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Evaluation Of The Safety Status Of Intra-Hospital Transfer Of Critically IllPatients

Fatima Ali Dagriry[1], Laila Ibrahim Moeed Asiri[1], Khayrah Ahmed Ali Hazazi[2], Salha Ahmed Ali Hazazi[2], Ebtehal Mohammed jaber Doshi[3], Sahar Mohmmed Ahmed Haider[3], Hadeel Hamad Ali Dogdougu[3], Mohammed shabaan wajaan alraythi[4], Essa Husen Jaber Alkobaishi[5], Afaf Mohamed Salem Megzaze[6], Fahad Nasser Ali AlThurwi[7], Ghadeer Mohmed Ibrahim Shariah[8], Fatimah Yahya Mohamed Hezam[9]

Abstract

Background: One of the major activities in the health care process is the transport of patients. Much needed attention has been directed to the transfer of those suffering from actual or potentially life-threatening problems. The transport process requires a lot of assessment and preparation of the patient, staff, and equipment that should be made prior, during, and after transport. Critically sick patients are frequently transported throughout the hospital without previous planning. Critically ill patients often require intra-hospital transfer (IHT) for diagnostic and therapeutic procedures. However, this process carries potential risks and c[1]an harm the patient's safety. This study aims: to assess the safety of IHT for critically ill patients by gathering responses from emergency and intensive care unit (ICU) nurses. Methods: A cross-sectional study was conducted in KSA from January to June 2022. The study involved 288 emergency and ICU nurses. The data were collected through a paper-based form, which included demographic and work-related characteristics and an IHT safety scale. Results: The mean score of IHT was 75.2±15.53. The results of multiple regression analysis showed that work experience (B=0.291, p=0.011), perception of IHT safety (B=0.196, p=0.003), education level (B=−0.123, p=0.038) and equipment checker (B=−0.121, p=0.045), variables were the predictors of IHT safety. Conclusion: The study found that the safety level during the IHT was low. Hospitals aim to create a safe environment that minimizes the risks associated with IHT. Therefore, they must identify potential risks during the transfer process and take necessary measures to mitigate them. Practical strategies that can be employed include using experienced nursing staff, conducting equipment checks, ensuring a complete understanding of the tools and technologies involved in the transfer process, and increasing awareness of IHT safety.

Introduction

Intra-hospital transport (IHT) consists of the movement of a patient from one physical location within the hospital to another. Such transfers may be temporary (e.g., to obtain diagnostic imaging) or for a longer term (e.g., transfer from inpatient ward to an intensive

[1]Nursing Technician, Hakmat Aldgharir Dispensary Jazan, Saudi Arabia.
[2]Nursing Technician, Southern Health Sector Jazan, Saudi Arabia.
[3]Nursing Technician, Abu Arish General Hospital, Saudi Arabia.
[4]Nursing Technician, King Fahad Central Hospital Jazan, Saudi Arabia.
[5]Nursing Technician, Bani Malik Sector Jazan, Saudi Arabia.
[6]Nursing Technician, Primary Care In The Shatti Neighborhood, Saudi Arabia.
[7]Nursing Technician, Eradah & Psychiatric Hospital, Saudi Arabia.
[8]Nursing Technician, Sabya General Hospital Jazan, Saudi Arabia.
[9]Nursing Technician, Dhabiya Health Care Center, Saudi Arabia.

care unit), and are critical transitions in which complications and death may occur [1-4]. Risks associated with IHT have been suggested to be independent of the duration of hospitalization [5]. Of attention, the distance travelled between locations may affect care delivery, quality and outcomes [6, 7].

The intensive care unit (ICU) is designed for the monitoring and continuous care of patients that require on-site care and direct clinical supervision [8]. However, some patients need to receive services that cannot be performed in the ICU and require transfer to other units. Suppose this operation is performed inside the hospital. In that case, it is called intra-hospital transfer (IHT) [9]. In fact, IHT refers to moving a sick patient to a place inside the hospital to undergo advanced medical care or perform diagnostic procedures such as CT scan, MRI, nuclear imaging and endoscopy [10]. Consequently, the process of transferring ill patients from one place to another can be potentially dangerous due to the discontinuity of care [11]. In addition, greatest of the studies on the IHT of critically ill patients have been performed in the ICU, and few have been performed in the emergency department (ED), which is an integral part of intensive care [12].

The ED is the first point of contact for diagnosing and treating acute or critical patients, resuscitating patients and facilitating subsequent specialists' treatment process. Providing high-quality IHT is crucial for critically ill patients' timely diagnosis and treatment, reducing mortality [13]. Standardizing and optimizing the IHT process is necessary to ensure such patients' convenient and safe transfer. The ED should also be equipped to provide fast and high-quality IHT services to affected patients [14]. Studies have shown that adverse events during IHT vary from 1.7% to 80% [15, 16].

