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ORIGINAL ARTICLE

The Evaluation of In-Hospital Transportation of Emergency Room Critically Ill Patients

Acil Servis Kritik Alan Hastalarının Hastane İçi Transportunun Değerlendirilmesi

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ABSTRACT

Objective: The overcrowding of emergency departments, insufficient bed capacity in these units, lack of integrated radiology units and the distance of other departments and intensive care units from the emergency department make it inevitable to transport patients within the hospital for either short-term or long-term purposes. Patients can be transported at least once for diagnostic and treatment procedures to radiology units, operating rooms, or intensive care units for admission. However, even during short-term patient transport in critical situations, complications may arise.
Materials and Methods: This study evaluates the data obtained prospectively by examining the transport information of 588 patients who met the study criteria in an eight-month period in the emergency department of a university hospital in 2020. The study is designed to assess survival, disability, and the safe transport process of critically ill patients transported from the emergency department to hospital imaging, interventional procedures, surgery and admission units. For statistical analysis of the data, independent sample t-test was used for normally distributed variables, Mann-Whitney U test when the normality assumption was not met and chi-square, ANOVA tests were used for the comparison of categorical variables. The significance level for all hypothesis tests was set at 0.05.
Results: Of the 588 patients included in the study, 36.9% were female and 63.1% were male, with an average age of 61.9 years. The average transport time for patients transferred for examination, admission or interventional procedures was 18.5 minutes. 63.3% of the transferred patients sought medical attention during the night shift. During transport, 51.7% of patients experienced problems. Among the issues encountered during transport, 48.3% were related to the system, 27% were related to equipment and 24.7% were related to human factors. The most common problem, accounting for 23.0%, was waiting in radiology units or corridors for radiology examinations and interventional procedures.
Conclusion: In critically ill patients in the emergency department, the most common transport problems occur when planned examinations take place outside the emergency department. Therefore, the necessity of these requests should be carefully evaluated to reduce complications that may occur during transfer. The physical organization of emergency departments should be designed to facilitate the transfer of critical patients as quickly as possible to prevent problems that arise due to prolonged transfer times.

Keywords: Emergency department, In-Hospital transport, Intensive care, Critically patient, Complication

ÖZ

Amaç: Acil servislerin yoğunluğu, bu ünitelerde yeterli yatak kapasitesinin olmaması, bütünleşmiş radyoloji birimlerinin olmaması, diğer servis ve yoğun bakımların acil servisten uzakta olması hastaların hastane içi uzun veya kısa süreli transportunu kaçınılmaz kılmaktadır. Hastalar en az bir defa tanı ve tedavi amaçlı girişimler için radyoloji birimlerine, ameliyathaneye ya da yatış amaçlı yoğun bakım ünitelerine transport edilebilmektedir. Ancak kritik durumda olan bu hastaların kısa süreli transportu sırasında bile komplikasyonlar gelişebilmektedir.
Gereç ve Yöntem: Bu çalışma 2020 yılında bir üniversite hastanesinin acil servisinde sekiz aylık bir süreçte, çalışma kriterlerini sağlayan 588 hastanın transport bilgilerinin prospektif olarak incelenmesi sonucu elde edilen verileri değerlendirmiştir. Çalışma, acil servisten hastane içi görüntüleme, girişimsel işlem, operasyon, yatış için transport edilen kritik hastalarda sağkalım, sakatlık ve güvenli transport sürecini değerlendirmek amacıyla planlanmıştır. Verilerin istatistiksel analizinde normal dağılım gösteren verilerde bağımsız gruplarda t-testi; sağlanmadığı durumlarda Mann-Whitney U testi, kategorik değişkenlerin karşılaştırılmasında, ki-kare ve ANOVA testi kullanılmıştır. Tüm hipotez testlerinde anlamlılık düzeyi 0.05 alınmıştır.
Bulgular: Çalışmaya alınan 588 hastanın %36,9'u kadın ve %63,1'i erkek cinsiyette ve yaş ortalamaları 61,9 yıl olarak saptanmıştır. Hastaların tetkik, yatış veya girişimsel işlem için ortalama transport süresi 18,5 dakika sürmüştür. Transport edilen hastaların %63,3'ü gece vardiyasında başvurusu olan hastalardır. Transport sırasında hastaların %51,7'sinde sorun yaşanmıştır. Transport sırasında yaşanan sorunların %48,3'ü sistem kaynaklı, %27'si ekipman kaynaklı ve %24,7'si insan kaynaklıdır. En sık yaşanan sorun, %23,0'ü radyoloji tetkik ve girişimsel işlemler için radyoloji ünitelerinde veya koridorlarda sıra bekleme olarak belirlenmiştir.
Sonuç: Acil servisteki kritik hastalarda, en fazla yaşanan transport sorunlarının planlanan tetkiklerin acil servis dışındaki birimlerde yaşandığı görülmektedir. Bu nedenle bu istemlerin gerekliliklerinin önemle değerlendirilmesi transfere bağlı gelişebilecek komplikasyonları azaltmaya yardımcı olabilecektir. Acil servislerin fiziki yapılanmasının kritik hasta transportunu en kısa sürede sağlayacak şekilde konumlanması, transfer süresinin uzamasıyla gelişen sorunların önlenmesinde önemli bir konu olarak görülmelidir.

