Effect of Intra-Hospital Safe Transportation Guidelines for CriticallyIll Patients on Nurses' Performance and Patients' Clinical Outcomes

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Abstract

Background: Critically sick patients who are relocated within a hospital for diagnostic or therapeutic purposes are referred to as being intra-hospitality transported. Because of the severity of the patient's illnesses and the requirement for constant monitoring during the transfer, this type of work can be dangerous and extremely stressful, even for experienced nurses. **The study's objective** was to assess how nurses' performance and patients' clinical outcomes were affected by intra-hospital safe transportation standards for critically sick patients. **Setting**: The Minya University Hospital in Egypt's surgical intensive care units served as the study's site. **Method**: In this investigation, a quasi-experimental design was adopted. **The study** included a convenience sample of 60 critically ill patients, divided equally into 30 patients for the study and control groups, and all available nurses (70) working in the Surgical ICU. **Tools**: A self-administered questionnaire by nurses, a practice observational checklist by nurses, and patient clinical outcomes were the three instruments utilized to gather the data. ***Results*:** It was found that in comparison to the majority of them (82.9%) who reported high levels of knowledge following the adoption of guidelines, the great majority (90%) of the nurses under study indicated poor levels of overall knowledge before the guidelines' implementation. Additionally, there was a significant statistical improvement in the clinical outcomes of critically ill patients during intra-hospital transportation, with the majority of the studied nurses (90%) having an incompetent practice level compared to the great majority (98%) having a competent level of practice following the implementation of guidelines. **Conclusion*:*** The knowledge and practice of nurses might be improved by carefully crafted safe intra-hospital transportation guidelines, which would also reduce patient complications and unfavorable events during transportation. **Recommendation:** To stop unfavorable incidents from happening, it was advised that intra-hospital transfer policies, procedures, and checklists be followed consistently in every intensive care unit.

Keywords: guidelines, patients' clinical outcomes, nurses' performance, safe intra-hospital transportation, and critically ill patients.

Introduction

Critically sick patients (CIPs) have an increased risk of morbidity and death during transfer. Risks can be minimized and possibly improved with careful preparation, the use of personnel competent for the job, and the selection or availability of the appropriate equipment. The maintenance or monitoring of a patient's vital functions does not stop during transportation. Additionally, throughout the transit process, a patient's vital signs are constantly tracked and maintained. Furthermore, equipment and personnel with the necessary training are selected to suit the patient's needs for continuous or evident acute treatment. **(Ackley et al., 2020).**

Airway, breathing, circulation, disability, and exposure formats are all included in the organized ABCDE approach, which should be followed by a clinician with the necessary training to conduct ongoing assessments of the CIPs both inside and outside of intensive care units (ICUs). This framework affords a standardized approach among specialists and makes prioritizing the correction of life-threatening issues easier. **(Zangrillo et al., 2020)**.

Acute, long-term, palliative, home, primary, and community care are all parts of the care continuum, and patient safety iscrucial to each of them. It is estimated that 64 million

Worldwide, poor care results in the loss of disability-adjusted life years yearly. This indicates that one of the top 10 global causes of death and disability is most likely patient damage as a result of adverse events (AEs). ***(World Health Organization, 2021).***

AEs related to IHT are more common among critically ill patients (CIPs) who are hospitalized in the intensive care unit (ICU). A ventilator's necessity, unstable hemodynamics, and a lack of communication between healthcare personnel are just a few of the causes of adverse events ***(Murata et al., 2022).***

According to the standards, patients should get the same level of care while following normal protocols for intra-hospital patient transport, ensure that the ICU has available monitoring and intervention; give the sickest patients priority during the transfer. When managing patients, safety should be considered, along with the schedule, path, and final goal. ***(Khan et al., 2021).***

Although not all hospitals have the rules or adhere to them strictly, hospitals in various nations have produced patient transport and transfer criteria about those developed in industrialized nations. ***(Araiza et al., 2021).***

In addition to patient assessment, continuing monitoring, and management concerns as recommended, the intra-hospital transfer recommendations should contain information on how to prepare for the IHT by **Sharma *et al. (2020).*** Further suggestions to improve safety during IHT include conducting a risk-benefit analysis, verifying the credentials of the transport staff, evaluating the sufficiency of the equipment, and going through a pre-transport check list. ***(Hu et al., 2021).***

The body's circulatory and respiratory systems, as well as other organs, are frequently impacted by difficulties that arise during the intra-hospital transfer of CIPs. These disorders can eventually result in death. equipment-related complications in transportation. Numerous variables, including patients' health status, equipment failure, and device malfunction, increase the probability, inadequate monitoring of the patient during transfer, inadequate documentation of the intra-hospital transport method, and poor communication procedure ***(Sharafi et al., 2021)***.

Cardiovascular system issues, such as cardiac arrest, variations in blood pressure (typically hypotension), tachycardia, arrhythmia, and pulmonary edema, are among the sequence of complications that face surgical CIPs during IHT. alterations in breathing frequency, pneumonia, aspiration, airway blockage, inadvertent endotracheal tube displacement or movement, respiratory arrest, O2 reduction, and blood gas alterations are among the respiratory system complications. ***(Association of perioperative Registered Nurses (AORN) Anonymous, 2022).***

Therefore, by practicing thorough planning, creating effective communication, supplying necessary equipment, and accurately assessing patients' clinical situations, a well-trained and experienced team can increase the safety of the IHT of CIPs. Every stage of the transfer procedure is attended to by nurses, who are the primary members of the transport team. Due to their training, expertise, and close observation of patients, they can identify any potentially fatal situations that may emerge while the patient is being transported. **(Ackley et al., 2020).**