During IHT in critically ill patients, adverse events such as hemodynamic instability, increased intracranial pressure, respiratory changes, hyperglycemia, hypoglycemia, blood gas disorders, prolonged hospitalization and death (occurring in 2% of cases) may occur [17, 18]. Research on IHT began in the 1970s and has been grown-up steadily [19]. A doctor should evaluate many risk factors before requesting any diagnostic test or therapeutic procedure. These factors include the patient's clinical conditions, equipment and human and system-related factors [9]. Among the factors related to the patient's clinical conditions is the severity of the individual's disease, ventilation of the patient with a positive end-expiratory pressure above [13], receiving sedation before transfer between hospitals, etc [17]. Various factors, such as organizational and individual factors, communication issues, incomplete patient assessment and employee-related factors contribute to accidents during transfers [20, 21].

Only some studies have examined non-technical aspects of organizational culture such as teamwork and communication during transforms [22, 23]. However, a trained and knowledgeable team can constantly improve the patient's safety during transfer with training, comprehensive planning, good communication, provision of necessary equipment and correct judgment about the patient's clinical conditions [24]. In the present, for IHT, there was always a nurse in charge of the patient, an assistant nurse, a person to transfer the patient, a doctor or resident (rarely) and an intern (sometimes) in the patient transfer team [9]. As a result, the workload and associated stress can hurt the performance of team members, such as nurses, and ultimately threaten patient safety [25].

Nurses play a crucial role in ensuring patient safety during the transfer process. They are an essential part of the transfer team. They can use their knowledge, skills and experience to identify potential risks that may be life-threatening and respond quickly to maintain patient safety [9]. Gathering feed- back and insights on their performance can help redesign a system that facilitates the transfer process for critically ill patients [26]. Several studies have been conducted on the risks associated with IHTs, and checklists have been developed based on evidence and expert opinions [26, 27]. However, the percentage of

adverse events during IHTs has not yet been reduced to zero [28].

Moreover, IHTs of critically ill patients in the ED and ICU can still have multiple adverse events. This study was conducted to investigate the safety status of IHTs from the perception of ED and ICU nurses in KSA from January to June 2022. Considering the lack of research on patient safety during IHTs, this study's findings are valuable for improving patient safety and understanding the safety status of such transfers.

Method

A cross-sectional study was conducted in KSA from January to June 2022. The statistical population of this study includes all ED and ICU nurses. The inclusion criteria for the study were having at least a bachelor's degree for nurses and an associate's degree for nursing assistants, at least 6 months of work experience in the ED or ICU, participating in the transfer of critically ill patients from the ED or ICU to diagnostic or therapeutic wards (such as MRI, radiology or operating rooms) or from the ED to the ICU, and a history of at least one IHT of a critically ill patient during the study period.

Nurses and nursing assistants who participated in the transfer of intra-departmental patients or relatively stable patients from the ED and ICU to other departments were excluded from the study. This exclusion was because these hospital transfers did not require similar monitoring, equipment and treatments, and nurses did not have a role in these transfers. Additionally, 13 respondents who completed the questionnaires incompletely were excluded from the study. Cochran's statistical method was used with a known population size with an error level of 0.05 to determine the sample size.

Accordingly, all the nurses (the total number of ED and ICU nurses in the city) working in the medical training centers of Ardabil were listed (approximately 650 people). Then, according to Cochran's formula, the sample size was calculated to be 241 people. Since some questionnaires might not be answered or returned, the sample size was estimated to be 25% more, so the final sample size was 301 people selected through the convenience sampling method.

After obtaining the necessary permits from the Ethics Committee of University of Medical Sciences, the researchers explained the study's objectives to the potential respondents and obtained their informed consent. During the data collection period, the researchers were present in person at the emergency and ICU units during morning, evening and night shifts. Eligible participants with a history of IHT during the study period were included after providing informed written consent.

Questionnaires were made available as paper copies for participants in the units to complete after experiencing IHT during the study period. Considering that the nursing staff and nursing assistants had a history of performing several IHT during the data collection period, they could participate more than once. Therefore, to avoid recall bias, the participants were asked whether they had completed this questionnaire. Finally, data were collected from 288 ED and ICU nurses. The response rate in this study was 95%. The guideline of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) was used to conduct and report the study [29].

Demographic and work-related characteristics form Information on the general characteristics of the participants (age group, gender, marital status, workplace, education, general nursing experience, critical care or emergency nurse experience) and work-related characteristics (checking transport equipment, time spent on transport, transport protocol, knowledge of IHT guidelines, perception on IHT safety, the essential reason for unsafe transport, adverse events related to IHT, the most significant adverse events during transfer and selection of preferred device during IHT) was collected using a self-report

questionnaire. Data were collected by referring to previous research on ED and ICU nurses.

Intra-hospital transfer safety scale

A 24-item questionnaire was created by Bergman et al., (2020) [30] to evaluate the safety situation in IHT [30]. The questionnaire consists of five dimensions: organization (six items), tools and technologies (five items), transport related tasks (four items), environment (five items) and teamwork (four items). The participants rate the tool on a 5-point Likert scale, ranging from strongly agree (five points) to strongly disagree (one point). Higher scores indicate a better safety situation in IHT. Bergman et al., (2020) [30] investigated the tool's reliability and validity, and found Cronbach's alpha levels of 0.72 to 0.82, respectively [30].

