

The Characteristics of Patients Transferred by Helicopter Ambulance in Erzurum

Erzurum İlinde Helikopter Ambulans ile Taşınan Hastaların Özellikleri

Sultan Tuna Akgöl Gür¹, Atıf Bayramoğlu², Hüseyin Şahin³

¹Bölge Training and Research Hospital, Emergency Service, Erzurum, Turkey

²Atatürk University Faculty of Medicine, Department of Emergency Medicine, Erzurum, Turkey

³Namik Kemal University Faculty of Medicine, Department of Emergency Medicine, Tekirdağ, Turkey



Abstract

Objective: To analyze the characteristics of patients transferred by ambulance helicopter in Erzurum.

Materials and Methods: We retrospectively evaluated the records of patients transferred by ambulance helicopter between 2009 and 2012. Medical, demographics, geographic and flight data of the patients were all analyzed.

Results: A total of 347 (185 male, 162 female) patients were included in the study. 167 patients (48.4%) aged between 18 and 65 years. In the adult patients, the most common diagnoses were medical conditions in 82 (65.6%) men and 43 (34.4%) women. The number of male and female patients transferred during the summer was 64 (35%) and 50 (30.9%); in autumn, 54 (29.5%) and 34 (21%); in winter, 35 (19.1%) and 44 (27.1%); and in the spring, 30 (16.4%) and 34 (21%), respectively.

Conclusion: Transferring patients living far from medical centers by air ambulance has become common. Plane and helicopter ambulances have become a part of emergency services. Since evidence was obtained on the outcomes of patients affected positively by helicopter transfer, air health transfer services and the number of air ambulances covered by insurance companies have increased recently.

Keywords

Helicopter ambulance, patient transportation, Erzurum

Anahtar Kelimeler

Helikopter ambulans, hasta taşıma, Erzurum

Received/Geliş Tarihi : 03.01.2016

Accepted/Kabul Tarihi : 11.05.2016

doi:10.4274/meandros.2612

Address for Correspondence/Yazışma Adresi:

Sultan Tuna Akgöl Gür MD,
Bölge Training and Research Hospital,
Emergency Service, Erzurum, Turkey
E-mail : sultantuna@hotmail.com

Öz

Amaç: Erzurum'da helikopter ambulansla taşınan hastaların özelliklerinin analizinin araştırılmasıdır.

Gereç ve Yöntemler: Helikopter ambulansla 2009 ile 2012 arasında taşınan hastaların kayıtlarını retrospektif olarak inceledik. Hastaların tıbbi, demografik, coğrafik ve uçuş verileri incelendi.

Bulgular: Çalışmaya 347 hasta dahil edildi, 185'i erkek ve 162'si kadın idi. Hastaların 167'si (%48,4) 18-65 yaş arasındaydı. Yetişkin hastalar arasında en sık tanı erkeklerde 82 (%65,6) ile kadınlarda 43 (%34,4) ile medikal idi. Yazın taşınan hastaların 64'ü (%35) erkek, 50'si (%30,9) kadın; sonbaharda 54'ü (%29,5) erkek, 34'ü (%21) kadın; kışın 35'i (%19,1) erkek, 44'ü (%27,1) kadın; ilkbaharda 30'u (%16,4) erkek, 34'ü (%21) kadın idi.

Sonuç: Yaşadıkları yerden bir tıbbi merkeze hava ambulansı ile hasta transferi yaygınlaşmaktadır. Uçak ve helikopter ambulans acil hizmetlerinin bir bölümü haline gelmektedir. Helikopter ile taşınan hastaların taburculuklarını etkilediğine dair kanıtlara ulaşıldığından beri hava sağlık taşımacılığı hizmetleri ve sigorta şirketlerini hava ambulans sayısı son zamanlarda artmaktadır.

Introduction

Air medical transport is a part of the emergency medical services and it can be performed either by helicopter or plane. It is important to transfer patients having the priority for emergency care as soon as possible in order to reduce the rate of mortality and disabilities (1).

Ambulance helicopter plays an important role in transporting critically ill patients. Every passing minute without any intervention may result in more serious conditions. By reducing transport time significantly, air ambulances can provide earlier care to the patient. Ambulance helicopter services, which were established by the Ministry of Health and have increasingly been used, work in a multi-centered manner, affiliated to city ambulance service command and control centers.

