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Intrahospital transport related health consequences among critically ill patients

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Abstract: **Intrahospital transport of a critically ill patient has been associated with technical and life-threatening adverse events. Aim of the study: To explore intrahospital transport related health consequences among critically ill patients and different selected factors contributing to both negative and positive health consequences. Research Design:A descriptive exploratory research design was utilized. Research questions: Q1:- What are the intrahospital transport related health consequences among critically ill patients? Q2:- What are different selected factors contributing to both negative and positive health consequences? Setting: Intensive Care Unit of Cairo University Hospitals. Sample: A purposive sample of 62 critically ill adult patients. Tools of data collection: Two tools were utilized to collect data pertinent to the current study. Tool 1: Personnel Characteristics & medical data sheet, tool 2: Checklist of intrahospital transport related health consequences and different selected factors contributing to both negative and positive health consequences during intrahospital transport of a critically ill Patient. Results: the current study revealed no dominance in gender (50% male and 50% female) and 40.3% were in age group 40 < 50 years. No death occurred but there were 207 adverse events that occurred in 52 (83.9 %) of the 62 transports with more than one adverse event occurred during single transport in 39 transports (62.9%). Each of Airway/pulmonary complications and Hemodynamics instability formed about third of total negative health consequences (30%).Only five factors recorded a significant statistical correlation with negative health consequences these factors are the transport team, equipment & materials, connections, transport duration, intervention during transport. Conclusion: During intrahospital transport critically ill patients are at risk for significant adverse events. Moving these patients should only happen when there is appropriate monitoring and other necessary equipment in the presence of trained personnel who are familiar with the care of such patients Recommendations:The rate of health consequences occurs during intra-hospital transport require existence of an intrahospital transport protocol or plan is, obviously, not just useful, but very important.**

Keywords: **Critically ill patients, Health consequences, Intrahospital transport.**

1. INTRODUCTION

Management of critically ill patients in the intensive care unit (ICU) requires investigations and therapeutic procedures leading to numerous transports outside the ICU. Intrahospital transport of critically ill adult is necessary when it is not feasible to do this diagnsotic or therapeutic procedure at the bedside (Jones, Zychowicz, Champagne & Thornlow, 2016).

Intra-hospital transport (IHT) is an inevitable and important part of intensive care unit (ICU). IHT is frequently required to perform diagnostic or therapeutic procedures for critically ill patients. Transported patients have more significant illnesses than patients not requiring transport. Additionally, adverse events (AEs) during IHT occur commonly, and transported patients have significantly higher risks than non-transported patients in the ICU. The decision to transport a critically ill patient is based on an assessment of the potential benefits and risks. Knowledge of the incidence of AEs and risk factors for AEs during IHT is essential for scheduling safe ICU patient transport (Jia, Wang, Gao, Liu & Yu, 2016).

Adverse events during transport of critically ill patients fall into two general categories: mishaps related to intensive care (eg, lead disconnections, loss of battery power, loss of intravenous access, accidental extubation, occlusion of the endotracheal tube, or exhaustion of oxygen supply), and physiologic deteriorations related to critical illness (eg, worsening hypotension or hypoxemia). Unfortunately many studies do not distinguish clearly between these two categories (Lerman, Coté& Steward, 2016).

A number of patient factors (e.g., acuity of illness/severity of injury); system factors (e.g., environment change, lack of safety procedures, inadequate facilities, equipment deficiencies or failures); and personnel factors (e.g., poor communication, inadequate training, insufficient staffing, lack of supervision) frequently interact in a synergistic fashion to result in potential or actual patient harm during intrahospital transport of critically ill patient,figure 1 (Knight, et al, 2015).

Successful intrahospital transportation directly depends on the planning and work organization of the multidisciplinary team, as well as the use of appropriate equipment. In this context, an important aspect in the transportation of patients is the prior communication of information between the staff transporting the patient and the staff receiving the patient so that the safety and continuity of health care is reinforced (Almeida, et al, 2012).

1.1. Significance of the study

The rate of adverse events observed during transportation ranged from 30% to 70% of all cases of intrahospital transportation. The most frequently observed events included: patients' physiological alterations, problems related to the multidisciplinary team involved in the transport and equipment related problems (Almeida, et al, 2012).Through empirical observation, literature review and clinical experience it has been observed that,there are serious adverse events that occur during intrahospital transport of critically ill patients. These adverse events include physiologic deterioration that was defined as significant changes in physiologic variables (heart rate, respiratory rate, blood pressure and oxygen saturation), physical injury and dislodgement of some connections such as(endotracheal tube, central venous line, nasogastric tube and urinary catheter) which may lead to serious complications reaching to cardiac arrest. Also the investigator noticed that this serious adverse event occur due to improper planning for transfer which include presence of unqualified personnel in transport's team and malfunction of equipment. Therefore, this study designed in an attempt to provide health care professionals with an in-depth information about transport related health consequences, which hopefully will be reflected positively on the quality of patient's care and prevent suspected complications. Also this study is expected to raise the nurse's awareness and knowledge regarding transport related health consequences because of its importance for such group of patients to improve their quality of life, decrease transport's complications, avoid deterioration in patient's health status, decreases the hospital stay and costs.

2. SUBJECTS AND METHODS

2.1. Aim of the study

The aim of the current study was to explore intra-hospital transport related health consequences among critically ill patients and different selected factors contributing to both negative and positive health both consequence.

2.2. Research Questions:

Q1: What are the intra-hospital transport related health consequences among critically ill patients?

Q2: What are different selected factors contributing to both negative and positive health consequences?

2.3. Research Design

A descriptive exploratory research design was utilized in the current study. Descriptive exploratory design is to describe phenomenon in detail (Polit & Beck, 2012).

2.4. Setting

The current study was carried out at intensive care unit affiliated to Cairo University Hospitals.

2.5. Subject

A purposive sample of 62 adult male and female who was admitted to Critical Care Units in Cairo University Hospital and had intra-hospital transport for diagnostic or therapeutic procedure and was returned to the intensive care unit (ICU) after finishing the diagnostic or therapeutic procedure and willing to participate in the study and their age ranging from 20 to less than 60 years old. The study was carried out in a selected intensive care unit affiliated to Cairo University Hospitals, in Cairo governorate from February to Octobe 2017 and there was no equation because of unavailability of accurate statistical data about the total population.

2.6. Tools for data collection

Two tools were utilized for data collection designed by the researcher and reviewed by a panel of five experts . These tools were:

2.6.1. Personnel Characteristics & Medical data sheet e.g:

The patient'sage, gender, medical diagnosis, length of ICU stay, planned procedure and purpose, planned procedure and duration of transport.

2.6.2. Checklist of intrahospital transport related health consequences and different selected factors contributing to both negative and positive health consequences during intrahospital transport of a critically ill Patient.

