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GOING AND COMING FROM A SURGICAL CENTER: ASSESSING RISKS IN PATIENT TRANSPORT IN A UNIVERSITY HOSPITAL OF BRAZIL

INDO E VINDO DE UM CENTRO CIRÚRGICO: AVALIANDO RISCOS NO TRANSPORTE DE PACIENTES EM UM HOSPITAL UNIVERSITÁRIO DO BRASIL

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ABSTRACT: The patient's in-hospital transport is an activity that must be performed with safety and quality and involves considerable risks, especially for surgical patients. The objective of this study was to evaluate the adequacy or not of transport of surgical patients from inpatient units to surgical centers and vice-versa. The transport and patient profile, the nursing workload, the professionals and conditions involved were assessed for each patient (or transport), and subsequently the transports were evaluated as inadequate (some non-conformity) or adequate. The transport was inadequate in 39.3% of the evaluations. The most common non-conformities were the lack of knowledge of the transport at the patient's destination, incorrect documents, patient alone during the route, and absence of health professional during transport (when necessary). In this institution and in the period evaluated, the transport was mainly run by porter. Patients in rout to inpatient units have higher frequency of inadequate transport, mainly because of lack of communication with the destination unit. The increase in workload, evaluated by the Santos Score, also increased the risk of having inappropriate transport (*OR* = 1.21, $CI_{95\%}$: 1.08-1.16), and when the patients were grouped in minimal care versus non-minimal care, the latter also showed higher risk of inadequate transport. When the transports were evaluated separately by route, patients going to surgical centers had a higher risk when the Santos Score increased (*OR* = 1.168, $CI_{95\%}$: 1.07-1.27), and patients going to inpatient units had a lower risk when the Santos Score increased (*OR* = 0.605, $CI_{95\%}$: 0.46-0.80). In the last case, patients with a high workload were also accompanied by health professionals. The presence of a health professional when the patient was going to an inpatient unit also decreased the risk of inadequate transport (*OR* = 0.011, $CI_{95\%}$: 0.002-0.070). The patient returning to their origin unit showed more transport non-conformities. Perhaps the reason is the discredit attributed to risk in these patients once the surgical problem was solved. Thus, it is a fact that the patient nursing workload and the route of the transport were effective in predicting the risk of inadequate transport, being of great potential for practical use.

KEYWORDS: Patient transport. Patient safety. Surgical center. In-hospital transport.

INTRODUCTION

Poor-quality healthcare around the globe causes ongoing damage to human health. In low- and middle-income countries, between 5.7 and 8.4 million deaths occur each year from poor quality of care, which means that quality problems cause 10 to 15 percent of the total deaths in these countries (NATIONAL ACADEMIES OF SCIENCES, ENGINEERING; MEDICINE, 2018). One of the risk situations that the patient is exposed to is during transport. Patient transport is considered any type of patient displacement, inside or outside the hospital area. Therefore, it is necessary to promote means for transport without damage (SHIEDLS; OVERSTREET; KRAU, 2015).

The difficulty of interaction and poor communication between patient origin and destination unit teams contributes to the significant increase in complications in transport and, therefore, the nursing develops an essential role in the dissemination of information, which should be sensitive to the patient's real needs. The constant training and improvement of the professionals involved in transportation, as well as the standardization of actions and necessary equipment for the clinical monitoring of the patient should be provided for the prevention or minimization of adverse events, attainment of excellence in care and customer safety (ALMEIDA et al., 2012). The evaluation of the quality of the transport can be carried out through different ways and indicators that constitute important tools for hospital

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management (NAKAYAMA et al., 2012, GARROUSTE-ORGEAS et al., 2012).

Therefore, this study aimed to evaluate and characterize the transport between the surgical center and inpatient units of a university high complexity hospital. One of the secondary goals is to use this information to predict the risk of inadequate transport based on the profile of patients and transports prior to transport. Such information may enable the prediction of inadequate transport and the planning of assistance to patients, thus helping to prevent potential damage that could culminate in irreversible consequences or death, as well as evidencing possible points for the continuing education of the professionals involved.