Anahtar kelimeler: acil servis, hastane içi transport, yoğun bakım, kritik hasta, komplikasyon

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Introduction

The term "critically ill patient" is used for patients whose vital functions are unstable, undergoing supportive treatment, or predicted to deteriorate, and who are generally being monitored and treated in emergency departments or intensive care units (ICUs) (1,2,3,4). Patients, who arrive at the emergency department either on foot or by ambulance and are assessed as critical, may be transferred to other units within the hospital for examinations, interventions or hospitalization purposes. The high patient volume of emergency departments, inadequate bed capacity in these units, the absence of integrated radiology units, and the distance of other departments and ICUs from the emergency department make intra-hospital transport of patients, both short and long-term, inevitable. Patients may need to be transported to radiology units, operating rooms, or other ICUs at least once for diagnostic, therapeutic or hospitalization purposes (5). However, even during short-term transport of critically ill patients, complications can arise (6, 7, 8). Unfortunately, these problems occurring during critical patient transport can significantly increase the risk of morbidity and mortality (4, 9). The limited number of studies on this subject in our country and the inadequacy of protocols for assessing the patient's condition before and after transportation in today's hospital records have led to the planning of this study to evaluate survival, disability, and the safe transportation process of critically ill patients transported from the emergency department to hospital imaging, interventional procedures, operations and hospitalization units.

Materials and Methods

This research was conducted as a prospective and observational study, approved by the Ege University Non-Interventional Research Ethics Committee with decision number 20-4T/35 on April 6, 2020. The study was carried out in the Emergency Department of Ege University Faculty of Medicine Hospital (EUFMH) and included a total of 588 patients over an 8-month period. All patients admitted to the Emergency Department and met the inclusion criteria for critically ill patients in the triage category were included in the study, and no sampling method was used.

The inclusion criteria for the study were defined as patients of all age groups who met the definition of a critically ill patient in the triage category and were indicated for intra-hospital transportation by the primary emergency physician. The definition of a critically ill patient was determined using a diagnostic model and an objective parameter model. Patients who did not meet the study criteria, those considered suitable for inter-institutional transportation, and those who did not provide consent were excluded from the study.

The dependent variables of the study included mortality during transportation, morbidity during transportation, and problems during transportation (related to human, equipment, and/or system). The independent variables were the patients' socio-demographic characteristics, indications, time, duration, medical diagnosis, method of transportation, unit transported to, presence of trauma, number of accompanying persons during transportation, equipment used, pre-transportation communication, and vital signs and coma scale of the patients. The data of the enrolled patients were recorded using a data form consisting of twenty questions, immediately before transportation, during transportation and immediately after transportation. The questions in the data form were created by the researchers to define the dependent and independent variables and were reviewed by two emergency medicine specialists and an intensive care specialist as independent observers, and the final version was used.

In some patients included in the study, necessary radiological tests were performed while they were being transported to the hospitalization unit to prevent delays in life-saving interventions, based on the decision of the responsible primary emergency physician. Due to the physical organization of the hospital where the study was conducted, intra-hospital transportation was performed using stretchers or ambulances.