It was developed by the investigator. It was divided into two parts to covers the following data. First part included assessment of transport team members, equipment ,materials and medications involved in transport, The second part included include assessment of the following :- (vital signs, oxygen saturation, method of oxygenation and its characteristics (if the patient is mechanically ventilated mode, parameters was involved), electro-cardio-gram, Glasgow coma score (GCS) and Random blood sugar) pre, during and after transport. Also it included interventions during transfer and incidents that occurred during transport and interventions for this events.

2.7. Validity and reliability of tools

Content validity was done to identify the degree to which the used tools measure what was supposed to be measured. Developed tools were examined by a panel of five critical care nursing experts to determine whether the included items were clear and suitable to achieve the aim of the current study. To test reliability of the tools, the internal consistency of the tools was measured by cronbach's alpha test and the result was 0.78 which is accepted.

2.8. pilot study

A pilot study was carried out on ten critically ill patients who had intra-hospital transport for diagnostic or therapeutic procedure and was returned to the intensive care unit (ICU) after finishing the diagnostic or therapeutic procedure at Cairo University Hospital to test feasibility and applicability of the data collection tools. Carrying out the pilot study gave the investigator experience to deal with the included subjects, and the data collection tools. Based on results of the pilot study, no modifications were done so the ten patients of the pilot study were included in the study sample.

3. PROTECTION OF HUMAN RIGHTS

Ethical approval was obtained from the research Ethical committee at Faculty of Nursing, Cairo University. An official permission was obtained from directors of Intensive Care Unit at Cairo university hospitals before data collection. Written consents for patients's agreements (or responsible family member's agreement in case of unconsciousness) to be included in the study were obtained after explanation of the nature and purpose of the study. Each patient/relative was free to either participate or not in the current study and had the right to withdraw from the study at any time without any rational. Also, patients/relatives were informed that obtained data will not be included in any further researches subjects without permission, data collected will be used in the purpose for the research only and the entire needed sample in the study was followed until data had been analyzed. Confidentiality and anonymity of each subject were assured through coding of all data.

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4. PROCEDURE

This study was conducted through two phases: preparation and implementation

***4.1-Preparatory phase*:**

Involved preparation of the study tools through literature review and examining the tools for content validity and reliability.

4.2-Implementation phase:

Involved carrying out actual steps of the study. Once the official permission was granted to proceed with the proposed study, the research investigator initiated data collection by contacting the potential research subjects and explaining the purpose and nature of the study. The research investigator went 2 days in the week to the selected ICU which was affiliated to a selected university hospital in Cairo, Then the study subjects were obtained at the beginning of morning shift from the daily planned list of patients who had intrahospital transport for performing diagnostic or therapeutic procedure with considering inclusion and exclusion criteria this daily list was obtained after consultant round. Then, once the procedure's request or order was written by unit physician the investigator started to collect baseline data from patients's file, which included demographic characteristics and medical data (medical diagnosis, co-morbidity diseases, length of stay, name of planned procedure and purpose of planned procedure). It was fulfilled in around 10-15 minutes to be obtained for each participant from his medical file.

Then, by using (tool 2) :-

A- the pretransport phase started as the investigator assessed the preperations of transport that may affect the process of transport through assessment of the following items.

1-Transport team member's number & specialty (if they were nurse ,nurse aid ,house keeper ,intern physician and physician).

2-Equipment through identifying equipment that was used in the transport and if the assigned nurse checked this equipment for function or n't.

3-Patient's connections (to assess if the number of this connections was affecting negatively on the process of transport or not) .

4-Administrative part through assessment of the Communication with other department if it was informed or not with diagnostic or therapeutic procedure ,obtaining and documentation of base line vital signs, completion of the speciel requirement of the planned procedure and clarity of trnsport route to transport's members.

5-Medications before transport (infusions) to assess if some of infusions were stopped for transport or not, infusions accompanied during transport were well prepared (there is enough amount of medications and extra dose of infused medication was present or not), interventions that was done before transport to maintain a safe transport.

B- During transport phase

Once the above items were assessed the transport team's member started to transfer the patient from bed to patient's trolley and the investigator started to connect patient to portble monitor or defibrillator and pulse oximetry to assess hemodynamics and ECG. Then characteristics of patient being transported was assessed directly before transport, such as: (vital signs, oxygen saturation, method of oxygenation and its characteristics (if the patient is mechanically ventilated mode ,parameters should be involved),electro-cardio-gram, Glasgow coma score (GCS) and Random blood sugar), then transport team started to move the patient toward the receiving department and the investigator documented the starting time of transport and during transport the investigator was observing the patient through assessment of (vital signs, oxygen saturation, electro-cardio-gram, Glasgow coma score (GCS) and Random blood sugar) every 20 min and document of negative health consequences occurred during the transport and treatment or interventions conducted by the team to mange this health consequences and once the patient is arrived to receiving department the patient is carried to table of procedure and the investigator was staying in the room of procedure to observe the patient during the time of procedure except during time of MRI procedure (the patient was directly assessed before starting the procedure and

directly after finishing the procedure as no monitoring in the room of MRI machine). Once the procedure was finished the patient was started to be moved toward the intensive care unit.Then the patient was observed by investigator durig the transport to the ICU again.

C- Post transport phase

Once the patient is returned to unit the patient is carried to bed and the: (vital signs, oxygen saturation, electro-cardio-gram, Glasgow coma score (GCS) and Random blood sugar), directly after transport and every 30 min for one hour after transport. Then the investigator documented interventions during transport, the health consequences that occurred during transport and within 1 hr after transport. the duration of every transport was depending on planned procedure and it's purpose and transport's team and the investigator was observing only one transport in the day.

5. STATISTICAL DATA ANALYSIS

After completion of data collection, data were analyzed using SPSS program version 20; First, to analyse the data we used descriptive statistics: frequency measures for the qualitative variables. Dispersion measures for the continuous variables done such as means and standard deviations;. Second, "repeated measures analysis of variance (ANOVA) Statistical model was used and Friedman ANOVA test was performed for non-parametric data. General liner Model repeated measures for physiological parameters done. A significant level value was considered when P value is $P \leq 0.05$.

6. RESULTS

6.1. Table I shows that the studied sample was equal in gender (50% male and 50% female), their age ranged between 40- <50 years with a mean age of 2.71± 0.93.

6.2. Table II: shows that more than quarter of the studied sample had CNS problems(32.3%) with past history hypertension (19.4%) .

6.3. Fig. 1. illustrates that more than the half (62.89%) of the planned procedures were CT scan followed by ECHO (11.3%).

6.4. Fig. 2. illustrates that more than three quarters of the planned procedures(91.9%) were diagnostic procedures.

6.5. Fig. 3. shows that negative health consequences occurred in 83.9 % of all transports (52 transport).

6.6. Table III: Shows that 207 adverse events occurred during 52 transport and maximum number of adverse events during one transport was ten adverse events and occurred only in 3 transports. Also that minimum number of negative health consequences is one health consequences and occurred in 13 transport.

6.7. Table IV: Shows that each of Airway/pulmonary complications and Hemodynamics instability formed (30%) of total negative health consequences.

