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PATIENT SAFETY IN INTER-HOSPITAL AEROMEDICAL TRANSPORT: A SCOPING REVIEW PROTOCOL

SEGURANÇA DO PACIENTE NO TRANSPORTE AÉREO INTER-HOSPITALAR: PROTOCOLO DE REVISÃO DE ESCOPO

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RESUMO

Introdução: A utilização de aeronaves para deslocamento de pacientes aprimorou o transporte aeromédico, permitindo acesso rápido ao atendimento, ao superar distâncias e barreiras geográficas. No entanto, apresenta desafios, depreendendo de cuidados especializados e de protocolos baseados em evidências para assegurar a continuidade dos cuidados e evitar complicações e incidentes. **Objetivo:** Este estudo visa mapear os protocolos disponíveis relacionados à segurança do paciente no transporte aéreo inter-hospitalar. **Método:** Esta pesquisa consiste em uma Revisão de Escopo que será conduzida pelas diretrizes do *Joanna Briggs Institute* com busca nas bases Medline, Lilacs, BDENF, *Science Direct*, Scopus e *Web of Science* empregando o método População, Conceito e Contexto para formulação da questão de pesquisa.

Descritores: Segurança do Paciente; Transporte de Pacientes; Guia de Prática Clínica.

ABSTRACT

Introduction: Aircraft use for patient transfer has improved aeromedical transport, enabling rapid access to care by overcoming distances and geographic barriers. However, it presents challenges, requiring specialized attention and evidence-based protocols to ensure continuity and prevent complications and incidents. **Objective:** This study aims to map existing protocols related to patient safety in inter-hospital aeromedical transport. **Method:** This research consists of a scoping review to be conducted following the Joanna Briggs Institute guidelines. Data search will be conducted in the following databases: Medline, Lilacs, BDENF, ScienceDirect, Scopus, and Web of Science. The Population, Concept, and Context (PCC) framework will be used to formulate the research question.

Descriptors: Patient Safety; Patient Transport; Clinical Practice Guideline.

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INTRODUCTION

Aircraft use for patient transfer has enhanced out-of-hospital transport, serving as a strategy to shorten distances and overcome geographic barriers, thereby enabling rapid access to care[1]. In Brazil, aeromedical transport plays a key role in the emergency/urgency care network, coordinating specialized services and enhancing the healthcare system's capacity to meet needs in remote or hard-to-reach regions[2].

Inter-hospital intensive care transfers involve potentially high-risk transport for unstable patients requiring life-saving interventions. Resources in this setting are limited, and the challenge lies in ensuring patients receive adequate care during transfer[3].

Several studies indicate that inter-hospital aeromedical transport is associated with significant clinical risks such as disrupted continuity in care, communication failures between teams, clinical instability during flight, and limited capacity for immediate interventions[4-5]. The lack of standardized protocols, combined with logistical complexity and the need for rapid decision-making, can compromise patient safety in this context.

Therefore, aeromedical teams must fully master all aspects in patient transport. The type of aircraft available and its characteristics—acceleration and deceleration, vibration and noise, light intensity, and flight physiology, which affects atmospheric pressure, partial oxygen pressure, temperature, and humidity—can all influence a patient's clinical status during flight. These factors may also cause significant changes that require specific interventions to ensure a safe inter-hospital aeromedical transfer[6].

From this perspective, specialist nurses play a transversal role, participating in mission planning, organizing and implementing airborne evacuation protocols, providing care, and managing operational safety procedures throughout the entire process, working within an integrated aeromedical team alongside the flight crew[7].

Recognizing these challenges, the Federal Nursing Council (COFEN) published Technical Note No. 01/2025/ Plenary on safety in Mobile Pre-Hospital Care (APH), which addresses contexts, concepts, risk management, and safe practices in patient management. The document reinforces the need for specific guidelines that promote patient safety, guiding care based on evidence, standardization of conduct, and qualification of the teams involved. Similarly, COFEN also established Resolution No. 656/2020, amended by Resolution No. 660/2021, which regulates the role of nurses in direct care and in the management of mobile pre-hospital and inter-hospital care in aircraft, defining duties and requirements for the qualification of teams and the safety of aeromedical transport[8-10].