The problems encountered during transportation, one of the dependent variables of the study, were categorized as system-related, equipment-related and human-related. In cases of multiple transports for a patient, the transport sequence number and total transport count were recorded.

For the statistical analysis of the data, the independent t-test was used for normally distributed data in independent groups, and the Mann-Whitney U test was used when the normality assumption was not met. For the comparison of categorical variables, chi-square and ANOVA tests were used. The significance level was set at 0.05 for all hypothesis tests, and IBM SPSS Version 25.0 software was used for the analyses.

Results

The study included a total of 588 patients, of which 36.9% were female and 63.1% were male, with an average age of 61.9 years. The mean transportation time for patients undergoing examinations, hospitalizations or interventional procedures was 18.5 minutes. Regarding the systematic classification of patients' diagnoses, 28.6% were respiratory system diseases, 23.1% neurological diseases, 17.7% cardiovascular diseases, and 14.6% were diagnosed with sepsis. It was observed that the most common reason for transportation (51.4%) was for radiological examinations. The average duration of transportation for radiological examinations was 18.0 minutes while for hospitalization procedures, it was 16.7 minutes. About 63.3% of the transported patients were admitted during the night shift. Among the patients, 85.9% were non-traumatic cases. The rate of sending patients without contacting the unit to which transportation would be made before the transfer was 41%. Sedans were used for 90% of the transports while ambulances were used for the remaining 10%. During transportation, 65% of

Table 1. Transport-Related Descriptive Characteristics

Gender	Number (n)	Percentage (%)
Female	217	36.9
Male	371	63.1
The average age is 61.9 years		
Transport time averaged 18.5 minutes		
Diagnose according to system	n	%
Respiratory System Diseases	168	28.6
Neurological Diseases	136	23.1
Cardiovascular Diseases	104	17.7
Sepsis	86	14.6
Trauma	76	12.9
Metabolic Diseases	48	8.2
GIS Diseases	39	6.6
Covid-19	38	6.5
Post Arrest Syndrome	20	3.4
Premature Birth/Abnormal Pregnancy	2	0.3
Transported Unit		
Radiology	302	51.4
Service or ICU Hospitalization	218	37.1
Interventional Procedure	44	7.5
Surgery	24	4.1
Transported Shifts		
Day	216	36.7
Night	372	63.3
Patient Profile		
Trauma	83	14.1
Non-Trauma	505	85.9
Transport Mode		
Stretcher	529	90.0
Ambulance	59	10.0
Communicating with the Pre-Transport Unit		
No	241	41.0
Yes	347	59.0
Respiratory Support During Transport		
Intubated Patient	184	31.3
Intubated -MV	180	30.6
Intubated -BVM	4	0.7
Treatment During Transport		
No	382	65.0
Vasopressor-Inotrope	134	22.8
Antihypertensive	52	8.8
Blood Transfusion	15	2.6
Antiarrhythmic	4	0.7
Thrombolytic	1	0.2
Number of Health Workers in Transport		
1 health worker	237	40.3
2 or more health workers	351	59.1
Accompanying Health Worker		
Patient Transport Staff	533	90.6
Assistant Doctor	284	48.3
EMT	61	10.4
Intern Doctor	34	5.8
Nurse	3	0.5
Specialist Doctor	1	0.2
Patient Relative	13	2.2
Patient Admission / Transfer Place		
Emergency room	330	56.1
Anesthesia ICU	66	11.2
Cardiology	43	7.3
Covid-19 ICU	25	4.3
Chest Diseases ICU	19	3.2
Neurosurgery ICU	17	2.9
Cardiovascular Surgery ICU	15	2.6
Internal Medicine ICU	13	2.2
Neurology ICU	13	2.2
General Surgery	11	1.9
Other	36	6.1

ICU: Intensive Care Unit. EMT: Emergency Medical Technician. GIS: Gastrointestinal System. Covid-19: severe acute respiratory syndrome coronavirus 2. MV: Mechanical ventilation. BVM: Balloon Valve Mask

