

## Original Article

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## Preparation and Implementation of Intrahospital Transfer Protocol for Emergency Department Patients to Decrease Unexpected Events

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### Abstract

**Introduction:** Most of the patients hospitalized in the emergency department (ED) are in need of transfer to other hospital wards or paraclinic units. This process is called intrahospital transfer (IHT) that may lead to a wide range of complications known as unexpected events (UE).

**Objective:** In the present study we decided to evaluate the effect of using a pre-designed protocol on decrease of UEs and safety improvement of IHT among patients hospitalized in ED.

**Method:** The present cross-sectional study was carried out in 2016 in the ED of Imam Khomeini Hospital, Tehran, Iran. All patients with triage levels of 1 and 2 who were in need of temporary or permanent transfer to other departments of the studied treatment center based on clinical indication as decided by the in-charge physician were enrolled in the study. This study was conducted in 3 phases of pre-intervention, intervention and post-intervention. Any UE was recorded in first phase. During intervention phase ED-IHT protocol was prepared and implemented. the checklist of complications and UEs during transfer was filled again and pre and post-intervention results were compared.

**Results:** In this study, 207 patients with the mean age of  $58.9 \pm 20.6$  years were evaluated (61.4% male). Demographic data and baseline characteristics of the studied patients in the phases before and after implementation of the protocol has no significant difference. Overall, before implementation of the protocol out of the 105 studied patients, a total of 35 patients (33.3%) were affected by UE during transfer, but after implementation of the protocol this rate decreased to 11 patients (10.8%) out of the 103 studied patients and this decrease was statistically significant ( $p < 0.001$ ).

**Conclusion:** Based on the results obtained from this study, it seems that performing the IHT protocol specialized for ED patients has been effective in decreasing UE cases.

**Key words:** Complications; Emergency department; Medical audit; Patient care; Patient transfer

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### INTRODUCTION

Most of the patients hospitalized in the emergency department (ED), including critically ill patients, are in need of transfer to other hospital wards or paraclinic units. This transfer is usually done with diagnostic and treatment purposes and to various units such as radiology, operation room, angiography, hemodialysis, and general and specialty wards. This process is called intrahospital transfer (IHT) (1). These patients, who are in a vulnerable situation, are exposed to potentially dangerous events called unexpected events (UE) outside the emergency department. One of the definitions agreed upon in this regard, defines UE as an event that leads to a change in the treatment process due to IHT (2). UE due to IHT includes a wide range of early complications such as

manifestation of hypoxia and hemodynamic disorder as well as late complications like increased risk of developing ventilator associated pneumonia (3). Based on the researches performed, different prevalence, severity and types of UE have been reported during IHT, which sometimes include up to 70% of transfer cases (4-9). Various reasons have been proposed for this type of events until now, among which equipment dysfunction, insufficient monitoring, improper setup of the equipment and ineffective communication between the departments can be pointed out (4, 5, 7, 10-12). Preventing these events is considered as an important part of risk management programs in emergency department (ED) and this risk should be evaluated by the

emergency medicine physician before ordering the transfer and he/she should make a decision regarding its probable costs and benefits based on his/her evaluation. Until now, many guidelines have been designed with the aim of increasing safety and decreasing accidents during this process, most of which have been developed based on personal experiences and expert opinions (13-16).

Most existing studies in the field of IHT have been performed concentrating on intensive care units (ICUs). However, due to differences in nature of ED and ICU, transfer of patients from ED has its own complications and the condition of ED cannot be compared to ICU from the viewpoint of availability of human resources, facilities and equipment (17). The condition of patients hospitalized in ED, exhaustion in patients and their companions as well as medical service providers makes ED patients more prone to UE manifestation (16, 18). As mentioned before, until now few studies have been performed centered around the rate of negative outcomes and UEs during IHT of ED patients. In addition, the effect of various interventions on decrease of UEs related to IHT has not received much attention. Therefore, in the present study we decided to evaluate the effect of using a pre-designed protocol on decrease of UEs and safety improvement of IHT among patients hospitalized in ED.

