



CRITICAL PATIENT TRANSPORT: A CHALLENGE FOR THE 21ST CENTURY

TRANSPORTE DE PACIENTE CRÍTICO: UM DESAFIO DO SÉCULO XXI

TRANSPORTE DEL PACIENTE CRÍTICO: UN RETO DEL SIGLO XXI

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ABSTRACT

Objective: describing the factors that interfere with intra-hospital transport (IHT) of patients admitted to an intensive care unit (ICU). **Method:** cross-sectional study, with a quantitative approach, conducted at the general ICU of a public hospital. Data collection was carried out using a questionnaire. For statistical analysis, the Mann-Whitney test and the Fisher's exact test were used. Data were shown into tables and discussed with the literature. **Results:** 41 IHTs of 20 patients were followed. Out of the multiprofessional team, nurses' participation reached 95%. The most frequent adverse event (63.4%) in the IHTs was the existence of narrow gates between sectors. Changes in the APACHE II index and the use of noradrenaline were significantly associated with patient instability during IHT ($p = 0.014$, $p = 0.003$), respectively. **Conclusion:** there are still infrastructure-related barriers that pose limitations to a secure IHT. **Descriptors:** Nursing Care; Nursing; Patient Transport; Intensive Care Unit.

RESUMO

Objetivo: descrever os fatores que interferem no transporte intra-hospitalar (TIH) do paciente internado em unidade de terapia intensiva (UTI). **Método:** estudo transversal, de abordagem quantitativa, realizado na UTI geral de um hospital público. A coleta de dados ocorreu por meio de um questionário. Para análise estatística, foi aplicado o teste de Mann-Whitney e o teste exato de Fisher. Os dados foram apresentados em tabelas e discutidos com a literatura. **Resultados:** foram acompanhados 41 TIH de 20 pacientes. Da equipe multiprofissional, a participação do enfermeiro predominou em 95%. O evento adverso mais frequente (63,4%) nos TIH foi a existência de portas estreitas entre os setores. A alteração do índice APACHE II e o uso de noradrenalina associaram-se significativamente com a instabilidade do paciente durante o TIH ($p = 0,014$, $p = 0,003$), respectivamente. **Conclusão:** ainda há barreiras relacionadas à infraestrutura que representam limitações para um TIH seguro. **Descritores:** Cuidados de Enfermagem; Enfermagem; Transporte de Pacientes; Unidade de Terapia Intensiva.

RESUMEN

Objetivo: describir los factores que interfieren con el transporte intrahospitalario (TIH) del paciente ingresado en una unidad de cuidados intensivos (UCI). **Método:** estudio transversal, con un abordaje cuantitativo, realizado en la UCI general de un hospital público. La recogida de datos se realizó mediante un cuestionario. Para el análisis estadístico, se utilizaron la prueba de Mann-Whitney y la prueba exacta de Fisher. Los datos fueron mostrados en tablas y discutidos con la literatura. **Resultados:** se siguieron 41 TIHs de 20 pacientes. En el equipo multiprofesional, predominó la participación del enfermero en 95%. El evento adverso más frecuente (63,4%) en los TIHs fue la existencia de puertas estrechas entre sectores. Los cambios en el índice APACHE II y el uso de noradrenalina se asociaron significativamente con la inestabilidad del paciente durante el TIH ($p = 0,014$, $p = 0,003$), respectivamente. **Conclusión:** todavía existen obstáculos relacionados con la infraestructura que plantean limitaciones a un TIH seguro. **Descriptor:** Cuidados de Enfermería; Enfermería; Transporte de Pacientes; Unidad de Cuidados Intensivos.

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INTRODUCTION

The intensive care unit (ICU) is a hospital sector aimed at the care for critically ill patients whose demand for skilled human resources becomes key in the management of high-tech instruments used to provide assistance.¹

The ICU is the safest hospital environment and it has the greatest availability of critical patient monitoring resources.² Despite the sophisticated technological resources, not all the necessary exams or therapeutic procedures can be made available at the bedside, thus intra-hospital transport (IHT) becomes key and frequent.