6.8. Table V: shows that more than quarter of the studied sample(30.6%) had stridor and desaturation during transport followed by tachypnea(25.8%)in about quarter of transports.

6.9. Fig. 4. illustrates that more than quarter of the Studied sample (37.1%) had tachycardia followed by hypertension (22.6%).

6.10.Fig. 5. illustrates that carrdiac arrest occurred in (8.1%) of all transport.

6.11. Table VI: shows that the external bleeding that occurred in (3.2%) and skin abnormalities that occurred in (6.5%) of the studied sample were the only physical injury as aresult of transport.

6.12. Fig. 6. illustrates that (21%) of the studied sample had hyperglycemia and (14.5%) had hypoglycemia as result of transport.

6.13. Fig. 7. illustrates that (9.6%) of the studied sample had malfunction of oxygen cylinder followed by syringe pumb (6.6%)

6.14. Fig.8 . illustrates that (8.1%) of the studied sample had accidental removal of nasogastric tube followed by endotracheal tube (6.6%).

6.15. Fig.9 .illustrates that (8.1%) of the studied sample developed severe brain injury as result of transport.

6.16. Fig. 10. illustrates that (4.8%) of the studied sample had pulseless electrical activities.

6.17. Fig. 11. illustrates that (19..35%) of the studied sample had accidental removal of intravenous line.

6.18. Table VII: clarifies that there was a significant statistical correlation between the transport team, equipment & materials , connections, duration of transport, intervention during transport and health consequences during transport. However, no significant statistical correlation was found between medications and health consequences during transport.

6.19. Table VIII: clarifies no significant statistical difference between age, gender ,length of stay in relation to negative health consequences during transport (N= 62).

6.20. Table IX:clarifies no significant statistical difference between diagnosis and cormorbidity disease and negative health consequences during transport (N= 62).

6.21. Table X: clarifies no significant statistical difference between procedure, purpose of procedure and health consequences during transport (N= 62).

7. DISCUSSION

The present study delineated that no dominence in the gender , especially in the age group reflecting middle adulthood. This finding is merely in agreement with that of, Gimenez, et el (2017) who conducted a published study entitled as Analysis of Adverse Events during Intrahospital Transportation of Critically Ill Patients and found that, of the 293 patients included in the study, 53.9% were men and the median age was 66.5 (54.5–76) years.

As regards to the medical diagnosis, most of the studied sample had CNS problems (32.3%). This finding is consistent with, Martin, et el (2017) who conducted a study about Secondary Insults and Adverse Events During Intrahospital Transport of Severe Traumatic Brain-Injured Patients and said that A prospective study based on severe TBI patients admitted from June 2011 through June 2013 in a level I trauma center. “Head computed tomography (CT) is the reference imaging examination for initial diagnosis and early followup of TBI. CT highlights the presence of hemorrhagic and/ or bone lesions and guides the surgical or medical treatment".

As regards to planned procedures, CT scan done for more than the half of the studied sample (62.89%) followed by ECHO (11.3%) and more than three quarters of the planned procedures(91.9%) done for diagnostic purpose. This finding is inconsistent with that of Harish, et el , (2017) who studied Complications and benefits of intrahospital transport of adult Intensive Care Unit patients and revealed that diagnostic CT scan was done for more than the half of the studied sample (64.1%). From the investigator’s point of view, the majority of the studied sample had CNS problems that need to do diagnostic CT scan frequently to follow up prognosis and deterioration of the patient.

As regards to intrahospital transport related-health consequences this current study revealed that negative health consequences occurred in more than three quarters (83.9%) of trnsports (52 transports). This is approximetly in agreement with Martin, et al , (2017) who studied Analysis of adverse events during intrahospital transportation of critically ill patients and found that Adverse Events Incidence Twenty-four AEs occurred during transport of 19 patients (61 %) of 31 transports. But this finding isn't in the same with Jones, et al, (2016) who studied Intrahospital transport of the critically ill adult and revealed that Forty-one transports (8.2%) had an unexpected event of 502 transports.

Regarding number of negative health consequences per transport the current study revealed that 207 negative health consequences occurred during 52 transports but no death and maximum number of negative health consequences during one transport was ten negative health consequences and occurred only during 3 transports. Also the minimum number of negative health consequences is one health consequences and occurred dring 13 transports. This findings isn't in the same line with Harish, et al, (2016) who conducted a study which entitled Complications and benefits of intrahospital transport of adult Intensive Care Unit patients and revealed that the total number of major complications were 52 among 34 (28.3%) patients, 10 patients had more than one complication.

As regards to each negative health consequences in relation to total number of negative health consequences this study revealed that Airway/pulmonary complications and Hemodynamics instability were the most frequent negative health consequences as each of them formed (30%) of total number health consequences. This is in agreement with Gimenez, et al (2017) who studied the analysis of adverse events during intrahospital transportation of critically ill patients and

revealed that Physiological alterations occurred in 44.1% of adverse events, with alterations in heart rate being the most frequent change followed by respiatory complications(28.2%).

As regards to airway-pulmonary complicattions,this current study revealed that, the desaturation and stridor occured in more than quarter of the studied sample (30.6%) followed by tachypnea (25.8%). This is merely in agreement with Venkategowda, Rao, Mutkule& Taggu, (2014).who conducted astudy entitled Unexpected events occurring during the intra-hospital transport of critically ill ICU patients revealed that, Respiratory complications were reported up to 29%, in which they had increase in respiratory rate and decrease in spo2 as major complications.

As regards to hemodynamic instability the current study revealed that more than third of the Studied sample (37.1%) had tachycardia followed by hypertension (22.6%) as result of transport.this is merely in the same line with Jia, Wang,Gao , Liu& Yu (2016). Who studied High incidence of adverse events during intra-hospital transport of critically ill patients and new related risk factors:and revealed heart abnormality or more severe in 96 case (15.7%) and systolic blood pressure abnormality or severe in 78 cases (17.7%)

As regards to cardiac arrest the current study illustrated that carrdiac arrest occurred in (8.1%) of the studied sample as result of transport with no death this finding is consistent with Harish, (2016) who studied the Complications and benefits of intrahospital transport of adult Intensive Care Unit patients and enumerated that a number of patients who needed CPR in our cohort was high (7.5%). On the other hand, Parmentier-Decrucq,et al (2013), reported that no cardiac arrest occurred during IHT after studying adverse events during intrahospital transport of critically ill patients: incidence and risk factors.

As regards to physical injury the current study revealed that the external bleeding that occurred in (3.2%) and skin abnormalities that occurred in (6.5%) of the studied sample are the only physical injury as aresult of transport.this is merely in agreement with Beckmann, et al (2004) that revealed physical injury in 6 reports (3%) Incidents relating to the intra-hospital transfer of critically ill patients.