## METHODS

### *Study design*

The present cross-sectional study was carried out in 2016 in the ED of Imam Khomeini Hospital, Tehran, Iran. The method of performing the study was finalized by the research committee of emergency medicine group of Tehran University of Medical Sciences and was also approved by the ethics committee of Tehran University of Medical Sciences. It should be noted that all the steps of performing the study were done after coordination and obtaining the approval of the head of the ED in which the study was performed. Considering the design of the study no additional intervention was done on the patients and no additional costs were inflicted on them. Patient data were kept confidential and all ethical concerns were considered based on the declaration of Helsinki.

### *Definition*

Imam Khomeini Hospital Complex is located in Tehran, Iran. Despite having 43 beds in ED as its approved capacity, this department may be necessary to provide cares to more than 100 patients simultaneously.

It has one cardiopulmonary resuscitation (CPR) room, 3 emergency units including E1-3, an outpatient limited surgery room and an exclusive radiology unit. In each working shift 2 physicians who are faculty members of emergency medicine, 6 residents of emergency medicine, and 4 residents of other specialties are in charge. The studied hospital has 1 internal intensive care unit (ICU), 5 surgery ICUs, 1 cardiac ICU, 1 angiography department, 2 computed tomography (CT) units, 1 magnetic resonance imaging (MRI) unit and more than 30 general and specialty wards.

### *Study population*

All patients with triage levels of 1 and 2 who were in need of temporary or permanent transfer to other departments of the studied treatment center based on clinical indication as decided by the in-charge physician were enrolled in the study. Patients for whom the checklist was not filled or was filled incompletely for any reason or those who were transferred to somewhere outside the hospital were excluded from the study. Sampling was done via consecutive method in all day and night shifts. Sample size considering  $\alpha=0.05$  and  $\beta=0.2$  and based on estimation of the number of admissions to ED during the study period and agreement on primary outcome was considered to be 207 patients.

### *Data collection & intervention*

To gather data a pre-designed checklist was used. The first section of the checklist was related to the responsibilities of the nurse in charge of the department and another section was related to the responsibilities of patient transfer personnel. Notebooks were prepared for registering IHT of the patients and were given to nurses and evaluated daily to consequently review the profiles of transfer cases to extract probable UEs. Oxygen saturation (O<sub>2</sub>sat) dropping with a rate of 5% or more, 10 mmHg or more drop in systolic blood pressure (SBP) and any malfunction of the equipment used during transfer were considered UE in current study. It should be noted that patients and staff in charge of transferring the patient were unaware of the study aim and protocol.

This study was conducted in 3 phases of pre-intervention, intervention and post-intervention. In the first phase (pre-intervention) all the physicians in ED involved in this field and nurses attended a session for filing out the checklist and its content. In the pre-intervention phase, a physician or intern who was present matched the checklist with the condition of the patient before transfer and recorded the required data after reaching the destination. In second phase (intervention) and

**Table 1:** Baseline characteristics of studied patients in pre- and post-intervention periods

Variable	Pre-intervention	Post-intervention	p
	(n=105)	(n=102)	
	Number (%)		
<b>Sex</b>			
Male	64 (60.9)	63 (61.8)	0.905
Female	41 (39.1)	39 (38.2)	
<b>Endotracheal tube</b>	48 (45.7)	47 (46.1)	0.958
<b>Central venous catheter</b>	66 (62.9)	58 (56.9)	0.379
<b>Nasogastric tube</b>	71 (67.6)	63 (61.8)	0.378
<b>Urinary catheter</b>	83 (79.0)	72 (70.6)	0.161
<b>Chest tube</b>	1 (0.9)	1 (0.9)	0.984