MATERIAL AND METHODS

Study location and population

This is a quantitative, descriptive, analytical and observational research. The study was conducted in a university hospital in Brazil, Minas Gerais state, the "Hospital de Clínicas de Uberlândia", a tertiary care hospital, highly complex care and teaching hospital. The hospital has about 520 bedrooms.

Here, we only measured surgical patient transport related to surgical center, and this was classified in two routes. The first route was the transport from the patient bedroom in the inpatient units to the surgical center. The second route was the transport from the surgical center to the bedroom in the inpatient unit. All transports in these two routes characterized the study population. Each patient was evaluated only in one of these routes. The study sample was composed of 316 patients (or transports). To perform the sample calculation, we considered the monthly average of 1,769 transports, a prevalence of 50% of inadequate transports, significance of 5%, and margin of error of 5%. The same researcher collected all data to minimize errors.

Inclusion criteria and ethical considerations

The patients were randomly selected from the surgical schedule. The following patient inclusion criteria were used: 18 years old or older; acceptance in participating in the study by signing the free and informed consent (or authorized and signed by the legal guardians); being a patient transported in one of the two routes. The data collection was performed from November 2014 to February 2015. The study was approved by the Research Ethics Committee of the "Universidade Federal de Uberlândia"; under the number 818.171, on 22 of August 2014.

Professionals involved in transport

The characterization of all transports was performed with the following criteria. Each transport was evaluated regarding the professional involved or not in transportation as a health professional (anesthesiologists, nurses, physicians, nursing technicians and nursing assistants) and transport workers (named here as porter, these are characterized as non-specialized healthcare workers responsible only to conduct the transport). The hospital porters in this institution don't provide direct healthcare to patients and they don't have specific training for this type of care. Therefore, the hospital porters are responsible for conducting the stretcher, bed or wheelchair during transport. The need for the presence of each type of healthcare professional was established from the professional practice laws (COFEN, 2011; PEDREIRA et al., 2014).

Nursing workload

All patients were classified according to the nursing workload (SANTOS et al., 2007). After that, the scores were reclassified into minimal care (scores 12 to 17), intermediate care (scores 18 to 22), high dependence care (scores 23 to 28), semi-intensive care (scores 29 to 34) and intensive care (scores 35 to 48) (SANTOS et al., 2007).

Patient and transport profile

For each transport, we evaluated if the unit was aware of the transport, if the documentation of patient was correct (based on the institution protocol), means of transportation (stretcher, wheelchair, walking). The patients were also evaluated by age and sex.

In addition, transports were evaluated for the presence and the adequacy of specific care of each patient; namely: urinary catheter, nasogastric or enteral tube, central venous catheter, O_2 catheter or mask, Schilley catheter, peripheral catheter and other devices. We also evaluated the O_2 cylinder connected to devices (presence and evaluation of whether the gas was sufficient), monitoring devices (presence and enough battery charge), infusion pumps (presence and enough battery charge). Any other nonconformities were also monitored. Some of these criteria showed low frequency, or were not showed here but were used only to characterize the transport as inadequate or adequate.

Adequate transport classification

Non-conformities were considered as the non-fulfillment of any of the health care items related to transport or care. In the hospital studied and in the study period, the transport of a walking patient is not characterized as a non-conformity, despite being classified in the literature as inadequate (CARNEIRO; BEZERRA; SILVA, 2011), and in the present study based on this hospital routine it was not considered a non-conformity. The transports were classified as adequate when they did not present any non-conformity, and as inadequate when at least one non-conformity was present.

Statistical analysis

Chi-square independence test was used for comparison of the profile between adequate and inadequate transports. For calculating the probability of an inadequate transport some of the data were adjusted to the univariate logistic regression model. The multivariate models were also adjusted but were not significant, and weren't showed here. For the data used in the logistic regression model (data present in 316 patients) the following coding assignments for the model were used: transport (0: adequate, 1: inadequate), destination (0: inpatient unit, 1: surgical center), sex (0: male, 1: female). These analyses were performed independently from route, and separately for each transport route (but were showed only when one was significant). All statistical analyses were performed in SPSS 20.0 and a significance of 5% was adopted.

