Risk Factors Associated with Intra-Hospital Transportation among Critically Ill Patient

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Abstract

Background: Critically ill patients admitted to ICUs need to be transported according to their condition through hospital departments. Such transport is known as intra-hospital transportation (IHT) and classified as temporary or permanent. A nurse has a great role in this procedure especially in assessment of IHT risk factors, to prevent further complications. **Aim:** to assess risk factors associated with IHT among critically ill patients. **Design:** A descriptive exploratory study was utilized. **Setting:** Intensive care units in Tanta university hospitals. **Study subject:** A convenience sample of all available nurses (n=60). **Tools** for data collections: tool **I:** self-administration questionnaire including: demographic characteristics of nurses, nurses knowledge, nurses awareness, and the nurses risk factor expectations, tool **II**: nurses practice observational checklist used to assess nurses practice regarding IHT of critically ill patient. **Results**: The majority of the studied nurses (93.3%) had unsatisfactory level of knowledge about IHT of critically ill patient**,** 70% had low cognitive awareness about IHT of critically ill patients**,** the expected risk factors of the studied nurses were related to patients (78.3%), tool & equipment risk factors (64.4%), environmental risk factors (60.7%) and finally medical team risk factors (49.3%). 50% of studied nurses disagreed with the expectation of risk factors associated with IHT of critically ill patient, 75% had incompetent practice before, during, and after IHT of critically ill patients. **Conclusion**: according to this study patient related risk factor is the main risk factor associated with IHT. This study **recommended** that: nurses should use standardized systems of care (including checklists, staffing and equipment) when transferring critically ill patients within hospital.

Keywords: critical illness**;** intra-hospital transportation**;** risk factors - patient.

Introduction

Critical illness is a life-threatening stat and a multisystem process that may result in a significant morbidity or mortality rates. In most patients, critical illness is preceded by a stage of physiological deterioration; but evidence suggests that the early signs of this stage are usually missed **(Williams, et al, .2020).**

Most of the patients first hospitalized in the emergency department (ED), including critically ill patients. Most of them need to transfer to other hospital wards. This transfer is usually done for a diagnostic and treatment purposes and patient may transferred to many units such as radiology, operation room, angiography, hemodialysis, and general and specialty wards. This process is defined as intra-hospital transfer (IHT) **(Bloomer, et al, 2019).**

Medical team is recommended to consist of a minimum of two specialists who will accompany a critically ill patient. One of the staff personnel is usually a nurse who worked In ICU, and has completed data about the critically ill patient, from the time of admission to time of transfer **(Farnoosh, et al,. 2018).**

The risks of critical care transfer have been widely reported and can be split into three categories: Technical:

patient/equipment, Non-technical: crew resource management and Organizational: governance during transfer, monitoring and maintenance of physiological targets should be maintained, with care provided by a competent team in an expedient manner. It is essential on all those organizing transfer services and providing continuous care to ensure the safety of staff and patients. Transfer should not be undertaken unless the risks of continuing care in the patient's current location are greater than the potential benefits of transfer **(Martin, et al,. 2017)**.

Critical ill Patient transportation represents a challenging task as patients are often moved in unusual environments such as: hallways, elevators, and procedure areas, not specially designed for critical incidence management. Critically ill patients are usually suffering from unstable physiological state; transportation may expose patients to additional risks and lead to patient instability. The goal of critical ill patient transfer should be conduct with a high-quality care when moving the patient to any location, such transfer should managed in an expedient and safe manner **(Hetland et al., 2018).**

The complications that occur during intra-hospital transport of critically ill patients are usually from circulatory and respiratory systems, or from other systems and complications derived from the intra-hospital transport equipment**,** the risk factors for these complications are complex and related to patients and severity of their illness, equipment and malfunction of the devices, poor communication between staff that prepare and accompany the patient, inadequate monitoring of patient during transport and insufficient documentation of intra-hospital transport procedure **(Neal - Williams et al., 2021)**.

Nurses working as members of the intra-hospital transport team should provide qualitative, continuing health care and vigilance for the occurrence of complications during transport. In addition, as members of clinical departments in the hospital, they are also responsible for preparing and stabilizing patient before sending for transport and after admitting patient to destination department **(Habibzadeh, et al,. 2017).**

Significance of the study

Patients admitted to Intensive Care Units, these cases needs intra–hospital transportation for different causes such as (follow up and diagnostic procedure - transfer to another department …etc.) adverse events occur in 6% to more than 70% of IHTs performed. When limiting the definition of adverse events to changes in vital signs, unplanned extubations or cardiorespiratory arrests, this rate approaches 8% **(Akrami et al ., 2019).**

Although good practice or expert consensus has been published about mitigating risks in IHT, it is important to examine the risk situation in individual institution for the reason that procedures, facilities and staffing may vary from one institution to another, and the tolerance of the risk conditions also varies among the healthcare staff. Adverse events of IHT have been successively reduced through evidence-based nursing **(Bergman et al., 2020).**

So that; the aim of this study is to assess risk factors associated with Intra – Hospital transportation among critically ill patient.

