ORIGINAL ARTICLE

CHECKLIST FOR INTRA-HOSPITAL TRANSPORT OF CRITICALLY ILL ADULT PATIENT

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Highlights: (1) Intra-hospital transport of critically ill patients is often necessary. (2) It presents risks to the patient, such as the occurrence of incidents and adverse events. (3) Adverse events can be avoided with the use of protocols and checklists. (4) The need for further studies related to this topic.

PRE-PROOF

(as accepted)

This is a preliminary and unedited version of a manuscript that has been accepted for publication in the Revista Contexto & Saúde. As a service to our readers, we are providing this initial version of the manuscript as accepted. The article will still undergo revision, formatting, and author approval before being published in its final form.

http://dx.doi.org/10.21527/2176-7114.2026.51.15565

How to cite:

Martins JB, Viegas K, Blatt CR. Checklist for intra-hospital transport of critically ill adult patients. Rev. Contexto & Saúde. 2026;26(51):e15565

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CHECKLIST FOR INTRA-HOSPITAL TRANSPORT OF ADULT CRITICALLY ILL PATIENT

ABSTRACT

The objective of this study is to describe the validation and implementation of a checklist for intra-hospital transport of critically ill adult patients. The content of the checklist was validated by a panel of experts using the Delphi technique, followed by internal consistency analysis using Cronbach's alpha. In addition, indicators were developed to monitor the intra-hospital transport of critically ill adult patients. The final version of the checklist included ten domains: patient identification, invasive devices, level of consciousness, hemodynamics, equipment, pre-transport monitoring, post-transport monitoring, complications, medications, and contrast. Four rounds were conducted for content validation, and an internal consistency index of 0.845 was obtained. Six indicators were developed, including one structure indicator, four process indicators, and one outcome indicator. The developed instrument was validated and demonstrated good internal consistency. The outcomes of the checklist implementation indicated good acceptance by the nursing team and support from service coordination, with emphasis on improved organization of intra-hospital transport processes. It is expected that its application will contribute to the prevention of adverse events during intra-hospital transport.

Keywords: Patient Transport; Patient Transfer; Patient Safety; Critical Care; Adverse effects; Nursing.

Introduction

The Intensive Care Unit (ICU) is a hospital unit intended to provide specialized care for critically ill patients who require complex and continuous monitoring [1]. Some interventions cannot be performed within the ICU, requiring patient transportation for highly complex diagnostic tests, such as computed tomography, magnetic resonance imaging, angiography, or referral to the operating room for therapeutic interventions [2,3].

Intra-hospital transport (IHT) is defined as the displacement of a patient, carried out by a healthcare team within hospital facilities, with or without returning to the unit of origin [4]. IHT aims to maintain the continuity of patient care provided in the unit of origin; however, it is a procedure that presents risks and may result in incidents and adverse events [5–7].

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The risks associated with intra-hospital transport include adverse events related to the physical nature of transport, environmental changes, and the relocation of equipment used for patient monitoring. Adverse events can be categorized as minor (e.g., clinical decompensation) or major (e.g., requiring immediate intervention) and may occur during preparation for or throughout IHT. Regardless of the type of event, any intervention during transport may negatively impact the patient and lead to delayed treatment and interruption of intensive care [(8)].

However, IHT is considered a common procedure in hospital institutions and is often underestimated and performed mechanically [(9)], becoming a challenge for healthcare teams. To perform IHT in critically ill patients, in addition to team awareness [(10)], organizational prerequisites are required, such as coordination of the transport process, availability of resources, and an environment and equipment suitable for transport [(11)].

The clinical decision to transfer a patient from the ICU should be based on medical judgment and a careful assessment of potential benefits and risks [(12)]. In addition, transport must be properly planned, ensuring an adequate number of healthcare professionals [(8)] and material resources for adequate monitoring, and that it is carried out through teamwork [(11)].

The implementation of checklists in intra-hospital transport (IHT) has been shown to be an effective strategy for standardizing practices, significantly contributing to the reduction of adverse events and strengthening patient safety [(13,14)].

