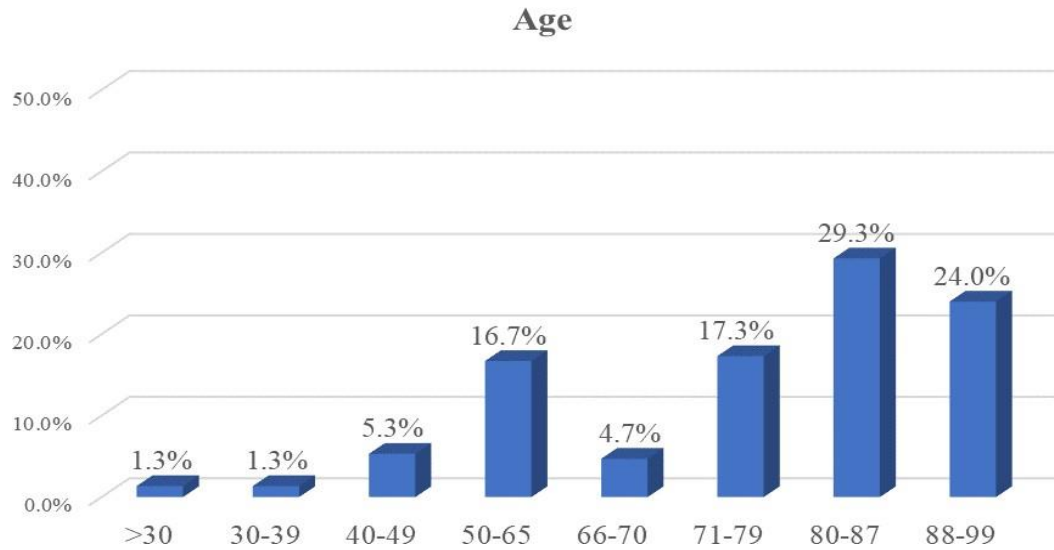
The patients that took part in this study were both females (56.7%, N=85) and males (43.3%, N=65). But females had a higher percentage in comparison to males. (Figure 1).



**Figure 1.** Patient's sex (females/ males)

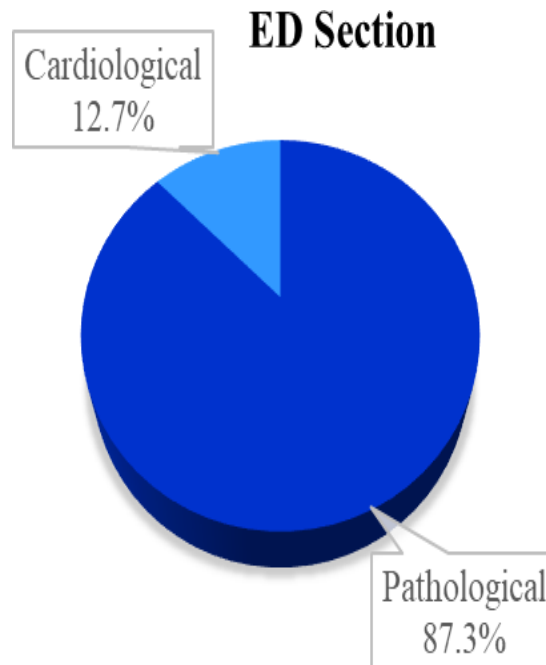
The next information that was gathered was about the age of the patients that took part. There were 8 age groups. Of all the patients, an important percentage of them were 80-87 years (29.3%, N=44), followed by those who were 88-99 years old (24.0%, N=36) & continue with less percentage in the other age groups (Figure 2).





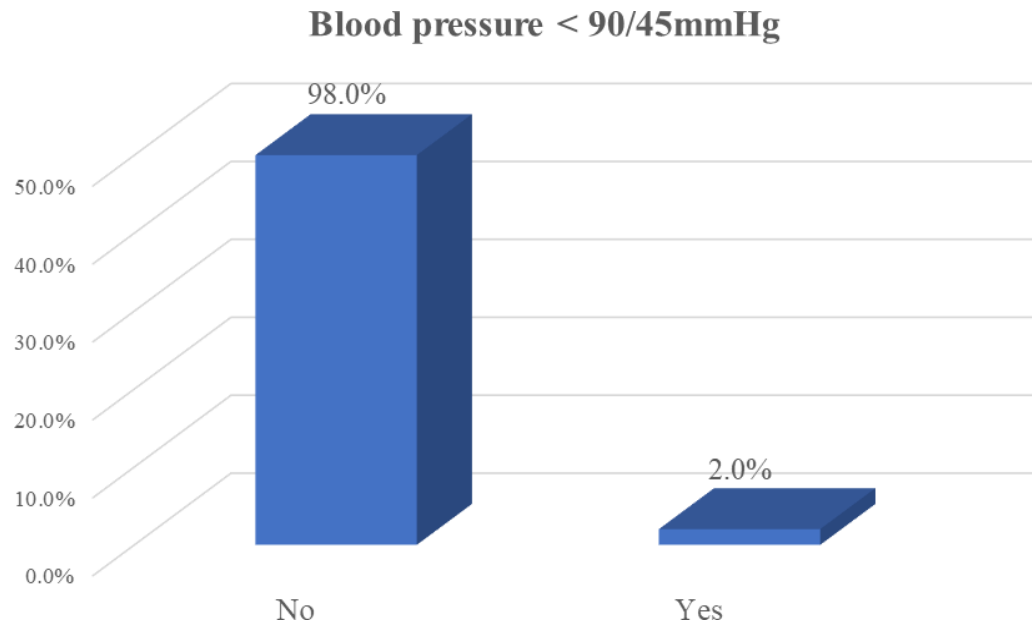
**Figure 2.** All the different age groups (all patients).

