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Characteristics of patients transferred by air: a descriptive epidemiologic study

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Aim: To analyze the characteristics of patients transferred by air ambulance in the eastern Anatolia region of Turkey.

Materials and methods: We retrospectively evaluated the records of patients transferred by air ambulance between January 2010 and December 2010. Demographics and medical data of the patients, geographic conditions, and flight duration data were all analyzed.

Results: A total of 241 patients were included in the study, of whom 51% were men and 49% were women. The majority of the patients were between 0 and 1 year old (40.2%). In the adult patients, the most commonly seen diagnoses were trauma (31.6%), obstetric problems (24.7%), cerebrovascular events (12.4%), and myocardial infarction (9%). It was determined that in terms of medical disciplines the patients were most commonly transferred to the clinics of pediatrics (45.2%), neurosurgery (9.1%), gynecology (9.1%), cardiology (6.2%), neurology (5%), and general surgery (5%). The total flight time was 115.3 ± 4.7 min and the patients were most commonly transferred to a university hospital.

Conclusion: The decision to use an air ambulance may be made based on the distance, the length of the transfer and transportation, the resources of the health institutions located in the relevant region, and the environmental and climatic conditions. However, the association between the likelihood of survival, the therapeutic benefits of the patient, and the cost should be analyzed.

Key words: Air ambulance, critically ill patient, transportation, time

Introduction

In cases that require emergency medical intervention, it is critical to transport the patient as soon as possible to a health center in which medical intervention may be performed, and to make the required intervention in time (1-3). In addition, patients may also be transferred from one hospital to another for advanced analyses and treatment after emergency medical intervention and stabilization, due to various reasons such as the lack of an intensive care unit, organ transplantation unit, or relevant departments (1,4,5). For this purpose, an ambulance system, particularly ground transport, has been globally used for a long time. Transportation of patients/casualties by air was first used during wars (e.g., the First World War, Korean War, and Vietnam War), and then was mostly used during disasters (6-8). Widespread air ambulance use rapidly began in countries worldwide, including European countries and the United States (7,9,10).

To date in Turkey, patients have mostly been transferred by ground ambulance. Recently, however, air ambulances have begun to be the more commonly used method for the transfer of patients from the scene or for patient/casualty transport from one health center to another. In Turkey, the transfer of patients

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by air was first implemented in the 2000s by civil airways, and air ambulance services were introduced by the Ministry of Health in 2009 (1). Centers dependent on city ambulance service command and control centers were founded in 15 different cities. All areas that were within a flight distance of 1 h from each city were included in the scope of the service (1). Van, which is a city located in the eastern Anatolian region, is one of the centers that has used air ambulances since 2009. The eastern Anatolian region is a rural area with mountains, passes, and terrain that are quite steep, in which a continental climate dominates. In this region, transportation may be very difficult, especially during the winter. Therefore, air transport is an important component of transportation in this region.

For the transportation of critically ill and injured patients, the decision whether to use a ground or air ambulance depends on many variables. Access to a suitable ground and air ambulance, the diagnosis of the patient, the anatomical and physiological status of the patient, accessibility to the scene of the event, resources or conformity of the local hospital (the lack of a third-line center and intensive care, and the lack of a relevant specialist physician), urgency of the transfer, distance and time of the transfer, environmental and climatic conditions, and cost may be some of the factors that require attention (1,9,11,12). Therefore, in Turkey, the Ministry of Health described the medical criteria for patient transfer by air ambulance and issued them in an announcement.

There are many reports to suggest that the use of air ambulance services is useful for the transfer of the patient prehospital and between hospitals in the event of trauma, neurologic, cardiac, pediatric, and obstetric conditions and other conditions that require special care (6,12-15). However, in Turkey, no descriptive study has been conducted on the transfer of patients/casualties by air ambulances. More epidemiological data are required to demonstrate the logistic, medical, and economic benefits of patient transfer by air.

This study aimed to evaluate the efficacy of this new implementation in the eastern Anatolian region of Turkey and to analyze flight data such as flight time, geographic conditions, and the medical and demographic characteristics of the patients. In addition, we reviewed the use of air ambulance services for the transportation of patients/casualties in the eastern Anatolian region.