Studies show that the adoption of structured protocols, such as checklists, not only standardizes care processes but also improves communication among teams and enables the early identification of risks during transport [(2).] A systematic review revealed that up to 70% of adverse events in IHT are preventable, highlighting the fundamental role of these instruments in preventing incidents and promoting safer care [(15).] Furthermore, the adoption of checklists is associated with continuous monitoring of clinical parameters, risk mitigation, and increased team confidence in the delivery of safe and high-quality care.

The development and implementation of protocols, along with the use of checklists, guide care routines and support clinical decision-making, as well as the standardization of practices, thereby promoting a positive organizational culture and high-quality care. The use of checklists reduces variability and improves team performance, with the potential to enhance the quality of care and decrease patient harm and healthcare costs associated with adverse events [7,9].

This type of script is considered a standardized method for ensuring safe intra-hospital transport (IHT), as it enables the healthcare team to systematically observe and inspect all steps that may compromise patient safety during transport [9]. Likewise, adherence to a structured protocol enhances the competence of healthcare professionals responsible for transport, providing greater autonomy and confidence in decision-making and ultimately promoting safer patient care [1,16].

In order to improve the intra-hospital transport process and contribute to patient safety and high-quality healthcare practices, this study aims to describe the validation and implementation of a checklist for the intra-hospital transport of critically ill adult patients.

Method

The study was conducted in a public Adult Intensive Care Unit located in the metropolitan region of Porto Alegre, Brazil. This unit is classified as a Type III ICU, indicating that it provides care for highly complex patients, including those in critical condition, with physiological instability and a high risk of death. The ICU has 59 beds distributed across four areas (Areas 1, 2, 3, and 4), all dedicated to the care of critically ill adult patients [17].

The study was developed in three phases. The methodological framework was based on the model proposed by Pasquali [18], which is widely used in nursing research due to its theoretical foundation in the development of instruments designed to measure subjective phenomena. This model consists of three procedural stages: theoretical, empirical (experimental), and analytical (statistical).

The theoretical procedural stage included the theoretical foundation, which involved conducting an integrative review on care practices for the prevention of adverse events during the intra-hospital transport (IHT) of critically ill adult patients. This review aimed to identify scientific evidence to support the development of the checklist items. This phase resulted in the publication of the article entitled *"Prevention of adverse events in intra-hospital transport: an integrative review"* [19].

The empirical procedural stage consisted of validating the content of the checklist through a panel of specialists composed of healthcare professionals working at the institution, using the Delphi technique [20]. This technique aims to achieve consensus among a group of experts in a reliable and systematic manner, based on a series of structured questionnaires and controlled feedback [20,21].

For this study, the sample consisted of 13 judges responsible for validating the checklist content. Nursing professionals (nurses and nursing technicians) with at least six months of experience in intensive care were selected, including both permanent and substitute staff members working in the ICU. Participants who were on legal leave during the data collection period were excluded. Convenience sampling was adopted, including only professionals working in the ICU where the checklist was implemented.

The judges were invited based on their professional experience in the area and were assigned the task of validating the checklist content. Access to participants was conducted electronically through the distribution of invitations and digital forms. The checklist used in this study was developed by the author based on an integrative literature review and her professional experience as an intensive care nurse.

To evaluate each checklist item, an instrument was used that allowed experts to assess the items using a five-point Likert-type psychometric scale (1 = totally disagree, 2 = partially disagree, 3 = neutral, 4 = partially agree, 5 = totally agree), with space provided for comments and justification of responses. The Delphi process was repeated in successive rounds until consensus was achieved among the experts [22].

For the validation of the checklist content, the degree of agreement among the judges during the evaluation process was quantified using the percentage of agreement formula [21]. Responses rated as 4 and 5 on the Likert scale were considered indicative of agreement [23]. This method was applied to each version of the checklist until a minimum agreement of 80% was achieved.

The selected judges initially evaluated the overall content of the instrument, assessing its comprehensiveness by determining whether all relevant items were adequately covered and included [23].

