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Construction and validation of indicators for patient safety in intrahospital transport

Construção e validação de indicadores para a segurança do paciente no transporte intra-hospitalar

Construcción y validación de indicadores de seguridad del paciente en el transporte intrahospitalario

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ABSTRACT

Objective: To construct and validate an indicator plan for measuring and assessing patient safety in intrahospital transport.

Method: Methodological study, developed in three stages, between July 2018 and July 2019. The content validity included the participation of nurses from the State of Bahia and experts from different regions of the country. For data analysis and interpretation, descriptive statistics were used.

Results: After a pre-test round and two rounds of expert consultations, using the Delphi technique, the general content validity index that assessed the clarity of the indicators was measured at 1.00 and the representativeness was 0.97.

Conclusion: The indicators make a significant contribution to the field of health and nursing, as it constitutes an instrument that will contribute to the professional practice of nurses, to patient safety and will still be viable for the practice of auditing or assessing the intrahospital transport process.

Keywords: Patient safety. Quality indicators, health care. Validation study. Transportation of patients. Nursing.

RESUMO

Objetivo: Construir e validar um plano de indicadores para mensuração e avaliação da segurança do paciente no transporte intra-hospitalar.

Método: Estudo metodológico, desenvolvido em três etapas, entre julho de 2018 a julho de 2019. A validade de conteúdo contou com a participação de enfermeiras do Estado da Bahia e *experts* de diferentes regiões do país. Para análise e interpretação dos dados utilizou-se a estatística descritiva.

Resultados: Após uma rodada de pré-teste e duas de consulta a *experts*, utilizando a técnica *Delphi*, o índice de validade de conteúdo geral que avaliou a clareza dos indicadores foi aferido em 1.00 e a representatividade foi de 0.97.

Conclusão: Os indicadores trazem uma significativa contribuição para o campo da saúde e da enfermagem, pois constitui-se num instrumento que contribuirá para a prática profissional da enfermeira, para segurança do paciente e ainda será viável para prática de auditorias ou avaliações do processo de transporte intra-hospitalar.

Palavras-chave: Segurança do paciente. Indicadores de qualidade em assistência à saúde. Estudo de validação. Transporte de pacientes. Enfermagem.

RESUMEN

Objetivo: Construir y validar un plan de indicadores para medir y evaluar la seguridad del paciente en el transporte intrahospitalario.

Método: Estudio metodológico, desarrollado en tres etapas, entre julio de 2018 y julio de 2019. La validez de contenido incluyó la participación de enfermeros del Estado de Bahía y especialistas de diferentes regiones del país. Para el análisis e interpretación de los datos se utilizó estadística descriptiva.

Resultados: Luego de una ronda de pretest y dos rondas de consulta con especialistas, utilizando la técnica Delphi, se midió el índice de validez de contenido general que evaluó la claridad de los indicadores en 1,00 y un representante de 0,97.

Conclusión: Los indicadores hacen un aporte significativo al campo de la salud y enfermería, ya que constituye un instrumento que contribuye a la práctica profesional del enfermero, a la seguridad del paciente y seguirá siendo viable para la práctica de auditorías o planificación del proceso de transporte en el hospital.

Palabras clave: Seguridad del paciente. Indicadores de calidad de la atención de salud. Estudio de validación. Transporte de pacientes. Enfermería.

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INTRODUCTION

Among the possible occurrences of adverse events (AE), which can compromise patient safety and, consequently, damage their health and life, there are those related to intrahospital transport (IHT), understood as temporary forwarding or definitive of patients by health professionals within the hospital environment. In this transportation, the patient is outside the care environment and, therefore, presents an enormous potential for complications, making vulnerable to factors that can culminate in rapid, progressive and avoidable hemodynamic changes[1–2].

The first records that IHT offers risks date back to the early 1970s, when arrhythmias were found in up to 84% of patients at high cardiac risk in these displacement situations, in which emergency interventions were necessary in 44% of cases. A study points out that the incidence of AE and incidents during IHT of critically ill patients can range from 8 to 70%[3]. In Brazil, these AEs are under-reported, given that the Notification System in Health Surveillance (*Sistema de Notificação em Vigilância Sanitária* – NOTIVISA), developed by the National Health Surveillance Agency (*Agência Nacional de Vigilância Sanitária*), does not specify this type of occurrence, and there is a lack of indicators capable of supporting planning in the search for improvement of health actions.