Materials and methods

Study design

The study was conducted with official authorization obtained from the Van Provincial Health Directorate and Emergency Health Care Services Department. In the study, we retrospectively examined the data included in the air ambulance transfer form provided by the Provincial Directory of Health for the patients that had been transferred by air ambulance in the city of Van between January 2010 and December 2010.

Study protocol

The data obtained were evaluated by categorizing them in 4 groups: demographic, medical, flight, and geographic data.

Demographic data included all of the flight data; all of the flights performed, including aborted missions and the flights performed for a purpose other than patient transfer; the patients who could not be recorded due to the lack of data records; sex; age (0-1 year, 2-18 years, 19-65 years, >65 years); numbers and ages of the patients according to seasons; and the distribution of the patients by discipline. Medical data included the diagnosis of the patients by age (0-1 year, 2-18 years, 19-65 years, >65 years); the most common diagnosis of the cases; referral/arrival department according to diagnosis; the distribution of the disciplines by age groups; numbers and causes of arrest/intubation; and, if any, the complications that occurred during the flight. Flight data included the total flight time by seasons; nonstop flights; flights with one or more stops; flight durations (first flight, second flight, total flight, and total duration of all of the flights); and aborted missions and their causes. Geographic data included the type of team/vehicle with which the patient had been picked up from the heliport; arrival institution/hospital; the places from which the patient had been picked up; the places to which the patient had been transferred; and the hospitals to which the patient had been transferred according to specialties.

The definitions of some terms are provided to facilitate understanding (Table 1). For exclusion criteria, the patients with missing data and the patients who could not be included in the study for any reason (death, night, missing the flight, etc.) were put in the aborted mission category and were not included in the evaluation.

Data analysis

The data were analyzed using Microsoft Excel XP (Microsoft Corporation, Redmond, WA, USA) and SPSS 13.0 (SPSS Company, Chicago, IL, USA). For the variables in the study, descriptive statistics were calculated. All of the data are expressed as mean ± standard error, minimum-maximum, median, or incidence rate. When the normality assumption was not met, the groups were compared using the Kruskal-Wallis test and the categorical variables were compared using the chi-square test. In all of the tests, $P < 0.05$ was considered statistically significant.

Results

Demographic data

When the distribution by all of the flight data was considered, the total number of flights was 268; the number of the flights performed, including the aborted missions, was 254; the number of the flights performed for a purpose other than patient transportation was 6; the patients who were not included in the records due to missing data numbered 8; and the resulting number of patients enrolled in the study was 241 (Figure 1).

Of the 241 patients who were transferred, 51% (n = 123) were men and 49% (n = 118) were women. When the number of patients transferred was evaluated by age group, it was observed that the majority of the patients were in the age group of 0-1 years (n = 97; 40.2%), in which the patients were accumulated in the age subgroup of 0-1 month (n = 80), and that the age group of 0-1 years was followed by the age groups of 19-65 years (n = 89, 36.9%), 2-18 years (n = 38, 15.8%), and >65 years (n = 17, 7.1%). The mean age of the patients was 20.43 ± 1.5 (range: 0-84 years, median: 11 years). When the number of patients transferred was evaluated by season, it was observed that 31.5% were transferred during the summer, 26.6% were transferred during the spring, 21.2% were transferred during the autumn, and 20.7% were transferred during the winter. When the distribution of sex by season was examined, it was found that women were mostly transferred during the summer (n = 40) and men were mostly transferred during the spring and summer (n = 36). When the sexes

Table 1. Definitions of some terms used in the study.