In addition, the judges analyzed each item individually, verifying whether the items were presented in a clear and relevant manner. Regarding clarity, the judges were instructed to evaluate the wording of each item to determine whether it was understandable, adequately expressed the proposed objective, and accurately reflected what was intended to be measured [22].

The analytical procedural stage was defined by the statistical analysis of the data to validate the developed instrument. In this phase, the checklist was applied to intra-hospital transports performed in the ICU at the institution where the project was conducted over a three-month period (April 12 to July 12, 2023). Subsequently, Cronbach's alpha coefficient was calculated to assess the internal consistency of the instrument, with values above 0.70 considered acceptable.

For the development of healthcare quality indicators in this study, Donabedian's quality of care model was adopted as the theoretical framework. This model is based on the triad of structure, process, and outcomes, which are considered fundamental pillars for the continuous evaluation and monitoring of healthcare services. The model enables the early identification and correction of failures, thereby contributing to the improvement and development of the evaluated services [24] .

The indicators were proposed based on the data obtained from the *critically ill patients intra-hospital transport checklist.* For each indicator, the following elements were defined: dimension, indicator name, indicator description, calculation method, and data source.

This study was registered on *Plataforma Brasil* and approved by the Research Ethics Committee under opinion numbers 5,528,465 and 5,636,997.

Results

The expert panel responsible for validating the *Checklist* content consisted of eight nurses and five nursing technicians, totaling 13 participants.

The characteristics of the participants in the panel of experts can be seen in Table 1.

Table 1. Characteristics of the participants (n=13) of the panel of experts, according to gender, age group, profession, time since graduation and service, higher degree and area of training. Porto Alegre, RS, 2022.

Variables	N (%)	Mean (SD)
Gender		
Women	12 (92.3)	
Men	1 (7.7)	
Age group (years)		
30 to 34 years old	2 (15.3)	
35 to 39 years old	5 (38.5)	38.46 (4.13)
40 to 44 years old	5 (38.5)	
45 to 50 years	1 (7.7)	
Profession		
Nurse	8 (61.5)	
Nursing Technician	5 (38.5)	
Years since graduation		
Up to 10 years	3 (23.0)	14.61 (5.20)
From 10 to 20 years old	10 (77.0)	
Length of service in the institution (median)		
Up to 5 years	5 (38.5)	
From 6 to 10 years old	1 (7.7)	3
From 10 to 15 years old	6 (46.1)	
From 16 to 20 years old	1 (7.7)	
Position in the institution		
Fixed clinical nurse	5 (38.5)	
Temporary nurse	3 (23.0)	
Nursing Technician	5 (38.5)	
Highest academic degree		
Specialization	5 (38.5)	
Residence	2 (15.4)	
Master's Degree	4 (30.7)	
No response	2 (15.4)	
Area of specialization		
Cardiology	1 (7.7)	
Intensive Care/ critically ill patient	6 (46.2)	
Master's degree (Nursing, Health Education, Health Technologies, Nutrition, Nephrology)	4 (30.7)	
No response	2 (15.4)	
Total	**13**	

Source: survey data (2022).

Each expert evaluated a total of 49 items developed for the checklist, including 12 items related to patient identification, 11 related to invasive devices, 5 related to level of consciousness, 2 related to the patient's hemodynamic status, 10 related to materials and equipment used in intra-hospital transport (IHT), 3 related to pre-transport monitoring, 3 related to post-transport monitoring, and 3 miscellaneous items for post-transport documentation (adverse events, use of medications during IHT, and use of contrast). In each Delphi round, the suggestions and observations provided by the specialists were carefully considered for checklist improvement. The proposed modifications were discussed with the working group (WG) and with the nursing coordination of the unit, and the necessary revisions were implemented in each subsequent version of the checklist.

Thus, modifications were made to the checklist until all items reached >80% agreement.

Table 2 presents the values obtained by calculating the agreement index (%) for each item that composes the checklist based on the Likert scale evaluation during each round of the expert panel.

Table 2. Agreement index of the items that make up the Checklist for intra-hospital transport by the experts' assessment. Porto Alegre, RS, 2022.