Table 2. Descriptive Characteristics of Transport-Related Problems

Problems	Number (n)	Percentage (%)
Source of the problem		
System	147	48,3
Equipment	82	27,0
Human being	75	24,7
Cause of the problem		
Long Queue Waiting Time	70	23.0
The patient's bed in the Service Is Not Ready	42	13.8
Faulty Infusion Pump Device	22	7.2
Delay in Intra-Hospital Distance	19	6.3
Elevator Failure	17	5.6
Removal or Non-Operation of the Vascular Tract	13	4.3
Emergency IT Unit Is Closed (Defective/Cleaning, etc.)	13	4.3
Going on Transfer with a Broken Stretcher	11	3.6
Relocation/Exit of ETT	10	3.3
Inadequate Patient Sedation/Agitated Patient	10	3.3
Running Out of Oxygen Cylinder	10	3.3
Pulse oximeter not working/defective	9	3.0
Patient Arrest	9	3.0
Unencoded Request/Request Does Not Come Out in the System	8	.6
MV circuit disengagement/oxygen connection disconnection	7	2.3
Failure to Perform Systemic or Patient-Induced Imaging/Procedure	7	2.3
Vomiting to prevent transfer in the patient	5	1.6
Lack of Availability of Patient Hospitalization-Emergency Transfer	5	1.6
Waiting for an ambulance	4	1.3
Waiting at the ICU Gate	4	1.3
MV Failure/False/Out Mode Operation	4	1.3
Absence of Radiology Technician on Site	2	0.7
Defibrillator Failure	2	0.7
Transfer without Infusion Pump	2	0.7
NG Probe Exit	1	0.3
Patient and Patient Relative Dissatisfaction	1	0.3
Removal of Drainage Connection with Thoracic Tube	1	0.3
Incorrect ID Armband -Wrong/Belonging to Another Patient	1	0.3
Transport time for those who do not develop problems during transport is 14 minutes	p<0.001**	
Transport time for those who develop problems during transport is 18 minutes		

EET: Endotracheal Intubation Tube, MV: Mechanical Ventilation, NG: Nasogastric Tube, CT: Computed Tomography,

ICU: Intensive Care Unit,**Independent Sample T test)

Table 3. The Relationship of Transport-Related Problems with Independent Variables

Arguments	No Problems Experienced		Human Related		System-Related		Equipment Related		p
	n	x□	n	x□	n	x□	n	x□	
Transport time	284	14.00	75	16.00	147	20.00	82	16.00	**<0.001****
Transport time									
Day	102(47.2%)		21(9.7%)		60(27.8%)		33(15.3%)		0.258**
Night	182(48.9%)		54(14.5%)		87(23.4%)		49(13.2%)		
Transport Indication									
Radiology	124(41.1%)		51(16.9%)		77(25.5%)		50(16.6%)		**0.001***
Hospitalization	123(56.4%)		15(6.9%)		59(27.1%)		21(9.6%)		
Interventional	27(61.4%)		7(15.9%)		5(11.4%)		5(11.4%)		
Surgery	10(41.7%)		2(8.3%)		6(25.0%)		6(25.0%)		
Transport mode									
Stretcher	264(49.9%)		68(12.9%)		127(24.0%)		70(13.2%)		0.077**
Ambulance	20(33.9%)		7(11.9%)		20(33.9%)		12(20.3%)		
Treatment During Transport									
No	178(48.8%)		46(12.6%)		102(27.9%)		39(10.7%)		**0.013****
Yes	106(47.5%)		29(13.0%)		45(20.2%)		43(19.3%)		
Spontaneous Breathing									
No	39(48.8%)		11(13.8%)		12(15.0%)		18(22.5%)		**0.035****
Yes	245(48.2%)		64(12.6%)		135(26.6%)		64(12.6%)		
Use of Transport Material									
No	45(47.9%)		11(11.7%)		33(35.1%)		5(5.3%)		**0.014****
Yes	239(48.4%)		64(13.0%)		114(23.1%)		77(15.6%)		
Communicating with the Unit									
No	80(33.2%)		23(9.5%)		103(42.7%)		35(14.5%)		**<0.001****
Yes	204(58.8%)		52(15.0%)		44(12.7%)		47(13.5%)		

*one-way Anova test. **Independent Sample T test)

Table 4. Examination of Transports of Patient Transport Personnel and Physician-Supported Team