Careful patient preparation, prompt intervention, early identification and monitoring of any adverse events that may occur during transit, and customized sedation, evacuating patients during transportation is a major responsibility of critical care, and it can be achieved by evaluating the suitability of the equipment, acting quickly, and performing routine patient and equipment inspections. carer ***(Catalán-Ibars et al., 2022).***

Significance. of. the. study:

According to research by Murata et al. (2022), transporting critically ill patients can be dangerous; adverse events have been linked to between 6% and 70% of all IHT cases, and 8% of cases that required medical therapy were reported to have changes in vital signs, inadvertent extubating, and cardiopulmonary arrest. Furthermore, the Australian Incident Monitoring Study in Intensive Care documented major bad outcomes in 31% of transport episodes, with patient deaths occurring in 2% of these reports. ***(Williams et al., 2020).*** The morbidity and mortality rate of the total patients at Minya University

Hospital during IHT intra- hospital transportations was not disclosed by statistics result revealed

There have been reports of intra-hospital transfers being dangerous, particularly for CIPs. Because of the emergency circumstances of critically sick patients, even the quickest transportation route may result in potentially fatal complications. To reduce the negative impacts of transportation and enhance the clinical outcomes of patients, critical care nurses must expand their understanding of and experience with applying intra-hospital safe transportation protocols.

Aim. Of. The. Study

The purpose of this study was to assess how clinical outcomes for patients and nurses were affected. The following methods will be used to do this:

1. Evaluate the performance (knowledge and experience) of the nurses in terms of safely transporting critically sick patients within the hospital.
2. Create into practice safe intra-hospital transportation protocols for nurses tending to patients with critical illnesses.
3. Assess how nurses' performance and patients' clinical outcomes are affected by intra-hospital safe transportation policies for critically patients.

Research. hypothesis:

For the current study, there are two research hypotheses that are as follows:

- The nurses' performance (knowledge and practice) for the safe intra-hospital transfer of critically sick patients would improve if the guidelines were put into place.
- Following the implementation of intra-hospital safe transportation rules, anticipated that patients' clinical outcomes will improve**.**

Operational. Definitions

Nurses performance: means nurses' knowledge and practice.

Guidelines: the researcher will develop safe IHT guidelines for critically ill patients to prevent various adverse events accompanied with their transportation based on the related recent literatures.

Critically. ill. patients: refers to patients who were admitted to the hospital of choice's surgical intensive care units.

Patients' .clinical .outcomes: contains the following parameters: unfavorable occurrences and complications that may arise during intra-hospital transit, such as endotracheal or tracheostomy tube disconnection, removal of the chest tube, disconnection of the intravenous lines, displacement of the nasogastric tube, disconnection of the wound drainage, unintentional removal or blockage of the central line catheter, SPO2 falling more than 5% from baseline for more than a minute (hypoxic event), temperature below 350C (hypothermia), elevation of heart rate, and drop of 20 mmHg, 20% increase in systolic and 10% reduction in diastolic pressure from baseline for longer than 5 minutes (hypertensive event); 10% increase in diastolic pressure from baseline for longer than 5 minutes (hypertensive event).

Subjects. and. method:

Study .design: This investigation employed a quasi-experimental research design.

Setting:

This study was carried out in the surgical intensive care units of Minya University Hospitals, a teaching hospital located on the first floor with 47 beds total. The surgical intensive care unit had 27 beds, while the anesthesia intensive care unit had 20 beds.

Subjects:

The seventy eligible nurses who provide direct nursing care and have direct contact with CIPs and are employed in the aforementioned venues. The subjects were chosen at random from among 60 CIPs who were born in the intensive care units of hospitals connected to Minya University, providing a convenience sampling of 60 critically ill patients. The sample size was calculated using Epi-

info as a fraction of the total number of patients admitted to intensive care units (ICUs) each year (200 patients to the Anesthesia ICU and 300 patients to the Surgical ICU) hospital for education) and split into two equal groups of thirty people each, as follows:

Control. Group: The thirty very sick patients received IHT care according to the hospital's regular schedule. routine medical attention provided during transit without evaluating the patient, checking any attached tubes, or inspecting the equipment before, during, or after the trip. During transit, there was no ongoing assessment. Medication-wise, prior to transportation, only an adrenaline ampule and diluted sedation were taken. Just grabbed an oxygen-filled Ambo bag for equipment.

Study. Group: The group comprised of thirty recently admitted critically ill patients who required IHT for any reason, as well as those who were exposed to safe IHT guidelines and the stability of CIPs' hemodynamic parameters.

Tools. of. Data. Collection:

For this study's data collection, three instruments were employed.

Tool. I: Questionnaire that nurses self-administered:

It was divided into the following two parts:

Part. (1): Age, gender, educational attainment, years spent in the intensive care unit, prior training, and attendance at safety workshops are among the demographic characteristics of nurses.

Part. (2): After examining pertinent literature, the researcher created the **Nurses' Knowledge questionnaire** on Intra-Hospital Safe Transportation **(Maddry et al., 2017, Williams et al., 2020& Hu et al., 2021)** to evaluate the previous, current, and post-IHT knowledge of nurses. Nine items in the general knowledge category, ten items in the before, eight items in the during, and seven items in the post-IHT categories, and eight items in the immediate nursing intervention category comprised the nurses' knowledge.

Scoring. System:

There will be three different question scoring levels, which are as follows: Complete and accurate response received (2) Both complete and accurate responses were scored (1). Unknown or inaccurate response (0) The following will be computed and categorized as the overall patient knowledge scoring system:

- Good → > 85% of. The. total. score
- Fair → ≥ 60% - 85% of. The. total. score
- Poor → < 60% of. the. total. score.