Thus, specific guidelines play a central role in ensuring safe inter-hospital aeromedical transport. These tools should cover high-quality, specialized care throughout the entire transfer, ensuring continuity in health services and preventing adverse events and unnecessary delays in patient recovery[11]. Implementing patient safety–focused guidelines should be regarded as a practice- and theory-based tool that supports care planning and assessment. Adopting practices grounded in the best scientific evidence contributes to improved health outcomes, positively affecting quality indicators and raising care standards, with safeguards that ensure both effective treatment and risk prevention for patients[12].

Given the above, this study aims to map available protocols related to patient safety in inter-hospital aeromedical transport.

METHOD

Type of study

This research is a scoping review to be conducted following the methodology proposed by the Joanna Briggs Institute (JBI)[13], applying the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist[14]. This approach allows identifying, critically evaluating, and selecting relevant studies, as well as collecting pertinent data for the review.

This protocol is registered with the Open Science Framework (OSF) under the following DOI: https://doi.org/10.17605/OSF.IO/KAFN9.

The study will be conducted in the following phases: research question formulation, identification of relevant studies, study selection, data extraction, and results presentation.

Research question

The research question was formulated using the PCC strategy, consisting of the following mnemonic elements: P – Population; C – Concept; and C – Context. Each element was defined as follows: P (adult patients); C (protocols and tools addressing patient safety); and C (inter-hospital aeromedical transport). Accordingly, the research question was defined as: Which protocols and tools are available in the literature to support patient safety during inter-hospital aeromedical transport for adult patients?

Inclusion criteria

Studies will be selected according to the elements defined by the PCC mnemonic.

This review will focus on protocols and tools applied to adult patients with any comorbidities who underwent transfer between healthcare units via aeromedical transport. Regarding patient safety, the World Health Organization (WHO) defines it as minimizing the risk of unnecessary harm linked to healthcare to a level considered acceptable. This acceptable level reflects what is feasible, considering current knowledge, available resources, and the context in which care is delivered, while also considering the potential risks of foregoing treatment or choosing an alternative approach[15]. Therefore, studies presenting protocols or tools aimed at reducing risks during transport will be included. Finally, the context will encompass studies involving patients transported by air between units, whether for temporary purposes, such as specialist consultations or specific procedures, or for definitive transfer, such as admission to intensive care units, specialized clinics, or repatriation.

Exclusion criteria

Studies involving transport on commercial aircraft will not be selected. In addition, experience reports will be excluded.

Types of sources

The research will encompass all available full-text technical and scientific sources from the literature. Eligible studies may include secondary research employing qualitative, quantitative, or mixed-method approaches, using diverse methodological designs that address the research question and align with the proposed objective. Grey literature sources such as theses and dissertations, protocols, guidelines, best practice manuals, and documents from professional associations will also be considered. There will be no restrictions on time, geography, or language.

Research strategy

The search strategy will be developed using Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH), combined with the Boolean operators AND and OR to enhance information retrieval aligned with the study objectives. A librarian will collaborate in designing the search combinations, and each database's specific characteristics will be considered to ensure comprehensive and consistent data collection, as shown in Figure 1.

Data searches will be conducted across the following scientific databases and technical-scientific information portals: the Regional Portal of the Virtual Health Library (Portuguese Acronym: BVS), managed by the Latin American and Caribbean Center on Health Sciences Information (BIREME), including its main databases: Latin American and Caribbean Health Sciences Literature (Portuguese Acronym: LILACS) and Nursing Database (Portuguese Acronym: BDENF). In addition, data searches will be conducted through the PubMed portal at the National Library of Medicine (NLM), using the Medline database. The Science Direct portal (scientific journals) and the Capes Journal Portal will also be accessed, including the Scopus (Elsevier) and Web of Science (Clarivate Analytics) databases. These sources were selected for their extensive indexed content and strong focus on health and nursing studies, allowing broad and diverse mapping of available publications. References within the selected articles will also be examined to identify further studies relevant to the research topic.