Aim of the Study:

Assess risk factors associated with intra - hospital transportation among critically ill patients through the following:-

- Assessing nurses' level of knowledge regarding risk factors associated with intra hospital transportation among critically ill patient.
- Assessing nurses' level of practice regarding risk factors associated with intra hospital transportation among critically ill patient.
- Assessing nurses' level of awareness regarding risk factors associated with intra hospital transportation among critically ill patient.

Research questions:

This study is based on answering the following research questions:

- What is the nurses' level of knowledge regarding risk factors associated with intra hospital transportation among critically ill patient?
- What is the nurses' level of practice regarding risk factors associated with intra hospital transportation among critically ill patient?
- What is the nurses' level of awareness regarding risk factors associated with intra hospital transportation among critically ill patient?

Subjects and methods

The subject and methods will be portrayed under the four main designs as follows:

I - Technical design.
II- Operational design.
III- Administrative design.
IV- Statistical design.

1- Technical design:

The technical design includes research design, setting, subjects and tools for data collection.

-Research design:

A descriptive exploratory research design was used in carrying out this study.

-Setting:

This study was conducted at General Intensive Care Units (Emergency -cardiac-neurological and post-surgical), which is affiliated to Tanta University Hospitals.

$$\text{Sample size} = \frac{Z_{1-\alpha/2}{}^2 p(1-p)}{d^2}$$

$Z_{1-\alpha/2}$ =1s standard normal variate (at 5%type1 error ($p<0.05$) it is 1.96 and at 1%error ($p<0.01$) it is 2.58).as in majority of studies p values are considered significant below 0.05 hence 1.96 is used in formula.

P =expected proportion in population based on previous studies or pilot studies.

d =absolute error or precision – Has to be decided by researcher.

Justification of sample size

The sample size calculation was performed using EpI-Info 2002 software statistical package designed by World Health Organization (WHO) and by Centers for Disease Control and Prevention (CDC).

The sample size was calculated as N > 22 in each group based on the following considerations: 95% level of significance and 80% power of the study, 16.6% prevalence of intra – hospital transport complications in our hospital with 10% precision. 6 cases will be added to each group to overcome dropout. Therefore, 60 cases will be recruited.

-subject

A convenient sample of (60) nurses who work in Intensive Care Unit was included in the study.

-Tools for data collection:

The data were collected using the following tools:

1- Nurses' self -administered questionnaire:

It was designed by the researcher after reviewing the relevant and most recent literatures and divided into four parts:

Part I- Concerned with demographic characteristics of nurses such as (age, gender, educational level, years of experience previous training courses). This part developed by the investigator in Arabic language.it included 5 closed ended questions.

Part II- Concerned with assessment of nurses level of knowledge regarding risk factors associated with intra-hospital transportation among critically ill patient (before, during and after intra-hospital transportation process)**. (Khan et al., 2021) and (Murata et al., 2021).**

❖ **Scoring system:**

The nurses' knowledge assessment consisted of 5 multiple choice questions (M CQ), and two complete questions. One score was given for each correct answer and zero for the incorrect answer. The total scores of the knowledge were 25 scores distributed as the following:

Section 1: Nurse's knowledge about before intra-hospital transportation of critically ill patient 5 (MCQ) questions with 5 scores.

Section 2: Nurse's knowledge about during intra-hospital transportation of critically ill patient 1complete question with 10 scores.

Section 3: Nurse's knowledge regarding post intra-hospital transportation of critically ill patient 1complete question with
10 scores.

The total score of every part were summed and percentage was calculated.

Total level of knowledge was categorized into:

*Satisfactory ≥ 80%

*unsatisfactory < 80%

Part III- Concerned with assessment of nurses' awareness regarding risk factors associated with intra-hospital transportation among critically ill patient such as definition, indications, types, distance, equipment's …etc**. (Williams et al., 2020) and (Sakshia and Vinay.,2021).**

❖ **Scoring system:**

Nurses awareness consisted of 10 open ended questions. 2score was given for each correct complete answer, 1score was given for each correct incomplete answer and zero score was given to the wrong answer. The total score of nurse's awareness were 20 scores distributed as the following:

Section 1: complete 4 questions with 8 scores.

Section 2: list 6 questions with 12scores.

The total scores for every part were summed and percentage was calculated.