To use the IHT safety scale, the questionnaires underwent a forward and backward translation process. First, two expert translators who were unaware of each other translated the questionnaire into Arabic, the language used by ED and ICU nurses. Then, the two translation versions were merged into a single version by two nursing faculty members and the authors, who selected the best items. In the next step, this selected Arabic version was translated into English by two expert translators, unaware of each other and the original questionnaire version. The English translation and the original version were then compared by independent translators. Finally, a group of eight experienced ED and ICU nurses evaluated the translated versions' relevance and utility, leading to the preparation of the final version of the Arabic hospital transfer safety scale.

The questionnaire used in this study was given to 10 experts from relevant field to determine its content validity index (CVI) and content validity ratio (CVR). Each expert assessed the CVI based on a four-part scale (simple, relatively simple, somewhat complex and complex) for each question, using the criteria of simplicity, appropriateness and certainty. The minimum CVR for each item was 0.62. The CVI was found to be 0.89, indicating high content validity. The questionnaire also demonstrated reliability, with a Cronbach's alpha coefficient 0.93. Cronbach's alpha coefficient ranged from 0.78 to 0.87 in the present study.

The data were analyzed using the SPSS statistical package, version 28. Descriptive statistics were used to examine the participants' demographic and work-related characteristics, as well as the safety level and dimensions of the IHT. Independent t-tests and one-way analysis of variance were performed to determine differences in IHT safety and its dimensions based on demographic and work-related factors. Additionally, multiple regression analysis was utilized to identify predictors of IHT safety. Durbin-Watson's test was then used to verify the independence of observations, including residual values or errors.

Results

Table (1) shows descriptive statistics for participants' demographic and work related characteristics. A total of 288 nurses completed and returned the questionnaires. Most respondents were 21–30 (43.8%) and 31–40 (41.3%). Among the participants, 75.7% were women and 52.8% were single. Furthermore, 88.9% of the participants had a bachelor's degree in nursing, and 5.9% had a postgraduate degree in nursing.

Moreover, 53.8% of nurses and assistant nurses worked in the ED. Most respondents (58%) stated they spend more than 30 min in hospital transfers of ill patients. In 68.4% of cases, the participants were verbally informed about the guidelines and protocols for the IHT of critically ill patients. Only 3.8% of the participants knew very well about the guide- lines for the safe IHT of critically ill patients. Also, 88.2% of ED and ICU nurses stated that they did not experience any adverse events during the IHT of critically ill patients. Furthermore, the most adverse event experienced by the respondents was patient agitation (**table 1**).

Intra-hospital transport safety based on domains

Table (1) shows the mean score of IHT was 75.2 ± 15.53, with a score range of 32–120. Also, 'organization (subscale I)' had a mean score of 18.84 ± 4.88 out of the mean score of 6–32 points, 'tools and technologies (subscale II)' had a mean score of 15.94±3.67 out of a score range of 6–25 points, 'environment (subscale) III)' has a mean score of 14.94 ± 4.4 out of a score range of 5–25, 'teamwork (subscale IV)' had a mean score of 12.31±3.12 out of a score range of 4–20 and 'transport-related task (subscale V)' had a mean score of 13.02±3.34 out of a score range of 4–20.

Predictors of intra-hospital transfer safety

Table (3) shows a multiple linear regression analysis was performed using IHT safety as the dependent variable, and demographic and work-related characteristics as the independent variables. Out of these 16 variables, four variables were significant predictors of IHT safety. The regression model's coefficient of determination (R^2) showed that the input variables explained 14% of the total IHT safety score of the model. Among the variables fed into the model using the ENTER method, the total work experience (B=0.291, p=0.011), perception of IHT safety (B=0.196, p=0.003), education level (B=−0.123, p=0.038) and equipment checker (B=−0.121, p=0.045) variables were statistically significant.

Table (1): Socio-demographic and work-related characteristics of the participants (n=288)

Variable	Characteristics	Frequency	%
Age group (years)	21–30	126	43.8
	31–40	119	41.3
	>40	43	14.9
Gender	Male	70	24.3
	Female	218	75.7
Marital status	Single	136	47.2
	Married	152	52.8
Workplace	ICU units	133	46.2
	Emergency department	155	53.8
Educational status	Associate degree	17	5.9
	Bachelor degree	256	88.9
	Master's degree	15	5.2
General nursing experience (years)	1–3	89	30.9
	4–6	81	28.1
	7–10	48	16.7
	>10	70	24.3
Critical care or emergency nurse experience (years)	1–3	150	52.1
	4–6	53	18.4
	7–10	39	13.5
	>10	46	16
Who checks equipment for transport?	Clinical nurse	158	54.9
	Unit/Department Manager or Supervisor nurse	53	18.4