It has been reported that 160 patients were transported by means of an observation balloon during the siege of Paris in 1870 (2,3). In 1918 in the USA, by the end of World War 1, a pilot and a major converted a biplane into an airplane ambulance by modifying the rear cockpit to accommodate a standard litter. In our country, the most commonly used vehicles in emergency health services are ground ambulances. Air ambulance services that were started with two helicopters in 2008 continue with 17 helicopters and 3 planes today. While ambulance helicopters are restricted to flying in daylight hours, ambulance aircrafts are used in situations necessitating night flights in Turkey.

Air ambulances offer faster mode of transport in emergency conditions to suitable hospitals from locations far from health centers or from locations that patients cannot be transferred by ground ambulances due to weather conditions. Additionally, transport of hospitalized patients to more developed hospitals can be performed by air ambulances (4). By this means, patients can be transferred to the appropriate centers quickly and safely.

In this study, we aimed to evaluate the demographic characteristics of patients who had received emergency medical services by ambulance helicopter in the Eastern Anatolia Region.

Materials and Methods

The design of the study: In this study, we retrospectively evaluated 422 air ambulance services performed in the Eastern Anatolian Region between

2009 and 2012. There were no urgent patients in 36 flights, five flights ended without patient transportation because of false alarm. There were five exitus in the scene of the accident. One of the flights was carried out for drill. The remaining 347 cases were enrolled.

Study protocol: The obtained data were analyzed in four groups named as demographic, medical, flight and geographical data. For each patient; gender, transport date and time, the departure point of the air ambulance, the arrival point of the air ambulance, the places that the patient was picked up and delivered (result), total flight time, the first intervention for the patient, the preliminary diagnosis, the intervention during the flight, Glasgow Coma Scale (GCS) score, electrocardiogram (ECG) and vital signs of the patient during reception and following transfer were investigated.

Data analysis: Data were analyzed using SPSS 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, version 20.0, Armonk, NY: IBM Corp.). In the statistical analysis, for numerical data, median±standard deviation, minimum and maximum values and for categorical data, frequency and percentages were calculated. The chi-square test was used for comparison of categorical data. In all tests, a p value of less than 0.05 was considered statistically significant.

Results

The study was initiated with 422 cases. Following exclusion of 75 patients who did not meet the criteria, the remaining 347 cases were analyzed (Figure 1). The median±standard deviation values of the

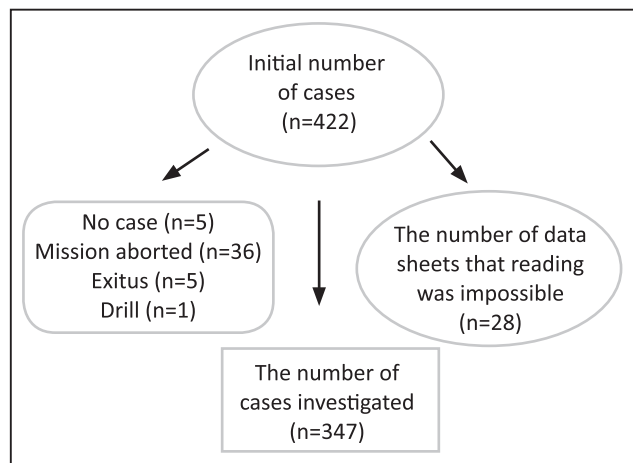


Figure 1. Study workflow

demographic, medical and flight data of the patients who had received transport service are shown in Table 1.

Demographic data: The relationship of age and gender with seasons were analyzed. One hundred sixty-two patients were female and 183 were male. Sixty-four (35%) males and 50 (30.9%) females were during the summer, 54 (29.5%) males and 34 (21%) females during the autumn, 35 (19.1%) males and 44 (27.1%) females during the winter, and 30 (16.4%) males and 34 (21%) females during the spring. When compared, no significant difference was found between genders in terms of seasons ($p=0.099$) (Table 2).

There was a statistically significant correlation between gender and preliminary diagnosis ($p\leq 0.001$). In patients received for medical causes, 82 (65.6%) were male and 43 (34.4%) were female. Sixty-five (72.2%) patients who were received for trauma were male and 25 (27.8%) were female. Thirty-one (39.7) of newborn patients were male and 47 (60.3%) were female. In patients received for burns, four (66.7%) were male and two (33.3%) were female.

When patients were analyzed according to their age groups, the number of newborn patients (0-28 days of age) was 71 (20.6%); the number of infants (aged 28 days-2 years) was 18 (5.2%); the number of children (aged 2-18 years) was 38 (11%); the number of adults (aged 18-65 years) was 167 (48.4%), the

number of elderly (over 65 years of age) was 52 (14.8%) (Figure 2).