RESULTS

Most of the patients were male (43.3%) and were being transported from the inpatient unit to the surgical center (62%), predominantly walking (49.7%), or on a stretcher (42.4%), and most were classified as minimal care (62.0 %). The patients had a mean age of 53.1 years and mean Score of Santos of 17.70 points. (Table 1)

The transport was rated as adequate in 60.7% (n = 192) and inadequate in 39.3% (n = 124) of the transports. In the inadequate transports (n=124), the main non-conformity observed was the lack of knowledge of the transport at the destination (88%, n = 109), followed by wrong patient documents (7%, n = 9), patient remaining alone during the transport (3%, n = 4) and absence of health professional during transport when these were necessary (2%, n = 2). During the transport no adverse events or visible damage to the patient were noticed. Note here, that we did not measure any change in clinical variables in the patient that could evidence adverse events, and the patient walking is not considered a non-conformity in the institution evaluated.

Table 1. Baseline and profile of 316 surgical patients transported to and from the surgical center in a university hospital from Brazil, 2014-15.

Trait	Level	n	%
Gender	Female	137	43.3
	Male	179	56.6
Destination of the transport	Surgical Center	196	62.0
	Inpatient units	120	37.9
Means of transport	Stretcher	134	42.4
	Wheel chair	25	7.9
	Walking patient	157	49.7
Nursing care type [(1)]	Minimum	196	62.0
	Intermediate	38	12.0
	High dependence	59	18.7
	Semi-intensive	18	5.7
	Intensive	5	1.6
Trait (unit)	Mean ± Standard Deviation	Minimum	Maximum
Age (year)	53.1 ± 1.0	18	88
Santos Score (points) [(1)]	17.7 ± 0.4	12	45

[1] Nursing care type was based on patient system classification of Santos et al. (2007)

When the transports were evaluated as a whole, we found that the patient transport route affects the occurrence of inadequate transport, with a higher rate of inadequacy when the destination is the inpatient unit (90.8%) when compared to the surgical center (7.7%). The type of patient care obtained by the classification system showed that the minimum care had fewer risks (22.4%) than other grouped (66.7%). Independently of the destination, the presence of a health professional did not affect the occurrence of inadequate transports. (Table 2)

Table 2. Stratification in evaluation for adequate or inadequate transport of patients coming and going to a surgical center in a university hospital from Brazil, 2014-15.

Factor	Level	Relative frequency, % (n)		
		Inadequate	Adequate	Chi-square (*p*)
Destination (route)	Inpatient unit	90.8 (109)	9.2 (11)	
	Surgical Center	7.7 (15)	92.3 (181)	212.52 (<0.001)
Health professional presence	Yes	27.3 (3)	72.7 (8)	
	No	39.7 (121)	60.3 (184)	0.263 (0.608)
Minimum care type[1]	Yes	22.4 (44)	77.6 (152)	
	No	66.7 (80)	33.3 (40)	59.20 (<0.001)

[1] Nursing care type based on patient system classification of Santos et al. (2007)

The univariate analyses, independently from route, age, sex, presence of health professional, were not able to predict the patient's risk of suffering an inadequate transport (Table 3). Patients going to the surgical center had low risk of inadequate transport (*Odds Ratio*: *OR* = 0.008; $CI_{95\%}$ = 0.004-0.02), patients with non-minimal care had higher risks of inadequate transport (*OR* = 6.909; $CI_{95\%}$ = 4.16-11.47). As the Santos Score increased, the risk of inadequate transport also increased (*OR* = 1.121; $CI_{95\%}$ = 1.08-1.16) (Table 3).

Table 3. Univariate logistic regression models applied to occurrence of inadequate transports of patients coming and going to a surgical center in a university hospital from Brazil, 2014-15.