According to the following category, the score was totaled and converted into a percentage: Under 60% was deemed to be a low level of knowledge. Higher levels of knowledge were defined as those that exceeded 85%, with a moderate level of knowledge being defined as those that fell between 60% and less than 85%.

Tool. II: Nurses`. Practice. Observational. Checklist. regarding. Intra- Hospital. Transportation:

The researcher created this tool—an observational checklist—to evaluate nurses' practices prior to, during, and following IHT after reviewing pertinent literature (**Mukabagire, 2019; Souza et al., 2022**). The six domains of nursing practice included: preparing necessary medications (5 items), checking necessary equipment (22 items), preparing the patient's connected tubes and devices, and preparing intravenous fluids and position (19 items), nurse practice during the transportation phase (7 items), nurse practice immediately following IHT (7 items), monitoring of hemodynamic parameters (7 items), and checking the position of the ventilator and cardiac monitor (7 items).

Scoring. system:

The following will be the practice scoring system:

-Done. will. take (1)

- Not. Done. will. take (0)

After computation, the overall practices score will be categorized as follows:

-Competence → ≥ 85%. of. the. total. score

- Incompetence → < 85%. of. the. total. score

Tool. III: Patients'. Clinical. Outcomes.

Assessment. Tool:

After studying pertinent literature, the researcher created this tool (**Teasdale, 1979, Madalena et al., 2020&Putra et al., 2022)** for gathering of baseline information on CIPs. It violated the following three sections:

Part. (A): Patients'. Demographic. data; include the patient's age, gender, diagnosis, length of illness, breathing technique, physical examination, breathing and hemodynamic parameters, and any attached tubes or devices, such as surgical wound drains, urinary catheters, gastric tubes, and arterial lines.

Part. (B): Glasgow. Coma. Scale. (GCS): Teasdale (1979) created it in order to gauge the consciousness of CIPs. The eye response, verbal response, and motor response domains comprise the three categories into which the GCS was divided. The response levels ranged from 1 (no response) to 4 (eye-opening response), 5 (verbal response), and 6 (motor response), or normal values. The total score assigned to each domain was used to determine the level of consciousness, which was then categorized as follows:

-Score. Of. 13-15. considered. mild.

- Score. of. 9–12. considered. moderate.
- Score. Of. 3-8. considered. severe.

Part. (C): Intra-Hospital. Transportation. related. Complications.; After studying pertinent literature (Putra et al., 2022 & Souza et al., 2022), the researcher developed it. It was used to evaluate CIP complications and adverse events that can happen during and after IHT, such as; removing or disconnecting the chest tube, disengaging the nasogastric tube, disconnecting the wound drainage, disconnecting the central line catheter by accident, disconnecting the tracheostomy or endotracheal tube, intravenous lines, Temperature <35C (hypothermia), decrease in systolic and diastolic pressure of 20 mmHg and 10 mmHg from baseline for more than 5 minutes (hypotensive event), and a drop in Spo2 of more than 5% from baseline for more than a minute. Hypertensive event: rise in systolic and diastolic blood pressure of 20 mmHg and 10 mmHg, respectively, obstruction of an artery; inadvertent dislodgement of a urinary catheter; altered mental status; need for advanced oxygen support; hypoxia; and cardiac arrest.

Scoring. system: A score was assigned to the presence or absence of intra-hospital adverse events and complications. A score of (1) was assigned to current complications, while a score of (0) was assigned to non-current complications.

Operational. design

Preparatory. phase: Using books, articles, online magazines, and periodicals to build tools for data collection, it involved analyzing relevant literature and theoretical understanding of several study-related topics.

Tools. Validity. And. reliability

Content. Validity: All of the tools used in the study were created by the researcher following a review of recent, pertinent literature, with the exception of tool 3, part B, which had been created by Teasdale (1979).

After assessing the content validity of the generated tools and concluding that they were applicable and understandable, seven specialists in medical surgical and critical care nursing made the necessary revisions. The outcome of the calculations was = (88%).

Reliability: The reliability of each tool was assessed using the following methods: the Cronbach Alpha was calculated for Tool I (0.85), Tool II (0.75), and Tool III part C (0.82) in order to confirm the instrument's reliability through two test-retesting on the same participants who took part in the instrument pilot.

Pilot. study:

Before any data was actually collected, a pilot study involving ten nurses and ten patients was carried out to make sure the questionnaire was clear and easy to read.

Field. Work:

The period from the beginning of June to the end of November 2023 was chosen for data collection, with an approximate 6-month

duration anticipated.In order to conduct the study, it was divided into four phases: assessment, planning, implementation, and evaluation.

Assessment. phase: In order to gather data and evaluate nurses' knowledge and practice of safe IHT, the researcher used Tools (I and II). Nurses were given it by the researcher to complete individually. The demographic features of the patient were also evaluated through the use of tool III (part A). The investigator employed Tool III (part B) to evaluate IHT-related complications prior to implementing guidelines. The nurses took between 20 and 35 minutes to complete the knowledge questionnaire, and the researchers completed each nurse's observational check list in 20 minutes.

Planning. phase: A program of guidelines that aimed to enhance nurses' performance and patients' clinical outcomes was designed based on an evaluation of nurses' educational needs and a review of the literature. A straightforward Arabic booklet with illustrations was created backed by instructive images to serve as a guide for the nurses, and a variety of teaching techniques, including group discussions, videos, and presentations for the theoretical portion and demonstrations and redemonstrations for the practical part, were employed.