Considering the conception of different authors, based on the theoretical framework consulted, intrahospital transport was defined as the guiding concept of this study, as follows: type of temporary transfer, commonly adopted in hospitals during the provision of health care, in order to perform additional procedures that are not available to the patient in bed. It is an action conceived by a set of knowledge, attitudes, technical and cognitive actions that enable accessibility, acceptability and effectiveness, ensuring rigor in minimizing risks; consequently, greater safety and quality in the care provided[4–6].

It is understood that nurses and nursing technicians are the ones who, mostly, provide care during intrahospital transport and that, if these are provided in an unsafe manner, they can often cause irreparable damage. The implementation of indicators and safety measures can contribute to the prevention of errors and these initiatives must be present at all stages of care, as an important strategy for guiding the safety of hospitalized patients. However, there is no defined set of indicators that support the assessment and decision-making in IHT by the nursing team; in addition to scarce research on the subject, a fact verified after surveying the state of the art in the following portals: PUBMED and Virtual Health Library (VHL).

This article, therefore, intends to contribute to the reflection and decision-making of the team members involved in the IHT, especially the nurses, making them adopt specific and safe measures in the management of care, offering subsidies for the identification of dangers, reduction of risks and AE, with the incorporation of good practices that favor the effectiveness of the care provided. Thus, the study sought to find an answer for the following guiding question: Is it possible to construct a plan of indicators for measuring and assessing patient safety in the IHT and validate its content through the consensus obtained from a panel of experts? While it also sought to achieve its objective, which was: To construct and validate a plan of indicators for measuring and assessing patient safety in intrahospital transport.

METHOD

This is a methodological study, developed in three stages, from July 1, 2018, to July 1, 2019. The first stage comprised the process of constructing the research instruments, starting with the Logical Model (LM)[7], which consists of the systematic and visual representation of the stages that make up the IHT safe for patients, presenting the internal rationality of the operation of an intervention, that is, the interaction between the necessary resources, the planned activities and the expected effects, allowing to point out strong and weak points for assessment.

The construction of this LM, including its indicators and dimensions, was supported by the literature review, based on the search in the PUBMED and VHL portals, using the descriptors: "transportation of patients"; "nursing" and "patient safety" joined by the Boolean operator *and*. The following inclusion criteria were defined: research available in full and with free access in selected databases in Portuguese, English, and Spanish, published between 2007 and 2017. As a result of the search in both databases, 48 articles were found, all of them in the English language. After reading the titles and abstracts, 39 of these articles were excluded for not being related to the object of study, totaling nine works that were analyzed in full.

Subsequently, the LM supported the development of an instrument called Matrix of Analysis and Judgment (MAJ), which allowed the establishment of indicators and their parameters, their assumptions, their evaluative questions and scores for analysis and interpretation of the collected data. For this, two Likert-type measurement scales were adopted, included with the aim of analyzing the degree of concordance among research participants against the set of statements related to the object of study[8]. The instrument

also included a comment area, where judges could register their opinion, suggestion or guidance on the item analyzed.

The first Likert-type scale, used in the second stage, sought to assess the Content Validity Index (CVI)[9] corresponding to the clarity of the indicator, that is, its language and wording, observing whether they were written in an understandable way, adequately expressing what is expected to measure, with responses presented from 1 (not clear) to 4 (very clear). The second Likert scale, included in the instrument in the third stage, sought to assess the representativeness of the indicator, which refers to the conceptual adequacy and relevance of the item in the dimension in which it is inserted, through the (CVI) with a score of 1 (totally disagree) to 4 (totally agree). Thus, the score was calculated through the sum of the items that were marked as "3" or "4" by the participants. Items that received a score of "1" or "2" were revised or eliminated.

The second stage, called pre-test, took place after the study was approved by the Research Ethics Committee (REC). This phase aimed to assess the form and content of the instrument, seeking to detect defects and gaps in filling out the MAJ, qualitatively adjusting it before consulting with experts. Therefore, it was sought, to improve the research instruments developed in the previous stage.