Variable	Characteristics	Frequency	%
	Nurse responsible for the shift	77	26.7
The average transfer time of intra-hospital critically ill patients	<30 min	121	42.0
	> 30 min	167	58.0
Transport protocol	Written	50	17.4
	Oral	197	68.4
	No	41	14.2
Knowledge of guidelines of IHT	Do not know at all	34	11.8
	Do not know	71	24.7
	Know usually	90	31.3
	Know fair	82	28.5
	Know very well	11	3.8
Perception on safety of IHT	Not safe at all	10	3.5
	Not safe	42	14.6
	Usually, safe	156	54.2
	Safe	64	22.2
	Very safe	16	5.6
In your opinion, what is the most important factor that can make the transfer intra-hospital of critically ill patients unsafe?	Lack of time	62	21.5
	Absence of guidelines and protocols	47	16.3
	Lack of perception of safe intra-hospital transport	59	20.5
	Increased workload	61	21.2
	Lack of equipment	30	10.4
	Lack of employee training	29	10.1
Experience of adverse effectsrelated to IHT	Yes	34	11.8
	No	254	88.2
In your opinion, what is the most important adverse event during the intra-hospital transfer of a critically ill patient?	Failure of cardiac monitoring and pulse oximetry	55	19.1
	Incorrect destination of intra-hospital transfer	35	12.2
	Oxygen desaturation	48	16.7
	Agitation	98	34.0
	Creating a new pressure ulcer	35	12.2
	Falling	10	3.5

Variable	Characteristics	Frequency	%
	The intravenous line displacement/exit	5	1.7
	Displacement/withdrawal of the tracheal tube	2	0.7
Please select your preferred devicefor carrying during the intra-hospital transfer of critically ill patients	Infusion pump	13	4.5
	BVM	55	19.1
	Portable ventilator	87	30.2
	Portable suction device	80	27.8
	AED	38	13.2
	Resuscitation medications	15	5.2
AED, automated external defibrillator; BVM, bag valve mask; ICU, intensive care unit; IHT, intra-hospital transport.			

Table (2): Intra-hospital transport safety scale of critical care and emergency nurses according to the domains (n=288)

Variable (domain)	Strongly disagree N (%)	Disagree N (%)	Neither agree nor disagree N (%)	Agree N (%)	Strongly agree N (%)	Mean score (SD)
Organization						**18.84 (4.88)**
We had sufficient staff resources to prepare for the transport.	34 (11.8)	92 (31.9)	54 (18.8)	89 (30.9)	19 (6.6)	2.88 (1.16)
We had enough time to prepare for the IHT.	17 (5.9)	88 (30.6)	70 (24.3)	95 (33.0)	18 (6.3)	3.03 (1.06)
IHT preparation in the ICU and ED was well coordinated.	4 (1.4)	60 (20.8)	75 (26.0)	125 (43.4)	24 (8.3)	3.36 (0.94)
We had sufficient staff resources to settle the patient back in the ICUand ED.	20 (6.9)	78 (27.1)	65 (22.6)	100 (34.7)	25 (8.6)	3.10 (1.10)
We had enough time to settle the patient back in the ICU and ED.	17 (5.9)	61 (21.2)	73 (25.3)	120 (41.7)	17 (5.9)	3.20 (1.03)
I was able to perform IHT-related tasks without being interrupted.	8 (2.8)	60 (20.8)	87 (30.2)	115 (39.9)	18 (6.3)	3.26 (0.951)
Tools and technologies						**15.94**

Variable (domain)	Strongly disagree N (%)	Disagree N (%)	Neither agree nor disagree N (%)	Agree N (%)	Strongly agree N (%)	Mean score (SD)
						(3.67)
The transport equipment met the requirements needed to perform the transport safely.	11 (3.8)	64 (22.2)	103 (35.8)	91 (31.6)	19 (6.6)	3.15 (0.96)
The transport equipment was reliable.	16 (5.6)	74 (25.7)	81 (28.1)	100 (34.7)	17 (5.9)	3.10 (1.02)
It was easy to monitor the patient throughout the IHT.	14 (4.9)	90 (31.3)	69 (24.0)	101 (35.1)	14 (4.9)	3.04 (1.02)
Audible alarms supported my work in monitoring the patient.	14 (4.9)	64 (22.2)	73 (25.3)	115 (39.9)	22 (7.6)	3.23 (1.03)
Medical tools (IV lines, tubes, cords and so on) were suited to theintended purpose.	12 (4.2)	43 (14.9	69 (24.0)	139 (48.3)	25 (8.7)	3.42 (0.98)
Environment						**14.94 (4.04)**
The physical layout of the hospital facilitated safe performance of thetransport.	41 (14.2)	60 (20.8)	66 (22.9)	102 (35.4)	19 (6.6)	2.99 (1.18)
The physical layout of the ICU and ED facilitated preparation for thetransport.	24 (8.3)	71 (24.7)	94 (32.6)	82 (28.5)	17 (5.9)	2.99 (1.05)
Rooms at the destination sites were designed for ICU and ED.	34 (11.8)	79 (27.4)	87 (30.2)	77 (26.7)	11 (3.8)	2.83 (1.06)
Hallways were free from obstacles.	40 (13.9)	85 (29.5)	77 (26.7)	69 (24.0)	17 (5.9)	2.78 (1.13)
We were able to maintain the patient's privacy during the transport.	15 (5.2)	54 (18.8)	65 (22.6)	125 (43.4)	29 (10.1)	3.34 (1.05)
Teamwork						**12.31 (3.12)**
A team leader was clearly recognized.	31 (10.8)	87 (30.2)	83 (28.8)	67 (23.3)	20 (6.9)	2.85 (1.10)