As regards to glucose abnormalities the curreny study revealed that the current study revealed that that (21%) of the studied sample had hyperglycemia and (14.5%) had hypoglycemia as result of transport. This is merely in agreement with Jia, et al (2016) who studied the high incidence of adverse events during intra-hospital transport of critically ill patients and new related risk factorsand reported that the rates of hypoglycemia and hyperglycemia in this study were 3.38 % and 23.75 %, respectively. The percentage of glucose level deterioration was 8.8 % (39 IHTs) in our study.

As regards to accidental removal of patient's connections the current study revealed that (19.4%) of the study sample had accidental removal of connections and (8.1%) of them had accidental removal of nasogastric tube followed by endotracheal tube (6.6%). This is consistent with American Academy of Orthopaedic Surgeons, & American College of Emergency Physicians. (2017) who studied Critical care transport and revealed that the complications related to nursing/medical error (22%) were accidental dislodgement of peripheral intravenous lines, central venous catheters, surgical drains, orogastric tubes, and endotracheal and tracheostomy tubes.

As regards to malfunction of equipment the current study showed more than quarter of the study sample had malfunction of equipment(22.6%) and (9.6%) of them was malfunction of oxygen cylinder followed by syringe pumb (6.6%) this is consistent Adam, Osborne & Welch (2017) in book of Critical care nursing: science and practice. and revealed that the significant problem of equipment malfunction is highlighted in studies that showed a 30% incidence of total eadverse events.

As regards to deterioration of mental status the current study revealed that (11.3%) (7 patients) of the study sample had altered consious level (8.1%) of them developed severe disability as result of intrahospital transport. This is merely in agreement with Venkategowda, Rao, Mutkule, & Taggu, (2014) who studied Unexpected events occurring during the intra-hospital transport of critically ill ICU patients and revealed.that altered mental status occurred in 5 cases (3.59%),

As regards to cardiac arrythmias the current study revealed that (11.3%) (7 patients) of the study sample had cardiac arrythmias and (4.8%) of them had pulseless electrical activities this is merely in agreement with Venkategowda, Rao, Mutkule, & Taggu, (2014) who studied Unexpected events occurring during the intra-hospital transport of critically ill ICU patients and revealed.that arrhythmias occurred in 6 cases (4.31%) patients.

As regards to accidental removal of intravenous line, current study showed that less than quarter of the studied sample had**,** accidental disconnection of intravenous line (16.1%) this in the same line with Harish, et al (2016) who conducted astudy entitled Complications and benefits of intrahospital transport of adult intensive care unit patients and revealed that 22 case had accidental disconnection of intravenous line (19.9%).

Regards to Correlation between transport team, equipment& materials, medications, connections, administrative part ,intervention during transport and health consequences during transport.the current study clarified a significant statistical correlation between the transport team, equipment & materials , connections, administrative part ,intervention during transport and health consequences during transport. However no significant statistical correlations were found between medications and health consequences during transport. The above findings is consistent with Day, D. (2010). who studied Keeping patients safe during intrahospital transport and revealed that Human-based mishaps developed from inadequate training of team members,monitoring and communication with the other department (administrative part). equipment based and human based, both often resulting from poor preplanning. Examples of equipment-based mishaps include battery failure of portable equipment, monitor malfunction, and depletion of portable oxygen supplies. The reported prevalence of equipment-related mishaps during critical care transport is from 11% to 34%.

As regards to comparsion between age, gender ,length of stay in relation to health consequences during transport. The current study reveled that no significant statistical difference between age, gender ,length of stay in relation to health consequences during transport this is consistent with Martin , et al (2017) who revealed that no difference in ICU length of stay was found between patients with or without patient-related AE during IHT and patient's sex and age was not a risk factor for the occurrence of an AE during IHT.-after studying Secondary insults and adverse events during intrahospital transport of severe traumatic brain-injured patients.

As regards to diagnosis and comorbidity diseases in relation to health consequences during transport the current study clarified that no significant statistical difference between diagnosis and cormorbidity disease and health consequences during transport this finding is merely in agreement with Collop, et al (2007). Who studied Clinical guidelines for the use of unattended portable monitors in the diagnosis of obstructive sleep apnea in adult patients and clarified that There were no significant differences when comparing diagnosis of patient and comorbidity diseases or types of studies to the number of changes in the physiologic parameters, nor were there significant differences within a physiologic parameter when comparing patient types or diagnostic studie

As regards to procedure ,duration and purpose of procedure in relation to health consequences during transport the current study clarified that no significant statistical difference between procedure ,duration and purpose of procedure in relation to health consequences this is consistent with Lahner, et al (2007) who studied incidence of complications in intrahospital transport of critically ill patients–experience in an Austrian university hospital and revealed that no an association between the occurrence of adverse events and the duration of the transportation, purpose of transport diagnostic or therapeutic and type of procedure.

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Last but not least, Special thanks for my family who bear a lot in completion of this thesis. Also thanks to my wife for her continuous support and encouragement.

APPENDICES – A

Table I: Frequency distribution of studied sample in relation to age and gender (N= 62)

Variables		
	No	%
1-Age		
20-<30 year	7	11.3
30-< 40	17	27.4
40- <50	25	40.3
50 -≤ 60	13	21.0
	mean±SD=2.71± 0.93	
2-Gender		
male	31	50
female	31	50

Table II: Distribution of studied sample in relation to medical diagnosis and cormorbidity diseases. (N= 62)

Variables	Study sample N=62	
	NO	%
1-Medical Diagnosis		
Respiratory problem	16	25.8
Cardiovascular problem	9	14.5
CNS problems	20	32.3
Renal problem	6	9.7
GIT problem	6	9.7
CNS problems+cardiovascular	1	1.6
cardiovascuar +GIT problem	2	3.2
CNS problems +GIT problem	1	1.6
renal problem+GIT problem	1	1.6
2-Cormorbidity Disease		
HTN	12	19.4
DM	9	14.5
IHD	2	3.2
CKD	2	3.2
CVS	4	6.5
Convulsion	3	4.8
HTN+DM	7	11.3
HTN +IHD	4	6.5
DM + Hydrocephalus	1	1.6
HTN + Liver cirrhosis	1	1.6
HTN+CVS	2	3.2
HTN +CKD	2	3.2
Liver cirrhosis + HCV	1	1.6
NO Past history	10	16.1
CVS+ Convulsion	2	3.2

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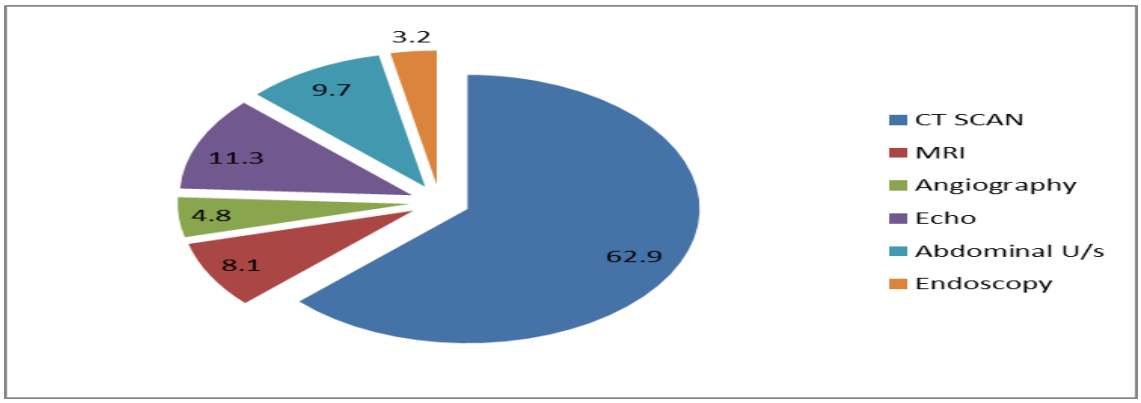

Fig. 1. Percentage distribution of the studied sample as regards to planned procedure.(N=62).