Four sessions made up the program, and each ran for two days straight. During the morning shift, the sessions were planned. Twenty to thirty minutes were allotted for each lesson. Nurses were observed before and after the guideline's intervention was implemented, using an observational checklist, for the practical phase.

The researcher used interactive lectures, video presentations, and booklets to implement a guidelines program for nurses. There were seven groups of nurses, and within each subgroup there were ten nurses. Subgroups within each group were then further divided, sometimes into three groups, based on the distribution of endorsement shifts, with five nurses in each group.

Implementation: The following guidelines were put into practice by the researcher for all nurses under study:

Four sessions made up the program, and each ran for two days straight. During the morning shift, the sessions were planned. Each session lasted between twenty and thirty minutes. The observational checklist for the nurses under study was used for the practical phase, both before and after the guidelines were implemented.**Theoretical. Part. Sessions. Focused. On. The. following:**

The. First. session: concentrated on the meaning, nature, uses, indications, risks, complications, and unfavorable outcomes of inpatient hospital transportation (IHT).

The. Second. session: Concentrated on safe IHT procedures, including pre-IHT communication, equipment setup, patient monitoring, and preparation.

The following sessions were the focus of the practical portion:

The. Third. session: nursing evaluation and care of CIPs both during and after IHT were the main focus.

The. Fourth. session: centered on CIPs' assessment both during and after IHT and nursing intervention.

Through interactive lectures, video presentations, and booklets, the researcher implemented a guidelines program for nurses. The seven groups of nurses were separated. Following the division of each group into subgroups with five nurses in each, and occasionally with three nurses depending on the distribution of their endorsement shifts, each subgroup was made up of ten nurses.

Evaluation. Phase. The researcher employed tools I and II to assess nurses' knowledge and practice following the adoption of safe IHT guidelines. CIPs' clinical results are assessed using Tool III (parts B and C) To assess the impact of putting safe IHT guidelines into practice, a comparison of the pre- and post-safe IHT guidelines was conducted one week after the guidelines program's attendance.

Administrative .design

In order to conduct the study, permission was requested from the relevant authorities of the chosen settings and formal permission for data collection was obtained from the Faculty of Nursing.

Ethical. And. Legal. consideration:

Approval with code (REC 6/2023) was obtained from the Minya University faculty of nursing's ethical committee.

The goals of the study, the privacy of the data, the rewards, and the option to discontinue participation at any moment were explained to each and every participant. Following an explanation of the study's purpose and the fact that it wouldn't harm any of the participants, nurses gave their written informed consent to take part. Respect for patient privacy and confidentiality was upheld when collecting data.

Statistical. analysis: A Chi-square test was performed to compare qualitative variables between the before and after the protocol for the studied groups. The data entry and analysis were completed using SPSS Ver. 19. Descriptive statistics (number, percentage, mean, and standard deviation) were gathered. A P-value is deemed statistically significant when p is less than 0.05.

Results:

Table. 1: demonstrates that 77.1 percent of the investigated nurses were female and 88.6% of the nurses were in the age range of (21–30) years. Furthermore, only 4.3% of the nurses in the study had a diploma, compared to 67.1%) who had technical degrees. In terms of ICU experience years, it was found that approximately 74.2 percent of the nurses under study had one to less than five years of experience working in an ICU. Only 7.1% of the nurses in the study attended the sessions on guidelines for the safe IHT of CIPs. Moreover, no workshop on the safety IHT of critically ill patients was given to any of the investigated nurses.

Figure. (1): Demonstrates that sixty percent of the nurses surveyed had no prior records of adverse events occurring during IHT of patients who were extremely sick.

Table. (2): explains that changes in all knowledge domains were found to be highly statistically significant before and after the implementation of safe IHT guidelines, with p = 0.000.

Table. (3): shows that, prior to the safe implementation of IHT guidelines, 90% of the nurses under study reported having low overall knowledge, whereas, following the implementation of educational guidelines, 82.9 % of the nurses under study reported having high overall knowledge. Additionally, the mean ± standard deviation of the examined nurses' knowledge prior to the safe IHT guidelines' implementation was (28.13±4.122) and it was (71.33±5.128) after the guidelines' implementation.

Table. (4): demonstrates that there were very significant statistical differences in the areas of nurses' practice during the transportation phase, checking of necessary equipment, and the domains right after IHT (p=0.000). However, when it came to setting up the required drugs, the patient's attached tubes and devices, intravenous fluids and placement, checking the ventilator and cardiac monitor, and monitoring hemodynamic parameters, no statistically significant differences were found (p > 0.05).

Table. (5): demonstrates that after the safe IHT guidelines were implemented, 90.0% of the nurses who were studied had a practice level of incompetence while 98.6% of the nurses studied had a practice level of competence. Additionally, the average deviation of nurses' practices prior to the implementation of safe IHT guidelines was 42.11±18.150, while it was 82.49±4.050 afterward.

Table. (6): demonstrates a positive correlation (r=0.425, r =0.521 at P=0.000) between the total practice and knowledge level of the nurses under study before and after the guidelines were implemented.

Table. (7): shows that the levels of knowledge and practice prior to the intervention and the AEs that occurred had a statistically significant negative correlation (r=-0.589, -0.423 at P<0.001). Conversely, levels of knowledge and practice after the intervention and the number of adverse events (AEs) had a highly statistically positive correlation (r=0.487 at P<0.001) and 521 at P=0.000, respectively.

Table. (8): explains that, for patient demographics under study, no statistically significant differences were found when p >0.05. Also, this table made it clear that, in terms of gender, roughly 36.6% of the study group and 30.0% of the control group were between the ages of 18 and 30, respectively. It was also observed that, in both groups, the majority of the patients under study—86.6% and 90.0%—were men. Furthermore, with respect to areas of transportation, it was noted that 66.6% and 73.4%, respectively, of the patients in the control and study groups were taken to a computerized tomography scan unit.