This study included only two departments of the Emergency. The two specialities that in most days have many patients that come to the ED with symptoms that are either pathological or cardiological. The department of Medicine (Pathology) had the highest percentage of the two (87.3%, N=131). And the other had only 12.7%. (Figure 3).

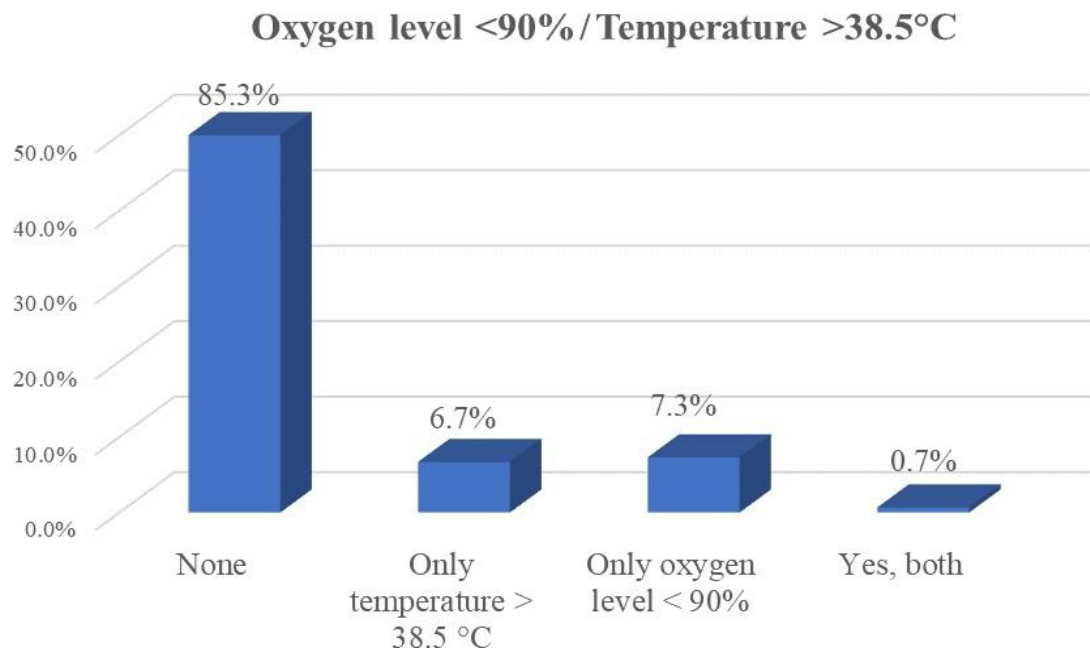


**Figure 3.** Show what percentage of patients attended which Department of the two that this study included.

After separating the two departments, we put all the patients together to examine what was happening with every patient's vital signs. Starting with the blood pressure to be higher than 90/45mmHg and what percentage was above and which below that measurement. (Figure 4). In addition, we kept a record of the oxygen saturation and the Temperature. Specifically, we recorded how many patients had Oxygen level < 90% & Temperature >38.5°C and made four categories. First, patients with oxygen higher than 90% and temperature less than 38.5°C, others with only the temperature higher than 38.5°C and oxygen higher than 90%, patients with oxygen saturation less than 90% but temperature lower than 38.5°C and last those who had oxygen saturation less than 90% but temperature higher than 38.5°C. (Figure 5).