Terms	Definitions
Nonstop flights	Flights which are done within the same day without stopping.
Flights with 1 or more stops	Flights which are not performed within the same day or at 1 time (the flights that are performed 1, 2, 3, etc., times).
First flight	The time between the departure of the air ambulance that the EMS reports and the arrival to the heliport where the event has occurred (min).
Second flight	The time between the time point in which the air ambulance picks up the patient from the scene and the arrival time to the heliport from which the patient will be transferred (min).
Total flight time	Sum of the first flight and the second flight – the total time the air ambulance remains in the air (min).
Total time	Total time between the calling time and arrival time to the heliport from where the patient will be transferred (min). It encompasses the total time, including calling time, case report time, departure time, arrival time to scene (heliport), departure time from the scene (heliport), and arrival time to the heliport from where the patient will be transferred.
Aborted mission	These aborted missions include the conditions in which the patient is not transferred due to any reason after the arrival of the helicopter at the scene.

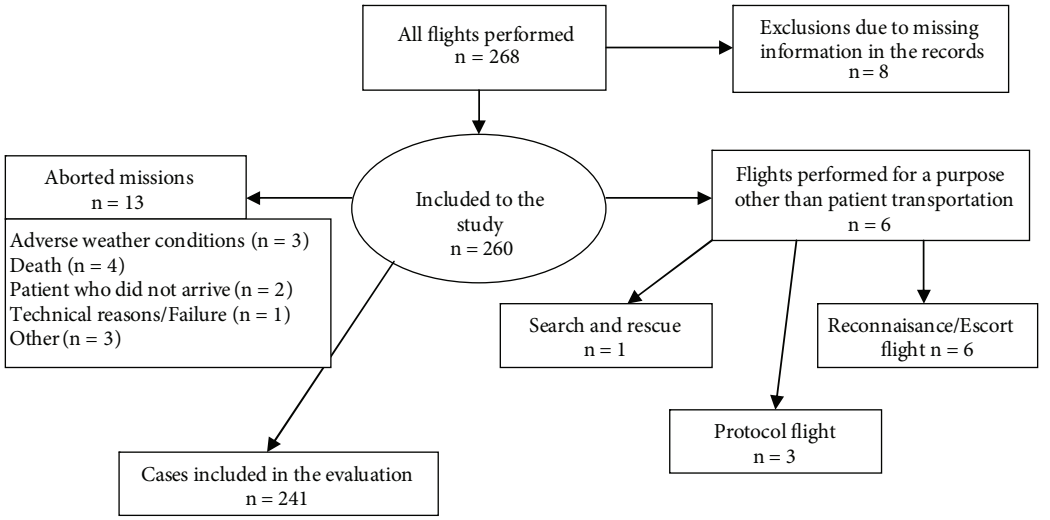

Figure 1. Data for all of the flights.

were compared according to seasons, no statistically significant difference was found between the groups (Table 2, P > 0.05).

Medical data

In the age group of 0-1 year, the leading cases were prematurity + respiratory distress syndrome (RDS) (n = 20, 20.6%), septicemia (n = 13, 13.4%), prematurity alone (n = 12, 12.4%), congenital heart disease (CHD) and additional problems (n = 12, 12.4%), RDS alone (n = 9, 9.3%), and pneumonia and pulmonary problems (n = 9, 9.3%). In this age group, based on the classification of the cases by disciplines, it was determined that the cases were within the specialty field of pediatrics (n = 89, 91.8%), pediatric surgery (n = 4, 4.1%), brain surgery (n = 3, 3.1%), and orthopedics (n = 1, 1%). In the age group of 2-18 years, the leading cases were trauma (n = 12, 31.6%), cardiopulmonary arrest (n = 5 13.2%), pneumonia (n = 4, 10.5%), burn (n = 3, 7.9%), meningitis (n = 2, 5.3%), septicemia (n = 2, 5.3%), and intoxication (n = 2, 5.3%). In the trauma patients, the leading causes of trauma were multiple trauma (n = 4) and firearm injury (n = 4). In this group, it was observed that the patients were within the specialty field of pediatrics (n = 20, 52.6%), pediatric surgery (n = 6, 15.8%), neurosurgery (n = 4, 10.5%), burn center (n = 3, 7.9%), and orthopedics (n = 2, 5.3%). In the age group of 19-65 years, the leading cases were traumas (n = 28, 31.6%), obstetric problems (n = 22, 24.7%), cerebrovascular accident (CVA) (n = 11, 12.4%), and myocardial infarction (MI) (n = 8, 9%). In this group, traumas were mostly due to head and spine trauma (n = 11) and multiple trauma (n = 5). The majority of the obstetric problems were related to pregnancy and its complications (high-risk pregnancy, preeclampsia, postpartum bleeding, intrauterine fetal death, etc.). According to the specialty field, the women were mostly referred to the clinics of obstetrics (n = 22, 24.7%), neurosurgery (n = 14, 15.7%), general surgery (n = 11, 12.4%), cardiology (n = 9, 10.1%), neurology (n = 8, 9%), and internal diseases (n = 7, 7.9%). In the age group of >65 years, the patients were mostly transferred with the diagnosis of CVA (n = 7, 41.2%), MI (n = 4, 23.5%), and heart failure (n = 3, 17.6%), and they were reported to be within the specialty field of cardiology (n = 6, 35.3%), internal intensive care (n = 6, 35.3%), and neurology (n = 4, 23.5%). For all of the patients, the distribution of age by specialty field is given in Figure 2.