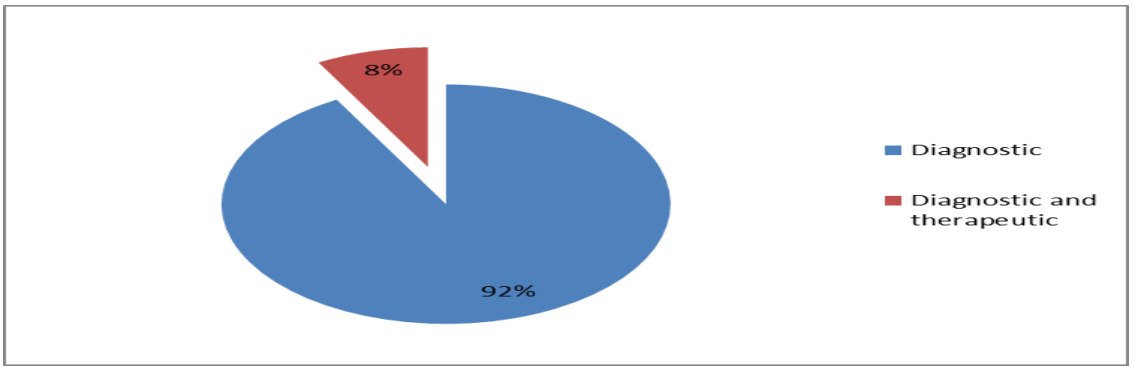

Fig. 2. Percentage distribution of the studied sample as regards to purpose of the planned procedure.(N=62).

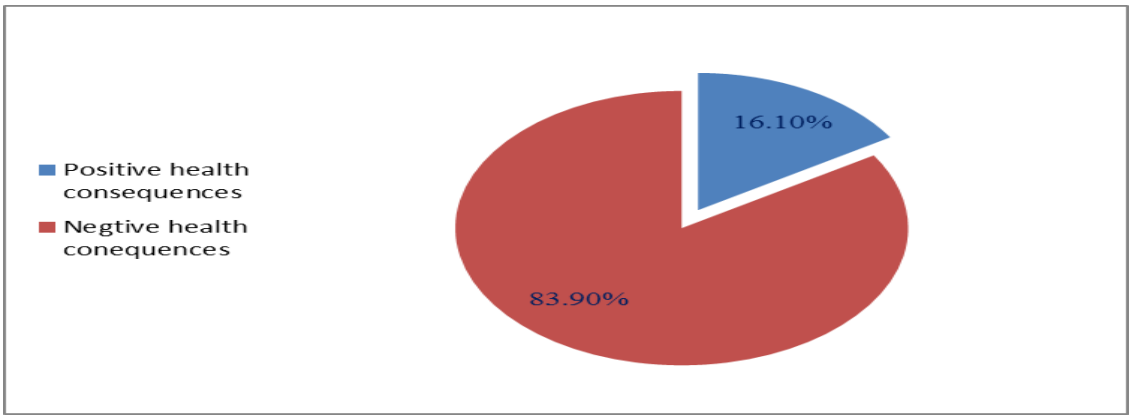

Fig. 3. Shows Percentage distribution of positive and negative health consequences

Table III: Shows number of negative health consequences per transport .

No	Number of transports	Number of negative health consequences	
		Number per transport	Total
1	3 transports	10	30
2	3 transports	9	27
3	2 transports	8	16
4	7 transports	6	42
5	6 transports	5	30
6	5 transports	4	20
7	3 transports	3	9
8	10 transports	2	20
9	13 transports	1	13
Total	52 transports	60	207

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Table IV: Shows percentage distribution of each negative health consequence.

Negative health consequence	Total number	percentage
1- Airway/pulmonary complications	62	30 %
2- Hemodynamic instability	62	30 %
3-Cardiac arrest	5	2.4 %
4- Physiacl injury	6	2.9 %
5- Glucose abnormalities	22	10.6 %
6- Accidental removal of any patient connection	12	5.8 %
7- Accidental disconnection of intravenous line	10	4.7 %
8- Malfunction of any equipment	14	6.8 %
9- Deterioration of conscious level	7	3.4 %
10- Cardiac arrthymias	7	3.4 %

Table V: Show percentage distribution of airway/pulmonary complications during transport.

No	Item	YES		NO		NA	
Occurrence of							
1-Airway /pulmonary complication							
1	Stridor	19	30.6	43	69.4	0	0
2	Emphyesma	0	0	62	100	0	0
3	hemothorax	0	0	62	100	0	0
4	Pneumothorax	0	0	62	100	0	0
5	Change in ventilator parameter according to pulmonary complication	0	0	0	0	62	100
6	Desaturation	19	30.6	43	69.4	0	0
7	Accidental extubation	5	8.1	21	33.9	36	58.1
8	Tachypnea	16	25.8	46	74.2	0	0
9	Bradypnea	3	4.8	59	95.2	0	0

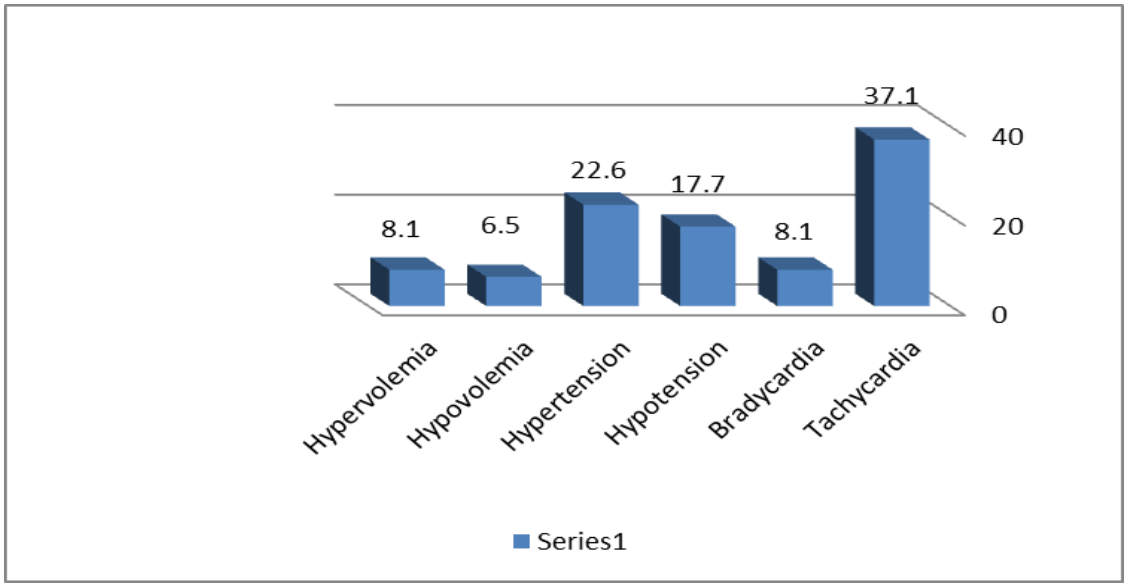

Fig. 4. Percentage distribution of the studied sample as regards to hemodynamic instability During and transport.(N=62).