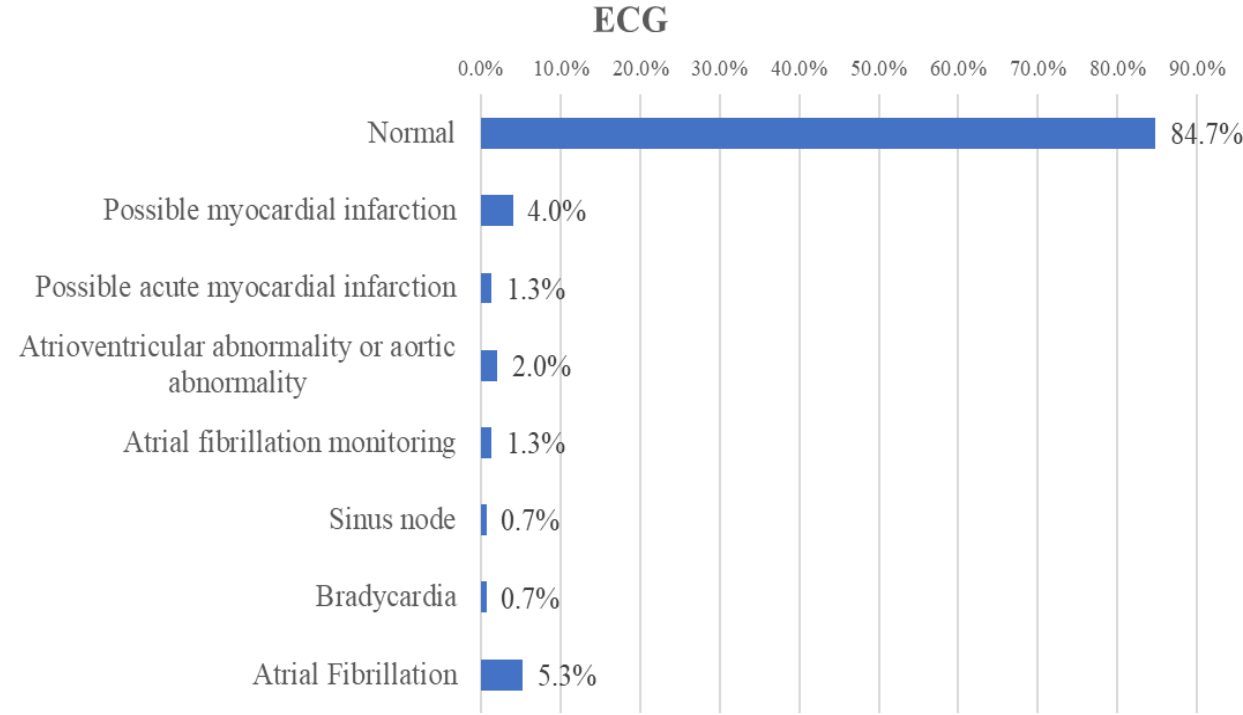


**Figure 4.** All the patients' Blood pressure if it was higher or lower than the criterion.

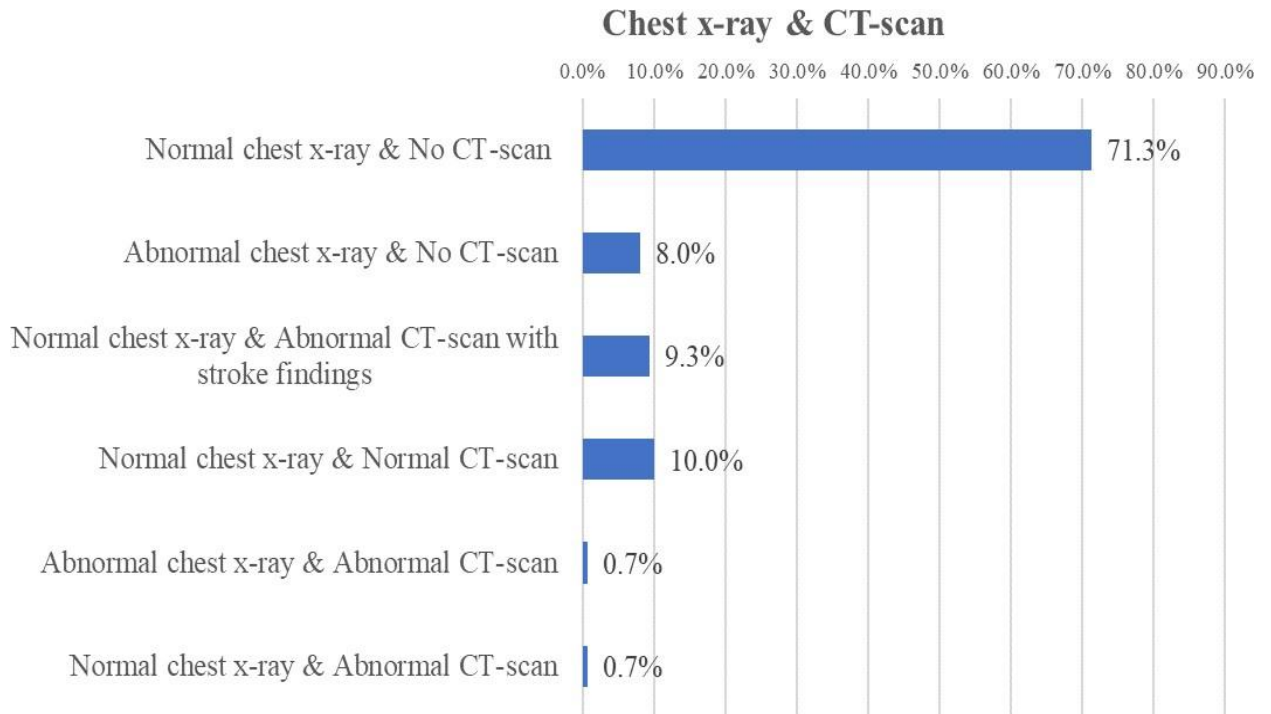


**Figure 5.** All patients' vital signs (oxygen saturation < 90% & Body temperature > 38.5°C).

The next criterion, which was recorded and analysed for every patient was the ECG. Besides the group of patients that had a normal ECG, there were also, another seven groups of patients' ECGS that had some type of abnormality. (Figure 6). In addition, we kept a record of the patients' chest x-ray. Every patient had an x-ray but which patients had a clear result and which might have findings. And we show those specific results. Along with the x-ray, some patients had a CT head. The CT was also taken into account and what type of results every patient had. (Figure 7).