Table 2. Sex distribution according to seasons.

Seasons	Female	Male	Total no. (n)	(%)
Spring	28	36	64	26.6
Summer	40	36	76	31.5
Autumn	31	20	51	21.2
Winter	19	31	50	20.7
Total	**118**	**123**	**241**	**100.00**

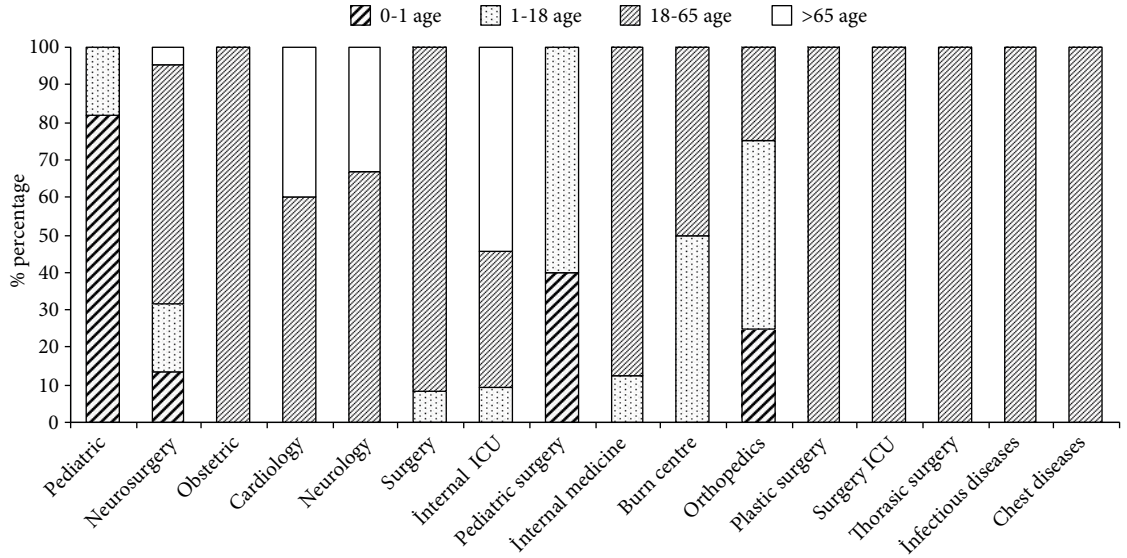

Figure 2. Distribution of patient ages according to medical discipline.

When we examined the number and causes of intubation/arrest of the cases, we found that in a total of 18 cases (7.5%) arrest occurred and intubation was required, including 4 cases of multiple trauma, 3 cases of drowning in water, 3 cases of conditions with unknown causes, 2 cases of perinatal asphyxia, 2 cases of postpartum bleeding, 1 case of electric shock, 1 case of chronic obstructive pulmonary disease + pulmonary edema, 1 case of pulmonary embolism, and 1 case of operated intracerebral hematoma.

As for complications, 1 patient with multiple traumas due to a car accident developed arrest in the air, probably due to his primary pathology. Generally, transportation by air was well tolerated by the patients.