Medical data: The number of patients in whom the initial medical intervention was made on site was 280 (81.2%), the number of patients without any on site intervention was 65 (18.8%), the number of patients intervened during flight was 279 (80.9%), and the number of patients not intervened during flight was 66 (19.1%).

A statistically significant relationship was found between delivery site of the patient (result) and preliminary diagnosis ($p=0.018$). Medical causes were found to be the most frequently encountered preliminary diagnoses (Figure 3). Ninety-four (75.2%) patients with medical preliminary diagnosis were delivered to Erzurum and 31 (24.8) delivered to sites

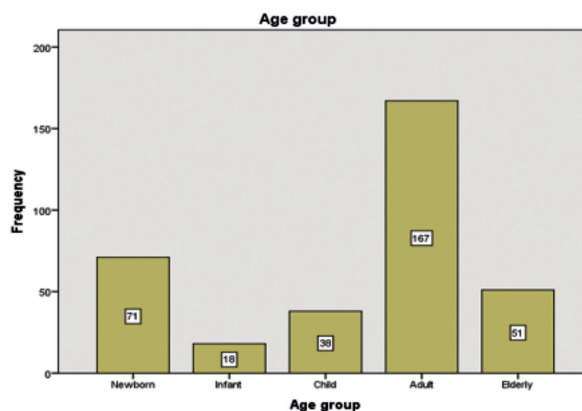


Figure 2. The distribution of cases according to age groups

Table 1. The median±standard deviation, minimum and maximum values of the demographic, medical and flight data

Demographic, medical and flight data	Mean±standard deviation (min.-max.)	Median	IQR (25-75)
Age (years)	32.19±24.5 (0-85)	30	9-52
Total flight time (minutes)	98.30±56.37 (20-418)	79	60.3-113.8
On reception BP (mean) mmHg	126.13±32.23 (21-281)	120.5	110-140
OR pulse/minute	101.94±30.80 (40-198)	95	78-124
OR respiratory rate/minute	21.69±13.45 (5-80)	16	15-20
OR SPO ₂ (%)	91.37±9.29 (40-100)	95	90-97
OR GCS	12.75±4.14 (3-15)	15	13-15
On delivery BP (mean) mmHg	125.14±26.42 (64-273)	120	110-136.6
OD pulse/minute	102.34±32.47 (0-209)	94	80-120.3
OD respiratory rate/minute	21.70±13.79 (0-85)	16	15-20
OD SPO ₂ (%)	96.11±6.13 (40-100)	98	95-100
OD GCS	12.69±4.24 (3-15)	15	13-15

OR: On reception, BP: Blood pressure, SPO₂: Saturation pressure of oxygen, GCS: Glasgow Coma Scale, OD: On delivery, IQR: Interquartile range, min.: Minimum, max.: Maximum

out of Erzurum. Eighty-one (90%) patients with trauma as the cause were delivered to Erzurum and 9 (10%) to sites out of Erzurum. Thirty-nine (86.7%) patients with obstetric preliminary diagnosis were delivered to Erzurum and 6 (13.3%) to sites out of Erzurum. Fifty-six (71.8%) newborn patients were delivered to Erzurum and 22 (28.2%) to sites out of Erzurum. While 4 (66.7%) burn patients were delivered to Erzurum, 2 (33.3%) were delivered to sites out of Erzurum. One flight took place for organ transplantation and that patient was delivered to Erzurum. Since no ECG data were found within the records, they could not be evaluated.

Flight data: The total flight times were analyzed. The longest flight time was 418 minutes and during summer, between Erzurum and Diyarbakır. The shortest flight time was 20 minutes and during summer, between Erzurum and its districts. The earliest departure time was 06:30, from Erzurum, with Samsun as the destination. The latest departure time was 18:16, between Erzurum and its districts.