The total level of cognitive awareness was categorized into:

*Low <60%

*Moderate (60-75) %

*High >75%

Part IV- Concerned with assessment of nurses expectation of intra-hospital transportation risk factors as regarding (patient, medical staff, equipment, and environment). **(Kiss et al., 2017)** and **(Williams et al., 2020)**

❖ **Scoring system:**

Consisted of 31 of expected risk factors, the nurses expectations calculated as,

2 scores was given to agree, 1 score was given to not sure and zero score was given to not agree. The total score of assessment of risk factors were 62scores distributed as the following:

Section1: Patient risk factor constitutes 8 closed ended questions with16 scores.

Section 2: Medical staff risk factor constitutes 9 closed ended questions with 18 scores.

Section 3: Equipment risk factor constitutes 9closed ended questions with 18 scores.

Section 4: Environmental risk factor constitutes 5 closed ended questions with 10 scores. The total scores for every part were summed up and percentage was calculated.

The total level of expected risk factors was categorized into:

*Agree >75%
*Not sure (60-75) %
*Disagree <60%

2- Observation checklist:

This checklist was used to assess nurse's practice regarding risk factors associated with intra-hospital transportation among critically ill patient. The investigator assesses the nurse when applied the procedure on the patient **(Sakshi & Vinay., 2021) and (Williams et al., 2020).**

❖ **Scoring system:**

The checklist was included of 39 steps. Every step that was done correctly by the nurse was given one score. While the steps that were not done or done incorrectly were given zero score. The total scores were calculated and changed into percentage.

The total level of practice was categorized into:

* Competent ≥80%
* Incompetent <80%

II- Operational design:

The operational design includes preparatory phase, content validity & reliability, pilot study and field work.

A-Preparatory phase:

It included reviewing of related literature and theoretical knowledge of various aspects of intra –hospital transportation of critically ill patients using books, articles, internet, periodicals and magazines to develop tools for data collection.

B- Tool validity and reliability:

-Content validity

Content validity was conducted to determine whether the tools cover an appropriate and necessary content as well as its relevance to the aim of the tools and study through jury of 7 experts from critical care nursing staff at the faculty of nursing. The expertise reviewed the tools for clarity of sentences, relevance, accuracy, comprehensiveness, simplicity and applicability, and no modifications were done.

- Tool Reliability

Reliability of the tools was assessed by Cronbach's alpha test to assure that the tools are reliable before data collection: **Cronbach's Alpha** for **part I** was **0.761** for 5 items applied on 6 nurses, **part II** was **0.892** for 7 items applied on 6 nurses, **part III** was **0.951** for 11 items applied on 6 nurses, **part IV**was **0.802** for 31 items applied on 6 nurses, **observation checklist** was 0.802 for 38 items applied on 6 nurses. **Cronbach's Alpha** for **the sheet in total is** 0.825 for 92 items applied 6 nurses.

C- Pilot study:

A pilot study was carried out on 10% (6 nurses) of the study subjects to test the applicability, clarity, feasibility of tool and to identify obstacles that may be encountered during data collection and to estimate the time needed for filling the

forms. No modification was done according to the results of the pilot study.

D- Field work

Field work was included the following:

An approval was obtained from hospital director and nursing director of Tanta university hospital. The purpose of the study was simply explained to the nurses who agreed to participate in the study, approval taken from the nurses who accept to participate and if need to withdrawals can be, prior to any data collection.

The actual work of this study started and completed within six months from March 2021 and was completed by the end of Augustus 2021. Data were collected by the investigator during nurse's questionnaire through three days per week (Sunday, Tuesday, and Thursday) at morning and afternoon shifts in the previous mentioned setting.

Each nurse was observed by the investigator during practice using the observational checklists it take about 30-45minutes.then the self –administrated questionnaire was filled by the nurses who providing care for patients it take about 30-35 minutes.

III-Administrative design:

An official permission was obtained from medical director of Tanta university hospital based on a letter that issued to him from Dean of Faculty of Nursing at Ain Shams University. The official permission was included the aim of the study, tools of data collection and characteristics of the study subjects.

IV- Statistical design:

The collected data were organized, tabulated and statistically analyzed using SPSS software statistical computer package version 26. For quantitative data, the range, mean and standard deviation were calculated. For qualitative data, comparison was done using Chi-square test (χ^2).

For comparison between means for variables pre and post intervention in a group, paired samples T-test was used. For comparison between means for variables during three periods of intervention in a group, or for more than two variables, the F-value of analysis of variance (ANOVA) was calculated.

Correlation between variables was evaluated using Pearson and Spearman's correlation coefficient r. A significance was adopted at $P<0.05$ for interpretation of results of tests of significance (*). Also, a highly significance was adopted at $P<0.01$ for interpretation of results of tests of significance (**).