Variable (domain)	Strongly disagree N (%)	Disagree N (%)	Neither agree nor disagree N (%)	Agree N (%)	Strongly agree N (%)	Mean score (SD)
We gave each other feedback throughout the transport.	10 (3.5)	79 (27.4)	89 (30.9)	98 (34.0)	12 (4.2)	3.08 (0.95)
We confirmed each other's responsibilities.	9 (3.1)	58 (20.1)	91 (31.6)	112 (38.9)	94 (32.6)	3.25 (0.95)
All team members were present when transfer information wasshared.	13 (4.5)	67 (23.3)	94 (32.6)	97 (33.7)	17 (5.9)	3.13 (0.98)
Transport-related task						**13.02** (3.34)
Individual team members knew what tasks they had to perform.	11 (3.8)	51 (17.7)	87 (30.2)	113 (39.2)	26 (9.0)	3.33 (0.98)
The skills of staff on our IHT team overlapped sufficiently so that workcould be shared when necessary.	14 (4.9)	52 (18.1)	102 (35.4)	99 (34.4)	21 (7.3)	3.21 (0.98)
We had a shared understanding of the task sequence.	12 (4.2)	47 (16.3)	102 (35.4)	114 (39.6)	13 (4.5)	3.24 (0.92)
I felt supported by the other team members.	12 (4.2)	57 (19.8)	96 (33.3)	94 (32.6)	29 (10.1)	3.25 (1.01)
ED, emergency department; ICU, intensive care unit; IHT, intra-hospital transport.						

Table (3): Multiple regression analysis predicting intra-hospital transport safety according to socio-demographic characteristics

Variables	B	E	Beta	T	Sig
(Constant)	83.77	10.13		8.27	p<0.001
Age group (years)	0.590	2.029	0.027	0.291	0.772
Gender	1.486	1.266	0.069	1.174	0.242
Marital status	0.362	1.977	0.012	0.183	0.855
Workplace	1.697	1.920	0.055	0.884	0.378
Educational level	5.677	2.720	0.123	2.087	0.038
Total work experience	3.906	1.521	0.291	2.568	0.011
Years of employment at current unit	2.650	1.263	0.194	2.099	0.062
Equipment checker	2.181	1.085	0.121	2.011	0.045
Time taken for transport	1.385	1.894	0.044	0.731	0.465

Variables	B	E	Beta	T	Sig
Transport protocol	1.864	1.659	0.068	1.123	0.262
Knowledge of guidelines IHT	0.345	0.934	0.024	0.369	0.713
Perception on safety of IHT	3.587	1.202	0.196	2.985	0.003
Reasons for unsafe transfer	0.400	0.638	0.041	0.627	0.532
Experience of adverse event related to IHT	0.760	0.605	0.084	1.256	0.210
Adverse events during the transfer	0.113	2.783	0.002	0.040	0.968
Select your preferred device during IHT	0.557	0.789	0.043	0.706	0.481
R^2=0.14, F (2.743), p<0.001. IHT, intra-hospital transfer.					

Discussion

To the best of the researchers' knowledge, this study this study aimed to investigate the IHT safety status of critically ill patients from the perspective of ED and ICU nurses. Previous studies investigated the relationship between human and system-based nosocomial transmission risk factors. IHT of critically ill patients is associated with risks that can endanger their safety [11]. Knowledge of the safe status and factors affecting patients' IHT is essential to improve patient safety.

The results showed that the mean total of IHT was much lower than the mean IHT in the study of Bergman et al., (2020) [30]. This could be due to a system failure regarding safe IHT practices. Akrami et al., (2019) [31] showed that the IHT quality of critically ill patients was poor in more than half of the cases (66%), which was due to the lack of IHT nursing training courses for critically ill patients and the lack of knowledge of the relevant standards among nurses [31]. Considering the role of nurses in preventing complications and achieving favorable treatment results, it is necessary to improve the knowledge of nursing care in transferring sick patients to maintain professional standards [32].

Therefore, the need to carry out some interventions, including training the nurses and assistant nurses in ED and ICU for safe IHT of critically ill patients, becomes increasingly apparent. However, more studies are needed to perform these interventions. Based on the results of the studies conducted by Bergman et al., (2020) [30], the reasons for higher IHT scores in patient transfer, compared with the present findings, can be attributed to several factors [30]. These include sufficient staff presence during patient transfer (ie, critical care nurses, physicians, assistant nurses or registered nurses undertaking their specialization in the ICU), adequate medical equipment and supervision, transport teams with sufficient training and emphasis on quality improvement and safety in patient transfer within the hospital.