It is argued about the difficulty of deploying specialized transport teams and the necessary expertise of professionals for continued complex decision-making during not only clinical care, but also patient transport. Critical patient transport planning is crucial to prevent potential instabilities. Therefore, a sufficient number of professionals should be ensured, as well as the material resources needed for adequate monitoring.³

Certainly, the removal of patients from a safe environment such as the ICU to perform an IHT is associated with 4.2 to 70% of the complications. In 38% of the cases, the incidents occur in the pre-transport phase and 47% in the transport phase. In the pre-transport phase, the most reported incidents were related to equipment and organizational issues. Despite the benefits obtained through the IHT, exposure to risk is significant and it may impact on the increase of morbimortality.⁴

Critical patient transport represents a big challenge for health professionals, as it involves the need to interconnect not only the health care technology, but above all the mastery of scientific principles and, at the same time, rigor of ensuring the patient's therapeutic needs is required, in order to minimize adverse events and ensure a safe and good-quality patient care. From this viewpoint, we regard as crucial consolidating professionals' knowledge and patient safety, team training in simulated environments, which mimic a real condition of critical patient transport.⁵

In IHT, a nurse stands out as the professional who plays a crucial role along with the team, in the coordination and planning of the process.⁶ It is within her/his competence anticipating the potential instabilities and clinical complications, as well as providing the necessary therapeutic

equipment and therapeutic interventions needed to health care during the peri-transportation period.⁷ From this perspective, specialized and skilled nursing that works in the ICU has the responsibility of coordinating and managing patient transport, based on clinical evaluation, indicators, and determination of risks to the patient.⁶

OBJECTIVE

- Describing the factors that interfere with IHT of patients admitted to an ICU.

METHOD

Cross-sectional study, with a quantitative approach, developed at the general ICU of a public hospital in the Federal District. The sample consisted of 20 patients who required in-hospital transport within the period from March to July 2013. Patients ≥ 18 years old admitted to the ICU were included and those who underwent emergency transport were excluded.

◆ Data collection phases

◆ **Phase I (Pre-transport period):** Patients were characterized applying a structured questionnaire, consisting of sociodemographic, hemodynamic, clinical, and diagnostic questions, comorbidities, neurological and ventilatory profile, and the score Acute Physiology and Chronic Health Disease Classification System II (APACHE II).

◆ **Phase II (Intra-transport period):** Characterized by the record of incidents and adverse events during transport, interventions, time elapsed (origin-destination), physiological variables (blood pressure, peripheral oxygen saturation), and the team responsible for transport.

◆ **Phase III (24-hour post-transport period):** In this phase, there was monitoring of patient's physiological, ventilatory, and neurological variables by means of the medical records to trace the post-transport evolution profile.

◆ Definitions

The pre-transport period is the moment prior to the beginning of patient preparation for transport.

For the purposes of data collection, we regarded the hemodynamic status of a patient within the pre- and post-transport period as that corresponding to the physiological variables registered in the medical records immediately before IHT and those recorded up to 24 hours after patient return to the facility of origin.

Cardiorespiratory change was determined by comparing a patient’s hemodynamic status concerning the pre- and post-transport period. This change was characterized by variation in heart rate (HR) ≥ 15 bpm, variation in respiratory rate (RR) ≥ 6 cycles/minute, variation in systolic blood pressure (SBP) ≥ 15 mmHg, variation in diastolic blood pressure (DBP) ≥ 15 mmHg, and decreased peripheral oxygen saturation (SpO₂) $\geq 5\%$.⁸

Adverse events were all those identified by the multiprofessional team, since the patient leaves the facility of origin up to 24 hours after her/his return.⁹

IHTs going towards the surgical center (SC) were monitored and analyzed considering only the one-way route, due to the impact of the surgical procedure on the patient’s hemodynamics within the period after procedure. Besides, we should take into account the fact that transport to return to the facility of origin (ICU) is provided by the SC team, which has adopted other health care resources and strategies different from those routinely adopted by the ICU team.

The results were expressed as average, standard deviation, median, and quartiles for quantitative variables and relative and absolute frequency for categorical variables. For statistical analysis, the Mann-Whitney test and the Fisher’s exact test were used. The result was considered as significant when $p < 0.05$.

The study was approved by the Research Ethics Committee of the Teaching and Research Foundation in Health Sciences (FEPECS/SES), under the CAAE 12801013.4.0000.5553, and it complied with the standards of ethics in research involving human beings.¹⁰

RESULTS

This study followed 41 IHTs of 20 patients. As shown in Table 1, the distribution between men and women was similar. Patients had an average age of 58 years and the average values for body mass index (BMI) and the score APACHE II were respectively 25.5 kg/m² and 21. The most frequent hospitalization diagnosis (55%) among the patients was sepsis/septic shock.

High blood pressure was the most frequent disease (35%) among ICU patients who underwent IHT. An average of two transports per patient was found (Table 1). Thus, the most frequent reason for IHT, the need to perform the CT scan, followed by tracheostomy. It was observed that most transports (95%) were carried out with the

participation of a nurse, on the other hand, the medical team participated in 12% of them. In 90.3% of the IHTs, the patient was taken on his own bed.