Ethical consideration:

The ethical research consideration in the study includes the following: The research approval was obtained from scientific ethical committee and Dean of Faculty of Nursing at Ain Shams University of before starting the study. The researcher was clarified the objective and aim of the study to nurses included in the study. The researcher was assured maintaining anonymity and confidentiality of subjects' data. Nurses was informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time.

Results:

Table (1): Reveals that the majority of studied nurses 93.3% had unsatisfied level of knowledge about intra-hospital transportation of critically ill patients, mean score ± SD 12.42±3.707**.**

Figure (1): introduced that the majority of the studied nurses 70% had low cognitive awareness about intra-hospital

transportation of critically ill patient, with Mean ± SD =12.65±2.713.

Figure (2): introduced that the maximum rank **78.31%** of items score of the expected risk factors of the studied nurses was risk factor related to patient, comparing with the minimum rank **49.33%** was risk factor associated with medical team.

Table (2): revealed that approximately half of the studied nurses 50% were disagree with the expectation of risk factors associated with intra-hospital transportation of critically ill patient , with **Mean ± SD 37.08±8.675.**

Figure (3): illustrated that the majority of the studied sample 75% had incompetent level of practice before, during, and after intra-hospital transportation of critically ill patients.

Table (1): The total level of nurses knowledge about intra-hospital transportation of critically ill patients (n=60).

Total Knowledge Level	The studied nurses N	%
▪ satisfied	4	6.7
▪ Unsatisfied	56	93.3
Range	**(3-22)**	
Mean ± SD	**12.42±3.707**	

<80% Unsatisfied **≥80% Satisfied**

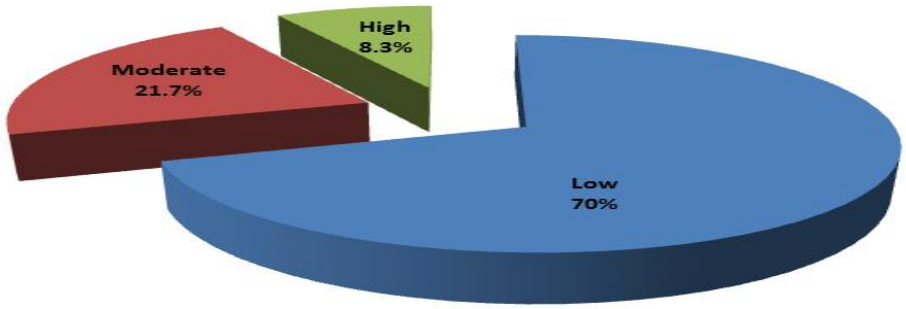

Figure (1): Distribution of the studied nurses according to their total level of awareness about intra hospital transportation of critically ill patients.

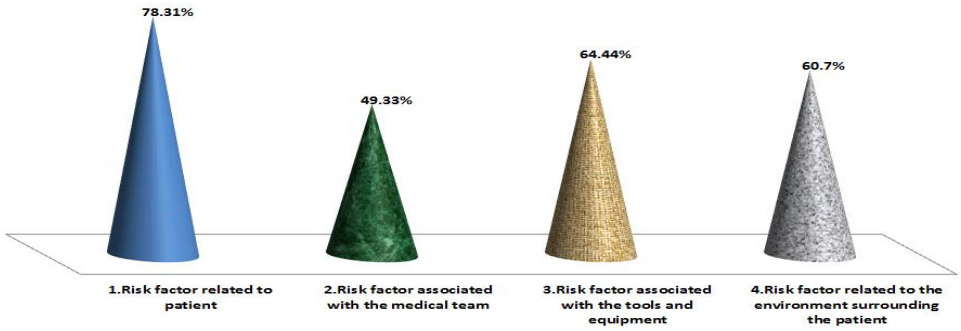

Figure (2): Mean percentage of the expected risk factors items of the studied nurses associated with intra-hospital transportation of critically ill patients.

Table (2): The total level of expected risk factors during patient transportation (n=60).

Total level of the expected risk factors	The studied nurses	
	N	%
▪ Disagree	30	50.0
▪ Not sure	18	30.0
▪ Agree	12	20.0
Range	**(28-59)**	
Mean ± SD	**37.08±8.675**	

<60% Disagree **(60-75) % Not sure** **>75% Agree**

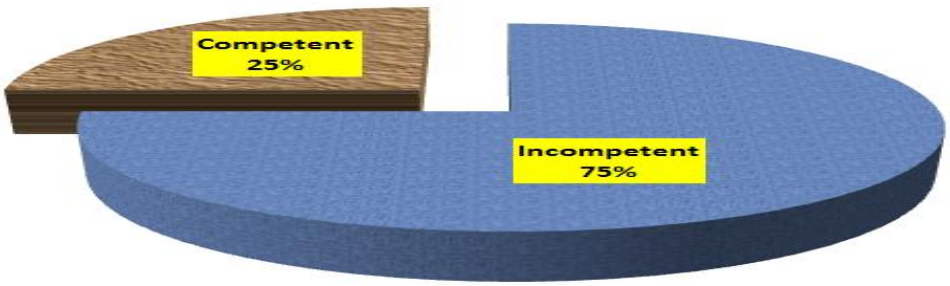

Figure (3): The level of the studied nurses regards to their total practice before, during and after transportation of critically ill patients.