Item	Care	Agreement Index (%) – 1st Round	Agreement Index (%) – 2nd Round	Agreement Index (%) – 3rd Round	Agreement Rate (%) – 4th Round
Patient identification					
1	ID bracelet	100%			
2	Allergies	100%			
3	Consent form	**76.9%**	**69.2%**	**76.9%**	84.6%
4	Date	100%			
5	Start time	**69.2%**	**77%**	92.3%	
6	End time	**69.2%**	**77%**	92.3%	
7	Underlying condition	84.6%		84.6%	
8	Transport team	92.3%			
9	Precautions	92.3%			
10	Transport risk	**76.9%**	100%		
11	Destination	92.3%			
12	Communication between units	92.3%			
Invasive devices					
13	Orotrachel tube/ Tracheostomy	100%			
14	Nasoenteral tube/ Nasogastric tube	100%			
15	Central venous access	100%			
16	Peripheral venous access	100%			
17	Shilley catheter	100%			

18	Arterial line	92.3%		
19	Drains	92.3%		
20	Chest tube	92.3%		
21	Pacemaker	100%		
22	Indwelling urinary catheter	92.3%		
23	Ostomy	91.6%		
Level of consciousness				
24	Awareness	92.3%		
25	Sedation	84.6%		
26	Pain Scale	84.6%		
27	Agitation-Sedation Scale (RASS)	**69.2%**	92.3%	
28	Requires analgesia or increased sedation for transport	**76.9%**	**69.2%**	84.6%
Hemodynamics				
29	Stable/unstable	100%		
30	Use of vasoactive drugs	92.3%		
Materials and equipment				
31	Check batteries/ proper operation/ connected alarms (multi-parameter monitor. infusion pump. transport fan)	100%		
32	Proper attachment of infusion pump to bed support	100%		

33	Check drug infusion and flow	100%			
34	Check need for extension lines for vascular access	84.6%			
35	Verify proper functioning of the manual resuscitator (AMBU)	100%			
36	Sufficient oxygen level (See protocol table)	100%			
37	Transport and medication case	100%			
38	Defibrillator	**46.2%**	**61.5%**	**69.2%**	92.3%
39	Additional battery	**46.2%**	**77%**	**77%**	100%
40	Patient medical Record	100%			
Pre-transport monitoring					
44	Ventilation	84.6%			
45	Non-invasive ventilation/ Invasive ventilation	92.3%			
46	Vital signs	92.3%			
Post-transport monitoring					
44	Ventilation	84.6%			
45	Non-invasive ventilation/ Invasive ventilation	92.3%			
46	Vital signs	92.3%			
Miscellaneous items for post-transport registration					

47	Complications	100%
48	Medications during transport	100%
49	Contrast	100%

Source: survey data (2022).

Therefore, for the elaboration and validation of the checklist, four Delphi rounds were necessary, resulting in an instrument with the following domains: patient identification, invasive devices, level of consciousness, hemodynamics, equipment/materials, pre-transport monitoring, post-transport monitoring, complications, medications, and contrast, totaling 47 items grouped into 10 domains, as shown in Figure 1.

After the completion of the checklist content validation stage by the specialists, the master's student, together with her advisors, evaluated the final document, in which adjustments were made to the layout and formatting of the instrument, and the name of the professional responsible for applying the checklist was added.

CHECKLIST FOR INTRA-HOSPITAL TRANSPORT

OF ADULT CRITICALLY ILL PATIENT

HNSC ICU – *CHECKLIST* FOR INTRA-HOSPITAL TRANSPORT

1. PATIENT IDENTIFICATION

Attach patient label	Date (dd/mm/yy)	
	ICU departure time (hh/mm)	
	ICU arrival time (hh/mm)	
	Identification Bracelet: [ ] Yes [ ] No	
	Allergies [ ] Yes [ ] No. If so, which:	
	Reason for hospitalization:	
	Professionals involved in TIH: [ ] Physician [ ] Nurse [ ] Nursing Technician [ ] Physiotherapist [ ] Resident _________ [ ] Undergraduate ________	
	Isolating precaution*: [ ] Standard [ ] Contact [ ] Respiratory * MDR bacteria carrier. Cleaning and disinfection confirmed [ ] Yes [ ] No [ ] NA	
	Medical clearance for transport [ ] Yes [ ] No – Justification: ____________	
	Destination: [ ] CT [ ]BC [ ] Hemodynamics Unit [ ] Scintigraphy [ ]Departure [ ] Deceased * Other:____________ Communication between departments confirmed: [ ] Yes [ ] No *No need to fill in other items.	