No statistically significant difference was found between flight time and seasons ($p=0.563$). The mean total flight time was 98.3 ± 56.370 (20-418) minutes. In summer, it was found to be 107.78 ± 67.5 (20-418) minutes for 114 (33.5%) cases; in autumn, 101.4 ± 58.34 (42-337) minutes for 87 (25.6%) cases; in

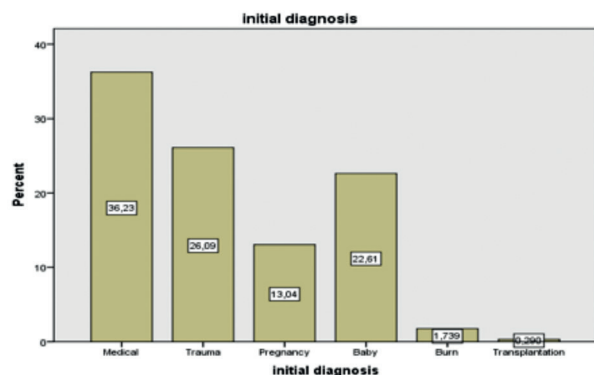


Figure 3. The preliminary diagnoses of patients who received emergency medical service

	Female	Male	Total	
Spring	34 (21%)	30 (16.4%)	64 (18.6%)	$p=0.099$
Summer	50 (30.9%)	64 (35%)	114 (33%)	$p=0.099$
Autumn	34 (21%)	54 (29.5%)	88 (25.5%)	$p=0.099$
Winter	44 (27.1%)	35 (19.1%)	79 (22.9%)	$p=0.099$
Total	162	183	345 (100%)	$p=0.099$

winter, 89.92 ± 44.83 (34-239) minutes for 76 (22.4%) cases; and in spring, 87.19 ± 39.73 (38 to 236) minutes for 63 (18.5%) cases.

Geographic data: The departure points of air ambulance were Erzurum, Sivas, Adana, Diyarbakır, and Van; the arrival points of air ambulance were Erzurum, Sivas, Adana, Diyarbakır, Van, Gaziantep, Muş, Gümüşhane, Trabzon, Şanlıurfa, Erzincan, Malatya, Batman, Ardahan, Samsun, Kayseri, Ankara, Ağrı, Bingöl, and Elazığ; the sites that the patients were received (PRS) were identified as Erzurum, Sivas, Iğdır, Diyarbakır, Van, Rize, Muş, Artvin, Trabzon, Siirt, Erzincan, Kars, Tunceli, Ardahan, Bitlis, Hakkari, Batman, Ağrı, Bingöl, and Elazığ and the sites that the patients were delivered were found to be Erzurum, Sivas, Gaziantep, Muş, Adana, Diyarbakır, Van, Erzincan, Malatya, Batman, Ardahan, Samsun, Kayseri, Ankara, Ağrı, Bingöl, Elazığ, Gümüşhane, and Trabzon (Table 3, 4).

Table 3. The relationship of geographic data with seasons and gender

Geographic data	Winter	Spring	Summer	Autumn
AADP Erzurum	78	63	14	87
AADP out of Erzurum	-	1	-	1
AAAP Erzurum	4	56	4	68
AAAP out of Erzurum	5	8	-	20
PRS Erzurum	4	50	5	56
PRS out of Erzurum	5	14	9	32
PDS Erzurum	5	52	1	67
PDS out of Erzurum	4	12	3	21

AADP: The departure points of air ambulance, AAAP: The arrival points of air ambulance, PRS: The sites that the patients were received, PDS: The sites that the patients were delivered

Table 4. The relationship of geographic data with gender

Geographic data	Female	Male	Total
AADP Erzurum	161 (99.4%)	181 (98.9%)	342 (99.1%)
AADP out of Erzurum	1 (0.6%)	2 (1.1%)	3 (0.9%)
AAAP Erzurum	127 (78.4%)	155 (84.7%)	282 (81.7%)
AAAP out of Erzurum	35 (21.6%)	28 (15.3%)	63 (18.3%)
PRS Erzurum	104 (64.2%)	121 (66.1%)	225 (65.2%)
PRS out of Erzurum	58 (35.8%)	62 (33.9%)	120 (34.8%)
PDS Erzurum	123 (75.9%)	152 (83.1%)	275 (79.7%)
PDS out of Erzurum	39 (24.1%)	31 (16.9%)	70 (20.3%)

AADP: The departure points of air ambulance, AAAP: The arrival points of air ambulance, PRS: The sites that the patients were received, PDS: The sites that the patients were delivered