Discussion

Critically ill patients refer to patients whose organ function is insufficient temporarily or for a prolonged period. IHT is the process of transporting patients from one area to another in a hospital setting for diagnostic or therapeutic purpose **(Bergman et al., 2017).**

Intra-hospital transportation (IHT) is not only a simple procedure of transport, but also a continuous process of treatment and monitoring. Safety hazards exist in the whole process **(Gimenez et al., 2017)**. To achieve safe IHT, we must assure that every transport sub-process is safe and accurate. AEs may occur unexpectedly. In this regard, risk management should be carried out before the events occur. Most transport-related complications are preventable with proper evaluation and preparation before transportation **(Borghi et al., 2019)**.

According to the present study the majority of the studied nurses had

unsatisfied level of knowledge about intra-hospital transportation of critically ill patients, as nurses have incomplete or wrong answer about patient Assessment before, during, and post intra-hospital transportation of critically ill patients. This result is in a line with **Sampaio**, **et al., (2016)** who conducts a study about "Knowledge of the nurse on the intra-hospital transport of critically ill patients "and found that the majority of the studied nurses had unsatisfactory level of knowledge regarding intra-hospital transportation of critically ill patient.

This result is not in agreement with **Ignatyeva,et al., (2018**) who conduct a study about "Transport of Critically Ill Cardiovascular Patients" and found that the majority of the studied nurses had a satisfactory level of knowledge about intra-hospital transportation of critically ill patients.

From the investigator point of view, this may be due to that the nurses did not have enough information or training about intra-hospital transportation of critically ill patients. Also more of them working in another hospitals and did not have enough time and neglect to read or attending courses under the pretext that they did not have enough time.

According to this study the majority of the studied nurses had low total cognitive awareness about intra-hospital transportation of critically ill patient, This finding is in agreement with **Akrami, et al., (2019)** who conduct a study titled "Assessing the Effect of Training the Safe Transfer Checklist on the Quality of Intra-hospital Patient Transfer "and found that 72% of nurses not aware about intra-hospital transportation of critically ill patient.

The previous findings were contraindicated with **Bergman, et al., (2020).** Who conduct a study about "In safe hands: Patients' experiences of intra-hospital transport during intensive care." And find that 68%nurses had cognitive awareness about intra-hospital transportation of critically ill patients.

The investigator point of view may be nurses don't have an interest to view the IHT process as critical procedure but they see it as a simple procedure, so they don't read or attend courses about this procedure.

According to the present study findings demonstrate that the majority of the studied nurses have agreed that patient connected to ventilator is more at risk than others during transportation, while approximately half of the studied nurses saw that the psychological state of the patient is dangerous while he is transported. Patient connected to mechanical ventilator in a great danger as improper or wrong handling of patient may lead to extubation of indo-tracheal tube, desaturation, also most of patients on MV controlled with sedative drugs which need close monitoring of rate.

This finding was supported by **Lin, et al., (2020)** who conducts a study about "Improving patient safety during intra-hospital transportation of mechanically ventilated patients with critical illness." Intra-hospital transportation (IHT) of patients under significantly increases the risk of patient harm. A structured process performed by a well-prepared team with adequate communication among team members plays a vital role in enhancing patient safety during transportation. Also the study of **Veiga, et al., (2019)** which titled "Adverse events during intra-hospital transport of critically ill patients in a large hospital" is in agreement with the finding as the mechanically ventilated patients increase risk of adverse events.

According to **Murata et al., (2021)** who conduct a study titled "Adverse events during intra-hospital transport of critically ill patients: A systematic review and meta-analysis." the result is contraindicated with his result as he found that patient disturbed

level of consciousness is increased risk of adverse events and may lead to patient deterioration and Patients with physiologic instability before transport had a higher incidence of AEs during transport.

According to **jia, et al., (2016**) who conduct a study titled "High incidence of adverse events during intra-hospital transport of critically ill patients and new related risk factors: a prospective, multicenter study in China." Anxiety or agitation was recorded in more than 25 % of transports. Pain, discomfort, and resistance to ventilation when intubated occurred in about 19 % of IHTs. These AEs were perhaps due to inadequate analgesia and sedation in patients. Patient sedation before transport is a well-described risk factor for AEs during IHT.