		Transport with Single Patient Transport Staff **Number (n) Percentage (%)**		Transport Accompanied by Assistant physician Number (n) Percentage (%)	
Communication with the Counterparty Before Transport	Not made	162	68.4	57	20.1
	Was made	75	31.6	227	79.9
	Sum	237	100	284	100
Issue development status	No Problems Experienced	112	47.3	140	49.3
	Problem Experienced	125	52.7	144	50.7
	Sum	237	100	284	100
The Source of the Developing Problem	System	81	64.8	45	31.3
	Equipment	22	17.6	53	36.8
	Human being	22	17.6	46	31.9
	Sum	125	100	144	100

the patients received vasoactive-inotropic treatment, 25% received antihypertensive treatment, and 2.6% were transferred with blood transfusion. Among the patients, 184 were intubated before transportation, and 180 of them were transported with mechanical ventilation support. During transportation, 59.7% of the patients were accompanied by two or more healthcare workers. The most common healthcare worker accompanying the patients (90.6%) was transportation personnel. After transportation, 56.1% of the patients were transferred back to the emergency department. The most common units where patients were admitted after transportation were the Anesthesia ICU (11.2%), followed by the Cardiology ward (7.3%), and the COVID-19 ICU (4.3%). During transportation, 51.7% of the patients experienced problems (Table 1). The problems encountered during transportation were 48.3% system-related, 27% equipment-related and 24.7% human-related. The most frequent problems were waiting in radiology units or corridors for radiological examinations and interventional procedures (23.0%), unavailability of space in the unit to which the patient was transported for hospitalization or surgery (13.8%), infusion pump device malfunction

(7.2%), hospital crowding and delays within the hospital due to elevator failures (6.3%) and vascular access problems (4.3%). The median transportation time for patients without problems during transportation was 14 minutes, while for those with problems, it was 18 minutes. The difference between the two groups was statistically significant (p<0.001) (Table 2).

During transportation, the median transportation time was 16 minutes for human-related problems, 20 minutes for system-related problems, and 16 minutes for equipment-related problems, and the difference between these groups was statistically significant (p=<0.001). Problems during transportation were more frequently experienced during the night shift. There was a statistically significant relationship between the indication for transportation and the source of problems that occurred during transportation (p=0.001). Similarly, there was a statistically significant relationship between medication use during transportation and the source of problems (p=0.013). For equipment-related problems, the rate was 10.7% among those who did not use medications whereas it increased to 19.3% for those who used medications. The presence of spontaneous respiration during transportation also showed a statistically significant relationship with the source of problems (p=0.035). Among those with no spontaneous respiration, the most common source of problems was equipment-related (22.5%).

Regarding communication with the opposite side before transportation, the most common source of problems (42.7%) was system-related (Table 3).

In the study, 284 transports were performed with the participation of residents. While problem reporting was not done in 49.3% of transports with residents, problems occurred in 50.7% of the transports. The rate of system-related problems was 33.2% in transports without residents whereas it was 15.8% in transports with residents (Table 4).

Discussion

The emergency departments accept patients of all age groups continuously and provide initial interventions to patients in need of emergency healthcare services. Emergency departments have a wide range of patient diversity.

In our study, the average age of patients was higher than the average ages reported in other studies of patients admitted to the emergency department in our country (10,11). In the study by Hurst et al. (12), which aimed to determine the adverse effects of in-hospital transfers and included 100 patients, the average age of the patients was 60. In the study by Indeck et al. (13), which aimed to determine the risks and benefits of in-hospital transports and included 56 patients, the average age of the patients was 48. In the study by Knaus et al. (14), which evaluated in-hospital transfer procedures and included 286 critically ill patients, the average age of the patients was reported as 51. The higher average age in our study can be explained by the increasing number of elderly patient populations admitted to the emergency department in recent years, the association of critical findings and diagnoses with patient age in the enrolled patients, the low rate of hospitalizations from the emergency department in our hospital, and the necessity of in-hospital transport for these patients due to their prolonged stay in the emergency department and for radiological procedures.