All transports routes together						
Predictor	β_o	*p*	β_i	*p*	*OR*	$CI_{95\%}$
Age in years	-0.43	1.000	0.00008	0.229	1.00	0.99-1.01
Sex	-0.43	0.001	0.01	0.955	1.01	0.64-1.60
Destination	2.29	<0.001	-4.78	<0.001	0.01	0.004-0.02
Non-minimum care	-1.12	<0.001	1.93	<0.001	6.91	4.16-11.47
Health Professional Presence	-0.42	<0.001	-0.56	0.414	0.57	0.15-2.20
Nursing Workload Score[1]	-2.49	<0.001	0.11	<0.001	1.12	1.08-1.16
Model for Santos Score and for each route destination						
Destination	β_o	*p*	β_i	*p*	*OR*	$CI_{95\%}$
Inpatient units	16.51	<0.001	-0.50	<0.001	0.60	0.46-0.80
Surgical Center	-5.11	<0.001	0.15	<0.001	1.17	1.07-1.27
Model for presence of health professional for each route destination						
Destination	β_o	*p*	β_i	*p*	*OR*	$CI_{95\%}$
Inpatient units	3.29	<0.001	-4.54	<0.001	0.01	0.002-0.07
Surgical Center	-2.55	<0.001	2.55	0.076	12.86	0.76-216
Model for non-minimal care type for each route						
Destination of transport	β_o	*p*	β_i	*p*	*OR*	$CI_{95\%}$
Surgical Center	-3.08	<0.001	1.80	0.001	5.99	2.01-17.80

The models were performed independently from destination route or separately for each route; Legend: β_o*:* constant estimative from the model, β_i*:* parameter estimative for predictor variable, *OR*: Odds Ratio, $CI_{95\%}$*:* Confidence interval at 95% to *OR*, *p*: probability based Wald Chi-square to parameter estimative; Variable codification: Sex (0: male, 1: female), Destination (0: inpatient unit, 1: surgical center); [1] Nursing Workload Score obtained by classification system of Santos et al. (2007)

As the previous analyses show that the route is important to predict the risk of inadequate transport, the data were reanalyzed separately for each destination route. We found some important differences. For patients going to the surgical center, the risk of inadequate transport increased when the Santos Score increased (*OR* = 1.168; $CI_{95\%}$ = 1.07-1.27; Figure 1A), while for patients going to the inpatient units the risk of inadequate transport lowered with an increase in the Santos Score (*OR* = 0.605; $CI_{95\%}$ = 0.46-0.80; Figure 1B). The presence of a health professional when the patient was going to the impatient unit also decreased the risk of inadequate transport (*OR* = 0.011; $CI_{95\%}$ = 0.002-0.07), but no evidence was found when the destination was the surgical center. These last analyses need additional investigations due to low sampling. Patients classified as non-minimal care also had an increase in the risk of inadequate transport when going to the surgical center (*OR* = 5.99; $CI_{95\%}$ = 2.01-17.80). The data did not permit the last analyses for the surgical center to inpatient unit transport route since no adequate transport was recorded for patients with minimal care with this destination. (Table 3)

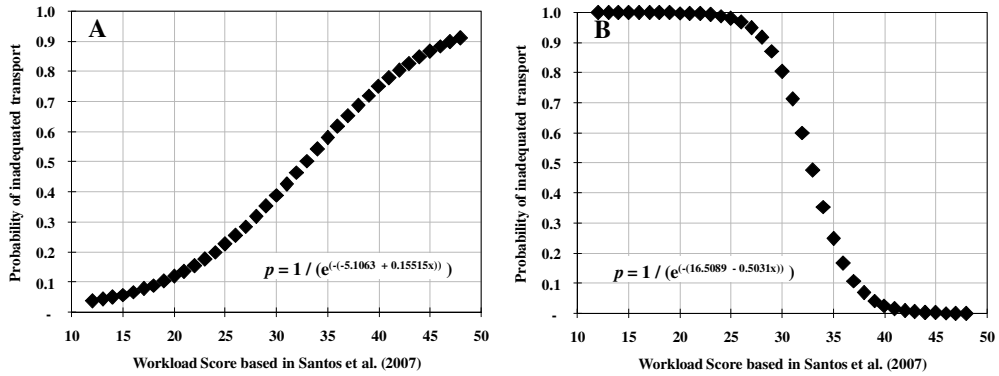

Figure 1. Probability of inadequate transport of patients coming and going to a surgical center in a university hospital from Brazil, 2014-15; as a function of nursing workload measured by a score of Santos et al. (2007).
A. Patient transport from inpatient unit to surgical center. B. Patient transport from to surgical center to inpatient unit.