No statistically significant difference was found between genders in terms of geographic data. When analyzed according to the departure points of the air ambulance, in females, Erzurum was identified in 161 (99.4%) cases and a site out of Erzurum in 1 (0.6%) case; in males, Erzurum was in 181 (98.9%) cases and a site out of Erzurum in 2 (1.1%) cases ($p=0.546$). When analyzed according to the arrival point of air ambulance, in females, Erzurum was identified in 127 (78.4%) cases and a site out of Erzurum in 35 (21.6%) cases; in males, Erzurum was the arrival point in 155 (84.7%) cases and a site out of Erzurum in 28 (15.3%) cases ($p=0.085$). When analyzed according to the site that the patient was received, in females, Erzurum was found in 104 (64.2%) cases and a site out of Erzurum in 58 (35.8%) cases; in males, Erzurum was the patient reception site in 121 (66.1%) cases and a site out of Erzurum in 62 (33.9%) cases ($p=0.397$). When analyzed according to the site that the patient was delivered, in females, Erzurum was identified in 123 (75.9%) cases and a site out of Erzurum in 39 (24.1%) cases; in males, Erzurum was the delivery site in 152 (83.1%) cases and a site out of Erzurum in 31 (16.9%) cases ($p=0.066$).

Discussion

The pre-hospital emergency medical services are observed to be evolving quite rapidly throughout the world and also in our country. The data and quantity of studies on pre-hospital health care, which is a new field in our country, are not sufficient. Further studies evaluating the impact of transfer times in inter-hospital transport on patients' disorders are necessary. We hope that our study, by presenting the data of air ambulance services in our region, will contribute to the literature and lead to more comprehensive studies in the future.

Emergency department faced by patients with various health statuses and responsible for providing the best service as soon as possible, is a difficult field of medicine. In our country, emergency aid and rescue operations are performed mostly by 112 Emergency Health Services, which is affiliated to the Ministry of Health. However, when compared to developed countries, the ambulance helicopter service is quite new. The transports in this study were mostly for patients referred from lower-level hospitals to fully equipped ones, for further diagnostic and therapeutic management.

In our study, the patients were found to be most commonly transferred during summer (33%). This was considered to be due to the fact that people are being more mobile in summer season, due to weather conditions being convenient in Eastern Anatolia region.

In our study, the most frequently identified group of causes for transport of the patients was medical. Of these patients, 82 were male and 43 were female. Although 24 males were transferred in the autumn for medical causes, the number of male patients transferred for trauma was 25 during the summer. The reasons for trauma being more common in summer may be traffic accidents, fights for water in rural areas and agricultural workers and construction sector being more active. A total of 47 females, being most frequently in the neonatal period, were transported. Although 15 cases were transferred most frequently in the summer, a total of 45 cases were transported due to pregnancy. The number of cases transported for pregnancy was 16 in the winter. During the winter, the rural roads are closed due to bad weather conditions. Therefore, it was considered that ambulance helicopter was preferred to deliver pregnant women to the hospitals quickly and safely.

The average age of the 347 patients included in the study was 32.19 ± 24.5 years (0-85). When the patients were classified according to their age groups, the majority (48.4%) were adults (18-65). The second row belonged to newborn patients (0-28 days) with the rate of 20.6%. In similar studies, the age distribution range of patients transported by air ambulance has been observed to be quite wide (35-66 years) (5-7). Various data on the average age of transported patients exist in the literature. In a study conducted by Wong and Lau (7), the majority of patients were reported to be in the elderly group (over 65 years of age). In some other studies (6,8,9), the adult patients were reported to constitute the majority of patients transported by the air ambulance (53.3%), consistent with our results. This led us to consider that, since the working populations in Eastern Anatolia were usually adult males, they were the group who were most frequently exposed to stress, trauma and accidents.

In our study, the burn patients constituted 1.74% of the transferred cases. They were transported most frequently in the summer. The most convenient times for flight in the summer are 4th and 7th days. Since fluid

loss is increased due to decreasing moisture during flight, precautionary measures such as adequate fluid replacement, insertion of Foley catheter and changing the burn wound dressings should be performed during flight. Patients having 3rd degree and greater than 40% burns should be considered to be included in the risk group (5). In a study conducted in the United Kingdom, investigating the ambulance helicopter transport of burn patients, it was concluded that in terms of both costs and medical point of view, decision to transfer the patient by air ambulance was wrong in 26% of burn patients and they should have been transferred by ground ambulances instead (5).

The average GCS score of patients in our study was 12.8 during reception and 12.7 when delivered. We suggest that although the records were not kept very orderly, since a great difference between the two values was not detected, the intervention regarding vital signs was adequate and they were fairly stabilized during their transport by ambulance helicopter.