As a strategy for selecting the pre-test participants, an invitation was published in a group of the Brazilian Society for Quality of Care and Patient Safety, in Bahia (*Sociedade Brasileira para Qualidade do Cuidado e Segurança do Paciente* – SOBRASP-BA), through the WhatsApp application. This group had the participation of 250 health professionals from the State of Bahia who develop activities, in different organizations, related to the subject of patient safety, whether in the health service, teaching or research. Among these professionals, 31 people expressed interest in participating and only 12 completed the process, all nurses.

The Delphi method[10] was the adopted validation technique. In essence, this method is a series of questionnaires or sequential "rounds", interspersed with controlled feedback. It aims to obtain the most reliable consensus from a group of experts selected intentionally and is justified by the interest of selecting experts in the study theme.

The third and last stage, in turn, was characterized as the moment of validation of the plan of indicators, developed in two rounds of consultation, using the Delphi method, to a panel of experts in patient safety, selected from the Lattes Platform, through the simple search tool, in the "subject" search mode, selecting the base of "Doctors" and the field "Brazilian nationality"; in the search field, the words: "patient safety" were used. The selection criteria were: being a nurse, professor or researcher who works or researches themes related to patient safety.

For the selection of experts, there are no universally accepted criteria that guide the minimum or maximum number of participants necessary to validate the obtained results, varying according to the phenomenon under study. It is essential to consider a relevant level of professional qualification within the area to be studied, in order to obtain the best result. Initially,7,614 resumes appeared, and the initial presentation of the first 350 profiles was read in sequence. Among these, 63 were selected for meeting the sample selection criteria.

From there, an invitation was sent to the selected experts, requesting their collaboration in the process of validating the indicators and the possible indication of other people who could also contribute to the research, all contact and sending of materials was made by email. At the end of the third stage, only 11 experts in patient safety, from different research and teaching institutions in the country participated. The expert sample also had the participation of an expert in the field of linguistics, aiming at a more precise assessment of the criteria of clarity and relevance of the text.

For the data analysis from the second and third stages, we used the Microsoft Excel version 15.0 (Office 2013) software. Descriptive statistics was adopted to analyze and interpret the Content Validity Index (CVI). Considering, as a decision criterion on the level of clarity and representativeness of the instrument item, a minimum concordance of 0.80 of the CVI[9]. Thus, with the interference of the calculations, the data obtained in the Delphi technique rounds were consolidated.

Figure 1 systematically illustrates the procedures adopted in the methodological path.

The study was approved by the Research Ethics Committee (REC) of the *Universidade Estadual de Feira de Santana*, under registration CAAE: 10705318.0.0000.0053, opinion number: 3.421.493.

RESULTS

The first stage of the research resulted in the elaboration of the Logical Model, consisting of three dimensions – A: management, B: care and C: monitoring (Figure 2). Each of the dimensions has its respective quality indicators that resulted from the analysis of the selected manuscripts in the literature review. These indicators aim to detect care related to the process described and express the organization of the service in search of care to patient safety. In addition, each one of these dimensions was linked to an element of the "Donabedian Triad[11]" – an evaluative model for measuring