Table. (9): demonstrates that before, during, and after transportation, there were no statistically significant in the conscious level between the study patients and the control group.

Table. (10): shows the most frequent adverse events and complications that patients in the study and control groups experienced. This table showed that, with significant differences (p <0.005), only 16.7% of patients in the study group were significantly affected by the disconnection of their IV and ETT lines, compared to 50% of patients in the control group.

Additionally, only 16.7% of study one reported NGT displacement, compared to 56.7% of the control group. These differences were significant, with p <0.05, between the two groups. Conversely, concerning other aspects of the negative effects of IHT, no appreciable distinctions were found between the study and control group

Table. (1): Percentage. Distribution. Of. The. Studied. Nurses. Regarding. Their. Demographic. Characteristics.

Characteristics	The. studied. nurses (n=70)	
	N	%
Age (in years)		
▪ (21<30)	62	88.6
▪ (30<40)	8	11.4
Gender		
▪ Male	16	22.9
▪ Female	54	77.1
Social. Status		
▪ Single	40	57.1
▪ Widow	30	42.9
▪ Divorced	0	0.0
Educational. level		
▪ Diplomas	3	4.3
▪ Technical	47	67.1
▪ Bachelor	20	28.6
Years. of. experience. years.in. ICU		
▪ (1 <5)	52	74.2
▪ (5< 10)	14	20.0
▪ (10<15)	2	2.9
▪ (>15)	2	2.9
Previous. Educational. Sessions. related to. s a f e t y IHT. of critically ill. patient		
▪ Yes	5	7.1
▪ No	65	92.9
Previous. workshops. regarding. safety. IHT. ofcritically. ill. patient.	70	100
▪ No		

Figure (1): Percentage. Distribution. of the studied. nurses. regarding them**. previous** incidence. reports about. adverse. event. happened. during. IHT. of critically. Ill. patient.

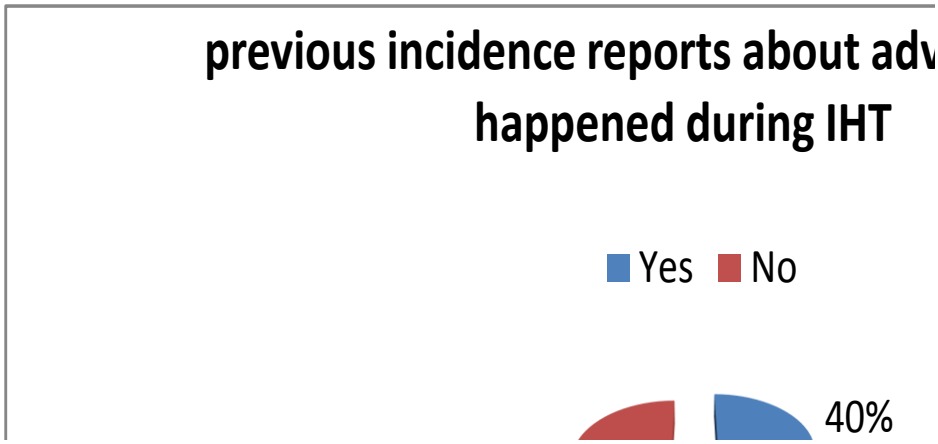

Table (2): Mean. Scores. of the. Knowledge. Domains. of the. studied. nurses. about. intra hospital. transportation. of critical. ill. patient. pre. and. post. intervention.

Knowledge. domains	**Range Mean ± SD**		**t/ P**
	Pre	**Post**	
• Questions general about IHT for patients in critical condition	(0-8) 5.35±2.201	(9-17) 15.48±1.712	29.88 0.000**
• Information regarding critically ill patients prior to IHT	(0-11) 7.89±2.439	(10-19) 16.97±1. 785	24.88 0.000**
• Information pertaining to critical illness patients during IHT	(0-8) 4.11±1.793	(9-17) 13.77±1.710	32.23 0.000**
• Post-IHT-related knowledge	(1-6) 4.65±1.372	(7-13) 11.88±1.307	32.31 0.000**
• Understanding of adverse events and potential risks that could affect both the patient and the nurse during IHT and the need for prompt nursing intervention	(1-12) 5.99±2.211	(9-17) 13.77±1.67 5	23.47 0.000**

Pre: Pre- safe IHT guidelines
IHT: Intra-hospital Transportation
Post: Post safe IHT guidelines
** highly statistically significant at level P<0.001

Table. (3): Pre- and post-implementation of guidelines percentage distribution of the nurses under study based on their overall knowledge of safe IHT of critically ill patients.

Total. Knowledge. Level	**The. studied. nurses (n=70)**				x^2 **P**
	Pre		**Post**		
	N	**%**	**% N**	**%**	
▪ Low ▪ Moderate ▪ High	63 6 1	90.0 8.6 1.4	1 11 58	1.4 15.7 82.9	**140.00 0.000****
Range Mean ± SD	**(17-37) 28.13±4.122**		**(51-81) 71.33±5.128**		**t=54.68 P=0.000****

* Significant at level P<0.0
**High significant at level P<0.001

Table. (4): The study's nurses' pre- and post-intervention mean scores across practice areas