The hospitals have also paid special attention to improving the quality and safety of intra-hospital patient transfers, with continuous efforts being made to enhance this process [17, 26, and 30]. In contrast, others studies indicate that there is often no physician in the transfer team in hospitals. The transfer team usually consists of a nursing assistant, a nurse and sometimes an anesthesia technician. Other reasons for poor scores include weak supervision in emergency and ICU departments and inadequate education and awareness among nurses and transport teams. The issue of transferring critically ill patients has recently received significant attention, and measures have been taken to address this. Future studies are needed to investigate and improve this issue further [9, 31, and 32].

Also, the mean score of 'organization' (subscale I) was lower than that obtained from the same subscale in Swedish nurses [30]. This shows that the studied hospitals are at a lower level regarding organizational structure (ie, management supervision and support). Considering the low rating of the item 'We had sufficient staff resources to prepare for transport', it can be claimed that the limitation of staff resources can risk the safe IHT of critically ill patients by the ED and ICU because this issue leads to the lack of patient preparation for transport or their relocation in the relevant department after the transfer [17].

The results of the study by Alizadeh et al., (2021) [9] suggest that the transfer team of critically ill patients in a hospital should include, in addition to the nurse in charge of the patient, a physician and at least two other members of the healthcare team (including a nurse aide and a patient carrier) who must be present during the transfer of a critically ill patient. If there is a lack of human resources, the patient's family can help in the transfer. There should be a nurse in the destination department (radiology, CT and MRI departments) to provide care and assist the nurse in charge of the patient [9].

In the 'tools and technologies' (subscale II), the mean score was lower than the mean score reported by Bergman et al., (2020) [30]. This dimension refers to usability, efficiency, access and familiarity with tools and technologies related to the transfer of critically ill patients. Among the factor II questions, 'it was easy to monitor the patient during IHT' was ranked the lowest. Therefore, poor patient monitoring during IHT can reduce patient safety. The concept of monitoring or situational awareness includes gathering information, interpreting and understanding data and predicting what can happen in the future, which is reduced by factors such as lack of experience, workload and distraction and prevents decision-making and appropriate responses in critical situations [9].

It is essential to be equipped with appropriate monitoring equipment before transfer because performing major interventions during transfer is very difficult. By training and completing the performance of all members involved in IHT and standardizing monitoring equipment and actions, adverse events can be prevented, and the IHT safety of critically ill patients can be guaranteed [33]. In addition, the mean score of 'environments' (subscale III) was lower than the mean score reported for Swedish nurses [30].

This result shows that from the point of view of emergency and ICU nurses, the physical layout and design of the hospital environment, including the ED and ICU settings, the rooms and the destination, especially the obstacles in the corridors (according to the score of the relevant item), are pretty suitable for safe transfer. Bergman et al., (2020) [30] showed that the environments surrounding IHT hindered the team's ability to provide care. Even the infrastructure of the physical environment can be considered a factor in accidents during IHT [17, 26, and 30]. In some cases, even the simple movement of the patient in the corridors and elevators of the hospital may cause patient discomfort [33].

The mean score of 'teamwork' (subscale IV) was lower than the mean score in Bergman et al., (2020) [30] study. This dimension covers essential aspects of teamwork, such as team leadership, information transfer, validation of team roles and feedback among team members. In the present study the low level of teamwork means that the effective teamwork of healthcare professionals and proper interdepartmental communication affect their performance and positively affect IHT [33].

In this subscale, the item 'a team leader was clearly recognized' had the lowest rating. This result suggests that the absence of a leader in the transfer team may compromise the IHT of critically ill patients. Bergman et al., (2020) [30] showed that non-technical skills such as teamwork, situational awareness and leadership are increasingly recognized as essential for providing safe and high-quality care, especially in the ICU [36]. Effective leadership creates high standards, defines expectations, encourages people to take initiative,

and supports team members [9].

The results indicated that the mean score of 'transport-related task' (subscale V) was lower than the mean score reported in Bergman et al., (2020) [30], which could indicate relatively less knowledge and experience in performing tasks related to the safe IHT of critically ill patients. In factor V, the item 'skills of our IHT team staff overlapped enough to share work when necessary' was ranked the lowest. Bergman et al., (2020) [30] suggests that IHT-related tasks should be evaluated to reduce their complexity. In addition, disturbances and interruptions affecting transport-related jobs should be limited [17].

The results of multiple regression analysis indicated that total work experience is one of the effective predictors of nurses' IHT safety. In this study, nurses with high work experience had a better perception of the IHT safety of critically ill patients, which was consistent with the results of the study by Song et al., (2022) [34] indicated that because most experienced nurses are involved in informing new personnel about standard procedures, explaining IHT procedures to other involved staff and implementing the IHT plan, they have a greater understanding of IHT [34].

The study's results also showed that perception of IHT safety predicted IHT safety in critically ill patients. Most participants considered their understanding of the IHT of critically ill patients to be a generally safe process. However, Hu et al., (2021) [12] reported that most nurses believed that a severe risk of death threatens patients while moving around inside the hospital [12]. Also, in the study of Silva et al., (2017) [35] the nurses stated that all the stages of IHT of patients, from the moment they leave the ward to the time they return, expose the patients to potential risks and instabilities and can lead to unexpected complications, which is in contrast to the results of the present study.