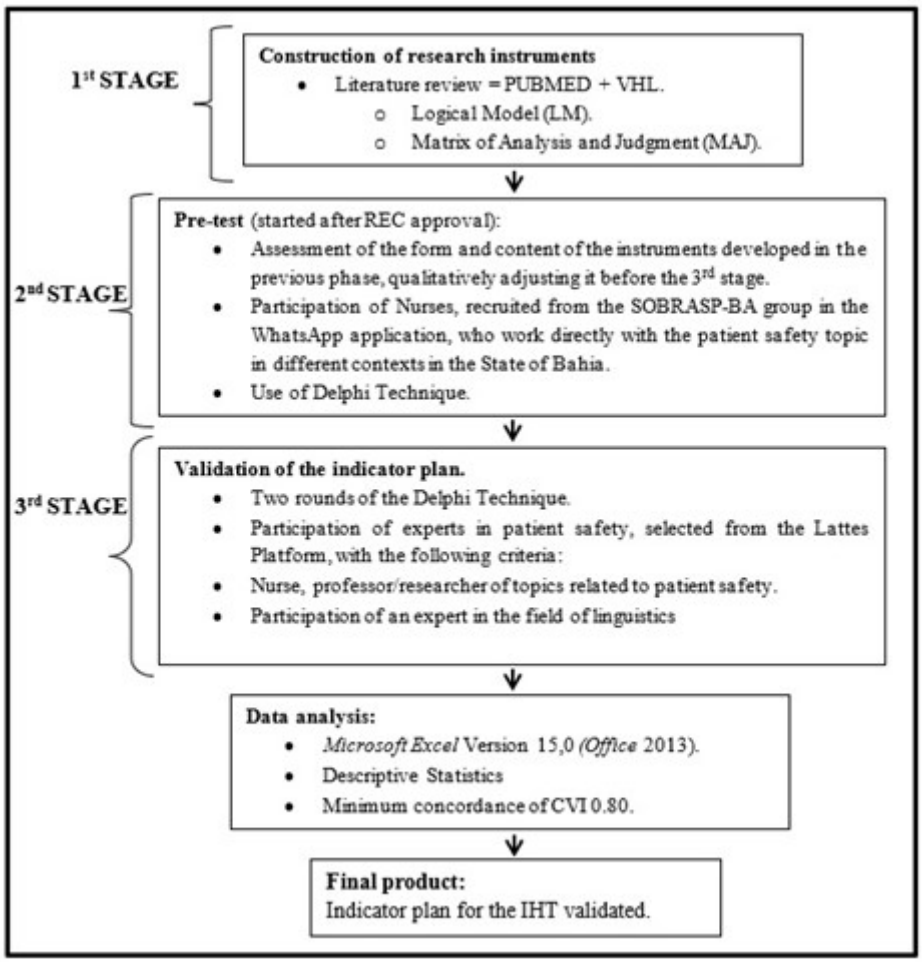

Figure 1 – Visual scheme of the stages of the methodological path, Feira de Santana, Bahia, Brazil, 2018-2019
Source: Research data 2018-2019.

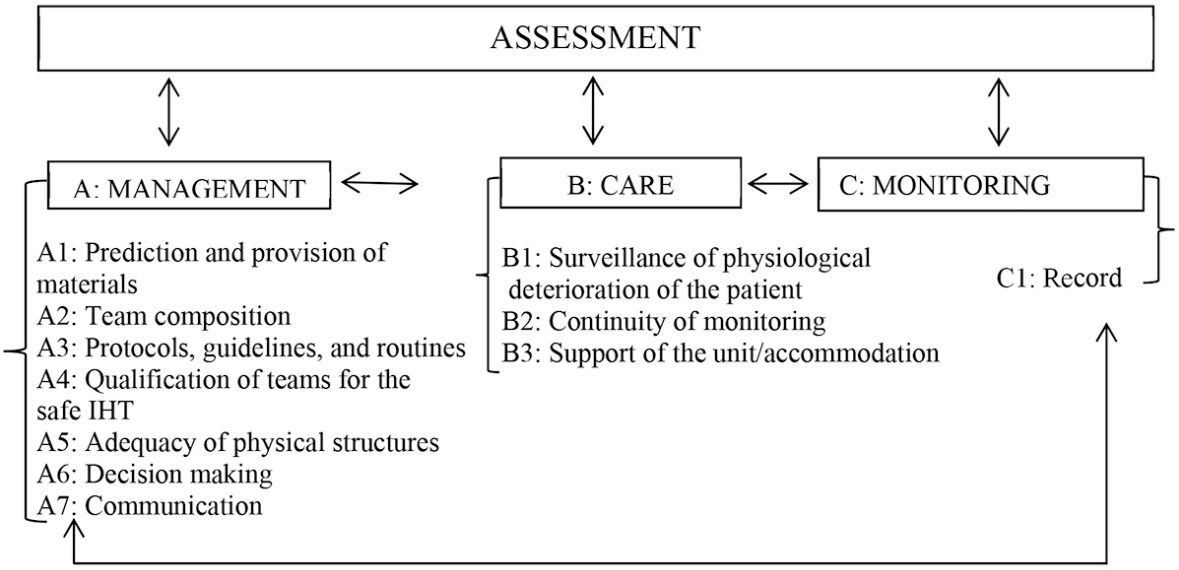

Figure 2 – Logical model for safe intrahospital transport**,** Feira de Santana, Bahia, Brazil, 2018-2019
Source: Adapted from the authors[5,6,12–15].

the quality of care. This model is based on three axes: structure (essential resources for implementing care), process (implementation of care) and the result (impacts of the care provided).