From the investigator point of view patient depend on mechanical ventilation (MV) need special care inside ICU outside it he need close observation, and care and this represent stressful environment for both nurse and patient.

Approximately three quarter of the studied nurses had felt that the failure of medical team to assess the time during intra-hospital transportation is dangerous. this result is a line with The research conducted by **Doring et al., (2017)** titled as " Factors that contribute to complications during intra-hospital transport of the critically ill." reported that the increased intra-hospital patient transport time increases the occurrence of hematological instability.

This finding also supported by the finding of **Ringdal et al., (2016)**" Intra-hospital transports of critically ill patients: critical care nurses' perceptions "as nurses report that undertaking transports were a stressful activity, and when transport time increase this lead to higher stress caring for the patient outside the ICU to nurse, and cause patient complications.

This result is in contrast with **Choi et al., (2016)** " A before- and after-intervention trial for reducing unexpected events during the intra-hospital transport of emergency patients" who found that time of patient transportation determined by the distance, and To minimize patients' risk during IHT, appropriate pre-transfer stabilization of the patient, good communication between various areas of the hospital and transport preparation is necessary.

From the investigator point of view transportation time is important to be detected and nurse deal with time by shift patient shouldn't transport at end of shift as nurse need to leave her work by end of shift not by end of transportation procedure.

According to the current study about half of the studied nurses believed that nurse experience alone is sufficient to transport critically ill patient intra-hospital. This in agreement with **Ringdal et al., (2016)**" Intra-hospital transports of critically ill patients: critical care nurses' perceptions "67% of the nurses stated that they alone were responsible for the patient during IHT without an accompanying physician during IHT.

Also this result in contrast with **Canellas et al., (2020)** who conduct a study about" Checklist for a safe intra-hospital transport of critically ill patients" and found that the IHT team must include, at least, one nurse and one doctor, with the specific skills and training required to perform this type of transport.

From the investigator point of view intra-hospital transportation need at least two persons, transportation need doctor but nurse need to take responsibilities' and deal with the situation as depending on their experience and skills no wrong will be happen.

The majority of the studied nurses sample were believed and ensured that must be no folds or closer of surgical drains or

collection bags attached to the patient this finding is in agreement with **Mukabagire., (2019)**who conduct a research of "Nurses' Knowledge, attitudes and practice towards intra-hospital transportation management of the critically ill adult patients: in selected referral hospitals, Kigali-Rwanda", and found that majority of the studied nurses62% had knowledge about intra-hospital transportation of patient having surgery with surgical drains or chest tube outcomes and its care during intra-hospital transportation.

This result is not in agreement with **Abuejheisheh, et al., (2021**) who conduct a study of "Chest drains: prevalence of insertion and ICU nurses' knowledge of care." Chest drain is prevalent in Jordanian ICUs, which requires nurses to know how to care for patients with this critical intervention. However, they seemed to lack the needed knowledge for the appropriate care.

As the investigator point of view nurse know patient condition and surgeries he have and doctor instruct them about its importance and inform them about its secure and care so they deal with it carefully and secure it will.

Related to the present study less than half of the studied nurses believed that the availability of means to keep the patient warm during transportation depends on his health condition and saw blanks as a loading during transport, this result is in a line with **Murata, et al., (2021)**.Who conduct a study titled "Adverse events during intra-hospital transport of critically ill patients: A systematic review and meta-analysis." And found that 18%of the studied nurses believed that worming of patient depend on his condition and the previous reading of temperature.

This finding is in contrast with the study of **Zhang, et al., (2021)** Who conduct a research of "Proactive risk assessment of intra-hospital transport of critically ill patients from emergency department to intensive care unit in a teaching hospital and its implications", and found that temperature during hospital varied from one location to another so patient body temperature should be monitored to avoid hypothermia and its complications.

The investigator point of view is nurse need to move patient easily need drains and catheter to be observed so they don't pay attention to cold places as it considers a temporary situation and they don't worth its complications.

According to present study an approximately three quarter of the studied nurses saw that the distance between diagnostic units and hospital care, the greater the risk of intra-hospital transportation of critically ill patient, this finding is in line with **Ismail, et al., (2020)** who conduct a research titled "Study on the incidence of adverse events during intra-hospital transfer of critical care patients from emergency department "and found that wide distance between hospital physical locations increase risk of transportation adverse events.

This finding is contraindicated with **Gurrala., (2021)** who conduct a study of " Improving Intra-Hospital Patient Transportation System by Implementing Geographic Assignment Logic Using Discrete Event Simulation " and found that the geographic assignment logic was designed to improve the transport turnaround time throughout the hospital by considering patient movement between different floors in hospitals instead of the patient movement between units reducing the patient waiting time.