In our study, one male patient was transported for organ transplantation during the autumn. An organ transplantation case, in which the time, even the minutes are very important, existing in our study group is quite gratifying. We consider that increasing the number of such flights will increase the quality of life.

It is obvious that the helicopter flight time constitutes an important place in patient transport time in air ambulance. When the flight time of ambulance helicopter was investigated, the average flight time was found to be 98.30 ± 56.370 (20-418) minutes. This time period was recorded as 213 (60-515) minutes in a study conducted (8) by Norum and Elsbak (10).

In our study, the longest average flight time was 107.78 ± 67.5 (20-418) minutes in the summer season. Since the daylight periods are longer and the number of flights is increased accordingly, and additionally, the weather conditions being good, we consider that the flight distances and times are increased.

Conclusion

The geographic condition of the region in which air transport is performed is important. Ambulance helicopters are affected by strong winds, darkness,

and weather conditions of winter (11-13). While 114 flights were performed with Erzurum as the take-off point, no flight with take-off point out of Erzurum was found during the same season.

Limitations of the Study

The single-center and retrospective design was a limitation of our study. Multi-centered and prospectively performed studies are needed on this subject. Additionally, lack of some study records was another limitation and we were not able to acquire the data of these patients following their delivery to the hospital.

Acknowledgement: I would like to thank the Emergency Health Services Department affiliated to Provincial Directorate of Health.

According to the regulation on clinical trials of pharmaceutical and biological products Chapter 1, Matter 2- (2), retrospective studies are beyond the scope of this regulation.

Ethics

Ethics Committee Approval: Since it was a prospective study, we did not obtain Ethics Committee Approval, **Informed Consent:** Patient informed consent was not received, because we did not meet patients in our study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.T.A.G., A.B., **Concept:** A.B., **Design:** H.Ş., **Data Collection or Processing:** S.T.A.G., H.Ş., **Analysis or Interpretation:** A.B., **Literature Search:** H.Ş., S.T.A.G., **Writing:** A.B., S.T.A.G.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Yenice H, Köksal Ö, Armağan E, Köse A, Çetinkaya HB, Sığırlı D. The Evaluation of Patients Transported to a University Hospital Emergency Department with Air Ambulance. *Uludağ Medical Journal* 2013; 39: 105-10.
2. Lam DM. To pop a balloon: aeromedical evacuation in the 1870 siege of Paris. *Aviat Space Environ Med* 1988; 59: 988-91.

3. Macnab AJ, Freeman J, Sun C. Air evacuation: costs, benefits, and priorities. *BC Med J* 1995; 37: 251-6.
4. Köse A, KÖSE B, Akpınar AA, Köksal Ö, Aydın Ş, Armağan E. Characteristics of patients transferred by air: a descriptive epidemiologic study. *Turk J Med Sci* 2012; 42: 876-85.
5. Chipp E, Warner RM, McGill DJ, Moiemmen NS. Air ambulance transfer of adult patients to a UK regional burns centre: Who needs to fly? *Burns* 2010; 36: 1201-7.
6. Sand M, Bollenbach M, Sand D, Lotz H, Thrandorf C, Cirkel C, et al. J Epidemiology of aeromedical evacuation: an analysis of 504 cases. *Travel Med* 2010; 17: 405-9.
7. Wong TW, Lau CC. Profile and outcomes of patients transported to an accident and emergency department by helicopter: prospective case series. *Hong Kong Med J* 2000; 6: 249-53.
8. Özşahin A, İnan F, Sofuoğlu T, Taviloğlu K, Ertekin C, Güloğlu R. Scene transplant patients Evaluation Inc. Trauma Resuscitation Department. Lodos Publishing İstanbul 2006; 21-42.
9. Pasquier M, Geiser V, Riedmatten MD, Carron PN. Helicopter rescue operations involving winching of an emergency physician. *Injury* 2012; 43: 1377-80.
10. Norum J, Elsbak TM. Air ambulance services in the Arctic 1999-2009: a Norwegian study. *Int J Emerg Med* 2011; 4: 1.
11. Leaman AM, Nutbeam T. Trauma systems and medical helicopters in the UK. *Injury* 2011; 42: 12-4.
12. Menteş MO, Akinci H. Aeromedical evacuation of critically ill and injured patients. *Ulus Travma Acil Cerrahi Derg* 2006; 12: 1-8.
13. Gray A, Bush S, Whiteley S. Secondary transport of the critically ill and injured adult. *Emerg Med J* 2004; 21: 281-5.