DISCUSSION

The profile of patients is very similar to other tertiary or high complexity institutions, not demonstrating any significant difference (STAHLSCHMIDT et al., 2018; PEREIRA et al., 2019; GONZÁLES et al., 2008; MAZZA et al., 2008). Furthermore, the rate of inadequate transport is really close to other studies with 44% (WINTER, 2010) and other studies show clinical events occurred in 7.5 and 9.8% of transports and non-clinical events occurred in 8.0% and 1.9% of transports (VEIGA et al., 2019, MENEGUIN et al., 2014)

During transportation, the majority of the patients covered the route in walking conditions. In this institution, this practice was not considered a non-conformity, as it is a practice that is not viewed as risky to the patient, but it is worth mentioning that the main risk these patients are being exposed to is of falling due to preoperative fasting (OLIVER; HEALEY; HAINES, 2010). Most of the patients were classified as minimal care, contrasting the high complexity patterns expected (ex. GVOZD et al., 2012). These patients also are involved in non-conformity, and this demonstrates the underestimation of the risks involved in the transport of patients that required a small nursing workload, requiring a reassessment of this conduct.

The main non-conformities found were related to the lack of team communication among units, being communication a key point in planning transport and care (RILEY, 2011; ALMEIDA, et al., 2012). This is similar to other studies, where humans and communication factors seem to be more relevant than the structural and system aspects (BECKMANN; GILLIES; BERENHOLTZ et al., 2004). This problem interferes in the hospital's transport dynamics as it can cause delays in surgery referrals, and expose patients to unnecessary risks and damages (BRAAF; MANIAS; RILEY, 2011). The presence of transport protocols in the units are important to prevent possible complications related to lack of health professionals, communication, equipment and human resources (ALMEIDA et al., 2012; NAKAYAMA et. al., 2012; SHIEDLS; OVERSTREET; KRAU; 2015; SILVA; AMANTE, 2015).

Studies have reported that transport complications may be related to the problems with staff involved in the transport, team communication problems and equipment failure. The most common physiological alterations are the increase of heart rate, increase of intracranial pressure, changes in blood pressure, cardiac arrhythmias, heart attacks, respiratory distress, cardiac arrest, agitation, decrease in oxygen saturation and some other blood disorders (MENEGUIN et al., 2014, FANARA; MANZON; BARBOT et. al.; 2010, BERG; ARESTEDT; KJELLGREN; 2013, BERGMAN et al., 2017). Such non-conformity events result in risk and potential damage to the patient's life, influenced by inadequate transportation.

The transport performed in this hospital is carried out mainly by porters, without the presence of a nursing or health professional, a situation that may compromise security by promoting a risk and unsafe healthcare, which can be avoided when the provision of assistance is carried out properly and by people trained for any emergency action (FREITAS; SILVA; MINAMISAVA et. al., 2014). The presence of a nursing or health professional was seen exclusively in critical care patients, what could be related to correct communication with the inpatient units, since these patients needed more healthcare. The presence of a nursing professional decreased mortality and improved the indicators for their assistance (KANE et al., 2007, CHO; SLOANE; KIM et al*.;* 2015), in addition, post-operative patients may present an increased risk for instability or dependence, reinforcing the necessity of health professionals (KHURI et. al., 2007).