Search Strategy	Database	Results
(((Patient [MeSH] OR Patients OR Patient acuity OR transportation of patients OR inter-hospital transport OR patient transfer OR Inter-Hospital Patient Transfer [title/abstract] AND (air ambulances [Mesh] OR air ambulance OR air ambulances [title/abstract])) AND (guidelines [mesh] OR guideline OR protocol OR protocols [title/abstract])	Medline (PubMed)	171
Tw:("paciente" OR "patient" OR "gravidade do paciente" OR "patient acuity" OR "transporte de pacientes" OR "transportation of patients") AND ("protocolo" OR "protocolos" OR "protocol" OR "protocols") AND ("ambulâncias aéreas" OR "transporte aéreo de pacientes" OR "air ambulances" OR "air ambulance")	Lilacs (BVS) BDEnf	179 6
((Patient OR "Patient acuity" OR "transportation of patients" OR "patient transfer") AND ("air ambulances" OR "air ambulance") AND (guideline OR protocol)	*Science Direct*	253
(TITLE-ABS-KEY(patient OR patients OR Patient acuity OR transportation of patients OR inter-hospital transport OR patient transfer OR Inter-Hospital Patient Transfer) AND TITLE-ABS-KEY (air ambulances OR air ambulance) AND TITLE-ABS-KEY (guidelines OR guideline OR protocol OR protocols))	Scopus	45
((Patients OR Patient OR "Patient acuity" OR "transportation of patients") AND ("air ambulances" OR "air ambulance")) AND (guidelines OR guideline OR protocol OR protocols)	*Web of Science*	255

Figure 1 - Database search strategy. Rio de Janeiro, RJ, Brazil, 2025

Selection of the studies

Data collection in the selected databases will follow a three-phase strategy. The first phase will consist of an initial search in two databases, LILACS (Portuguese Acronym: BVS) and Medline (PUBMED), aimed at identifying terms used in article titles and abstracts, along with indexing terms. Next, in the second phase, a comprehensive search will be conducted across all selected databases, including all indexed terms and keywords. The third and final phase will involve manually reviewing reference lists from selected studies to complete the review, following pre-established inclusion criteria.

After conducting the searches for this study, all retrieved citations will be gathered and uploaded into the Rayyan *software* for duplicate identification and removal. Two independent reviewers will screen the studies by applying the inclusion criteria and assessing titles and abstracts. A consensus meeting will then be held to compare selected studies, with a third reviewer resolving any disagreements that may arise. Subsequently, the pre-selected studies will be read in full to confirm their relevance and eligibility.

Data extraction

For the data extraction phase, a synthesis table will be created and tailored according to JBI Manual recommendations, capturing all relevant data from each selected publication. This table must include items recommended by the JBI Manual, such as title, year of publication, country of origin, type of intervention (protocol used in adult patient aeromedical transport), and key data/content covered by the protocols or tools, as illustrated in Figure 2. Data will be recorded in Microsoft Excel.

Title and Year of publication	Country of origin	Type of intervention (protocol or tool applied in adult patient aeromedical transport)	Key data/content included in the protocols or tools

Figure 2 - Data extraction tool for identified studies, highlighting protocols and tools used in adult inter-hospital aeromedical transport. Rio de Janeiro, RJ, Brazil, 2025

Data analysis and presentation

The study selection process will be illustrated using a flowchart, following guidelines from the PRISMA-ScR[14]. Data extracted from studies selected for inclusion will be organized and presented in the aforementioned synthesis table, providing detailed information throughout the review.

This scoping review aims to map existing protocols and tools while identifying knowledge gaps and inconsistencies in practices implemented across aeromedical services.

In practical terms, the findings may support improvements in care processes, promote standardization in aeromedical practices, and contribute to developing new clinical protocols focused on patient safety, serving as decision-making tools for multidisciplinary teams.

Furthermore, the results may serve as a foundation for developing institutional guidelines and public policies, thus contributing to enhanced quality and safety in aeromedical transport services. Findings from the review will provide a comprehensive, up-to-date overview on the topic, supporting managers, healthcare professionals, and researchers in developing guidelines to improve clinical outcomes and reduce risks during transfer of critically ill patients between hospital units via aeromedical transport.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP CONTRIBUTIONS
Study conception: Rocha MW, Paes GO. Data collection: Rocha MW, Santos CM, Gonzalez CM. Data analysis: Rocha MW, Santos CM, Gonzalez CM. Data interpretation: Rocha MW, Santos CM, Gonzalez CM. All authors are responsible for the writing and critical review of the intellectual content, the final published version, and all ethical, legal, and scientific aspects related to the accuracy and integrity of the study.