Literature Review

TEXTO & CONTEXTO ENFERMAGEM
TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

COMPETENCIES FOR AEROMEDICAL EVACUATION PRACTICES IN EMERGENCIES AND DISASTERS: A SCOPING REVIEW

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ABSTRACT

Objective: to map the competencies developed in training strategies for air transport practices for patients, in the face of emergency situations and disasters involving chemical, biological, radiological and nuclear (CBRN) agents.
Method: this is a scoping review structured in accordance with the JBI and Preferred Reporting Items for Systematic reviews and Metanalyses extension for Scoping Reviews recommendations. The study was carried out in five stages: search for sources in 17 databases, an information portal and two repositories of gray literature, using 125 DeCS, MeSH and Emtree descriptors, without temporal and idiomatic clipping; selection; critical reading of the texts selected by two double-blind reviewers; summary of results and presentation of mapped competencies.
Results: a total of 878 studies were analyzed, of which 18 composed the sample. In all, 11 competencies were mapped, with emphasis on the technical training domain. Competencies refer especially to technical-scientific knowledge in disaster situations involving CBRN agents and the safety of patients and professionals involved.
Conclusion: the operationalization of artifices to improve qualification processes based on competencies proved to be strategic to increase the quality and safety of patient air transport practices. The approach of the sources on specific aspects of the particularities of practices related to emergencies and disasters involving CBRN agents in training/training processes demonstrates the academic effort to promote the reduction of the risk of these events when, in due course, civil and military institutions and their health operators are activated.

DESCRIPTORS: Disasters. Emergencies. Air ambulances. Air transport. Disaster team. Disaster preparedness. Teaching. Competency-based education.

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COMPETÊNCIAS PARA PRÁTICAS DE EVACUAÇÕES AEROMÉDICAS EM EMERGÊNCIAS E DESASTRES: REVISÃO DE ESCOPO

RESUMO

Objetivo: mapear as competências desenvolvidas em estratégias de capacitação para práticas de transporte aéreo de pacientes, diante de situações de emergência e desastres envolvendo agentes químicos, biológicos, radiológicos e nucleares (QBRN).
Método: revisão de escopo estruturada conforme as recomendações do *Joanna Briggs Institute* e do checklist *Preferred Reporting Items for Systematic reviews and Metanalyses extension for Scoping Reviews*. O estudo foi desenvolvido em cinco etapas: busca de fontes em 17 bases de dados, um portal de informação e dois repositórios de literatura cinzenta, utilizando 125 descritores DeCS, MeSH e Emtree, sem recorte temporal e idiomático; seleção; leitura crítica na íntegra dos textos selecionados por dois revisores em duplo cego; síntese dos resultados e apresentação das competências mapeadas.
Resultados: foram analisados 878 estudos, dos quais 18 compuseram a amostra. Ao todo, foram mapeadas 11 competências, com destaque para o domínio capacitação técnica. As competências referem-se especialmente ao conhecimento técnico-científico em situações de desastre envolvendo agentes QBRN e à segurança do paciente e dos profissionais envolvidos.
Conclusão: a operacionalização de artifícios para aperfeiçoar os processos de capacitação baseados em competências mostrou-se estratégica para elevar a qualidade e a segurança das práticas de transporte aéreo de pacientes. A abordagem das fontes sobre aspectos específicos das particularidades das práticas relacionadas às emergências e desastres envolvendo agentes QBRN em processos de formação/capacitação demonstra o esforço acadêmico de promover a redução do risco desses eventos quando, oportunamente, forem acionadas instituições civis e militares e seus operadores de saúde.

DESCRITORES: Desastres. Emergências. Resgate aéreo. Transporte aéreo. Equipe de desastre. Preparação em desastres. Ensino. Educação baseada em competências.