The prediction of inadequate transportation should be noted, since the probability of an inappropriate event increased as the patient became more dependent on nursing, i.e., it rated the highest Santos Score. Nursing workload indicators have been largely related to quality of care (eg. DAUD-GALLOTTI et al.; 2012); Non-conformities in transport has multi factorial causes (BECKMANN; GILLIES; BERENHOLTZ et al., 2004), which enhances the applicability of our prior prediction of risk and the possibility of reducing the occurrence of adverse events and therefore related damage. Although prior information to transport appears to be a limiting factor in individual studies or comparisons between studies on transport (FAN; MACDONALD; ADHIKARI et. al.; 2006). It would require the decomposition of the System of Classification of Santos, to try to clarify what items are most related to inadequate transport. For this, it would also be necessary to include patients with the highest scores. This presence reinforces the necessity of monitoring the transport with a professional nurse or health team, regardless of the patient's profile or the risks involved. Check-lists had been proposed to assure adequate transport, but they need future evaluation (SILVA; AMANTE, 2015)

Unfortunately, we did not assess whether the absence of communication from the transport to the destination generated any injury to the patient in the post-transport. This failure of communication can cause problems such as the improper preparation of the operating room or the bed for the patient. The evaluation of post-transport becomes essential in this scenario in future studies allied to evaluation of the clinical variables. We also made it clear here that as the study was conducted in 2014-15, the transportation of patients in the institution may not be carried out in the same way presently. Unfortunately, we did not evaluate the current situation of transport in the institution, and this is a limiting factor in our discussion.

CONCLUSIONS

The transport of hospital patients from or to surgical center is being, mostly, carried out properly.

The non-conformities found were the lack knowledge at the destination of the patient, improper documentation, absence throughout the course of a professional responsible for the transport and the absence of a health professional.

The nursing workload and the transport route (from or to surgical) were effective in defining the risk of an inadequate transport and could show great applicability in hospital routine.

RESUMO: O transporte hospitalar do paciente é uma atividade que deve ser realizada com segurança e qualidade e envolve riscos consideráveis, especialmente em pacientes cirúrgicos. O objetivo deste estudo foi avaliar a adequação ou não do transporte de pacientes cirúrgicos da unidade de internação para o centro cirúrgico e vice-versa. O perfil, a carga de trabalho em enfermagem, os profissionais envolvidos no transporte foram avaliados para a cada transporte, então os transportes foram avaliados como inadequados (quando ocorreu qualquer não conformidade) ou não. O transporte foi inadequado em 39,3% das avaliações; as não-conformidades mais comuns foram o desconhecimento do transporte no destino, documentos incorretos,

paciente sozinho durante a rota, e a ausência do profissional da saúde (quando necessário). Nesta instituição e no período avaliado, o transporte era principalmente realizado por maqueiros. Pacientes com destino a unidades de internação têm maior frequência de transporte inadequado, principalmente por nenhuma comunicação. Sobre a carga de trabalho, avaliada pela pontuação de Santos, com a carga de trabalho aumentando o risco de ter o transporte inadequado também aumentou (*Odds Ratio*, *OR* = 1,21; $IC_{95\%}$: 1,08-1,16), e quando os pacientes foram agrupados em cuidados mínimos versus cuidado não mínimos, os últimos também mostram maior risco de transporte inadequado. Quando os transportes foram avaliados separadamente por rota, o paciente que vai para o centro cirúrgico tem maior risco quando o Score de Santos aumenta (*OR* = 1,168; $IC_{95\%}$: 1,07-1,27), e os pacientes que vão para a unidade de internação tem menor risco quando o Score de Santos aumenta (*OR* = 0,605; $IC_{95\%}$: 0,46-0,80). Pacientes no último caso, quando tem alta carga de trabalho também foram acompanhados por profissionais de saúde. A presença de profissionais de saúde quando o paciente vai para a unidade de internação também diminuem o risco (*OR* = 0,11; $IC_{95\%}$: 0,002-0,07). Quando os pacientes retornam às suas unidades mostram mais riscos de transporte e não-conformidades, talvez a razão é o descrédito atribuído ao risco nesses pacientes, uma vez que o problema cirúrgico foi resolvido. Assim, é fato que a carga de trabalho de enfermagem e a rota do transporte do paciente foram eficaz na predição do risco de transporte inadequado, sendo que apresentam grande potencial para uso prático.

PALAVRAS-CHAVE: Transporte do paciente. Segurança do paciente. Centro cirúrgico. Transporte intra-hospitalar.

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