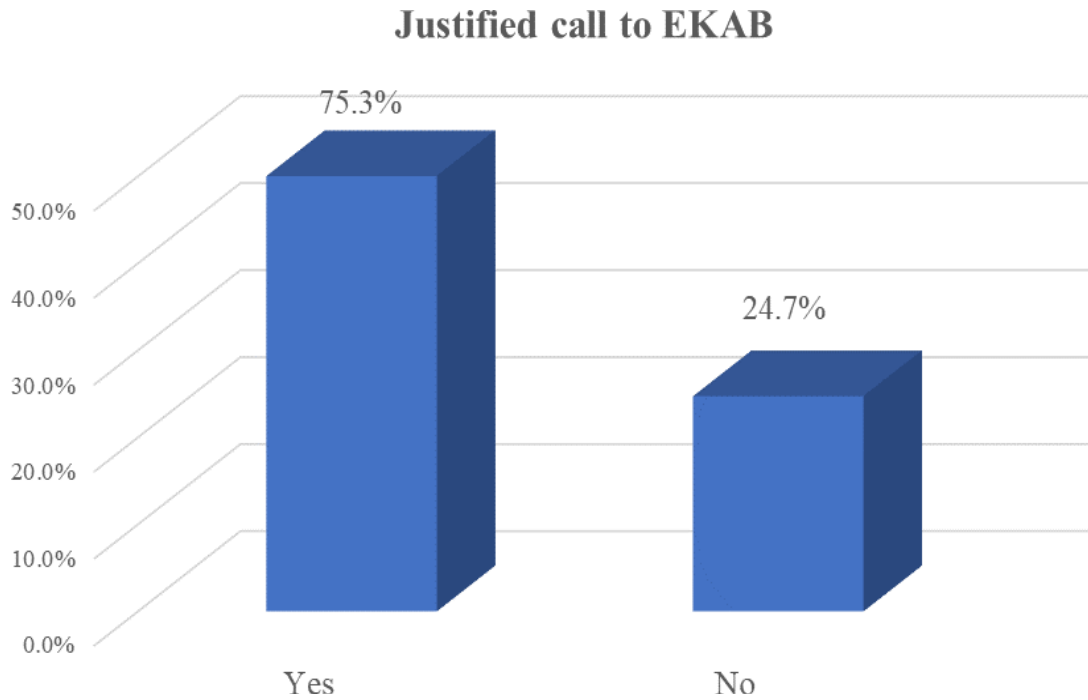


**Figure 6.** Showing the different types of patient's ECG (normal or abnormal)



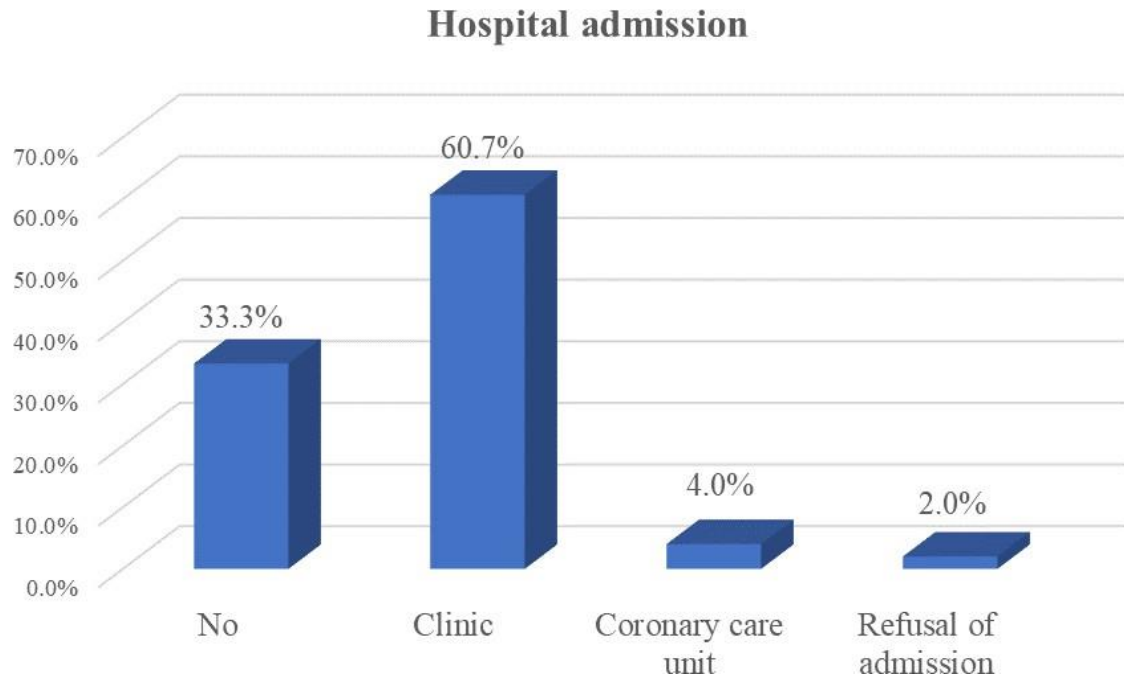
**Figure 7.** Patient's chest x-ray & CT-scan (head) shown in different categories. (All patients included).