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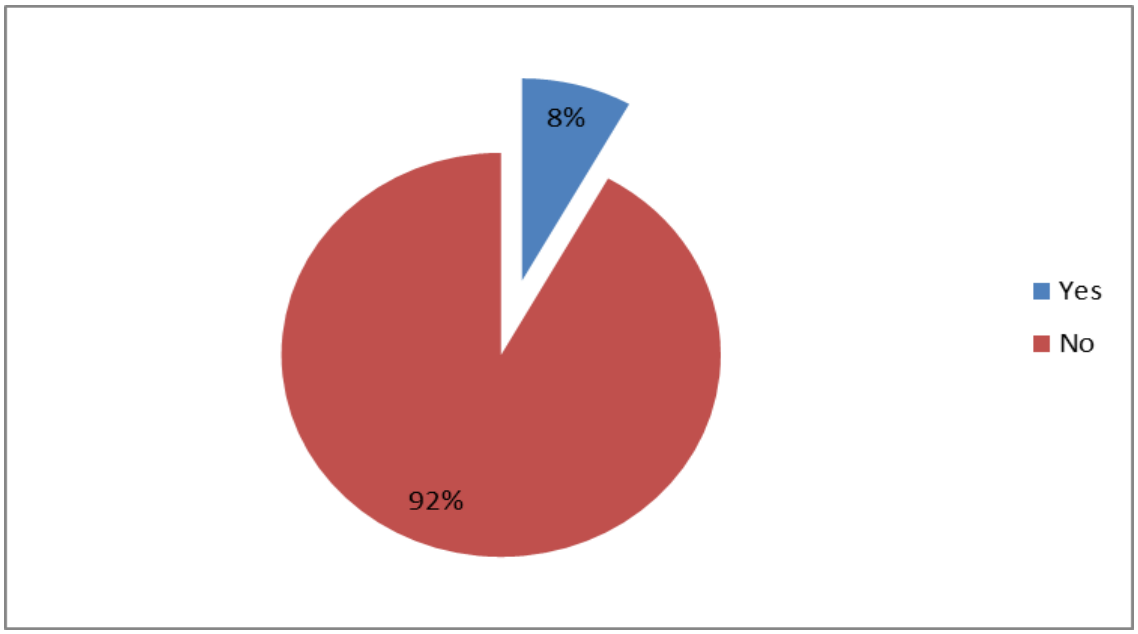

Fig. 5. Percentage distribution of the studied sample as regards to cardiac arrest during and post transport.(N=62)

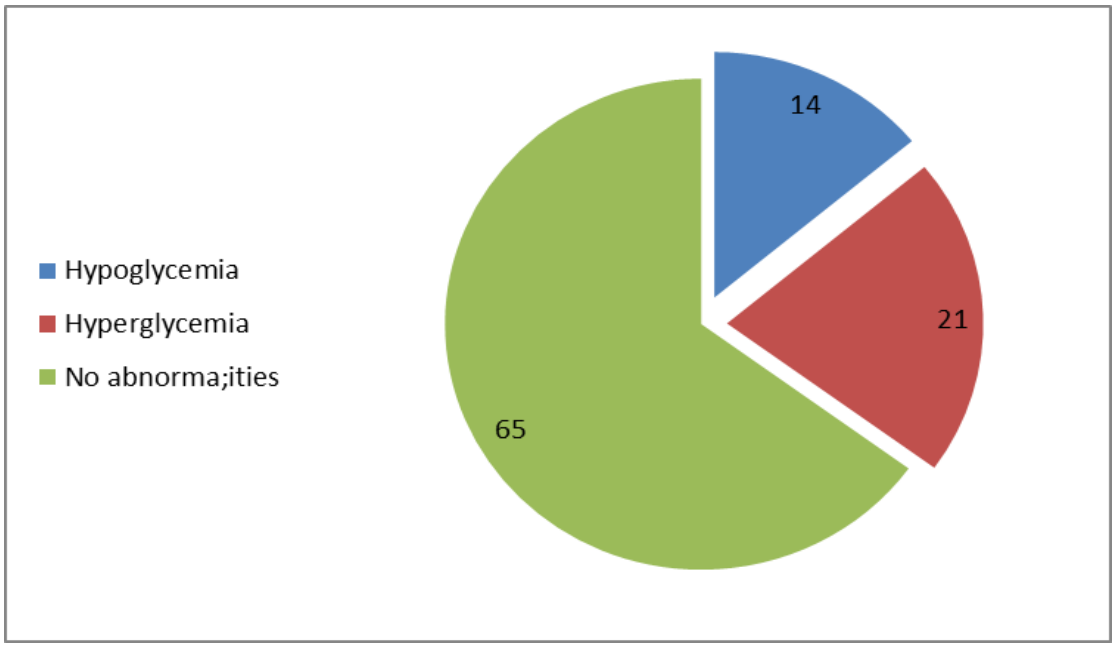

Fig.6. Percentage distribution of the studied sample as regards to Glucose abnormalities during and post transport.(N=62).