Domains. of. nurses. practicemeans. score	The. Studied. nurses (n=70) Range Mean ± SD		t p
	Pre	Post	
▪ Checking. of. necessary. equipment	(4-17) 9.21±3.077	(5-18) 11.18±3.455	0.382 0.000**
▪ Preparation. Of. Necessary. medication	(1-5) 2.56±0.790	(1-5) 2.77±0.799	1.391 0.167
▪ Preparation. of the. patients. connected tubes., devices,intravenous. fluids & position	(0-14) 4.01±3.009	(0-14) 5.07±3.466	1.855 0.051
▪ Checking. of cardiac. monitor and Ventilator	(1-6) 1.79±1.583	(1-6) 2.17±1.803	1.384 0.195
▪ Monitoring. of hemodynamic. parameters	(1-6) 2.55±1.360	(1-6) 2.77±1.442	1.099 0.288
▪ Nurse' practice.During transportation phase.	(1-13) 6.55±4.231	(11-13) 12.77±0.517	12.249 0.000**
▪ Nurse' practice. Immediate. post. IHT	(2-17) 10.02±4.441	(11-19) 19.51±0.899	17.327 0.000**

Table. (5): Pre- and post-implementation percentages of the researched nurses' overall practice level before and after safe IHT guidelines were implemented

Total. Practice. level	The. Studied. nurses (n=70)				x^2 P
	Pre guidelines		Post guidelines		
	N	%	N	%	
• **Competence**	7	10.0	69	98.6	**FE**
• **Incompetence**	63	90.0	1	1.4	**0.000****
Range	**(24-82)**		**(71-91)**		**t=18.190**
Mean ± SD	**42.11 ± 18.150**		**82.49 ± 4.050**		**P=0.000****

****** high Significant at level P<0.001 FE: fisher exact test

Table. (6): Pre- and post-intervention correlations between the studied nurses' overall knowledge and practice levels

Total. Knowledge. level	The. studied. nurses (n=70) Total. Practice. level	
	R	P- value
Pre	0.425	0.000**
Post	0.521	0.000**

Pre: Pre-guidelines Post: Post guidelines * * high Significant at level P<0.001

Table (7): Correlation between nurses' total scores of knowledge and practice regarding intra-hospital safe transportation of critically patients and adverse events occurred pre, post intervention.

variables		Total. score. of. knowledge		Total .score .of .practice	
		Pre	post	Pre	post
Adverse. Events	R	-0.589		-0.423	
	p-value	<0.001**		<0.001**	
	N	70		70	
	R		0.487		0.487
	p-value		<0.001**		<0.001**
	N		70		70

Table (8): Amount in percentage. Distribution, of the. Studied. Patients, regarding. Their traits as a demographic.

Characteristics	The. studied. patients (n=60)				X^2 P
	Control. group (n=30)		Study. group (n=30)		
	N	%	N	%	
Age (in years)					
▪ (18-<30)	7	23.4	11	36.6	
▪ (30-<40)	11	36.6	9	30.0	5.633
▪ (40-<50)	8	26.6	2	6.7	0.137
▪ (50-60)	4	13.4	8	26.7	
Gender					
▪ Male	27	90.0	26	86.6	FE
▪ Female	3	10.0	4	13.4	1.00
Transported, from					
▪ Computerized tomography	20	66.6	22	73.4	
▪ Dialysis unit	6	20.0	6	20.0	1.759
▪ Operation unit	2	6.7	1	3.3	0.189
▪ X-ray	2	6.7	1	3.3	

Table. (9): Glasgow coma scale percentage distribution of the patients under study, both the control group and the study group, over the course of the investigation.

Glasgow. Coma. Scale	The. studied. patients(n=60)													
	Control. group(n=30)						x^2 P	Study. group(n=30)						x^2 P
	Pre		During		Post			Pre		During		Post		
	N	%	n	%	N	%		n	%	N	%	n	%	
- Mild (13-15)	12	40.0	13	43.3	14	46.7	1.300	5	16.5	8	26.7	7	23.3	**0.822**
- Moderate (9-12)	5	16.7	5	16.7	3	10.0	0.861	12	40.0	12	40.0	13	43.3	**0.935**
- Severe (3-8)	13	43.3	12	40.0	13	43.3		13	43.3	10	33.3	10	33.3	
Range Mean ± SD	**(3-15) 9.50 ± 2.873**		**(3-15) 9.80 ± 3.294**		**(3-15) 9.67 ± 3.436**		**F=0.065 P=0.935**	**(3-15) 10.00 ± 4.697**		**(3-15) 10.13 ± 4.739**		**(3-15) 10.10 ± 4.837**		**F=0.005 P=0.993**

Pre: pre-transportation During: During transportation post: post transportation

Table. (10): The study and control groups' percentage distribution of the patients under investigation based on the complications and unfavorable events that occurred during intra-hospital transfer.

Clinical data	The studied patients (n=60)				FE P
	Control group (n=30)		Study group (n=30)		
	N	%	N	%	
- Cutting the tracheostomy or endotracheal tube	15	50.0	16	53.3	1.00
- Intermittent IV-line disconnections	15	50.0	5	16.7	0.018*
- Chest tube removal or disconnection	1	3.3	1	3.3	1.00
- Displacement of the Nasogastric tube	17	56.7	5	16.7	0.002*
- Cutting off the drainage from a wound	9	23.3	4	30.0	0.771
- Unintentionally removing or blocking a central line catheter	8	26.7	7	30.0	0.209
- A >5% drop in SPO2 from baseline lasting longer than one minute (Hypoxic event)	8	26.7	10	33.3	1.00
- Temperature, <350C, (Hypothermia)	0	0.0	1	3.3	1.00
- Increase. Heart, rate	12	40.0	6	20	0.084
- Reduce systolic pressure by 20 mmHg and diastolic pressure by 10 mmHg over a period of five minutes (hypertensive event)	2	6.7	3	10.0	1.00
- For more than five minutes, increase the baseline systolic and diastolic pressure by 20 mmHg and 10 mmHg, respectively (hypertensive event).	3	10.0	1	3.3	0.492
- Arterial, line. blocking	9	30.0	4	13.3	0.209
- Accidental, dislodging, of. urinary. catheter	8	26.7	7	23.3	1.00
- Altered. in. mental, status	2	6.6	0	0.0	0.612
- Needing, advanced, 02. support	6	20.0	1	3.3	0.195
- Hypoxia	5	16.7	4	13.3	1.00
- Cardiac. arrest	2	6.7	2	6.7	1.00