Figure 8 shows the percentage of justified and unjustified calls to EKAB. The most important result. Showing how many cases misused the service.

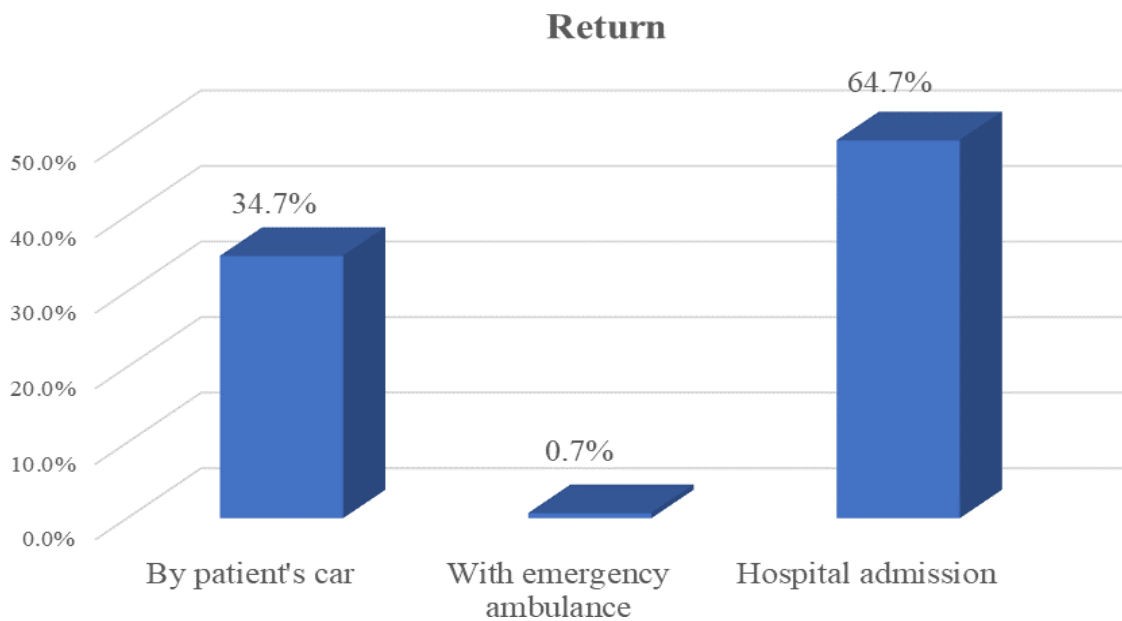


**Figure 8.** Showing all the calls to EKAB. Which of them considered to be (by ED doctors) “Justified call to EKAB” or not.

From all the cases 60.7% needed a clinical admission as it shows in Figure 9. In addition, 34.7% of the participants return home by their own car as it shown in Figure 10.



**Figure 9.** Patients' admission if yes and if not being admitted.



**Figure 10.** Patient's choice of the way of return home after discharge.

The most common symptom that led people to call the emergency medical services (EMS) was fainting (10.0%, N=15), followed by dyspnoea (9.3%, N=14), fever (8.0%, N=12), weakness (8.0%, N=12), aphasia/ sudden event of patient being unable to walk and talk (6%, N=9) and precordial pain (5.3%, N=8). The most common diagnosis that was anemia (8.0%, N=12), followed by respiratory and urinary infections (the patient has both infections) (6.7%, N=10), only urinary infection (5.3%, N=8), kidney cancer-metastasis (5.3%, N=8) and stroke (4.7%, N=7) (Table 2).

**Table 2.** Distribution of patient's symptom (that led to the call) and final diagnosis (after examining the patient).

	N	%
<b>Symptoms</b>		
Severe chest pain	4	2.7
Vomiting	6	4.0
Fainting	15	10.0
Aphasia/ sudden event of patient being unable to walk and talk	9	6.0
Syncope – Fainting	3	2.0
Dyspnoea	14	9.3
Trembling- Dizziness	6	4.0
Severe epigastric pain	4	2.7
Fever	12	8.0
Diarrhea	5	3.3
Shiver	1	0.7
Weakness	12	8.0



Decreased level of consciousness	6	4.0
Haemoptysis (cough a lot of blood)	2	1.3
hyperglycemia and no medical explanation why happened	2	1.3
Precordial pain	8	5.3
Dizziness / Fainting	6	4.0
Generalized Cancer	2	1.3
Patient report		
Dyspnoea (Saturation was 95% and higher)	8	5.3
Fatigue (feeling of being burn-out)	6	4.0
Melena (tarry stools)	2	1.3
Patient with no symptom has anemia (found by an outpatient doctor)/ came for more investigation	4	2.7

Headache	6	4.0
Swelling of both lower limbs	2	1.3
Severe pain (because of gynaecolog ical reason)	2	1.3
Obtundatio n	3	2.0
<b><u>Diagnosis</u></b>		
Herpes zoster virus	1	0.7
Infections of the urinary system	8	5.3
Hypertension- Dizziness- without finding what cause it	5	3.3
Stroke (EU)	7	4.7
Acute myocardial infarction	4	2.7
Aortic Disorder	2	1.3
Respirator y and Urinary Infection (patient has both)	10	6.7