Table VI: Shows percentage distribution of physical injury as result of transport

Item	YES		NO	
	no	%	no	%
Physical injury				
Bleedind (external)	**2**	**3.2**	**60**	**96.8**
Skin abnormalities (echymosis)	**4**	**6.5**	**48**	**93.5**

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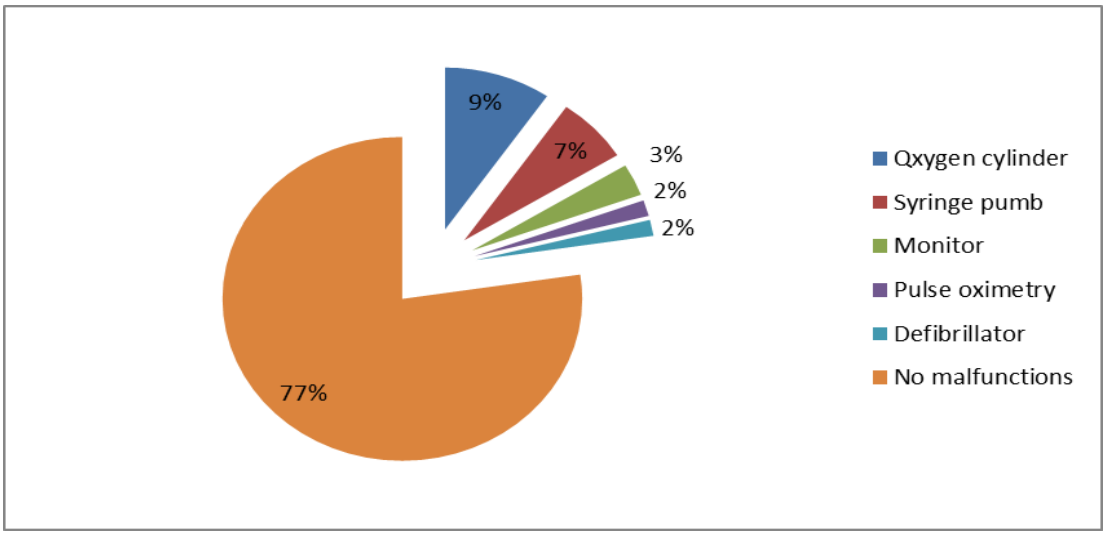

Fig. 7. Percentage distribution of the studied sample as regards to malfunction of equipment during transport.(N=62).

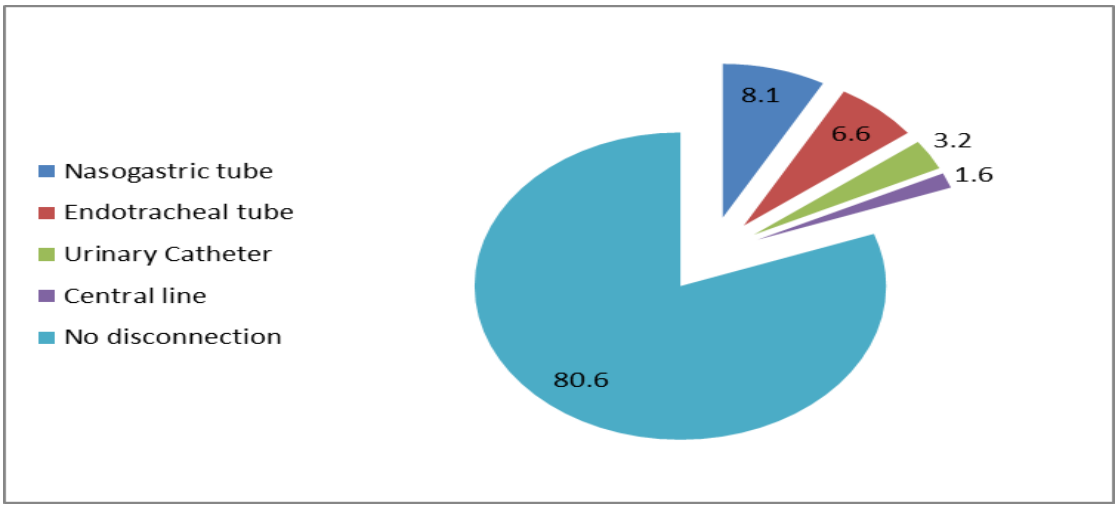

Fig. 8. Percentage distribution of the studied sample as regards to accidental removal of connections. (N=62).

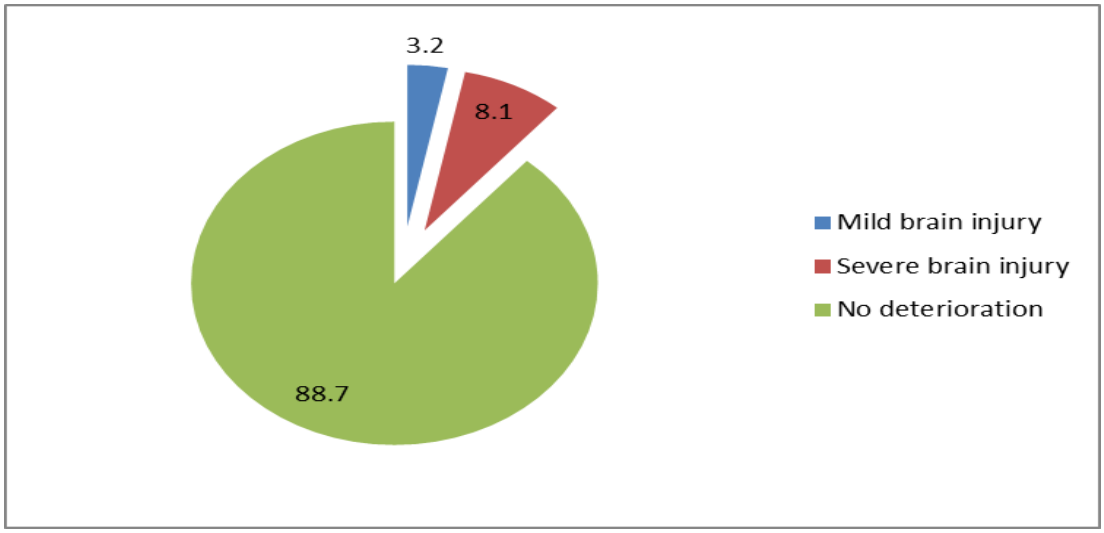

Fig. 9. Percentage distribution of the studied sample as regards to deterioration of conscious level. (N=62).

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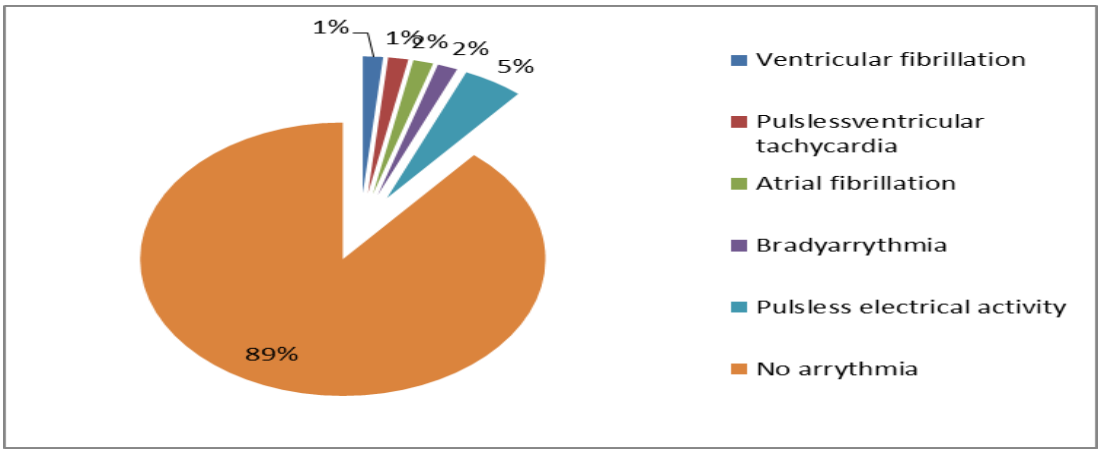

Fig. 10. Percentage distribution of the studied sample as regards to cardiac arrythmia developed during intrahospital transport. (N=62).