One of the criteria to be considered for critically ill patients planned to be transported from the emergency department is the transfer time. The primary emergency physician who decides on the patient's transport should consider the benefit-to-harm ratio and approve the transportation to be carried out at the most appropriate time, with a ready team, and in the shortest possible time. In this study, the average transportation time for patients undergoing examinations, hospitalizations or interventional procedures was found as 18.5 minutes. In the literature, the average transfer time is reported to range from 17 to 81 minutes (13,15,16,17). The shorter average transfer time in our study compared to the literature can be explained by the fact that patients are most frequently transported for radiological procedures within the emergency department and fewer transports occur outside the emergency department.

The transportation of the patients included in the study was most frequently performed during the night shift, and no statistically significant difference was found between the shift hour and the problems associated with transport. There are almost no studies in the literature that examine the problems experienced during the transportation of emergency department patients according to the working shift. A study conducted in the United States reported that patient transfers and problems were less frequent outside of regular working hours (18). In the emergency department where the study was conducted, the longer working hours during the night shift may explain the increase in the number of patient transports and the occurrence of problems.

In this study, non-traumatic patients were in the majority among the critically ill patients transported. There are very few studies in the literature focusing on the relationship between the profile of critically ill patients and the problems encountered. In this study, the average transport time for patients transported for non-traumatic reasons was 15 minutes. The use of materials such as trauma boards, splints, traction devices, and chest tubes required for trauma patients and the time spent on patient transfer between stretchers might account for the time difference.

In this study, it was found that most transports were made to radiology units. The presence of a CT scan device in the emergency department where the study was conducted resulted in shorter transport times for this test. In a study conducted by Damm et al. (19) in 2005, out of 123 transports, 64 were for radiological tests and 59 were for hospitalization or surgery (19). The patient transfer indications in this study were like

those reported in other studies (17,20). For patients diagnosed with COVID-19 and viral pneumonia, their admissions were made to the COVID-19 intensive care unit located on the upper floor of the emergency department, resulting in significantly shorter transport times. Therefore, the importance of having intensive care units close to the emergency department's physical location was evident, and reducing transport times could prevent potential problems. Similar recommendations are also present in relevant studies (21,22).

In the emergency department, some of patients' treatments need to be continued during transportation, and patients are transported with these ongoing treatments. In the study, 35% of the patients were transferred while receiving infusion therapy and undergoing blood transfusions. Among these patients, 52.4% experienced problems during the transfer. Some studies in the literature have reported problems and complications related to ongoing treatments, vascular access, and infusion pumps during transportation of patients who continue to receive treatment (4, 5, 7, 8, 19, 20, 23).

Of the transported patients, 13.6% were non-spontaneous breathing patients, and 184 patients were transported with intubation. In 6.6% of the transported patients, hypoxia developed during transportation. Studies suggest that hypoxic problems can occur during transportation and emphasize the importance of appropriate intubation before transport for critically ill patients to protect them from hypoxia. However, problems such as the displacement or removal of the endotracheal tube, disconnection of oxygen circuits, or depletion of oxygen cylinders can occur during the transport of intubated patients (20, 23-26).

In critically ill patients presenting to the emergency department, invasive procedures can be performed shortly before or after arrival, and materials and devices necessary for continuous monitoring and treatment can be applied. In the study, material and equipment-related problems during transportation accounted for 27% of all problems encountered. The literature reports varying rates of equipment-related problems, ranging from 25% to 68%, including issues with vascular access, Foley catheters, and endotracheal tube displacement during transport (5, 7, 12, 17, 20, 23, 27).

Another important consideration before conducting the transfer of a critically ill patient is planning the team members who will accompany the patient during the transport. Most transports were conducted with non-trained patient transport staff. Transports with two healthcare workers were performed with either assistant physicians or two emergency medical technicians in hospital ambulances. In cases where patients were intubated, assistant physicians or interns accompanied emergency medical technicians in the ambulance. Among transports without problems, 51.8% were carried out with a team of two people, and this rate is consistent with similar studies in the literature (22, 28). Studies have emphasized that a critical patient's transport should be accompanied by a minimum of two individuals, one being a trained transport staff with critical patient care orientation and education and the other being a nurse with critical patient education (29). Evans et al.'s study (15) demonstrated a 15.5% reduction in complications during transport with a team of specially trained personnel for critical patients. Studies have also stressed that for critically ill patients who require mechanical ventilator support and are intubated, there must always be a physician or respiratory therapist to accompany the patient during transportation (27, 29). The high number of single-person patient transports in the study may be attributed to inadequate human resources.