Severe Hypoglycemia	1	0.7
Paroxysmal atrial fibrillation	4	2.7
Gastrointestinal bleeding and also had minor infarction (myocardial)	3	2.0
Kidney cancer-metastasis	8	5.3
Inflammatory bowel disease	2	1.3
Positive clostridium	3	2.0
Acute pulmonary edema (ARDS)	2	1.3
Possible stroke	6	4.0
Fever	2	1.3
Fainting improved (no pathological reason found)	5	3.3
Aspiration (food or liquid)	4	2.7
Anemia	12	8.0
Hyper		0.7

glycemia / investigate the reason that cause it	1	
toxic inhalation / work accident	1	0.7
Cardiologi cal examinatio ns clear/ no cardiologic al finding	2	1.3
Hypoxia	1	0.7
Gastritis (recommen ded diet and medicine treatment)	3	2.0
Vertigo or stomach diseases causing dizziness or no reason found for the dizziness	6	4.0
Pulmonary Embolism	1	0.7
Hyponatre mia	5	3.3
Possible syncope	2	1.3
High Fever	6	4.0
Atrio	2	1.3

ventricular block- pacemaker (already in place)		
bradycardi a	4	2.7
Hypernatre mia	1	0.7
Exacerbati on of COPD	2	1.3
Haemorrha gic stroke	1	0.7
No cardiologic al abnormaliti es found after precordial pain	1	0.7
Possible hypotensio n	2	1.3
Severe renal insuffi ciency	4	2.7
Hysteria	1	0.7
Right Eye Disease	1	0.7
Suspected Pulmonary Embolism (Refused examinatio n)	1	0.7
Speech improveme nt/ no	4	2.7

findings that indicate stroke/ clear scans		
Epileptic seizure	1	0.7
All medical Tests done were clear after reference of chest pain	1	0.7
Antibiotic tablets as treatment/ Improved fever- possible Flu	1	0.7
Temporary anorexia	1	0.7
Menstrual cramps	1	0.7
Drug Overdose/ medication given to reverse the effect	1	0.7
Haematolo gic Examinatio ns performed with no pathologic al findings	1	0.7
Nystagmus / follow-up by	1	0.7

otorhinolar yngologist		
Epileptic seizure was not confirmed by examinatio n/ no findings of epileptic episode	1	0.7

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Table 3 shows the groups of patients that were made according to their age and how many hospital admissions were needed in each group. The majority of the patients aged 18-49 years did not need to be admitted to a ward (20% of all the patients that were not admitted were in this age group). Additionally, patients aged 50-65 years had a percentage of 33.3% (from all the patients admitted to CCU). Also, the patients aged between 71-79 years were 19.8% (of all the patients admitted to the ward) and 80-87 years were 33% of all, who were hospitalized and admitted to the ward (pathology and cardiology). (Table 3).

Table 3. Hospital admissions for every age group

Age	Hospital admission			
	No	Ward	Coronary care unit	Refusal of admission
18-49	10 (20%)	2 (2.2%)	0 (0%)	0 (0%)
50-65	11 (22%)	11 (12.1%)	2 (33.3%)	1 (33.3%)
66-70	3 (6%)	3 (3.3%)	1 (16.7%)	0 (0%)
71-79	7 (14%)	18 (19.8%)	1 (16.7%)	0 (0%)
80-87	12 (24%)	30 (33%)	1 (16.7%)	1 (33.3%)
88-99	7 (14%)	26 (29.7%)	1 (16.7%)	1 (33.3%)

Among the patients that were admitted to a ward the most common symptom of those patients, was weakness (12.2%), dyspnoea (11.1%) and fever (11.1%). In addition, patients that were not admitted and were discharged their most common symptom was fainting (16%), dizziness / fainting (10%) and severe chest pain (8%) (Table 4).

**Table 4.** Distribution of symptoms of patients that needed admission to hospital and of patients not needed admission. (Top five of each category).

<u>Symptoms</u>	<u>Hospital admission</u>
	No admission
Fainting	16%
Dizziness / Fainting	10%
Trembling-Dizziness	8%
Severe chest pain	8%
Dyspnoea	6%

<u>Symptoms</u>	Admission (ward)
Weakness	12.2%
Dyspnoea	11.1%
Fever	11.1%
Aphasia-sudden impossibility of walking & speech impediment	8.9%
Vomiting	5.6%

Furthermore, there was also the most common diagnosis for those patients that were admitted to the ward and the first was anemia (13.2%), then was infections of the urinary system (8.8%) and followed by stroke (6.6%). Those patients that were not admitted and were discharged, their most common diagnosis was dizziness (12%) and fainting improved /no pathological reason found (10%). (Table 5).