In this way, the management dimension is linked to the first component of this triad, the structure. It is related to the most invariant characteristics, that is, relatively stable in the provision of care, represented by instruments and by physical and organizational resources, including available professionals, material, and financial resources available.

The process, the second variable of the triad, is linked to the dimension of health care, represented by the work performed by professionals in conducting health care and interacting with the client. This technical practice, therefore, would consist of applying the knowledge and skill of professionals in conducting this type of assistance.

The result, in turn, the last variable of the triad, represents the monitoring dimension, which translates into the product resulting from the assistance provided (or not) to those who would benefit (or not). This is a dynamic process that involves the commitment of professionals, as well as critical and continuous reflection, with a focus on patient safety assessment, without disregarding the context of the institutions.

It is important to emphasize that all participants had access to the LM and to the theoretical basis that underpinned the construction of the MAJ, all of them duly filled in the objectives of the instrument, related to the response categories, however not all filled in the subjective field for comments. This field allowed the evaluator to make any critical suggestion, or guidance related to his objective answer, even though he agreed with the construction of the indicator, with its evaluative question, and its allocation in the described dimension.

The initial analysis of the indicators by the 12 nurses, the second stage of the research, as shown in Chart 1, allowed to infer that in dimension A: Management, which has the largest number of indicators, only two did not reach the desired consensus of 0.80, indicator A1 and A5, who had eight (0.66) and nine (0.75) respectively. Dimension B: Care obtained consensus in its three indicators B1, B2 and B3, with 12 (1.0), 11 (0.91) and 10 (0.83) respectively, and dimension C: Monitoring did not reach enough score to be considered valid for the content of its only indicator, C1, which had seven (0.58).

Therefore, the comments made by the participants were analyzed, with the objective of readjusting the MAJ, qualifying it for the moment of consultation with the experts, considering the evaluators' weightings. This analysis resulted in the reformulation of all evaluative questions and inclusion of the second Likert scale, which sought to measure the CVI corresponding to the representativeness of each indicator in its respective dimension.

Chart 2 presents the result of the third stage of the research, which consisted of the assessment of experts in two consultation rounds. The first resulted in a mean of clarity CVI of 0.96, in this case, all indicators were considered valid, as they reached the desired consensus. Indicators of dimension A: Management, A2, A3, A5 and A6, as well as indicators of dimension B: Care, B1 and B3, reached the maximum value, 11(1.0). In turn, the CVI, which sought to check the representativeness of each indicator, had an overall mean of 0.86, with A1 and B1 having the lowest result, eight (0.72).

In order to provide feedback from the first round of consultation to the expert panel, the MAJ was readjusted considering the observations made in the instrument, keeping all the items from the assessment of the indicators

Dimension A: Management	CVI Clarity	Dimension B: Care	CVI Clarity	Dimension C: Monitoring	CVI Clarity
Indicator A1	0.66	Indicator B1	1.00	Indicator C1	0.58
Indicator A2	1.00	Indicator B2	0.91		
Indicator A3	1.00	Indicator B3	0.83		
Indicator A4	1.00				
Indicator A5	0.75				
Indicator A6	0.83				

Chart 1 – Consolidation of the MAJ data from the pre-test, second stage of the research, Feira de Santana, Bahia, Brazil, 2018-2019
Source: Research data 2018-2019.

to be submitted to a new consultation. In this way, each participant was given the opportunity to reflect on their assessment, made in the previous round, and may or may not maintain their opinion considering the adjustments made; in addition, we seek to increase the CVI of some indicators.

As a result of the second round, the overall mean of the clarity CVI, after analyzing all indicators of the three dimensions, was 1.00, which indicates that all items reached consensus among the experts' opinions. Regarding the CVI representativeness, only indicators A1, A6 and B3 had 10 (0.9), the others reached the maximum concordance 11(1.0), therefore, with an overall mean of 0.97.

This result shows that, compared to the first round, only A6 and B3 maintained their indexes, all other indicators increased their CVI, some even reached the maximum score, 11(1.00) In addition, the indicator A1 previously named as "Prediction and provision of materials and people", after this last assessment, it was broken down into two indicators, namely "A1: Prediction and provision of materials" and "A2: Team composition", each with its respective elements in MAJ , with dimension A: Management, with a total of seven indicators.

Consequently, it is presented as the technical production of this research the plan of indicators validated with a view to assessing patient safety in the IHT, as shown in Chart 3.