The average time of IHT was 22 minutes, but when the reason was imaging exam this time increased to 30.7 minutes. The presence of narrow doors between sectors or bed size incompatible with door size in the destination sector was the most frequent difficulty during transport. In 24.4% of the transports there were equipment failures (litter, infusion pumps). In 7.3%, there was failure in communication between professionals of the teams from a patient’s origin and destination sectors and in 2.4%, patient’s hemodynamic instability.

Table 1. Distribution of characteristics and intervening factors to patient transport. Ceilândia (DF), 2013.

Variables	Characteristics	
	N (%)	Average (± SD)
Number of transports	41 (100%)	-
Number of transports/patient	-	2.1±0.6
Reason		
Tomography	25 (61.0%)	-
Tracheostomy	14 (34.1%)	-
Radiological examination	2 (4.9%)	-
Team		
1 nurse + 1 physical therapist + 1 nursing assistant	18 (43.9%)	-
1 nurse + 1 physical therapist + 2 nursing assistant	7 (17.1%)	-
Includes the nurse	39 (95.1%)	-
Includes the physical therapist	34 (82.9%)	-
Includes the physician	5 (12.2%)	-
Transport means		
Patient's bed	37 (90.3%)	-
Litter	3 (7.3%)	-
Wheelchair	1 (2.4%)	-
Transport time (minutes)	-	22±17
Transport time to the surgical center	-	5.9±2.9
Transport time for imaging exam	-	30.7±14.3
Adverse event during transport		
None	28 (68.3%)	-
Equipment failure	10 (24.4%)	-
Communication failure	3 (7.3%)	-
Hemodynamic instability (saturation dropped)	1 (2.4%)	-
Narrow doors or incompatible bed size	26 (63.4%)	-
Bed without support for infusion pump	1 (2.4%)	-
None	13 (31.7%)	-
Device used by the patient		
Venous access	41 (100.0%)	-
Delayed bladder catheter	38 (92.7%)	-
Enteral catheter	29 (70.7%)	-
Orotracheal intubation	24 (58.5%)	-
Tracheostomy	12 (29.3%)	-
Parenteral nutrition	6 (14.6%)	-
Drain	6 (14.6%)	-
Gastric probe	5 (12.2%)	-
Venous access and NEP and DBC and OTI	20 (48.8%)	-
Others	3 (31.7%)	-
Medication		
Sedation	24 (58.5%)	-
Vasoactive drug (noradrenaline)	20 (48.8%)	-
Sedation and noradrenaline	15 (36.6%)	-
Patients under mechanical ventilation	34 (82.9%)	-

Legend: SD - standard deviation; OTI - orotracheal intubation; NGT - nasogastric tube; DBC - delayed bladder catheter; NEP - nasoenteric probe.

Among the adverse events related to equipment, the most common, in 30% of the IHTs, was the end of the cylinder oxygen gas. Failure of the multiparameter monitor and unavailability of the oxygen cylinder to the

IHT were observed in 20% of the cases.

It was found that most of the patients, within the peri-transport period, showed systolic and mean arterial oscillations (Table 2).

Tabela 2. Distribution of patients according to cardiorespiratory changes within the pre-, intra- and post-transport periods. Ceilândia (DF), 2013.

Variable*	Increase	Decrease	Total n (%)
Variation in SBP ≥ 15 mmHg	14	11	25 (61.0%)
Variation in DBP ≥ 15 mmHg	9	6	15 (36.6%)
Variation in ABP ≥ 15 mmHg	12	10	22 (53.7%)
Variation in HR ≥ 15 bpm	9	5	14 (34.1%)
Variation in RR ≥ 6 cycles/min	4	4	8 (19.5%)
Decreased SpO ₂ ≥ 5%	-	2	2 (4.9%)

*The same patient may have one or more cardiorespiratory changes. SBP - Systolic blood pressure; DBP - Diastolic blood pressure; ABP - Average blood pressure; HR - Heart rate; RR- Respiratory rate; SpO₂ - Peripheral oxygen saturation.

There was a significant association between the high value on APACHE II and the use of intravenous norepinephrine with a

patient's hemodynamic instability during IHT, p = 0.014, p = 0.003, respectively (Table 3).

Table 3. Relationship between the use of noradrenaline and the score APACHE with hemodynamic stability of patients during in-hospital transport. Ceilândia (DF), 2013.