According to the present study about half of the studied nurses thought that temperature changes from one place to another inside the hospital are natural and not considered as a risk, this result is in contrast with **Agizew, et al., (2021)** who conducts a study of "Evidence-Based

Guideline on Critical Patient Transport and Handover to ICU." And found that any patient who requires transportation must be effectively stabilized before departure. The minimum standards of monitoring required during critical patient transport include appropriate temperature monitoring Planning and preparation for critical patient transport to ICU are vital to prevent adverse events.

According to the present study the maximum rank **(78.31%)** of domains score of the expected risk factors of the studied nurses was risk factor related to patient, this finding were in agreement with **Gimenez, et al., (2017**) who conduct a research about "Analysis of adverse events during intra-hospital transportation of critically ill patients" and found that patient physiological state, Physiological alterations were the most frequently encountered risks **44.1%,** but contraindicated with our result which find that the minimum rank**(49.33%)**was risk factor associated with medical team as his study reach a result that the minimum risk factor is related to environmental risk factor **12.7% .**

Risk factors also discussed by **Veiga, et al., (2019)** who conduct a research of "Adverse events during intra-hospital transport of critically ill patients in a large hospital" and find that the most commonly risk reported was team-related risk factor, which reached 60%., and the minimum risk factor documented as equipment related risk factors.

Also risk factors was discussed by **Lovell et al., (2018)** who conduct a study of "Intra-hospital transport of critically ill patients: complications and difficulties.", and find that risks mentioned as 31% were patient-related and 45% were related to equipment or the transport environment. (15% encountered problems in both areas). Many of the risks were preventable with adequate pre-transport communication and planning. Other risks were directly related to the increased severity of illness in these patients.

From the investigator point of view the presence of a team trained in monitoring during the entire transport is associated with the safety of the patient being transported.

According to the present study approximately half of the studied nurses had low level of the expectation of risk factors associated with intra-hospital transportation of critically ill patient**.** The present result was in disagreement with **Alizadeh, et al., (2021**) who conducts a study of "Improving the safety and quality of the intra-hospital transport of critically ill patients". And find the result that Nurses had high level of the expectation of risk factors, nurses thought that they are responsible for preparing and stabilizing the patient before, during, and after transport. They also believed that the combination of critically ill patients with unstable condition and inappropriate equipment is dangerous.

As a researcher point of view nurses were newly graduated, had little experience, and not attended courses or educational programs about IHT.

In the present study all entire studied sample had done the suction of airway secretions, and less than half of them done the preparing of a portable ventilator when transferring a case connected to the ventilator.

This finding was in agreement with **Alizadeh et al., (2021**) who conduct a study of "Improving the safety and quality of the intra-hospital transport of critically ill patients." and find that according to the nurses, Lung secretions should be suctioned out if needed before transport, Moreover, the pressure of the endotracheal tube cuff must be controlled before and after transport.

If a portable ventilator is used, the patient's condition and oxygen saturation should be checked before the patient is transferred. All connections of the patient

should be controlled during all stages of the transfer, and it should be ensured that they are fixed and are working appropriately. This finding also discussed by **parveez, et al., (2020)** who conduct a study of "Critical events during intra-hospital transport of critically ill patients to and from intensive care unit." and find that in critically ill patient connected to ventilator nurses before transportation fix the endotracheal tube and suction lung secretion to insure that they have patent airway, also they prepare a portable suction in the accompanying equipment's, but this study is contraindicated in our study as they secure a portable ventilator to all patients depend on M.V.

From the investigator point of view all nurses pay attention to patient airway as they consider its importance and they value the airway obstruction risk, but the availability of portable ventilator isn't in their hands as it depends on the hospital resources, in our study there is a 3 ICUs only in one present a portable ventilator and not used in all transportation process as it sometimes had a technical problems so the broad aspect of nurses depend on manual ventilation to prevent unpleasant situation or risk may be caused by using portable ventilator.

According to the present study the majority of the studied nurses had done checking of intravenous connection integrity and less than half of them done the checking of patient vital signs every **20** minutes. This result is in the same line with **Wulandari et al., (2021)**. Who conduct a study of "prevalence of adverse events during transport of critically ill patients from the emergency department to the intensive care unit", and find that Furthermore, risk management is required to reduce the complication at the time of transfer; during the transfer procedure continuous intravenous access must be ensured to minimize risk. This finding was in contrast with **Hukku., et al (2021)** who conduct a study of "Improving Safety During Intra Hospital Transport of Medical ICU Patients." And find that during intra-hospital transportation nurses pay all attention to vital signs, especially heart rate and O2 saturation and check oxygen supply.

From the investigator point of view risks were varied from one patient to another related to medical condition, nurses had different levels of education and different years of experience.