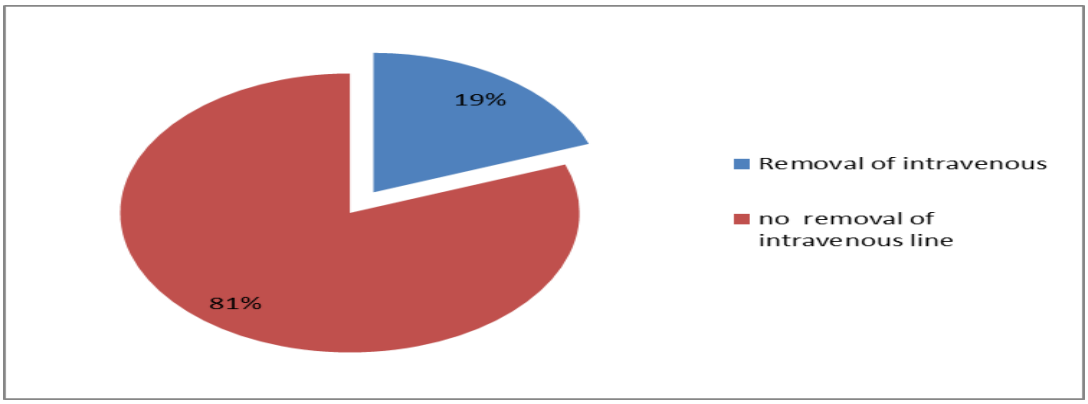

Figure.11. Percentage distribution of the studied sample as regards to accidental removal of intravenous line. (N=62)

Table VII: Correlation between transport team, equipment & materials, medications , connections, administrative part, intervention during transport and health consequences during transport (N= 62).

		Transport team	Equipment and materials	Medications	Connections	Administrative part	Interventions
Transport team	Pearson Correlatio Sig.(2-tailed)						
Equipment and materials	r : P :	.453 .000** S					
Medications		.157 .222 NS	.329 .009** S				
Connections	r : P :	.411 .001**	.317 .012**	.254 .046** S			
Administrative part	r : P :	.173 .179 NS	-.141- .273 NS	-.254- .047** S	.103 .425 NS		
Interventions	r : P :	.352 .005** S	.439 0.000** S	-.254- .736 NS	.407 .001** S	.200 .120 NS	
Health consequences	r : P :	.348 .006** S	.393 .002** S	-.068- .599 NS	.442 .000** S	.239 .061** NS	.672 .000** S

**Correlation is significant at P ≤ 0.05 NS: Not Significant

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Table VIII: Comparsion between age, gender ,lengrth of stay in relation to health consequences during transport (N= 62).

Variables	Categories	mean±SD	F	P
Age	20 <30	39.5714 ±5.15937	.347	.792
	30<40	37.8235±4.92741		
	40 <50	38.2000±6.01387		
	50 <60	37.1538±3.50823		
Gender	Male	38.3226±4.78461	.582	.448
	Female	37.7419±5.47703		
Length of stay	< one week	38.2917±5.03448	.588	.626
	one week < two week	38.5500±4.91480		
	3 weeks < 4 weeks	36.3846±4.38821		
	4 weeks and more	39.0000±8.24621		

Table IX: Comparsion between diagnosis and cormorbidity diseases in relation to health consequences during transport (N= 62)

Variables	Categories	mean±SD	F	P
Diagnosis	respiratory problem	41.3750±5.43906	1.394	.221
	cardiovascular problem	36.6667±3.46410		
	CNS problems	36.6000 ±5.22544		
	Renal problem	37.6667±3.88158		
	GIT problem	36.6667±5.46504		
	CNS problems+cardiovascular	36.0000		
	Cardiovascuar problem+GIT problem	40.0000±5.65685		
	CNS problems +GIT problem	38.0000		
	renal problems +GIT problem	34.0000		
Cormorbidity	HTN	39.6667±5.64613	1.179	.322
	DM	38.2222±6.59124		
	IHD	39.0000±4.24264		
	CKD	38.0000±5.65685		
	CVS	33.7500±3.30404		
	CONVULSION	34.3333±2.51661		
	HTN+DM	39.1429±4.87950		
	HTN +IHD	37.2500±3.40343		
	DM + HYDRCEPHALUS	42.0000±		
	HTN +LIVER	44.0000±		
	HTN+CVS	33.0000±1.41421		
	HTN +CKD	32.0000±.00000		
	LIVER + HCV	46.0000±		
	NO Past history	38.9000±4.77144		
	CVS+CONVULSION	36.0000±.00000		

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Table X: Comparsion between procedure ,duration and purpose in relation to health consequences during transport (N= 62).

Variables	Categories	mean±SD	F	P
Procedure	CT Scan	37.9231±4.99149	1.446	.239
	MRI	34.2000±3.63318		
	Angiography	38.0000±3.46410		
	Other	39.6000±5.71714		
Duration	<15 min	38.2105±4.04940	.042	.959
	15 min <30 min	37.8214±5.51801		
	30 < 45 min	38.2000±5.80886		
Purpose	Diagnostic	38.2759±5.17685	2.080	.154
	Diagnositic and therapeutic	34.5000±1.91485		

8. CONCLUSION

Based on findings of the current study; it can concluded that: During IHT patients are at risk for significant adverse events, such as airway/pulmonary complications, hemodynamic perturbations (including cardiac arrest), cardiac arrhythmias, physical injury, glucose abnormalities, accidental removal of connections, deterioration of conscious and malfunction of equipment. True mortality estimates from IHT are challenging because mortalities resulting from IHT often cannot distinguished from those of the general ICU population. Transportation of critically ill patients should only occur when the benefits of a procedure or diagnostic test outweigh the risks. Moving these patients should only happen when there is appropriate monitoring and other necessary equipment in the presence of trained personnel who are familiar with the care of such patients.

Based on the findings of the present study, the following recommendations are suggested:

1- Intensive care should not be interrupted by transportation of the patient.

2- Maintain a close observation and comprhensive assessment to the transported critically ill patients to evaluate their conditions and to weight benefits agaist risks and prevent occurrence of these risks.

3- Specific training programmes should be developed to promote patient's safety during transport.

4- Nurses should be aware of the risk factors for complications and act accordingly to transport policies to avoid the occurrence of unexpected outcomes.

5- Specialized retrieval teams should be staffed by a physician, preferably an intensivist, an ICU nurse and nurse aid.

6- Further studies have to be carried out in order to assess the effect the quality of nursing care and other risk factors on the complication's ratio during intrahospital transport.

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