* Significant at level P<0.05

Discussion:

A transportation protocol within the hospital may reduce the frequency of adverse events and complications. The clinical condition of the patient, the apparatus, the system, or human factors are typically involved in adverse events. Therefore, proficient nursing knowledge and practice are necessary to decrease the frequency of adverse events during intra-hospital transportation. Furthermore, skilled nurses are essential to enhancing both their own practice and patient outcomes. **(Souza et al., 2022).**

Aim. Of. This. study: Examine how nurses' performance and patients' clinical results are affected by intra-hospital safe patient transportation guidelines.

Regarding, to, demographic characteristics. of the. studied, nurses, the bulk of the study's nurses were between the ages of 21 and 30, per the study's findings. Given that this age group is

thought to be the healthiest and most capable of handling the workload in the surgical intensive care unit, it is possible that this finding stems from the fact that recently graduated nurses were place in the intensive care unit. Along with improving identity and fostering fruitful personal relationships, it also considered the best times for them to learn and adapt from their ICU training. This result is consistent with the research conducted by **Alizadeh Shariffi et al. (2021**) who stated that over half of the nurses in the study were female and over three quarters were under 30 years old. Additionally, the bulk of the nurses in the study were under the age of thirty, according to **Xie et al. (2020).**

However, this result contradicts that of **Song et al. (2022)**, who found that over half of the nurses in their age group were older than 35. Their study, "Intra hospital transport of critically ill patients: A cross-sectional survey of Nurses' attitudes and experiences in adult intensive care units," was about the same.

Regarding. gender, Women made up the bulk of the nurses under study, it was noted. According to the findings, men have only recently begun to study nursing; most male nurses are employed abroad, and prior to that, women completed the majority of nursing education. This data aligns with **Song et al.'s (2022)** findings, which showed that most staff nurses in intensive care units are female.

Additionally, over half of the nurses in the study were unmarried. The results of this study are in line with those **of Sharafi et al. (2021)**, who investigated ways to "improve the safety and quality of the intra-hospital transport of critically ill patients" and found that over three-quarters of the sample were married. This may be explained by the fact that the majority of the sample was young, with half being between the ages of 18 and 25.

Concerning. Educational. Level. and years. of experience. in. ICU, the results revealed that between one and less than five years, approximately three quarters of the nurses in the study were technical, and over two thirds were. This might be the result of the technical institution graduating more students than the high school graduation rate for nurses. The results of this study were in line with those of **Edrise et al. (2021)**, who found that two thirds of the sample had less than five years of ICU nursing experience. Their study focused on the "Knowledge of Nurses Regarding Transfer of Critically Ill Surgical Patients in Three University Hospitals in Khartoum."

Additionally, this result supported **Anchal and Reema's (2020)** assertion that the majority of the investigated nurses were graduates of the Institute of Nursing and had varying degrees of ICU experience, ranging from five to less than ten years. The majority of the examined nurses had a secondary education and graduated from a technical institute of nursing, according to **Keykaleh et al. (2018),** who also corroborated this finding. **Seilbea et al. (2020**), who added that the majority of the examined nurses had graduated from nursing schools and had worked in intensive care units for fewer than ten years, corroborated the findings as well.

Regarding, previous, incident, report More than one-third of the nurses in the current study reported seeing prior incidence reports about adverse events that occurred during IHT of critically ill patients. This information was obtained during intra-hospital transfer. This conclusion might be explained by the nurses under study having less experience with IHT adverse events and not understanding how crucial it is to record adverse events that occur during transit.

This result was consistent with a study by **Ignatyeva et al. (2018**), which found that between one-third and half of nurses experienced adverse events during intra-hospital transport.

Studied. nurses. Knowledge. Related. to safe intra-hospital. transportation; The study's conclusions showed that, both before and after the safe IHT guidelines were implemented, there were highly statistically significant differences in all knowledge domains. It was evident that the safe IHT guidelines had a beneficial effect on nurses' knowledge because the majority of the examined nurses had a respectable level of knowledge following their implementation. As per **Ignatyeva et al. (2018),** the outcome agreed. who stated after guidelines were implemented, nurses' understanding of intra-hospital transfer for CIPs increased.

Studied. nurses. Practice. Related. to safe. intra-hospital. transportation, With the adoption of safe IHT guidelines, the practice of nurses significantly improved, according to the current study. The conclusion may have to do with nurses' interest in topics covered in guidelines. In addition, the post-implementation of the guidelines was improving the knowledge and practice of nurses.

Hatem (2019) found that training critical care nurses improves their practice and lowers the rate of adverse events related to IHT of critically ill patients. These findings were consistent with their research. Furthermore, nurses who participated in educational sessions improved their knowledge and application of IHT, according to **Fatemeh et al. (2021).**

The results of the study showed that, both before and after the guidelines were implemented, there was a highly statistically significant positive correlation between the studied nurses' total practice and knowledge levels. Perhaps it has to do with how improved patient care can be achieved by the nurses who are the subject of the study receiving better education and training. According **to Ahmed et al. (2015) and Shwu et al. (2020),** the outcome was showed that critical care nurses' knowledge and practice had a statistically significant correlation, which was a result of the intra-hospital transportation training program.