2. INVASIVE DEVICES

[ ] ETT/ Tracheostomy – Check position, fixation, and cuff. Suction ETT/tracheostomy and upper airways before transport.
[ ] NGT/ NET – Check position and fixation. Need for NPO for the exam: [ ] Yes [ ] No. Time: ____ Blood glucose: ____
[ ] CVC – Check functionality, fixation, dressing and, if necessary, ensure a lumen is available for contrast administration.
[ ] Peripheral IV catheter – Check functionality, fixation and dressing.
[ ] Hemodialysis catheter (Shilley) – Check functionality, fixation and dressing. Use of Tego connectors: [ ] Yes [ ] No. Use of heparin: [ ] Yes [ ] No.
[ ] Arterial line – Check functionality and dressing. Fix the MAP transducer to the upper limb.
[ ] Drains – Which: _______ Location: _______ Empty before transport and record quantity and appearance on the record sheet.
[ ] Chest drain – Confirm it is unclamped.
[ ] Pacemaker – Check fixation. Confirm capture on the transport monitor.
[ ] Urinary catheter (Foley) – Check fixation. Empty urine bag before transport and record the volume on the record sheet.
[ ] Ostomy – Empty effluents before transport and check if the bag is well adhered and secured.

3. LEVEL OF CONSCIOUSNESS

Consciousness: [ ] Alert and oriented [ ] Agitated [ ] Confused [ ] Sedated. Sedation: [ ] Midazolam [ ] Fentanyl [ ] Propofol [ ] Dexmedetomidine [ ] Other ______ Infusion rate: _____ Pain scale: _____ [ ] VAS [ ] BPS. Agitation-sedation scale - RASS: _____
Continuous sedation pause for transport: [ ] Yes [ ] No [ ] NA

4. HEMODYNAMICS

[ ] Stable [ ] Unstable. Vasoactive drugs: [ ] Yes [ ] No Which: ________ Infusion rate: _______

5. EQUIPMENT – MATERIALS

[ ] Check batteries/ proper operation/ alarms activated (multi-parameter monitor, infusion pump, transport ventilator, pacemaker)	[ ] Check need for IV extension lines
[ ] Proper attachment of infusion pump to bed support	[ ] Verify proper functioning of bag-valve mask (BVM)
[ ] Check drug infusion and infusion rate	[ ] Sufficient oxygen level (See protocol table)
	[ ] Transport and medication kit
	[ ] Patient medical record

6. PRE-TRANSPORT MONITORING

Ventilation: [ ] Spontaneous [ ] Non-invasive [ ] Invasive [ ] Oxygen therapy (Device and L/min)__________ __
NIV/IMV: Mode: ___ FiO2: ___ PEEP: __ VAC: _ Vital signs: BP: ____ MAP: ____ HR: _____ RR: ____ Temp: ___ SpO2: ____

7. POST-TRANSPORT MONITORING

[ ] Spontaneous [ ] Non-invasive [ ] Invasive [ ] Oxygen therapy (Device and L/min)__________ __
NIV/IMV: Mode: ___ FiO2: ___ PEEP: __ A/C: _ Vital signs: BP: ____ MAP: ____ HR: _____ RR: ____ Temp: ___ SpO2: ____

8. COMPLICATIONS

Presence of complications: [ ] Yes [ ] No. If yes, specify: ______

9. MEDICATIONS

Use of medications during transport: [ ] Yes [ ] No. If yes, which medication and dose/volume:

10. CONTRAST

Use of contrast: [ ] Yes [ ] No. If yes, what volume:

Healthcare professional: ______________________________________

Figure 1. Checklist prepared after validation of the content by the panel of experts. Porto Alegre, RS, Brazil, 2023.