COMPETENCIAS PARA PRÁCTICAS DE EVACUACIÓN AEROMÉDICA EN EMERGENCIAS Y DESASTRES: REVISIÓN DEL ALCANCE

RESUMEN

Objetivo: mapear las competencias desarrolladas en estrategias de formación en prácticas de transporte aéreo de pacientes, ante situaciones de emergencia y desastres con agentes químicos, biológicos, radiológicos y nucleares (QBRN).
Método: una revisión de alcance estructurada de acuerdo con las recomendaciones del JBI y la lista de verificación Elementos de informe preferidos para revisiones sistemáticas y la extensión Metanalyses para revisiones de alcance. El estudio se realizó en cinco etapas: búsqueda de fuentes en 17 bases de datos, un portal de información y dos repositorios de literatura gris, utilizando 125 descriptores DeCS, MeSH y Emtree, sin recorte temporal e idiomático; selección; lectura crítica de los textos seleccionados por dos revisores doble ciego; resumen de resultados y presentación de competencias mapeadas.
Resultados: se analizaron 878 estudios, de los cuales 18 compusieron la muestra. En total, se mapearon 11 competencias, con énfasis en el dominio de formación técnica. Las competencias se refieren especialmente al conocimiento técnico-científico en situaciones de desastres que involucran a agentes QBRN y la seguridad de los pacientes y profesionales involucrados.
Conclusión: la operacionalización de artificios para mejorar los procesos de calificación basados en competencias demostró ser estratégica para aumentar la calidad y seguridad de las prácticas de transporte aéreo de pacientes. El abordaje de las fuentes sobre aspectos específicos de las particularidades de las práctic*as relacionadas con* emergencias y desastres que involucran a agentes QBRN en los procesos de formación/capacitación demuestra el esfuerzo académico por promover la reducción del riesgo de estos eventos cuando, en su momento, se activan las instituciones civiles y militares y sus operadores de salud.

DESCRIPTORES: Desastres. Ambulancias aéreo. Transporte aéreo. Equipos Humanos. Preparación ante desastres. Enseñanza. Educación basada en competencias.

INTRODUCTION

Studies on the competencies of nurses in emergencies and disasters have been systematically developed on a global scale. With the aim of formalizing and standardizing what is incumbent upon these professionals and better structuring the education and training processes to work in such situations. Examples are emergencies and natural (floods, floods, landslides, droughts, epidemics, pandemics, infestations/pests, earthquakes and tsunamis), technological emergencies (accidents with explosive, chemical, biological, radiological and nuclear materials, urban fires, rupture of tailings dams, building collapses, oil spills, water contamination and accidents in passenger transport), or social (terrorist attacks, forced migrations, violence and urban chaos, genocide, wars, civil conflicts, ethnic and religious intolerance, poverty extreme and disassistance)disasters[1].

The complexity, dynamics and demands commonly observed in these events require broad debate with nurses. Timely, the International Council of Nurses has been defending the need to structure specific competencies of nurses by type of disaster, in the understanding that the term "competency" refers to a level of performance that demonstrates the effective application of knowledge, skill and judgment[1]. Thus, we highlighted, in this study, the competencies developed in training strategies for air transport practices for patients in situations of emergencies and disasters involving chemical, biological, radiological and nuclear (CBRN) agents, theme still little explored in health professionals' training curricula.

CBRN events are recognized for their expressive ability to cause harm to human health or cause death. These events transcend the labor dimension, becoming a matter of national security and demand constant improvement in their management[2]. The impacts can be felt in several sectors, such as health and defense, reinforcing the need to develop technologies, contingency plans, public policies and training programs that can prevent future risks as well as prepare the agents and sectors involved to respond better to such events. Amidst these emergencies and disasters, there are also outbreaks, epidemics and pandemics involving biological agents, such as the cases of Influenza A – H1N1 (2009), Ebola (2014 and 2019) and COVID-19 (2020), examples of public health issues that highlighted the need for expanding interdisciplinary collaborations and communications in all aspects of health care[3].