**Table 5.** Distribution of diagnosis of patients that needed admission to hospital and of patients not needed admission. (Top five of each category)

Hospital admission



<u>Diagnosis</u>	No admission
Dizziness	12%
Fainting improved (no pathological reason found)	10%
Hypertension-Dizziness (not found the cause)	8%
Speech improvement/ not a pathological finding	8%
Respiratory and Urinary Infection (patient has both)	6%

<u>Diagnosis</u>	Admission (ward)
Anemia	13.2%
Infections of the urinary system	8.8%
Respiratory and Urinary Infection (patient has both)	7.7%
Stroke	6.6%
Hyponatremia	5.5%

Table 6 shows the frequency of symptoms depending on whether the call was justified. The three most common symptoms among patients with justified calls were dyspnoea (11.5%, N=13), fever (9.7%, N=11) and weakness (9.7%, N=11). In contrast, the three most common symptoms among patients with unjustified calls were fainting (16.2%, N=6), severe chest pain (8.1%, N=3), and headache (8.1%, N=3).

**Table 6.** Distribution according to whether the call was justified or not. (Start from the most common symptom for those who made a justified call and those who did not.)

<b>Symptoms</b>	<u>Justified call to EKAB</u>	
	<b>Yes</b>	<b>No</b>
Dyspnoea	11.5%	
Fever	9.7%	
Weakness	9.7%	
Fainting	8%	
Aphasia-sudden impossibility of walking and speech impediment	7.1%	
<b>Symptoms</b>		<b>No</b>
Fainting		16.2%
Headache		8.1%
Severe chest pain		8.1%
Syncope - Fainting		5.4%
Severe epigastric pain		5.4%

Table 7 shows the frequency of diagnosis depending on whether the call was justified. The most common diagnosis among patients with justified calls was anemia (9.7%, N=11), Respiratory and Urinary Infection (patient has both) (8%, N=9). In contrast, the most common diagnosis among patients with unjustified calls was hypertension-dizziness (10.8%, N=4) and fainting after a meal (10.8%, N=4).

**Table 7.** Distribution according to whether the call was justified or not. (Start from the most common diagnosis for those who made a justified call and those who did not.)

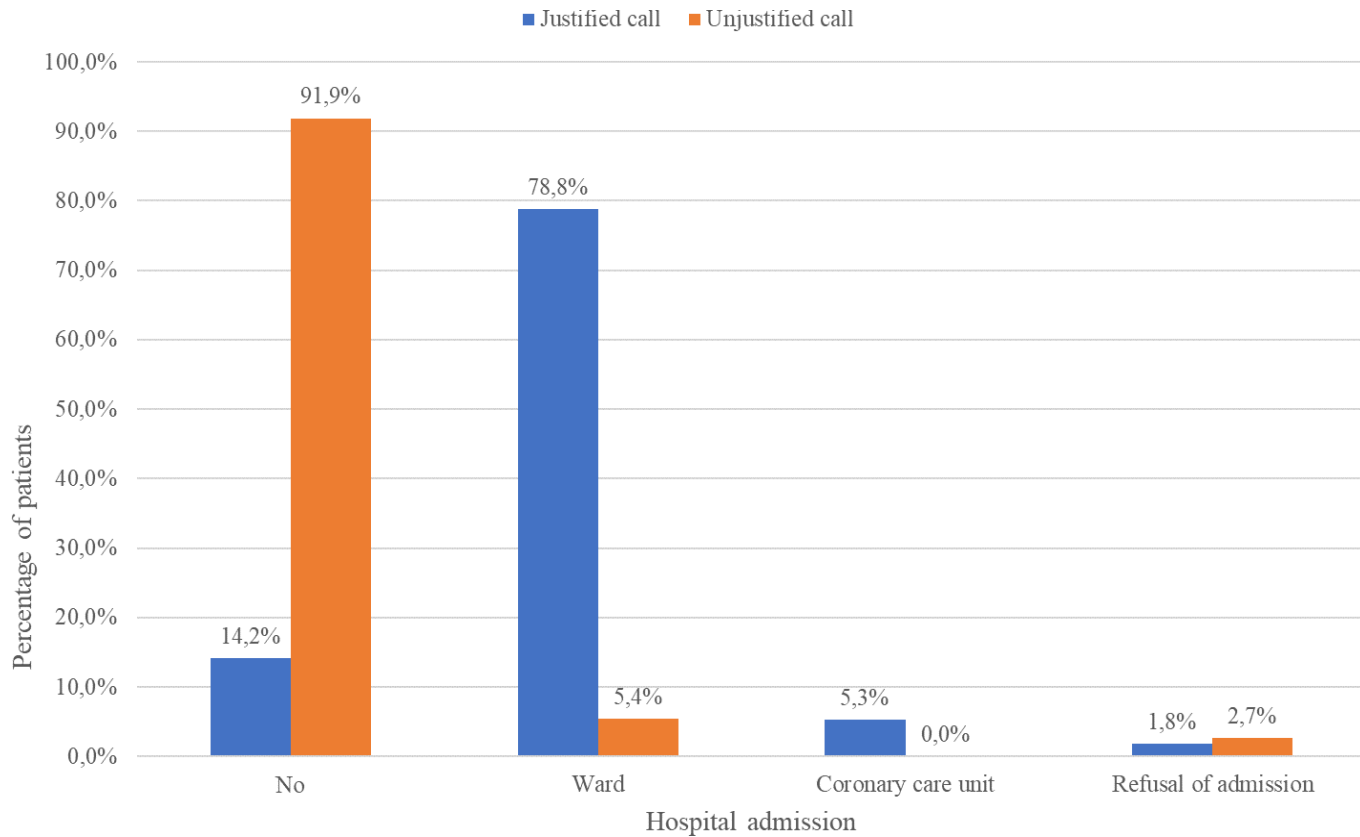
<b>Diagnosis</b>	<u>Justified call to EKAB</u>	
	<b>Yes</b>	<b>No</b>
Anemia	9.7%	
Respiratory and Urinary Infection (patient has both)	8%	
Infections of the urinary system	7.1%	
Stroke	6.2%	
Kidney cancer-metastasis	6.2%	
<b>Diagnosis</b>	<b>No</b>	
Hypertension-Dizziness	10.8%	
Fainting after a meal	10.8%	
Dizziness	8.1%	
Speech improvement/ not a pathological finding	8.1%	
Epigastric pain	5.4%	