It is noteworthy that the 'Source' indicates how the indicator can be found/generated by whoever is applying the indicator plan in practice, and that the 'Formulas' were determined, by the experts, in the validation process, through the MAJ, based on the theoretical framework used in the elaboration of the respective indicators.

3rd stage of the research: 1st Round of the Delphi method								
Dimension A: Management	**CVI Clarity**	**CVI Repres.**	**Dimension B: Care**	**CVI Clarity**	**CVI Repres.**	**Dimension C: Monitoring**	**CVI Clarity**	**CVI Repres.**
Indicator A1	0.90	0,72	Indicator B1	1.00	0.72	Indicator C1	0.90	0.81
Indicator A2	1.00	1.00	Indicator B2	0.90	1.00			
Indicator A3	1.00	0.90	Indicator B3	100	0.90			
Indicator A4	0.90	0.81						
Indicator A5	1.00	0.90						
Indicator A6	1.00	0.90						
Overall CVI (Clarity) = 0.96				**Overall CVI (Representativeness) = 0.86**				
3rd stage of the research: 2nd Round of the Delphi method								
Dimension A: Management	**CVI Clarity**	**CVI Repres.**	**Dimension B: Care**	**CVI Clarity**	**CVI Repres.**	**Dimension C: Monitoring**	**CVI Clarity**	**CVI Repres.**
Indicator A1	1.00	0.90	Indicator B1	1.00	1.00	Indicator C1	1.00	1.00
Indicator A2	1.00	1.00	Indicator B2	1.00	1.00			
Indicator A3	1.00	1.00	Indicator B3	1.00	0.90			
Indicator A4	1.00	1.00						
Indicator A5	1.00	1.00						
Indicator A6	1.00	0.90						
Overall CVI (Clarity) = 1.00				**Overall CVI (Representativeness) = 0.97**				

Chart 2 – Consolidation of the MAJ data from the first and second rounds of the Delphi method in the third stage of the research, Feira de Santana, Bahia, Brazil, 2018-2019
Source: Research data 2018-2019.

DIMENSION	INDICATOR	TYPE	SOURCE	FORMULAS
Management Organizational structure – Institutionalization of the safety culture.	Prediction and provision of materials	Structure	Direct Observation	Existence or not of materials. Calculation: Numerator: No. of equipment used in transport / Denominator: No. of equipment indicated for transport according to the patient's clinical profile.
	Team Composition	Structure	Direct Observation	Calculation: Numerator: No. of professionals who carried out the transport / Denominator: No. of professionals indicated for transport x100
	Protocols, guidelines, and routines.	Structure	Audit	Existence or not of protocol, guidelines, and routines.
	Qualification of teams for safe IHT	Structure	Existence or not of trainings	See in reports, attendance lists and/or course plan of educational activities. Calculation Numerator: of trainings carried out with a focus on IHT / Denominator: No. of trainings indicated for the IHT team defined by the organization and according to the patient's clinical profile
	Adequacy of physical structures	Structure	Direct Observation	Adequate or not adequate.
	Decision-making	Structure	Direct Observation	View minutes of meetings and non-participant observation of the meetings, as well as the management report.
	Communication	Structure	Direct Observation	Existence or not of records.
Care Care for patients in intra-hospital transport situations with a focus on identifying risks/dangers.	Surveillance of physiological deterioration of the patient	Process	Direct observation/ medical record	Numerator: No. of patients with complete surveillance records / Denominator: Total No. of patients
	Continuity of monitoring	Process	Direct observation/ medical record	Numerator: No. of patients with continuity of monitoring records / Denominator: Total No. of patients
	Support of unit/ accommodation	Process	Direct Observation	Adequate or not Calculation: Numerator: No. of transports with complete support of unit / Denominator: Total No. of transports

Chart 3 – Plan of indicators for patient safety in intrahospital transport. Feira de Santana, Bahia. Brazil, 2018-2019

DIMENSION	INDICATOR	TYPE	SOURCE	FORMULAS
Monitoring Assessment of the result	Record	Result	Medical record	Medical records that are in compliance or not. Calculation: Numerator: No. of items that compose the record performed / Denominator: Total No. of items expected to be recorded for the patient's clinical profile according to organizational SOP.

Chart 3 – Cont.
Source: Research data 2018-2019.