Commonly, in events of this nature, there is a concern with the safety of professionals and patients during the assistance and transport of victims. Such issues involve technical training and are crucial for serving the population and for patient and professional safety in exposure to CBRN agents[4]. Timely, the Centers for Disease Control and Prevention has developed guidelines for air medical transport regarding the procedures that should be performed on asymptomatic patients who develop symptoms during the flight, particularly when transporting multiple patients at the same time. To this end, a protocol was developed to ensure the safety of air transport for patients and crew members. Guidance applies to flights of any duration and using any type of aircraft[5,6,7].

Emergencies and disasters involving CBRN agents, in addition to causing victims (sometimes en masse), can result in serious social, environmental and economic damage, as was the case of the event that occurred in the municipality of Goiânia (Brazil) in September 1987, involving cesium-137, considered the greatest radiological disaster in the world that happened outside of nuclear power plants, mobilizing numerous government sectors[7].

As a response strategy to these situations, patient air transport (PAT) consists of the use of different aircraft, with fixed or rotary wings, used to meet the need for faster transport[8]. Right after an emergency or disaster situation is installed, PAT system's main objective is to save as many lives as possible and provide support to hospitals overwhelmed by the care of multiple victims[9].

The development of a multidisciplinary team's competencies is the focus of critical patient transport planning. It is necessary to stabilize clinical priorities, optimize equipment and transmit clinical information clearly[10]. To work in this type of transport, specific knowledge of flight physiology, care for victims, biosecurity, planning and management of actions during the pre-flight, flight and post-flight are required.

Thus, it is important to invest in training strategies for health teams so that the response to a CBRN event is organized more quickly and effectively, thus reducing possible damage and the number of fatalities. It is emphasized, therefore, that excellence in training tends to generate greater flight safety, safety of the team to be transported, savings in time and resources to be mobilized and, above all, quality and adequate assistance for carrying out PAT.

Therefore, the competencies of professionals working in this area involve not only specific care for air removal, but also clinical care with the effects that these CBRN agents can cause in patients and in the operators themselves. Therefore, understanding which competencies should be considered by members of health teams is strategic and necessary.

Considering the above, the study aims to map the competencies developed in training strategies for air transport practices for patients in emergency situations and disasters involving CBRN agents.

It should be noted that a preliminary search was carried out in the MEDLINE (via Pubmed), PROSPERO, Cochrane Database of Systematic Reviews and JBI Evidence Synthesis databases and no other published or ongoing reviews on this topic were identified. It is considered that the findings may contribute for the development of qualifications and training processes guided by the alignment of competencies as a way to support the preparation of human resources in the health area as well as the teaching activities and curriculum review of civil and military institutions that form these resources.

METHODS

This is a structured scope review as proposed by the JBI, with the function of allowing the synthesis of knowledge and mapping of concepts in a given area of research[11–13]. The review was organized through the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA – ScR) and the protocol was registered in the Open Science Framework (OSF) at the link https://osf.io/jftzk/.

The following research question was delimited: what are the competencies to be considered in the training of health professionals in air transport practices for patients in emergency situations and disasters involving CBRN agents?

Thus, Population, Concept and Context (PCC) acronym elements, indicated for conducting scoping reviews, were defined as follows: P (Population) – health teams (doctors, nurses and nursing technicians); C (Concept) – competencies; and C (Context) – PAT in emergency and disaster situations. In this review, "competency" is understood as the application of knowledge, skills and judgments to act in a complex situation[1].

From the association of PCC mnemonic elements, the terms were mapped in the controlled vocabularies Health Sciences Descriptors (DeCS), MeSH Medical Subject Headings (MeSH) and Embase Subject Headings (Emtree). It should be noted that terms identified in the titles, abstracts and descriptors of the articles initially identified were also considered. The terms used in database search strategies are described in Chart 1.

Chart 1 – Terms used in search strategies and database. Rio de Janeiro, RJ, Brazil, 2022.