Characteristics		Did not destabilize (n = 26)		Destabilized (n = 15)		p
		N (%)	Median (25-75)	N (%)	Median (25-75)	
APACHE II	-	-	18.5 (18-22)	-	24 (22-26)	0.014*
Use of norepinephrine	8 (30.8)	-	-	12 (80.0)	-	0.003**

*Mann-Whitney test; **Fisher’s exact test.

DISCUSSION

The work environment of critical care nurses is generally considered as stressful, requiring not only management of care, but the need for recognizing various types of equipment, devices, and assurance of patient care and safety.¹¹ Besides, it is required that this professional is able to work independently, making her/his own decisions and implementing measures that meet the patient’s needs.¹²

The IHT of critically ill patients represents an activity that exposes and imposes on the nursing professional the need for initiative, leadership, and decision making. A high rate of complications is associated to this type of transport¹³ and mortality equivalent to 4.1%.¹⁴

The physical isolation between the patient and the team during examination limits the supervision and proper evaluation of the hemodynamic profile, which is in turn signaled by monitors and alarms. This fact illustrates the need for greater team acuity. At times, this isolation contributes to the occurrence of complications that culminate in the prolongation of the IHT time.¹⁵

It has been found that patients admitted to critical care settings are submitted to more than one type of transport within the period of hospitalization. Another study also showed similar findings.¹⁶ On the other hand, it is emphasized that most IHTs are indicated due to the need for imaging tests and CT scans are highlighted in this scenario.^{4,17} A finding ratified by this study.

Often, there are factors common to the critical patient’s environment that predispose to the occurrence of complications mainly during IHT, among which mechanical ventilation, have their supremacy.¹⁶

Currently, mechanical ventilation constitutes a risk factor for IHT, mainly due to its impact on the occurrence of mechanical ventilation-related atelectasis and pneumonia.¹⁷

The existence of a qualified team represents the key to safe transport and it increases patient’s survival. In this study, despite the significant participation of nurses in the IHTs of the critical patient, the medical

team’s performance has been reduced in relation to what is recommended by RDC 26, enacted on 2012.¹⁸

Adverse events are complications likely to occur during IHT. However, the most common ones are related to equipment use, found both in the literature and in this study. Oxygen cylinder emptying and failure and/or insufficient battery of portable monitoring devices stood out during IHT.¹⁷ Effective IHT planning is also dependent on material resources available in the hospital facility. The irregularity of supply and maintenance of these resources generates frequent problems in health services, which culminate in significantly negative consequences on the performance of comprehensive patient care.¹

Care during IHT is consolidated through adequate communication between the teams of the sectors involved.¹ Intercurrences related to communication failures, although not very expressive in this study, represent targets of strategies, considering the impact they can have on patients’ safety and lives.

Continued and systematic monitoring of a patient throughout the course of IHT is highly recommended, as it allows rather accurate register and evaluation of changes and repercussions of physiological variations.¹⁹ This finding, besides being common in 88.4% of transports, was also observed in this study.²

The severity and risk of clinical deterioration of patients submitted to IHT can contribute to a higher occurrence of complications. This fact may be verified mainly by those patients using catecholamines as shown herein, corroborating another study.²⁰

Limitations of physical structure, observed in most transports, may interfere directly or indirectly or even hamper patient care during IHT. Thus, the problems related to hospital infrastructure can predispose to the occurrence of adverse events, especially when associated with incidents involving equipment. As it is known, physical constraints are generally enduring because they interconnect the physical design, a basis for the construction of hospitals. Thus, it is up to professionals resorting to astute intelligence, inherent to those who are deeply familiar with professional practice, in order to

design means that go beyond such limitations, ensuring continuity of care and continued assistance and avoiding adaptations and improvisations, to overcome obstacles and difficulties.²¹

The importance of constructing assistance protocols, training of skilled teams, or quick response teams for transport in hospital facilities is a consensus in the literature. Effective planning combined with a qualified team and adequate equipment provide a patient with greater reach of continuity of care and minimize the potential complications of IHT.^{17,22}

CONCLUSION

Despite the current technological advances in the hospital setting, there are still many infrastructure-related barriers that pose limitations to a safe ITH. Even an insufficient clinical evaluation can impact on the patient's outcome.

Regarding the hemodynamic profile, blood pressure oscillations were more frequently observed in patients undergoing ITH.

The nurse showed active participation in most of the transports carried out, however, we should understand that the offer of greater safety, both for the patient and the professional, can be achieved by planning health care strategies on the part of teams qualified to perform ITH and through the creation of standard operational protocols aimed at the facility's demand.

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