Flight data

The majority of the flights were nonstop (n = 230, 95.4%). The remaining flights were with 1 stop (n = 8, 3.3%), 2 stops (n = 2, 0.8%), or 3 stops (n = 1, 0.4%). The leading cause of the stops was low visibility due to darkness.

The mean duration of the first flight was 40.7 ± 1.7 min, the mean duration of the second flight was 73.9 ± 4 min, the mean duration of the flights overall was 115.3 ± 4.7 min, and the mean total duration was 140.4 ± 5.2 min. When the total flight time was compared by seasons, the mean total flight time was 123.9 ± 9.2 min during the spring, 122.6 ± 9.7 min during the summer, 109 ± 10.4 min during the autumn, and 99.7 ± 6.8 min during the winter. Although the mean total flight time was shortest during the winter, no statistically significant difference was found among the groups ($P > 0.05$).

When we examined the mean total flight time according to the place from which the patient had been picked up, the mean total flight time was 88.8 ± 6.4 min, 104.9 ± 5.8 min, 79.2 ± 8.5 min, and 138.7 ± 15.8 min for Bitlis, Hakkari, Van, and Muş, respectively, which are the places from which the patients were most commonly picked up. The total flight times by arrival heliport/places were 81 ± 2.9 min, 144.3 ± 11.2 min, 141.2 ± 15.3 min, and 164.2 ± 21.4 min for Van, Elazığ, Diyarbakır, and Erzurum, respectively.

Geographical data

The patients were mostly transferred from the same heliport to which they had been transported to the referral hospital by Emergency Medicine Services (EMS) ground ambulance (n = 222, 92.1%). The remaining patients were transferred by air ambulance (n = 14, 5.8%), private ground ambulance (n = 4, 1.7%), and university ground ambulance (n = 1, 0.4%). The patients who were transferred by air ambulance were picked up from the arrival heliport and transferred to another heliport located in another city.

While the patients were most commonly transferred to university hospitals (n = 128, 53.5%), they were most rarely transferred to military hospitals. In addition, the patients were also transferred to state hospitals (n = 46, 19.1%), private hospitals (n = 37, 15.4%), education and research hospitals (n = 25, 10.4%), and military hospitals (n = 4, 1.7%). As for the patients transferred by air, the most common departure areas were Hakkari, Bitlis, Van, and Muş, and the most common arrival areas were Van, Elazığ, Diyarbakır, and Erzurum.

For the specialty field of the cases transferred, the majority of the pediatric patients were transferred to university hospitals (n = 47, 19.5%), state hospitals (n = 27, 11.2%), and private hospitals (n = 28, 11.6%), whereas the majority of the patients within the specialty field of neurosurgery were mostly transferred to university hospitals (n = 15, 6.2%). While the majority of obstetric patients were transferred to university hospitals (n = 13, 5.4%) and state hospitals (n = 9, 3.7%), cardiologic (n = 10, 4.1%) and neurologic patients (n = 7, 2.9%) were mostly referred to university hospitals. While the patients within the specialty field of orthopedics, plastic surgery, thoracic surgery, and infectious diseases were transferred only to university hospitals, the only patient within the specialty field of thoracic diseases was transferred to an education and research hospital. The majority of the remaining patients were transferred to university hospitals (Figure 3).

Discussion

Use of an air ambulance for the transportation of critically ill and injured patients has become an important part of modern emergency care, in both rural and urban areas (16,17). Although the use of air medical transport services provided by private and insurance company-dependent air ambulance companies has substantially increased during the last 15 years (18,19), it is still controversial to use advanced transport resources. In some earlier publications, it was difficult to define the most eligible patients for the use of air transport, due to various reasons, such as cost, number of air vehicles available, limited flight time and resources, and safety concerns (6,12,16,20). However many investigators obtained evidence that suggested improved patient outcomes with the use of helicopter transport (6,17,20).

Moreover, for many injured and critically ill patients, it is not always possible to immediately have access to an advanced center. These patients should undergo the first evaluation and stabilization process in a normal institution, before being referred to an advanced and well-equipped center. Thereafter, it is important to consider transport of the patient to the most suitable place in the most appropriate and timely manner (11,12).