Terms used in search strategies	*Equipe de Assistência ao Paciente, Equipe de Assistência Médica, Equipe de Cuidados de Saúde, Equipe de Saúde, Equipe Interdisciplinar de Saúde, Equipe Multiprofissional, Equipes de Saúde, Grupo de Atención al Paciente, Equipo Multiprofesional, Grupo de Atención de la Salud, Grupo de Atención Médica, Grupo de Salud Interdisciplinario, Équipe soignante, Équipe des professionnels de santé, Équipe interdisciplinaire, Enfermería, Médicos, Médecins, Técnicos de Enfermagem, Infirmiers auxiliaires autorisés, Infirmières professionnelles diplômées, Assistência ao Paciente, Soins aux patients, Cuidados ao Paciente.* Patient Care Team, Patient Care Teams, Interdisciplinary Health Team, Interdisciplinary Health Teams, Healthcare Team, Healthcare Teams, Nursing, Nursings, Nurses, Physicians, Licensed Practical Nurses, Licensed Practical Nurse, Licensed Vocational Nurses, Licensed Vocational Nurse, Patient Care. *Substâncias Perigosas, Agente Biológico Perigoso, Agentes Biológicos Perigosos, Composto Químico Perigoso, Compostos Químicos Perigosos, Fatores de Risco Biológicos, Fatores de Riscos Biológicos, Materiais Perigosos, Poluentes Tóxicos, Produto Biológico Perigoso, Produto Químico Perigoso, Produtos Biológicos Perigosos, Produtos Químicos Perigosos, Substância Biológica Perigosa, Substância Perigosa, Substância Química Perigos, Substância Tóxica Ambiental, Substâncias Biológicas Perigosas, Substâncias Químicas Perigosas, Substâncias Tóxicas Ambientais, Sustancias Peligrosas, Contaminantes Tóxicos, Material Peligroso, Químicos Peligrosos, Riesgo Biológico, Produits dangereux, Agents biologiques dangereux, Agents chimiques dangereux, Composés chimiques dangereux, Matériaux dangereux, Matières dangereuses, Produits biologiques dangereux, Produits toxiques pour l'environnement, Substances biologiques dangereuses, Substances chimiques dangereuses, Substances dangereuses, biológico, químico, Radiação, Nuclear, Explosivo, Radiactivo, Radioativ*. Hazardous Substances, Biohazard OR Biohazards, Environmental Toxic Substances, Hazardous Chemical, Hazardous Chemicals, Toxic Environmental Substance, Toxic Environmental Substances, radiation accidented, chemical, Biologic, radioactive. *Desastres, Catastrophes, Catástrofes, Eventos com Potencial de Criação de Lesão, Tragédias, Sinistres, Urgencias Médicas, Urgences, Desastre Biológico, Catastrophe Biologique, Resgate Aéreo, Ambulâncias Aéreas, Helicópteros para Transporte de Pacientes, Ambulancias Aéreas, Ambulancias Helicopteros, Ambulances aéroportées, Hélicoptères pour urgence, Hélicoptères sanitaires, Véhicules de transport aérien, Transporte de Feridos e Doentes, Transporte de Heridos y Enfermos, Transport sanitaire, Évacuation sanitaire, Transport de patients, aeroevacuación, Aeroevacuação,* Biological Disaster, Air Ambulances, Aeromedical evacuation.

Eligibility criteria for information sources

All categories of free access technical-scientific information sources, in all languages and years of publication, that describe the competencies and/or training processes of health teams to carry out air transport practices for patients in situations of emergencies and disasters involving CBRN agents were included. Sources that were not available in full text format and duplicate articles were excluded.

Search strategy

The searches were carried out in January 2022 in the databases of the following information and gray literature portals: Regional Portal of the Virtual Health Library (VHL), under the responsibility of the Latin American and Caribbean Center on Health Sciences Information (BIREME), in its main databases: Latin American and Caribbean Literature on Health Sciences (LILACS), *Bibliográfico Español em Ciencias* (IBECS), *Banco de Dados de Enfermagem* (BDENF), *Coleção Nacional das Fontes de Informação do SUS* (ColecionaSUS), DISASTERS and others; at the PubMed Portal and PubMed Central (PMC) of the National Library of Medicine (NLM); at the Scientific Electronic Library Online (Scielo); on the CAPES Journals Portal, through the databases: Elsevier, Embase and Scopus; Clarivate Analytics: Web of Science; Ebsco: Cumulative Index to Nursing and Allied Health Literature (CINAHL); Academic Search Premier; and Epistemonikos: Database of the best Evidence-Based Health Care, information technologies and a network of experts.