The implementation of the checklist was carried out as part of a pilot test in the hospital, with its application in intra-hospital transport in the ICU over a period of three months. A total of 70 checklists were applied during this pilot period. The nursing team, including nurses and nursing technicians, demonstrated good acceptance of the instrument, with adjustments made after observation of clinical practice. For example, the item referring to pre- and post-transport monitoring of vital signs, specifically SpO_2, was included after being identified as missing during the initial application of the checklist, resulting in the final version of the instrument.

The unit's nursing coordination was also involved in the approval process and implementation support, ensuring that the checklist was used effectively and according to the needs of clinical practice, with emphasis on improving the organization of intra-hospital transport processes.

After the checklist application period, the internal consistency of the instrument, measured by Cronbach's alpha, was 0.845, indicating good reliability of the items. For the calculation of internal consistency, transports in which the patient died were excluded. Checklist items referring to post-transport return were also excluded, since they cannot be applied to patients who were discharged, totaling 32 items, as described in Table 3.

Table 3. Statistical analysis of the reliability of the items on the intra-hospital transport checklist. Porto Alegre, RS, 2023.

Item Stats	
	Cronbach's alpha
Date	0.846
ICU Departure Time	0.849
ID bracelet	0.848
Allergies	0.846
Reason for hospitalization	0.848
Professionals at TIH	0.846
Precaution	0.846
Multidrug-resistant bacteria carrier	0.837
Medical clearance for transport	0.848
Destination	0.846
There was communication between the units	0.847
Device presence	0.842
Awareness	0.845
Sedation	0.846
Pain	0.851
BPS	0.846
NRS	0.846
RASS	0.844
Sedation interruption for transport	0.841
Hemodynamics	0.844
Vasoactive drug use (VAD)	0.846
Equipment/Materials	0.839
Pre-transport ventilation	0.840
PA – pre-transport	0.820
PAM – pre-transport	0.820
FC – pre-transport	0.820
FR – pre-transport	0.820
TAX – pre-transport	0.820
SpO2 – pre-transport	0.820
Complications	0.842
Use of medications during transport	0.844
Use of contrast	0.842
Total	0.845

Source: survey data, 2023.

The aim of this study was to evaluate and provide indicators based on the application of the checklist in order to improve the care of critically ill adult patients during intra-hospital transport. The indicators developed were based on the quality of care model known as Donabedian's Triad, categorized into structure, process, and outcomes.

The indicators proposed for monitoring intra-hospital transport are described in Figure 2.

Dimension	**Indicator Name**	**Indicator**	**How to Calculate**	**Source**
Process	Transport time	Average time in minutes of intra-hospital transport of critically ill patients in the month	Add up the patient transport times and divide by the number of critically ill patients who had transport that month.	*Checklist*
Structure	Transport Team	Percentage of critically ill patients transports carried out with the minimum team (physician, nurse and nursing technician) in the month * Not include high shipping	Number of critically ill patients transport for exams and surgeries with the physician , nurse and nursing technician divided by the total number of transport.	*Checklist*
Process	Communication prior to transport	Percentage of critically ill patients transport that was communicated with the destination unit before transport in the month	Total number of critically ill patients transport that was communicated with the destination unit prior to transport divided by the total number of critically ill patients transport.	*Checklist*
Process	Hemodynamic Instability	Percentage of transports with critically ill patients with hemodynamic instability in the period of one month	Total number of critically ill patients in transport with hemodynamic instability record divided by the total number of critically ill patients transports in the month.	*Checklist*
Result	Occurrence of complications	Percentage of complications in the transport of critically ill patients in one month	Number of complications recorded in the transport of critically ill patients within the hospital divided by the total number of transports in that month.	*Checklist*

Process	checklist application time	Average time in minutes of checklist application in a period of one month	Add up the checklist application times and divide by the number of transport for that month.	*Checklist*

Discussion

IHT is often an inevitable step for the critically ill patients to receive the necessary treatment. However, adverse events can occur during transport for various reasons, such as medications, equipment used and the transport team [(7)].