A Chi-square was performed to investigate whether there were differences in the frequency of hospitalization between the justified and unjustified calls. It was noticed that quite a few patients that had made an unjustified call returned home (91.9%), but the patients who made a justified call only a small percentage returned home (14.2%) (see Figure 13). The percentage of patients who were

admitted either in a clinic [justified (78.8%) vs unjustified (5.4%)] or in a coronary care unit [justified (5.3%) vs unjustified (0%)] were mostly patients who made justified calls ( $p < 0.001$ ). (Table 8).

**Table 8.** Distribution of hospital admission depending on whether the call was justified

	Justified call to EKAB		p
	Yes	No	
Hospital admission			
No	16 (14.2%)	34 (91.9%)	<0.001
Ward	89 (78.8%)	2 (5.4%)	
Coronary care unit	6 (5.3%)	0 (0%)	
Refusal of admission	2 (1.8%)	1 (2.7%)	



**Figure 11.** Percentage of patient’s hospital admission depending on whether the call was justified

## Discussion

When this research study was finished, we found a result that was the most important for us and it was which calls from the total were considered to be an unjustified call to EKAB. But we recorded the justified calls as well. Similar results of inappropriate calls to EMS were found in London, Sweden.

In our study every time a patient's call was categorized as unjustified it was a decision of 2 or 3 doctors and in most cases were the same doctors who decided and that made the study more solid and worthy. In the London research there was only one junior doctor that was making the decision and not always the same doctor.[24] But there was more similarity with the study which was taken place in Sweden because they used a specific tool called "Rapid Emergency Triage and Treatment System" (RETTS) for almost all the cases. And includes, measurements of vital signs (VS) and an emergency signs and symptoms (ESS) code.[25]

Even though, our study and the London study were close enough. Our study found that 24.7% made an unjustified call, while London had a rate of 15.7% of inappropriate calls.[24] And the Swedish research found that 37% were assessed as not requiring hospital resources so the use of ambulance was unnecessary. [25]

Additionally, another positive of the study of Volos was the recording of vital signs which also showed that all the patients with unjustified calls had completely normal vitals. The research of Sweden also did the same and had more accurate results.[25] But, London did not keep any record of the vitals of those patients only the judgment of the junior doctor.[24]

The disadvantage of our study was the time period and the population. (2 months/ 150 patients). The similar study that took place in London had a population of 300 consecutive emergency ambulance arrivals. It is not known the period of time.[24] The Swedish study had a population of 5,326 patients and the period of time was precisely a year. [25] So those results can be more accurate and more complete cause they cover larger percentage of people who could misuse the service or not.

Our research must be noted that it had some limitations. More specifically, some patients had a diagnosis that was different than all the others but they had to be included in a group of patients so the unique cases fallen into a category that might not be the perfect choice but it was something necessary for this research. This was a limitation that can be avoided in future research with more cases of patients and more categories, in which might be more specific the category that a unique case will be part of. Also, the cardiological patients had many abnormalities in their ECG that none could be prescribed extremely accurately. Because it must fit a general category. And, this could also change in a future study where there will be more cardiological patients with similar abnormalities.

The period of time was a limitation too. Because it was impossible to cover all shifts of the day by only one person, so all patients that were recorded came during the day and all the patients that came through the night were not included. If there is a future study it should cover 24hours of every day for a longer period and that will give us a more accurate result.

Lastly, our study was only about one hospital so it can be assumed that the result might change if you study a different hospital or more hospitals than one together. A study where more hospitals will be included will also be extremely beneficial because there will be a comparison between hospitals and departments. Another important thing to be mentioned is that the result might also change if the decision was taken by more doctors or more senior doctors or by a specific council. That might give a more accurate idea of who really made an inappropriate call and who did not and why.

In conclusion, using the ambulance service might look like something easy but it is a complicated situation. You should always think of the possible misuse that affects not only you but also the EMS and the ED stuff. An unjustified call that will bring you to the ED in order to be checked when you could have chosen a different way that might also be easy and give you the result you ask for. Also, what kind of patients need the treatment and get admitted in the hospital in order to get better. Most of the admitted patients were people who made a justified call to the EMS according to doctors. So, we must take more time to think and decide if we do the right thing by calling the ambulance. More research is needed in order to gain more knowledge about this subject. With a large population taking part, more time to gather data, and maybe more than one hospital taking part in order to find a more solid result proving what is happening with the use of EMS and what is the percentage of misuse.

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