Evidence selection

Based on the use of Rayyan application, developed by the Qatar Computing Research Institute (QCRI) to organize review data in a systematic way and blind assessment, two reviewers selected the studies based on the content of titles and abstracts, analyzed individually and simultaneously, maintaining the blinding of the review process. Disagreements were resolved by a third reviewer.

After this first stage, a new selection was carried out, based on a critical reading of full texts, to confirm the pertinence and extract the data of interest. The extraction of these data occurred independently by two reviewers, with the support of an adapted instrument proposed by the JBI. A third researcher analyzed conflicts in the absence of consensus.

RESULTS

A total of 878 studies were located in the databases/repositories, 49 in VHL, 62 in Ebsco, 458 in Embase, 73 in MEDLINE/PubMed, 115 in PMC, one in SciELO, 113 in Scopus, seven in WOS and four by manual search. In the end, 18 studies were selected, of which nine (50%) were extracted from Embase, four (22.2%) by manual search, two (11.1%) from VHL, two (11.1%) from PubMed and one (5.6%) from Ebsco, as shown in the PRISMA-ScR model flowchart (Figure 1).

For the purpose of characterizing the sources, the following information was organized in Chart 2: type of publication, authorship, year, journal, research institution, country of publication, type of institution of the authors (civil, military or government), title and language of origin.

It was found that 14 sources (77.8%) were published in the last ten years and that most authors' institutions of origin, 11 (61.1%), were linked to the civil environment, six (33.3%) to military institutions and one (5.6%) to a government institution.

Among the countries, the United States of America was the one that most published on the subject (six sources, 42.8%). The English language also stood out, with 13 publications (72.2%), followed by Portuguese, with three (16.7%), and Spanish, with two (11.1%). Considering the results, the authors identified four domains and 11 competencies that can be considered in the process of developing training strategies for air transport practices for patients in emergency situations and disasters involving CBRN agents (Chart 3).