It is important to have a better understanding of the reasons and risk factors associated with the development of such complications resulting from IHT, so that the necessary corrective measures can be instituted [(6)].

The literature shows that approximately one third of patients transported from the ICU for imaging tests may experience an adverse event, providing an additional risk to prolong the patient's stay in the ICU. As well as, the delay in imaging can negatively impact the patient's treatment plan and affect long-term outcomes, such as increased disability or mortality [(8)].

Care during IHT is a challenge for the entire team. Therefore, the development of transport protocols helps in the safety of the patient and the team [(5),] and the implementation of the *checklist* validated in this study – which presented satisfactory internal consistency (Cronbach's alpha = 0.845) – represents an advance in the integration between theory and practice. This initiative strengthens evidence-based care and transforms critically ill patients' care.

To this end, it is important, in addition to all the planning and procedures for transport, to carry out professional training of the teams responsible for the IHT, as well as to analyze the adverse events resulting from this process, predict possible complications and discuss strategies to reduce the incidence of these events [(5,6)].

The elaboration and validation of a *checklist* for the intra-hospital transport of critically ill adult patients in this study demonstrated not only statistical reliability, but also practical applicability, by considering suggestions from specialists and adapting the items to the hospital setting. The adjustments made increased the objectivity of the instrument and facilitated its completion, promoting greater adherence by the nursing team.

In addition, the proposed indicators can be used to better understand the phenomenon and improve clinical practice.

The theoretical foundation associated with care practice and articulation among nursing professionals strengthens praxis, facilitates the use of scientific knowledge, the science of clinical care, contributing to the development of instruments for routine patient care, transforming and improving nursing care and its documentation [25].

The improvements resulting from the experts' recommendations were largely concentrated in the content of the *checklist*, especially in the adequacy of items that were not feasible in daily hospital practice. With the pertinent modifications and exclusions, the instrument became clearer, more direct and more functional, favoring its incorporation into the nursing team's routine and contributing to a more efficient application that is aligned with care demands.

Another important point in this study was the elaboration of indicators that will help in the qualification of records relevant to patient safety. It is necessary to use measurable data, which are based on process indicators (users, professionals and their actions), structure (intended for the measurement of material and physical resources) and outcomes (final product of care) [24].

The instrument developed included patient identification, an important resource for patient safety, bringing data about the patient, such as: allergy, reason for hospitalization, professionals who will perform the transport and the place where they will be transported, as well as the importance of communication between the units. Studies show that effective communication between different departments has an positive overall impact on the IHT of critically ill patients [26,27].

The domain referring to the use of invasive devices was designed to allow the advance planning of specific care, contributing to the prevention of adverse events associated with these devices [8].

The domain identified as level of consciousness was elaborated with the intention of evaluating how the patient's sensorium is, whether he is using continuous sedation and evaluating the need to transport him with these infusions, as well as evaluating the patient's pain level for the performance of IHT, if necessary, perform analgesia beforehand in order to prevent pain-related hemodynamic changes during IHT.

The patient's hemodynamics are also fundamental and of paramount importance to be evaluated for the performance of a safe IHT, being one of the main factors related to adverse events, such as: physiological changes in the patient, especially hemodynamic and respiratory changes [2,27,28], such as hypotension and hypoxemia [2,30]. In this sense, the *Checklist* It contemplates this domain with special emphasis, allowing the monitoring of infusions of vasoactive drugs, such as norepinephrine, reported in the literature as the most used in 40% of critically ill patients who required vasoactive infusions during transport [5].

Equipment and materials were included into the instrument to reflect the importance of evaluating in advance the available resources and the quality of the equipment for the IHT [28], since the literature shows that adverse events related to problems with equipment may occur [5,6,31].

The inclusion of the pre- and post-transport monitoring domains allows the comparative analysis of ventilation and vital signs, fundamental for early detection of changes during displacement. Studies indicate a greater need for intervention in patients on mechanical ventilation (34.4%) compared to those who do not use this support (9.5 %) [5]. Thus, this domain contributes directly to the identification of risks associated with mechanical ventilation during IHT.