Concerning. Correlation. Between. total scores. of knowledge. and practice. The current study found a highly statistically significant negative correlation between the levels of knowledge and practice prior to the intervention and the AEs that occurred with regard to the safe intra-hospital transportation of CIPs. The study variables and the adverse events that happened after the intervention also showed a strong statistically positive correlation. The researcher believes that this could be because any practices or skills that need to be improved should be founded on accurate knowledge that improves as a result of the guidelines' post-implementation, which reflects on the outcome for patients by preventing any adverse events.

According to **Khan et al. (2021),** there was a highly significant positive correlation between the nurses' overall knowledge, their overall practice score, and their overall attitude toward transportation CIPs. These findings are consistent with the findings of the study. According to **Arpit et al. (2018),** there was a statistically significant positive correlation observed between the total knowledge, total practice, and total attitude score of the nurses under study.

Regarding. The. Demographic. Characteristics. of the. Studied. patients among. the studied. Groups., As for the demographic characteristics of the study and control groups, the current study results made clear that there were no statistically significant differences found. However, it was noted that the majority of the patients in both groups were young, and the majority of all the patients studied were male. The majority of the patients involved were male, and their age range was reported to be between 20 and 40 years old, according to a study by Ismail et al. (2020), which verified these findings. As a consequence of traffic accidents that result in traumatic events, the majority of patients, according to the results of this study, were young people who were admitted to the hospital. The bulk of the patients in the study were taken to a computerized tomography scan unit; this may have something to do with the corona virus pandemic, since all of the patients required a CT scan of their chests in order to assess their condition and to diagnose, assess, and monitor any traumatic events they had experienced.

These results were further corroborated by **Ismail et al. (2020)**, who demonstrated that the majority of the patients under study were sent to the radiology department, particularly for CT scans. According to **Omer et al. (2020)**, critically ill hospital patients most frequently end up in the CT scan room. More than half of all the patients in the study were completely dependent on a mechanical ventilator. It was also noted that the majority of the patients in the study and Control were admitted to the intensive care unit due to trauma-related events. **Qurram et al. (2020)** also found that most patients were transported by beds while on MV. These results were consistent with their findings.

Concerning. Level. of consciousness. of the studied. patients: The present findings indicated that prior to, during, and following

transportation, there were no statistically significant variations in the conscious level of the patients under study. Before being transported, most of the patients in the study were given doses of anesthetic and sedative medications, and the bulk of them were on mechanical ventilators and totally dependent on them. **Martin et al. (2017)** provided support for the findings, indicating that there were no noteworthy alterations in the conscious state of critically ill patients during their transportation.

Regarding. Adverse. Events. and complications. of the. studied. patients. during intra-hospital. transportation; The results demonstrated that following the implementation of guidelines, patients in the study group experienced fewer adverse events and complications than those in the control group. Furthermore, the disconnection of IV lines, followed by the displacement of the nasogastric tube and the disconnection of the endotracheal or tracheostomy tube, were the most frequent adverse events and complications among patients in the control and study groups. The most frequent adverse event in the study group, however, was the disconnecting of the tracheostomy or endotracheal tube. This discovery could be explained by the distance between the intensive care unit and the transport unit, the frequent positioning of the patients (from bed to dialysis chair or table to scanning table), and the overcrowding that occurs when family members, friends, and coworkers are being transported.

The present study's results were in line with those of **Habibzadeh et al. (2020**), who demonstrated that staff members who underwent safe intra-hospital training programs experienced a significant decrease in the incidence of adverse events. Given this background, the results are consistent with **Fatemeh (2021)**, who demonstrated how the quality of patient transfers had significantly improved following the interactive workshop, with less than 10% of transfers involving unfavorable complications and adverse events. **Additionally**, Increased knowledge and skills of nurses can compensate for performance deficiencies, according to a study by **Weiying et al. (2021),** which also suggested that training could significantly improve the quality of intra-hospital patient transportation and help reduce adverse events during transportation. Additionally, **Venn et al. (2021)** demonstrated that desaturation and dislodged peripheral lines were the most frequent adverse events seen during IHT of critically ill patients.

Yet, a study by Mohamad et al. (2021) found that deterioration in hemodynamic and respiratory status was the most frequent adverse event during the transportation process, which contradicted these findings. Furthermore, Ismail et al. (2020) demonstrated that desaturation, hypotension, and dislodged peripheral lines were among the conditions that severely ill patients experiencing an intra-hospital transfer experienced. **Additionally, Sinara et al. (2020)** found that increases in heart rate, intracranial pressure, and other physiological changes were the most frequent during IHT of critically ill patients, Blood disorders such as agitation, low oxygen saturation, heart attacks, respiratory distress, cardiac arrest, and changes in blood pressure.**Conclusion:**

- Before and after the safe IHT guidelines were implemented, there was a highly statistically significant positive correlation between the studied nurses' overall level of practice and knowledge.

-Adopting safe transportation guidelines for nurses also benefits patients' clinical outcomes after the guidelines are put into practice by enhancing nurses' knowledge and practice regarding safe IHT of critically ill patients.

Recommendation:

It, was, recommended, that:

- Improving critically ill patients' outcomes can be achieved by supporting critical care nurses' in-service training program on safe IHT.

-To assess the factors influencing patients' safety during IHT, more research ought to be recommended.

Limitation. of. the. study:

It was ensured that the study could not be broadly applied because it was limited to a single region of Egypt.

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