In the literature, some publications reported the use of an air ambulance for patients who experienced health problems due to any condition or event in

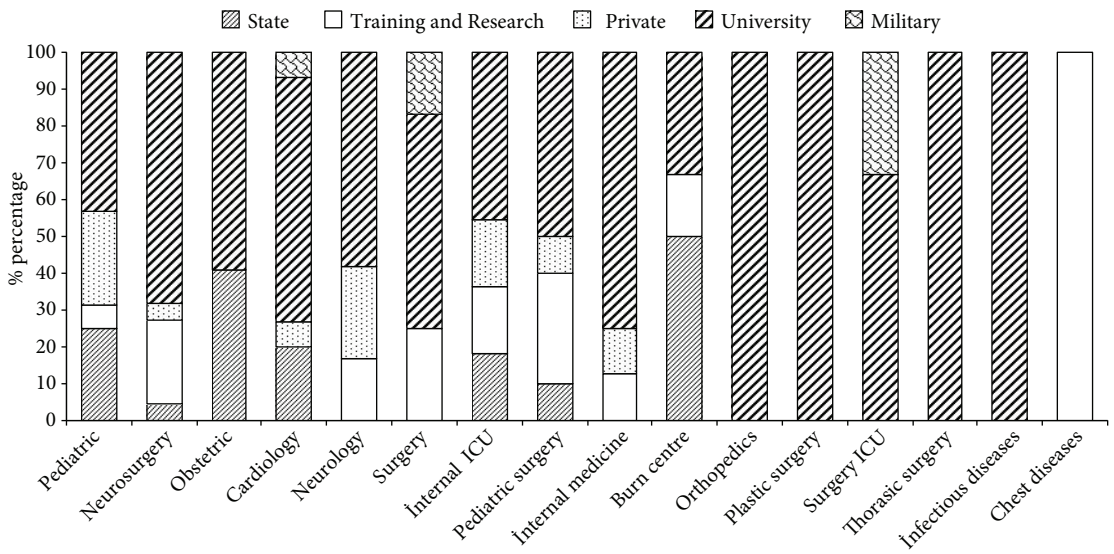

Figure 3. Referral hospitals of the patients transferred according to medical discipline.

different specialty fields (trauma, stroke, burn, pediatric patients, acute coronary syndrome, MI etc.) abroad, and to then proceed with their treatment and follow-up in their own country (6,12,21,22). However, general epidemiological studies on the use of an air ambulance are limited. Our study included 241 of a total of 268 patients within Van, in the eastern Anatolian region, with different diagnoses, who were transported by air ambulance. The majority of these patients were male and were patients from the age group of 0-1 year. In our study, the patients who were transferred were younger compared to those in other studies, with a lower mean age and an accumulation in a younger age group. In the studies performed by Wong et al. (23) and Sand et al. (4), it was reported that the patients who were transferred were older.