The item complications was prepared to be recorded if any type of complication has occurred, either in preparation for the IHT, during the IHT or after. This data will be relevant for the development of care indicators and monitoring of adverse events.

In addition, the item medications and contrast were elaborated to identify whether it has been administered during the course or during the exam, which is important for recording the patient's fluid balance.

The complexity of critically ill adult patients requires several precautions from the nursing team, with a view to preventing adverse events and improving patient safety. This situation refers to the need for care for this patient, during the period of displacement within the hospital, whether for diagnostic tests, for therapeutic interventions or for discharge to the hospitalization unit.

Therefore, this study presents an innovative instrument that aims not only to standardize practices, but also to strengthen evidence-based practice. In addition, it allows the measurement and evaluation of nursing actions through specific indicators for monitoring the intra-hospital transport of critically ill patients, contributing to greater safety and quality of care. It is noteworthy that the development of instruments that integrate clinical practice with scientific evidence and innovation is still a challenge for nursing professionals, which reinforces the relevance of this proposal for the improvement of care and the valuing of technical-scientific knowledge in nursing.

The proposal for the elaboration of indicators in this study aimed to guide the establishment of best health practices, based on the available theoretical-scientific foundation and the consensus of experts, guiding the diagnosis of how the practices are occurring and what is their conformity in relation to the expected quality [32]. In this way, the proposed indicators may enable the evaluation of the quality of health care.

In this sense, the plan of indicators elaborated in this study was based on three axes of health quality assessment described by Donabedian, which complement each other to obtain the best result from the care provided in the ITH, they are: structure (essential resources for the implementation of care), process (implementation of care) and the result (impacts of the care provided [24]. This approach makes the indicators robust for practical application, allowing the diagnosis of the weaknesses and potentialities of the IHT process.

The indicators developed in this study have the relevance and clarity necessary to be used in hospital institutions. Being able to assess patient safety in 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 can subsidize the formulation of care protocols for IHT, boosting the development of safer practices [33]. It is suggested that the indicators be measured monthly, as they represent an important tool for care evaluation and management in the professionals' work process.

In addition, it is expected that the *checklist* and indicators will support the creation of institutional protocols, promoting safer practices during the IHT. Although they do not completely eliminate risks, such practices significantly contribute to risk reduction, protecting patients from the inherent dangers of intra-hospital transport.

Conclusions

This study developed, validated and implemented a *checklist* for intra-hospital transport of critically ill adult patients, with the aim of improving the nursing process and patient safety for the prevention of adverse events in IHT. The instrument developed was validated by experts and proved to have good internal consistency.

This *checklist*, in a sense, provides the IHT team with an assessment tool to accurately identify the need for the materials, equipment, and personnel needed for preliminary identification of transport-related risks.

The potential positive impact of this study for the knowledge production and the development of safer practices is highlighted, based on new reflections and analyses of the quality of nursing care in the safety of patients in situations of IHT.

The limitations of this study were that the sample was small in relation to the proposed sample and the instrument was applied only in one hospital, and may have limit external validity, which does not prevent the *checklist* from being used by other institutions based on its adaptation.

The development of care indicators makes it possible to guide the path to improve the provision of care, making it possible to monitor processes, monitor aspects related to intra-hospital transport and evaluate patient outcomes, pointing out the efficiency and effectiveness of processes and organizational outcomes.

The potential impact of this study is the direct benefit of improving the care of critically ill patients undergoing intra-hospital transport, promoting improvements in communication between teams, preparation of materials and equipment, pre- and post-transport monitoring and identification of complications.

It is expected that with the application of the developed *checklist*, it will contribute to the transformation of care practice, promoting the improvement of care quality and the prevention of adverse events in critically ill patients undergoing intra-hospital transport.

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Submitted: January 25, 2024

Accepted: November 11, 2025

Published: April 9, 2026

Author contributions	
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Conflict of interest:	There is no conflict of interest.
Funding:	This research received no external funding
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Publisher:	Eliane Roseli Winkelmann. PhD