Education level was one of the predictors of IHT safety. In this study, nursing assistants with an associate's degree obtained higher scores in the IHT safety scale and its subgroups than nurses with bachelor and master degrees, which may be because, with an increase in education level, the understanding of the possible risks for the patient during patient transfers increases. On the other hand, nurses have more legal responsibility than assistant nurses in transferring sick patients, and they lead the patient transfer team, which causes stress and anxiety. Therefore, compared with other people, they consider the transfer group unsafe [36].

Moreover, the equipment checker was able to predict the IHT safety. According to the participants, the bedside nurses who checked most of the transfer equipment for critically ill patients obtained higher scores in the safe transfer scale and its subgroups than those in charge of the shift, supervision or ward. Knowledge of using the equipment is crucial for safe and successful IHT [36], which facilitates the care provided to the patient during the transition [36]. Nurses who check transfer equipment less may experience anxiety while working with unfamiliar equipment [37].

Protecting patients during transfer is one of the responsibilities of all medical team members, including nurses, which must be based on maintaining safety, health and human dignity. The nurse is often the only accompanying personnel responsible for the patient's safety during transfer [38]. According to the standards, the IHT team should include two health service providers, one intensive care nurse, one physician familiar with airway management, and one respirator [9].

Conclusion

The study revealed that both ED and ICU nurses perceived IHT safety poorly. As a result, hospital managers must identify the risks associated with IHT and take proactive measures to address them. It is essential to consider strategies like deploying experienced nursing staff in the transfer team, conducting equipment checks and ensuring that nurses are fully

acquainted with the tools and technologies related to transfer and perception of IHT safety. Therefore, it is imperative to teach the transfer staff about the factors that affect IHT safety. Medical policymakers and the health system should also prioritize the factors that affect the safe IHT of critically ill patients from the ED and ICU. Additionally, the procedures implemented by those responsible for the transfer, their effectiveness and safety should be examined.

References

1. Schwebel C, Clec'h C, Magne S, Minet C, Garrouste-Orgeas M, Bonadona A, et al. OUTCOMEREA Study Group. Safety of intra-hospital transport in ventilated critically ill patients: A multicenter cohort study. Crit Care Med. 2013; 41:1919–28.
2. Szem JW, Hydo LJ, Fischer E, Kapur S, Klemperer J, Barie PS. High-risk intrahospital transport of critically ill patients: Safety and outcome of the necessary "road trip" Crit Care Med. 1995; 23:1660–6.
3. Waddell G. Movement of criticall ill patients within hospital. Br Med J. 1975; 2:417–9.
4. Stawicki SP, Galwankar SC, Papadimos TJ, Moffatt-Bruce SD. Gurgaon, Haryana, India: Wolters Kluwer Health (India) Pvt. Ltd; 2014. Fundamentals of Patient Safety in Medicine and Surgery; pp. 5–78.
5. Parmentier-Decrucq E, Poissy J, Favory R, Nseir S, Onimus T, Guerry MJ, et al. Adverse events during intra-hospital transport of critically ill patients: Incidence and risk factors. Ann Intensive Care. 2013; 3:10.
6. Pascual JL, Blank NW, Holena DN, Robertson MP, Diop M, Allen SR, et al. There's no place like home: Boarding surgical ICU patients in other ICUs and the effect of distances from the home unit. J Trauma Acute Care Surg. 2014; 76:1096–102.
7. Nuckols TK. Reducing the risks of intra-hospital transport among critically ill patients. Crit Care Mede. 2013; 41:2044–5.
8. Schwebel C, Clec'h C, Magne S, et al. Safety of Intra-hospital transport in ventilated critically ill patients: a multicenter cohort study.Crit Care Med, 2013; 41:1919–28.
9. Alizadeh Sharafi R, Ghahramanian A, Sheikhalipour Z, et al. Improving the safety and quality of the Intra-Hospital transport ofcritically ill patients. Nurs Crit Care, 2021; 26:244–52.
10. Wacker J, Staender S. The role of the Anesthesiologist in perioperative patient safety. Curr Opin Anaesthesiol, 2014; 27:649–56.
11. Nonami S, Kawakami D, Ito J, et al. Incidence of adverse events associated with the in-hospital transport of critically ill patients. CritCare Explor, 2022; 4:e0657.
12. Hu Y, Shi D, You L, et al. Intrahospital transport of criticallyill patients: A survey of emergency nurses. Nurs Crit Care, 2021; 26:326–32.
13. Yang Z, Song K, Lin H, et al. Factors associated with emergency Department length of stay in critically ill patients: a single-centerretrospective study. Med Sci Monit, 2021; 27:e931286.
14. Lu K-K, Zhang M-M, Zhu Y-L, et al. Improving the quality of emergency Intra-hospital transport for critically ill patients by using Toyota production system methods. J Multidiscip Healthc,2022; 15:1111–20.
15. Veiga VC, Postalli NF, Alvarisa TK, et al. Adverse events during Intrahospital transport of critically ill patients in a large hospital. RevBras Ter Intensiva, 2019; 31:15–20.
16. Yang S-H, Jerng J-S, Chen L-C, et al. Incidence of patient safety events and process-related human failures during intra-hospital transportation of patients: retrospective exploration from the institutional incident reporting system. BMJ Open, 2017; 7:e017932.
17. Bergman LM, Pettersson ME, Chaboyer WP, et al. Safety hazards during Intrahospital transport: a prospective observational study. CritCare Med, 2017; 45:e1043–9.