In a 2-year Norwegian study that included 370 patients, it was concluded that transportation by air was beneficial in only 11% of patients. The greatest benefits were obtained in the cases of complicated delivery, with children with respiratory problems or serious infections (24). In high-risk neonatal and obstetric patients who require treatment in intensive care units, transportation to a third-line health center, where a specific specialist is present, for further surgical and medical evaluation decreases mortality and morbidity (13,14,21,25) The lack of well-equipped intensive care units with specific specialists for newborns and infants is an important problem in Turkey, as well as in European countries (21,26). In 2 separate studies on the transportation of newborns by air ambulance conducted in Norway, an average of 222-252 patients were collected during 10-year and 14-year periods (13,21). In the study performed by Lang et al. (21), the percentage of infants with low birth weight transferred by air ambulance was substantially high (95%), despite the long geographical distances. Again, in the same study, CHD was the most common reason for transportation (24%) and CHD-related mortality was also high (35%). In the study performed by Berge et al. (13), the main medical problems were respiratory disease (mostly RDS), asphyxia, malformations (mostly CHD), preterm (only), and pneumonia. The majority of the patients (n = 193) were transported within 24 h of birth and 30 neonates (12%) died within 1 year. Of the neonates, 94 were preterm and 10 were immature (13). Consistent with these studies, in our study, of the 97 patients from the age group of 0-1 year who were transported, the most common diagnoses were prematurity + RDS, septicemia, prematurity alone, CHD and additional problems, RDS alone, pneumonia, and pulmonary problems. Moreover, in our study, the majority of the transported patients were newborns, mostly with an age of 1-2 days. In various studies, it was demonstrated that high-risk obstetric patients could be safely and timely transported by air, even in an advanced stage of pregnancy, because delivery or serious complications did not develop during the flight (14,25,27). In these studies, the most common reasons for transportation included high-risk pregnancy, such as the pregnancy with the risk for preterm delivery, preeclampsia, bleeding, and early membrane rupture, and no serious complications were reported during the flights. In the study conducted by Wong et al. (23), of the transfers, 18.8% were due to pregnancy and delivery and the majority was only due to preterm delivery. In a study performed by Sand et al. (4), the obstetric cases mostly consisted of young patients (aged 18-40 years) (66.7%). In our study, the obstetric cases were from the age group of 19-65 years (9.1%) and were mostly due to pregnancy and its complications (high-risk pregnancy, preeclampsia, postpartum bleeding, intrauterine fetal death, etc.).

In this study, the main reasons for transportation included traumas (18.3%), sinus of Valsalva aneurysm (SVA) (7.5%), and cardiac diseases (non-MI cardiac diseases 7.5% and MI 5%). Many studies suggested that transportation of these patients by air ambulance to appropriate and well-equipped specific centers long distances away decreased the complications, the rates of mortality and morbidity, and the length of stay in the hospital and intensive care unit (9,12,15,18,22). We found that the leading reason for the transportation of adult patients (including the age group of 2-18 years) was traumas. While the main reasons for transportation were multiple trauma and firearm injury in the age group of 2-18 years, the majority of the patients were transported due to head and spine traumas in the age group of 19-65 years. In a study performed in Hong Kong, the reasons for transportation were reported to be trauma (especially extremity injuries) in 32.1%, neurologic problems such as coma and stroke in 21.8%, and primarily and secondarily transferred

cardiovascular diseases in 18.3% (23) of the patients. In a study conducted in Norway, traumas were reported in 19.3% of the patients and cardiovascular disease was reported in 43% of the patients as the reason for transportation (24). In a report by Leira et al. (15), of 215 flights, 43.7% were due to traumas, 19% were due to stroke, 10% were due to MI, and 27.9% were due to other medical conditions. In a study performed in Germany, it was reported that the most common diagnoses were traumas, MI, and stroke in adult patients (>18 years old) transferred by air ambulance (4). In events such as stroke and MI, it is vitally important to transport patients as soon as possible to a center where diagnosis and treatment are available (angiography, cranial magnetic resonance imaging, thrombolytic therapy, stenting, surgical intervention, etc.). In this study, 18 patients (7.5%) were transferred while being intubated as a result of a cardiopulmonary arrest. In other studies, the percentage of the patients who developed arrest and were transferred while being intubated was reported as 6.9%-11.3% (4,23). These patients were transferred with a mechanic ventilator or bag-valve-mask unit. Their survival rates may have been increased with proper intervention. In another study, a total of 157 patients were transferred to a third-line health center by helicopter due to inhalation-related arrest, trauma, and drowning in water, mostly resulting from a cardiac reason and the survival rates of the patients were recorded as 32.3%-36.2% (28).