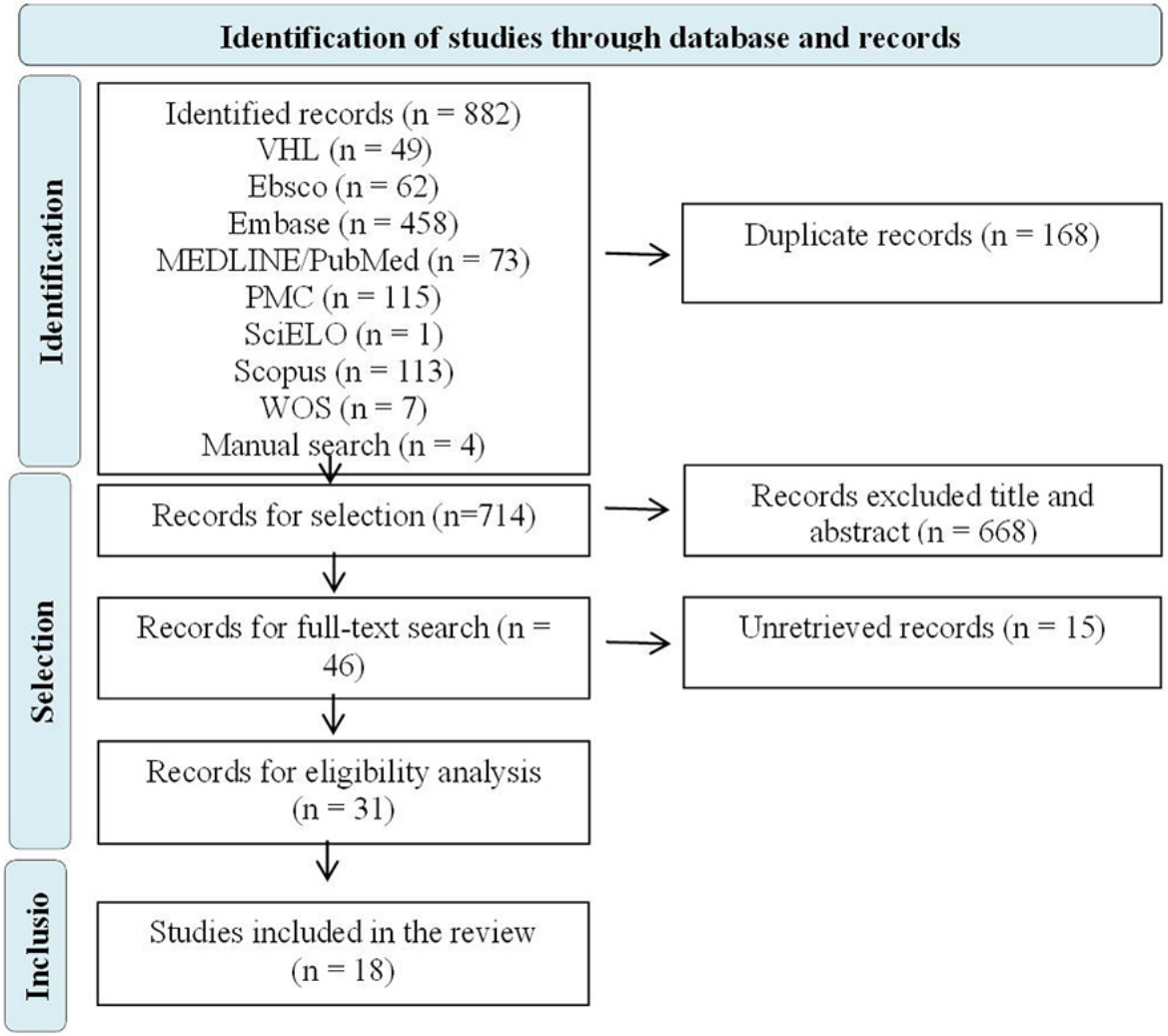

Figure 1 – PRISMA-ScR flowchart. Rio de Janeiro, RJ, Brazil, 2022.

Chart 2 – Sources mapped through scoping review. Rio de Janeiro, RJ, Brazil, 2022.

Title	Author/year	Source	Research binding institution	Country	Authors' institution type	Type	Language
Case study of medical evacuation before and after the Fukushima Daiichi nuclear power plant accident in the great east Japan earthquake	Okumura and Tokuno (2015)[9]	Disaster Mil Med.	NBC Threat Countermeasures (Nuclear, Biological and Chemical), Japan's Cabinet Secretariat National Security Affairs and Crisis Management	Japan	Government	Article	English
Evacuación sanitaria en condiciones de bioseguridad	Moya (2007)[13]	*Emergencias (St. Vicenç dels Horts)*	Military School of NBC Defense/ Spain	Spain	Military	Article	Spanish
Review of Literature for Air Medical Evacuation High-Level Containment Transport	Gibbs et al. (2019a)[14]	Air Medical Journal	Not identified	United States of America	Civil	Article	English
Ebola virus disease: preparedness and infection control lessons learned from two biocontainment units	Hewlett, Varkey, Smith, Ribner (2015)[15]	Curr Opin Infect Dis.	University of Nebraska Medical Center	United States of America	Civil	Article	English
La aeroevacuación de pacientes con patología infecciosa potencialmente tansmisible	Azofra and Mendez (2001)[16]	*Enferm. infecc. microbiol. clín*	Aerospace Medicine Instruction Center and Air Hospital	Spain	Military	Article	Espanhol
Doutrina de preparo e emprego da FAB em missões de transporte na defesa química, biológica, radiológica e nuclear (DCBRN)	Brasil (2014)[17]	*Diretriz do Cmd da Era DCA 1-6, de 07 de agosto de 2014*	Brazilian Air Force	Brazil	Military	Legislation	Portuguese
Multiple Patients with Burn Injury Induced by a Chemical Explosion Managed by Physician-Staffed Helicopters	Kondo et al. (2019)[18]	Disaster Med Public Health Prep.	Disaster Medical Research Center, Juntendo University, Shizuoka, Japan	Japan	Civil	Article	English
What clinical crew competencies and qualifications are required for helicopter emergency medical services? A review of the literature	Masterson et al. (2020)[19]	Scand J Trauma Resusc Emerg Med	Medical Directorate, National Ambulance Service, Dooradoyle -Ireland	Ireland	Civil	Article	English