DISCUSSION

Faced with such a challenging process, which is displacing patients to perform interventions in other areas of the hospital unit, going through corridors, elevators, and ramps, seeking to maintain the quality of care, free from undesirable events, without a doubt, the theme of patient safety in IHT attracts attention in the health care scenario. In this sense, the plan of indicators validated in this study incorporates the three classic dimensions of quality assessment in health described by Donabedian, which complement each other to obtain the best result of the care provided at the IHT, they are: structure, process, and results, the which justifies the choice of indicators.

The results presented show that, in the experts' opinion, the indicators have the necessary pertinence and clarity to be used in health institutions. This means that they are able to assess patient safety in the IHT, being able to contribute to planning, identifying advances, occurrence of incidents and related factors, as well as the weaknesses and inconsistencies of any action. In addition, they will be able to support the formulation of care protocols for the IHT, boosting the development of safer practices. Although these practices do not completely eliminate the risk, they can contribute to reducing the possibility of incidents, minimizing the exposure of patients to risks inherent to transportation.

The indicators can effectively contribute to the reduction of human errors, as the team is aware of the sub-processes that make up each action, avoiding errors and omissions. In this sense, the risks related to IHT can be potentially reduced by the implementation of technologies such as this one, which favors the effectiveness of the care provided and its safe management[12].

It is understood that the decision to transport a patient should be weighted considering the expected benefits of the intervention to be performed versus the risks caused by transport[13]. Therefore, in this research, current IHT standards and guidelines were also considered, in the construction of each dimension and indicator, particularly addressing issues of management, preparation, execution, with ongoing considerations for monitoring and assessing the process.

Considering that protecting patients from harm is a primary responsibility of the entire team, the plan of indicators can guide a careful preparation, enabling clinical decision-making based on best practices and patient safety policies, therefore, an important assessment and care management tool to be considered by professionals in their work process.

It is important for the team involved in the IHT to have the understanding that protocols/guidelines/routines represent a vehicle for guidance for those involved in the implementation of care. And, for this reason, the indicator plan also seeks to guide the implementation of educational programs based on the specific needs of the teams[14]. In addition, the assembly of equipment and the selection of appropriate drugs for the IHT depend on professionals qualified to perform such activity, according to institutionalized protocols, and who are able to recognize the risks inherent to transport and promote early guidance and communication between teams[15].

It is highlighted the potential positive impact of this study for the production of knowledge and development of safer practices, based on new reflections and analyses of the quality of nursing care in patient safety in IHT situations. However, it is worth highlighting the central role of the nursing team in relation to patient safety in the IHT, not only because it represents the largest contingent of professionals in Brazilian health organizations and is constantly close to patients, but also because it has implied their work process the effort to make health practices safer and more effective at all stages of care provision (planning, execution, and assessment).

The difficulty in gathering scientific references that would support the construction of indicators was considered as a limitation of the study, which can be attributed to two factors: the selection of only two databases; the descriptors

used. In addition, another limit was the search for experts in patient safety to participate in the Delphi technique and their adherence to the research, considering the large number of contacts with no answers or with dropouts, and also the impossibility of testing the indicators, which therefore maintains the need for new applications.

The research involving the plan of indicators in the IHT has prospects of being extended to different contexts and components of health care, as well as highlighting the need to incorporate assessments in pre- and extra-hospital transport, paying attention to the technical prerogatives of patient safety and the professional exercise.

CONCLUSION

The desired plan of indicators was elaborated through scientific evidence, with specific focal points on patient safety at IHT, through the LM and MAJ, which contemplated the dimensions: management, care and monitoring with their respective indicators. These were validated with satisfactory indexes, from the point of view of content, by experts on the subject, in a pre-test and two rounds of queries made using the Delphi technique. Therefore, it is a significant contribution to the field of Health and Nursing, to professional nursing practice, patient safety and society, being, therefore, a viable instrument for auditing or evaluating the IHT process.

The findings of this study significantly contribute to the reduction of risks related to the transport of patients through the implementation of quality indicators applicable by all members of the Health and Nursing team, as a strategy that aims to anticipate problems and safely prepare patients for the transport, which consequently guarantees the reliability of the application of guidelines, recording and monitoring of the action. Therefore, an important care strategy to be considered in the journey towards the continuous improvement of patient safety in IHT.

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