According to the present study the majority of the studied nurses make sure to write down the time and date of transportation process, and all of them had done making sure to write down the time and date, this result was in agreement with **Salt et al., (2020)** who conduct a research titled "Intra-hospital critical patient transport from the emergency department" and find that all clinical records document the patient's clinical status during transport until handover occurs at the destination.,

This finding was in disagreement with **Alamanou & Brokalaki ., (2020**) who conduct a study of " Intra-hospital transport policies: The contribution of the nurse " and find that lack of documentation of all transactions carried out during transport is an obstacle to the effective evaluation of the outcome, since it does not reflect the actual implementation of the process. Specifically, everyday transports documentation should be kept and evaluated in order to identify possible mistakes and correct transport tactics.

The present study find that less than half of the studied nurses done the checking of the patient vital signs every **10** minutes for the first hour after patient transportation. this result was in line with **Canellas et al., (2020)** who conduct a study of "Checklist for a safe intra-hospital transport of critically ill patients: A scoping review." and find that nurses monitor patient vital signs at least every 15 minute in the first hour after IHT.

As investigator point of view documentation is very important as nurses had a concept of "not record, not done" and nurse to achieve excellence in care provision and patient safety, with the nurse taking on a crucial responsibility, as part of the transport team.

According to the present study majority of the studied sample had incompetent level of practice before, during, and after intra-hospital transportation of critically ill patients. This result was in agreement with **Mukabagire ., (2019)** who conduct a study titled "Nurses' Knowledge, attitudes and practice towards intra-hospital transportation management of the critically ill adult patients" and reported a low level of practice of nurses towards intra-hospital transportation management of critically ill patients.

This result also was in agreement with **Bergman, et al., (2020**) who conduct a research tilled Improving quality and safety during intra-hospital transport of critically ill patients: a critical incident study and find that nurses had low level of practice through the three stages of IHT and this reflect on the presence of adverse events and complications.

This result was in disagreement with **Nasser., (2018)** who conduct a study of "Assessment of Nursing Knowledge and Practices during Intra-Hospital Transfer of Critically Ill Patients" and find that total nurses practice percent regarding three phases of intra-hospital transfer, Nurses' practice was very good to ensure patient safety.

From the investigator point of view, the education was very important element of improving level of staff practice, also lack of continuous educational training programs affect negatively on level of staff knowledge. Training courses enhance better performance and practice of nurses' skills especially with higher level of education. Educations open our mind, while training courses foster, enhance and empower our skills

According to the present study the majority of the studied nurse had unsatisfactory level of knowledge and low level of cognitive awareness level with positive, moderate and highly statistical significance correlation. The majority of the studied nurse had unsatisfactory level of knowledge and low expected risk factors level with negative, mild, non-significance correlation. The majority of the studied nurse had unsatisfactory level of knowledge and incompetent total practice level was positive mild statistical significance correlation

This result was in a line with **Mukabagire., (2019).** Who conduct a study of "Nurses' Knowledge, attitudes and practice towards intra-hospital transportation management of the critically ill adult patients" As the researcher observed practice only (25%) participants had moderate level, and (75%) obtained low level of practice. Surprisingly none of participants had high level of practice scores. Generally nurses had low level of practice towards intra-hospital transportation management of critically ill patients.

The previous study contraindicated our study as the great number of the studied nurses scored a moderate level of knowledge, while only (6.7%) of nurses were classified in the high level of knowledge category and the minority (3.2%) had low level of knowledge. The relationship between knowledge and cognitive awareness scores has shown a strong correlation.

From the investigator point of view may be lack of training, lack of continuous in service educational programs, absent of continuous supervision and evaluation. Also, it might be due to lack of hospital policy or lack of qualifications, lack of motivation to learn or take training courses and lack of exchange of funds for training were considered the main causes.

Conclusion

The results of the present study have concluded that: the majority of studied nurses had unsatisfied level of knowledge about intra-hospital transportation of critically ill patients, majority of the studied nurses had low cognitive awareness about intra-hospital transportation of critically ill patient, half of the studied nurses were disagree with the expectation of risk factors associated with intra-hospital transportation of critically ill patient, majority of the studied sample had incompetent level of practice before, during, and after intra-hospital transportation of critically ill patients.

Recommendations:

Based on the results of the present study the following recommendations are suggested:

1. Periodic health teaching programs for nurses including defining of IHT of critical ill patients, risk factors, the expected complications and to manage these complications.
2. Applied IHT strategies to improve patient safety and prevent any complications in general hospitals.
3. Providing ICUs and EDs with standardized procedures in the form of a check-list constitutes a significant step towards reducing the number of IHT-related AEs.
4. More studies are needed to identify risk factors of IHT.

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