18. Williams P, Karuppiah S, Greentree K, et al. A checklist for Intra-hospital transport of critically ill patients improves compliancewith transportation safety guidelines. Aust Crit Care, 2020; 33:20–4.

19. Pedreira LC, Matos Santos I, Farias MA, et al. Nurses' knowledge of intra-hospital transport of critical patients/Conhecimento DA Enfermeira Sobre O Transporte intra-Hospitalar do Paciente Critico/Conocimiento de la Enfermera Sobre El Transporte Intra-hospital ario de Los Pacientes en Estado Critico. EnfermagemUerj, 2014; 22:533–40.

20. Gimenez FMP, de Camargo WHB, Gomes ACB, et al. Analysis ofadverse events during Intra-hospital transportation of critically ill patients. Crit Care Res Pract, 2017; 2017:6847124.

21. Nisha S, Theresa SJ. Risk factors and adverse events during intrahospital transportation among critically ill with a view to develop patient transport checklist. Ijone, 2022; 14:111–7.

22. Naweed A, Murphy P. One-track mind: investigating positive and negative applications of non-technical skills in rail network control.Appl Ergon, 2023; 106:S0003-6870(22)00163-6.

23. Latzke M, Schiffinger M, Zellhofer D, et al. Soft factors, smooth transport? the role of safety climate and team processes in reducing adverse events during Intra-hospital transport in intensive care [Healthcare management review. Health Care Manage Rev, 2020; 45:32–40.

24. Shields J, Overstreet M, Krau SD. Nurse knowledge of Intra-hospitaltransport. Nurs Clin North Am, 2015; 50:293–314.

25. Keykaleh MS, Safarpour H, Yousefian S, et al. The relationship between nurse's job stress and patient safety. Open Access Maced JMed Sci, 2018; 6:2228–32.

26. Bergman L, Pettersson M, Chaboyer W, et al. Improving quality and safety during Intrahospital transport of critically ill patients: A criticalincident study. Aust Crit Care, 2020; 33:12–9.

27. Brunsveld-Reinders AH, Arbous MS, Kuiper SG, et al. A comprehensive method to develop a checklist to increase safety of intra-hospital transport of critically ill patients. Crit Care, 2015; 19:214.

28. Murata M, Nakagawa N, Kawasaki T, et al. Adverse events during Intra-hospital transport of critically ill patients: A systematic reviewand meta-analysis. Am J Emerg Med 2022; 52:13–9.

29. von Elm E, Altman DG, Egger M, et al. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. Ann InternMed, 2007; 147:573.

30. Bergman L, Chaboyer W, Pettersson M, et al. Development and initialPsychometric testing of the Intra-hospital transport safety scale in intensive care. BMJ Open, 2020; 10:e038424.

31. Akrami S, Sargazi GH, Safabakhsh L, et al. Assessing the effect oftraining the safe transfer checklist on the quality of Intra-hospital patient transfer: an Interventional study. Med Surg Nurs J, 2019; 8.

32. Mardani A, Griffiths P, Vaismoradi M. The role of the nurse in themanagement of medicines during transitional care: a systematicreview. J Multidiscip Healthc, 2020; 13:1347–61.

33. Canellas M, Palma I, Pontífice-Sousa P, et al. Checklist for a safe intra-hospital transport of critically ill patients: A Scoping review. Enfermería Global, 2020 ;19:525–72.

34. Song Y, Zhao Q, Yang M, et al. Intra-hospital transport of critically ill patients: A cross-sectional survey of nurses' attitudesand experiences in adult intensive care units. J Adv Nurs, 2022; 78:2775–84.

35. Silva RS, Amante LN, Salun NC, et al. Visibility of Intra-hospital transportin an intensive care unit: a descriptive study. Revista Gaúcha de Enfermagem, 2017; 38:e2017–0048.

36. Dabija M, Aine M, Forsberg A. Caring for critically ill patients during Inter-hospital transfers: A qualitative study. Nurs Crit Care,2021; 26:333–40.

37. Gustafsson M, Wennerholm S, Fridlund B. Worries and concerns experienced by nurse specialists during inter-hospital transports of critically ill patients: a critical incident study.

Intensive Crit Care Nurs2010; 26:138–45.

38. Habibzadeh F, Aliha JM, Imanipour M, et al. The effect of interactiveworkshop on the quality of intra-hospital patients' transfer: A quasi-experimental study. Nursing Practice Today, 2017; 4:79–86.