The most important disadvantage of air ambulances is that they are affected by unfavorable weather, the season, and geographical conditions. It is more difficult to fly under some conditions, such as low flight visibility and heat, high wind speed, darkness, and winter weather conditions (8,11,29). However, in our study, the majority of the patients (95.4%) were transported by air without a stop, whereas 4.6% were negatively influenced by low visibility due to darkness and climatic conditions. In our region, climatic conditions and transportation may be very difficult, especially during the winter. As night vision of the air ambulances (especially helicopters) is poor, the flights could be performed during the day, rather than the evening. Time is very important for the diagnosis and treatment of all patients (e.g., MI, SVO, trauma, and obstetrics conditions). The most important indication for the use of an air ambulance is the reduction of transportation time. In the selection of a transportation method to transfer patients/casualties, a ground ambulance was recommended for a distance that will take 30-60 min or up to 80 km, above which an air ambulance should be considered (3,8,11,30,31). It was stated in the announcement issued by the Ministry of Health of Turkey that in conditions in which the time required to arrive at the scene by ground ambulance is 30 min or more an air ambulance should be used (1). In addition to flight time, the time required for the transfer of the patient from the scene to the heliport, packaging, loading, preparation for the flight, and the transfer of the patient from the heliport to the emergency department should also be considered (9,11,20). Our transfers were performed according to this announcement in terms of distance and time; patients were also selected based on this announcement. Moreover, the mean total flight time of our patients was close to the transfer time recorded in many studies (4,9,25,31). Total flight time did not show any significant difference according to seasons. When choosing the air ambulance, the cost per transfer should also be taken into account, because the use of an air ambulance is a costly service. However, the association between the likelihood of survival and the therapeutic benefits of the patient and the cost should be analyzed. In our study, as not previously registered in the record forms, cost data could not be provided.

When transferring patients, the nearest hospital or the most appropriate, well-equipped hospital that may completely manage the disease should be targeted for the referral (3,9,20,30). Transfer to the most appropriate hospital decreases the morbidity and mortality of the patients; decreases the work load and cost, by lowering the duration of hospital stay; and decreases the subsequent need for a second hospital-to-hospital transfer in both rural and urban areas (9,13,15,22). In the present study, the transfers were mostly secondary, in which the patients were referred for advanced analysis and treatment to a well-equipped health center. The hospitals selected were the most appropriate hospital in which definitive treatment and care specific to the type of the disease/injury is performed. For this, the most suitable institutions were university hospitals. The patients who were referred mostly consisted of traumatic,

obstetric, neonatal, cardiac, and neurologic cases. The patients were generally transported from the heliport to the referral hospital by EMS ground ambulances. Again, when the referral city was selected, the distance and regional hospital resources were considered.

Consequently, the use of an air ambulance may be considered based on transportation time, the distance, transfer time, the resources of the regional health centers (the absence of advanced analytic and therapeutic tools, the deficiency of well-equipped and third-line health centers, and the lack of a specialist), and environmental and climatic conditions. However, the patient groups to be transferred should be analyzed with caution. For clinical traumas and important serious medical conditions or events (stroke, cardiovascular cases, obstetric, neonatal cases, etc.), the air ambulance may be used to transport the patient from the scene or for hospital-to-hospital transfer. We think that, in Turkey, patients are transferred according to the announcement for the terms and conditions and medical criteria for the use of an air ambulance issued by the Ministry of Health and many articles reported in the literature. In this context, it is important that a country is well informed about the general rules concerning the use of an air ambulance. Further larger prospective studies are needed to better define criteria for safe long-distance air medical transport of critically ill patients.

Limitations

As this was a retrospective study, there were many limitations, such as the lack or insufficiency of air ambulance flight data. As our study was conducted based on the data present in the previously prepared form of the Directory of Health and EMS, which is used all over Turkey, there was a lack of detailed information.

Important limitations of the study included the length of hospital stay of the patient and the procedure and treatments administered during the hospital stay, the health center from which the patients had been picked up and its equipment characteristics, physiologic data of the patient at the time of pick up (blood pressure, pulse, Glasgow coma scale, fever, respiratory rate, oxygen saturation, general health, etc.), detailed information about the physical examination, accurate reasons for the referral, some flight times, the distance from the departure point to the referral place (km), the time required to arrive from the heliport to which the patient had been transported to referral hospital, cost, characteristics of the patient in the referral hospital, and the interventions performed. This study may also underestimate the numbers, because it contains the flight data of only one area.

Therefore, a full and wide form with this information should first be prepared. In addition, new and larger prospective studies are warranted to evaluate the use of air ambulances in Turkey. Additionally, the Ministry of Health recently prepared a new detailed form and sent it to directorates.

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