**Table 2:** Problems in the multidisciplinary team and inter-staff communication

Variable	Pre-intervention	Post-intervention	p
	(n=105)	(n=102)	
	Number (%)		
<b>The Personnel failing to accompany the patient</b>	11 (10.5)	9 (8.8)	0.341
<b>Lack of knowledge</b>	9 (8.6)	2 (1.9)	0.017
<b>Lack of attention</b>	25 (23.8)	9 (8.8)	0.001
<b>Inappropriate preparation of equipment</b>	21 (20.0)	4 (3.9)	0.000
<b>Inappropriate preparation of patient</b>	26 (24.8)	9 (8.8)	0.001
<b>Incorrect patient transport</b>	1 (0.9)	0 (0.0)	0.050
<b>Inappropriate preparation of transport team</b>	24 (22.9)	8 (7.8)	0.001
<b>Inexperience</b>	4 (3.8)	1 (0.9)	0.057
<b>Communication failure between the teams</b>	2 (1.9)	0 (0.0)	0.051

after searching resources, by forming a panel of head nurses and some of the ED nurses of the hospital, and faculty members of Emergency Medicine Department of Tehran University of Medical Science, ED-IHT protocol was prepared in the second half of 2016. Thereafter, the training process was performed by a senior emergency medicine resident with the assistance of a skilled nurse in a 4-hour session. Categories of training process included transfer safety guidelines and required skills courses, re-evaluating the equipment before doing the transfer and basic life support (BLS). A written exam with multiple-choice structure was taken from the participant staff. In third phase (post-intervention), after implementation of ED-IHT protocol, the checklist of complications and UEs during transfer was filled again and pre- and post-intervention results were compared. At this stage, the physician or nurse in charge of the transfer was responsible for evaluating the items on the checklist before calling the patient transfer staff.

#### Statistical analysis

After finishing sampling, the acquired data were analyzed for assessing the effects of performing the protocol on the patient transfer process and decrease in UEs. Data were entered in excel tables separated by pre- and post-intervention phases and compared using statistical tests such as chi-square and independent sample test. In this study, p-value less than 0.05, was considered as level of significance.

#### RESULTS

In this study, 207 patients with the mean age of  $58.9 \pm 20.6$  years were evaluated 127 (61.4%) of whom were male. 105 of them with the mean age of  $58.4 \pm 21.7$  years were studied in the evaluation done before using the protocol and 102 with the mean age of  $59.3 \pm 20.2$  years were evaluated after implementation of the protocol. Mean age of the 2 groups was not significantly different ( $p=0.753$ ). Demographic data and baseline characteristics of the studied patients in the phases before and after implementation of the protocol has been summarized in table 1 and no significant difference was seen in the 2 studied time periods.

Table 2 shows the problems regarding the multidisciplinary team and inter-staff communication. Based on the findings, lack of knowledge and attention, and also inappropriate preparation of equipment, patient and transport team decreased significantly in the post-intervention period.

Table 3 reports the frequency of equipment failure during IHT. The rate of oxygen depletion in the cylinders and nasogastric tube pull out decreased significantly in the post-intervention period.

Table 4 depicts the frequency of UEs as well as the outcome of the patients in IHT process in pre- and post-intervention phases of the study, separately. Based on these findings, in the pre-intervention phase, a total of 81 patients (77.2%) and in the post-intervention phase, a total of 93 patients (91.4%) went through the IHT process without any

**Table 3:** Failure in equipment used during intrahospital transfer of the studied patients

Variable	Pre-intervention	Post-intervention	p
	(n=105)	(n=102)	
	Number (%)		
Depletion of oxygen in the cylinders	12 (11.4)	2 (1.9)	0.003
Nasogastric tube pull out	8 (7.6)	2 (1.9)	0.002
Ventilation equipment	4 (3.8)	0 (0.0)	0.053
Intravenous access	2 (1.9)	0 (0.0)	0.050
Dislodging of urinary catheter	1 (0.9)	0 (0.0)	0.081

**Table 4:** Unexpected events during intrahospital transfer of the studied patients

Variable	Pre-intervention	Post-intervention	p
	(n=105)	(n=102)	
	Number (%)		
<b>Physiological Alternations</b>			
Altered blood pressure	6 (5.7)	1 (0.9)	0.033
Increased heart rate	9 (8.6)	2 (1.9)	0.001
Arrhythmias	6 (5.7)	3 (2.9)	0.165
Cardiopulmonary arrest	4 (3.8)	2 (1.9)	0.212
Decreased oxygen saturation	14 (13.3)	8 (7.8)	0.056
Agitation	18 (18.1)	8 (7.8)	0.027
Hypoxemia	16 (15.2)	8 (7.8)	0.041
Bleeding	3 (2.8)	1 (0.9)	0.163
Vomiting	4 (3.8)	2 (1.9)	0.215
<b>Patient outcome</b>			
No change	81 (77.2)	93 (91.4)	0.002
Worsening	20 (19.1)	8 (7.7)	0.093
Dead	4 (3.8)	1 (0.9)	0.009

UE (p=0.002).