Chart 2 – Cont.

Title	Author/year	Source	Research binding institution	Country	Authors' institution type	Type	Language
Need for aeromedical evacuation high-level containment transport guidelines	Gibbs et al. (2019b)[22]	Emerg Infect Dis.	Not identified	United States of America	Civil	Article	English
Air evacuation of citizens during the COVID-19 Epidemic	Gomes et al. (2021)[23]	Aerosp Med Hum Perform.	*Instituto de Medicina Aeroespacial Brig Médico Roberto Teixeira*	Brazil	Military	Article	English
H1N1 09 influenza—An aeromedical perspective	Lang and Croker (2010)[24]	Australasian Emerg Nursing J.	Royal Air Medical Services, Queensland, Australia	Australia	Civil	Article	English
Enfermagem militar na "Operação Regresso ao Brasil": evacuação aeromédica na pandemia do coronavírus	Borges et al. (2020)[25]	*Rev Bras Enferm.*	Brazilian Air Force	Brazil	Military	Article	Portuguese
A triage model for chemical warfare casualties	Khoshnevis et al. (2015)[26]	Trauma Mon.	Faculty of Trauma, Baqiyatallah University of Medical Sciences, Iran	Iran	Civil	Article	English
Ebola 2014 — New Challenges, New Global Response and Responsibility	Frieden et al. (2014)[27]	New England J of Med	Centers for Disease Control and Prevention, Atlanta	United States of America	Civil	Article	English
Case report: agrichemicals complicating emergency helicopter transport of a farm worker	James and Clair (2004)[28]	J. Agromedicine	University at Buffalo—SUNY	United States of America	Civil	Article	English
Defesa química, biológica, nuclear e radiológica: o preparo da Força Aérea Brasileira para operações conjuntas trabalho	Camerini (2014)[29]	*Repositório da Escola Sup de Guerra*	Superior School of War of the Brazilian Army	Brazil	Military	Dissertation	Portuguese
Helicopter air ambulance services	Ruskin (2019)[30]	Curr Opin Anesthesiol	Department of Anesthesia and Critical Care, University of Chicago	United States of America	Civil	Article	English
Should helicopters transport patients who become sick after a chemical, biological, radiological, nuclear, and explosive attack?	Yanagawa et al. (2018)[31]	Air Med J.	Japan firefighters	Japan	Civil	Article	English

Chart 3 – Mapping of domains and competencies for air transport practices for patients in emergency and disaster situations involving CBRN agents. Rio de Janeiro, RJ, Brazil,2022.