In the study, system-related issues were identified as the primary concerns. These issues include patients waiting in front of radiology units or being kept on emergency department stretchers because rooms or beds are not ready in the units to which they are transported. For patients who are not in communication with the unit where they will be admitted prior to transport, the waiting time is prolonged due to the unit's unpreparedness. This leads to problems with equipment, such as infusion pumps running out of charge or oxygen tubes depleting, which are the most frequently encountered problems.

Effective communication with the relevant units and adherence to pre-transport protocols are crucial to prevent these complications. Studies in the literature have emphasized the importance of inter-unit communication (4, 25). In a study by Beckmann et al. (20) in 2004, it was found that establishing communication with the unit where the patient will be transferred affects the duration of transport, and they provided recommendations for keeping elevators ready and empty for cases involving elevator use (20).

The study identified patient-related problems as hypoxia, hypotension, and a decrease in the coma scale score, respectively. Wallen et al. (29) reported problems with hypoxia and decreased oxygen saturation in patients during transfers. In the study by Jalali and Rezaei (30), problems experienced by healthcare providers accompanying patient transport were considered as human-related problems. They emphasized that the team's training and experience play a significant role in preventing encountered problems.

In the study, equipment-related issues were primarily identified as the infusion pump not functioning or its battery running out. The subsequent problems were identified as the intravenous line not working and issues with the patient transport stretcher being faulty. Some studies evaluating equipment problems have considered the depletion of device batteries as life-threatening issues (7, 8, 20, 28, 31). Other studies in the literature have also included the exhaustion of oxygen cylinders and device batteries in this risk category, highlighting the potentially fatal consequences, especially when interruptions occur in the infusion of antiarrhythmic drugs due to equipment-related

problems (20, 27).

In the study, it was noticed that attention should be paid to the intravenous line during the transport of patients receiving treatment. A nurse was called from the unit to reestablish intravenous access, and the patient was kept in the radiology room while waiting for the new intravenous line to be established. Having a secure intravenous line in critically ill patients is crucial and a vital necessity (23, 29).

The relationship between systemic issues and pre-transfer communication was investigated, and it was observed that 42.7% of the problems in transfers without communication with the relevant unit were systemic in nature. Another issue that affected the transfer duration and systemic problems was the lack of prior identification of elevator malfunctions due to ineffective communication within the hospital during the transport. Beckmann et al.'s (20) study also evaluated equipment and material problems in hospital settings as systemic issues, reporting that 46% of the problems were systemic in nature. Effective communication and good coordination regarding all issues in the transport areas before the transfer are considered essential factors that should be emphasized.

The study did not find any significant differences between the problems encountered during transport and the patient's gender, work shift and patient profiles. This result was considered to be related to the specific sample used in the study, and among the recommendations, it was suggested that similar variables be examined in different emergency departments for evidence-based studies.

Conclusion

As a result of this study, some important issues have been highlighted, emphasizing the need to re-evaluate institutional protocols for a safe transfer:

• In critical patients in the emergency department, the most common transport issues seem to occur when planned tests are conducted in units outside the emergency department. Therefore, the necessity of these requests should be thoroughly evaluated to help reduce complications related to transfers.

• The physical layout of emergency departments should be designed in a way that allows for the shortest possible transport time for critical patients, aiming to prevent issues that may arise due to prolonged transfer times.

• In many critically ill patient transfers, failure to communicate with the unit to which the patient will be transferred has increased the frequency of problems.

• Effective communication with the units where patients will be transferred should be established to ensure patient safety. Patients or their relatives should be informed before the transfer, and potential issues during the transport should be explained to them. The number of healthcare providers accompanying the patient during transport should be decided in advance.

• Preparations should be made with the anticipation that device-related problems may occur during the transfer, and a healthcare provider capable of intervening during such situations should be present in the transfer team.

• For safe patient transport, it is considered essential for healthcare providers to participate in ongoing in-service training and to be updated with current educational resources, facilitating the implementation of preparedness into action.

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