Overall, before implementation of the protocol out of the 105 studied patients, a total of 35 patients (33.3%) were affected by UE during transfer, but after implementation of the protocol this rate decreased to 11 patients (10.8%) out of the 103 studied patients and this decrease was statistically significant (p < 0.001).

## DISCUSSION

After implementing the protocol, in the category of physiological changes of patients during IHT, the rate of complications such as shortness of breath, hypoxia, restlessness, blood pressure changes, and increase in heart rate, decreased, which is indicative of the effectiveness of performing the protocol in decreasing the mentioned complications. In addition, the frequency of complications such as bleeding during transfer, cardiac failure and arrhythmia also decreased but the effect of performing the protocol on them cannot be statistically confirmed and although the cases decreased after implementing the protocol, these changes cannot be considered as indices of protocol effectiveness during this time. Since the checklist was filled by the in-charge nurse before transfer of critically ill patients, the probability of manifesting complications for the patient during IHT had a significant decrease and this measure led

to a decrease in carelessness in the conditions of an overcrowded ED. Implementation of the protocol resulted in the required coordination for transferring the patient and preparation of the transfer team and all the related equipment being under supervision. With some time passing and accumulating experience in carrying out the protocol, the rate of error and the complications during transfer will surely decrease.

In a similar study, Choi et al., carried out a study with the purpose of evaluating the effect of using a checklist on the prevalence of UE happening during IHT of ED patients and published its results in 2012. The study was performed in the ED of a teaching hospital and on patients over 15 years of age who were transferred from the ED to general departments of the hospital, imaging unit, ICU, and operation room. The results of the study showed that using this checklist decreased the rate of transfer complications from 36.8% to 22.1% and additionally, led to reduction of serious complications from 9.1% to 5.2% (19). Additionally, Jarden et al. in another similar study prepared a checklist for carrying out the transfer process of a patient in an ICU. After about 1 year passing from using this tool in the mentioned unit, results showed that using this tool led to improvement of preparation steps of the patient and transfer team. Moreover, it resulted in

improvement of patient monitoring during transfer and more accurate registration of complications happening during transfer (20).

Preparation of patients before transfer, induction of proper sedation, repeated assessment of the equipment, employing a trained accompanying team, correct adherence to protocols and establishment of diagnostic units in a place that is easily accessible have been proposed as effective preventive measures in this regard by researchers in previous studies (2, 4, 6-8, 12, 14). Among other interventions done in this field is establishment of specialized transfer teams. Although employing these teams has significantly improved the outcome of patient transfer, factors such as scarcity of manpower and financial resources cause limitations for common use of this method (21). However, using a checklist is a simple tool with low cost for this purpose and it has been recommended multiple times (2). Considering the overcrowding of EDs, it is suggested to take necessary measures for increasing the number of staff and nurses of ED and training them regarding patient transfer in order to decrease human errors and carelessness due to overcrowding of ED. Considering the planning and performance of critically ill patients' transfer protocol it is good to take measures based on which the nurses of departments, as well as staff providing services and other staff become responsible for performing the protocol and new personnel also become familiar with their responsibilities and be held responsible for mandatory filling of the critically ill patients' transfer checklist.

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#### Limitations

The short duration of evaluating the results after implementing the protocol in the current study was among the limitations of this study. Repeated evaluations with regular intervals might be more convenient for shedding a light on the adherence of ED staff to performing it and the effectiveness of this measure.

#### CONCLUSIONS

Based on the results obtained from this study, it seems that performing the IHT protocol specialized for ED patients has been effective in decreasing UE cases.

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#### AUTHORS' CONTRIBUTION

All the authors met the standards of authorship based on the recommendations of the International Committee of Medical Journal Editors.

#### CONFLICT OF INTEREST

None declared.

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