Domains	Competencies	Sources
Safety	1. Uses instruments and personal protective equipment to ensure professional health and safety.	Azofra and Mendez (2001)[16]
		Brasil (2014)[17]
		Gibbs et al. (2019b)[22]
		Hewlett et al. (2015)[15]
		Kondo et al. (2018)[18]
		Masterson (2020)[19]
		Moya (2007)[13]
		Okumura, Tokuno (2015)[9]
	2. Develops safety culture.	Hewlett et al. (2015)[15]
		Ruskin (2019)[30]
Technical/ educational	3. Understands the defense system in CBRN events.	Brasil (2014)[17]
		Kondo et al. (2018)[18]
		Moya (2007)[13]
	4. Responds to the specificities of CBRN events through strategically planned interventions, at different levels, offering control of contamination and damage to the health of vulnerable individuals, families and communities.	Brasil (2014)[17]
		Camerini (2014)[29]
		Frieden (2014)[27]
		Gibbs et al. (2019a)[14]
		Gibbs et al. (2019b)[22]
		Hewlett et al. (2015)[15]
		James and Clair (2004)[28]
		Hewlett et al. (2015)[15]
	5. Understands the importance of continuous training.	Azofra and Mendez (2001)[16]
		Kondo et al. (2018)[18]
		Masterson (2020)[19]
		Yanagawa et al. (2018)[31]
	6. Operates in the different scenarios of air transport practice for patients in emergency care.	Brasil (2014)[17]
		Camerini (2014)[29]
		Gibbs et al. (2019b)[22]
		Gomes et al. (2022)[23]
		Kondo et al. (2018)[18]
		Lang and Croker (2010)[24]
		Masterson (2020)[19]
		Okumura, Tokuno (2015)[9]
		Ruskin (2019)[30]

Chart 3 – Cont.

Domains	Competencies	Sources
Technical/ educational	7. Plans PAT.	Brasil (2014)[17]
		Borges et al. (2020)[25]
		Gibbs et al. (2019a)[14]
		Gomes et al. (2022)[23]
		Hewlett et al. (2015)[15]
		Khoshnevis (2015)[26]
		Lang and Croker (2010)[24]
		Masterson (2020)[19]
	8. Makes decisions, knowing how to diagnose and solve problems to face situations in constant change.	Gibbs et al. (2019a)[14]
		Masterson (2020)[19]
	9. Demonstrates quality and safety in professional practice.	Gibbs et al. (2019a)[14]
		Khoshnevis (2015)[26]
Multidisciplinary work	10. Recognizes work relationships, integrating multidisciplinary actions.	Gibbs et al. (2019b)[22]
Communication	11. Establishes effective communication.	Brasil (2014)[17]
		Gibbs et al. (2019b)[22]
		Kondo et al. (2018)[18]
		Lang and Croker (2010)[24]
		Masterson (2020)[19]

The four domains mapped refer to safety, technical/educational, multidisciplinary work and communication. With regard to competencies, those involving the defense system in CBRN events and the response to the specificities of air transport practices through planned interventions were mapped in seven (38.8%) studies. The competencies that address the use of instruments and equipment that ensure patient and professional safety were highlighted in eight (44.4%) studies. The use of personal protective equipment (PPE) and collective protection equipment (CPE) is extremely important for air medical transport, reducing the risk of team, crew, patients and aircraft contamination. In turn, issues directly related to pre-flight, flight and post-flight, such as the actual planning of air transport practices, were aspects highlighted in nine (50%) publications. The ability to act in different emergency and disaster scenarios was demonstrated in nine (50%) publications. The competencies that refer to continuous training and the development of technical-scientific training that confer quality and safety to professional practice were verified in five sources (27.7%), and this same quantity was demonstrated for the competency to establish good risk communication.

DISCUSSION

The observance of the correct use of PPE and health team safety proved to be relevant for training and periodic simulation exercises for air transport practices for patients in emergency and

disaster situations involving CBRN agents[9,13–19]. Indeed, the correct use of clothing provides security and credibility to care, which has the effect of demonstrating a positive risk perception and adequate decision-making[20].

In such practices, type A, B or C suits are generally used. Type A suit refers to fully encapsulated equipment, highly resistant to different chemical elements and with an individual autonomous breathing system, aiming at use in a scenario where there is still an unidentified agent, with completely unknown lethality potential. In turn, type B suit has an individual autonomous breathing system, but is not completely sealed, being used in scenarios where CBRN agents are known and pose a risk of contamination by inhalation. Type C suit uses a mask with high filtration potential, not encapsulated, containing a fluid resistant coverall in addition to boots and gloves. Type D involves standard precautions used in an in-hospital environment, which does not necessarily apply to situations involving CBRN agents[20,21].

A previous study[15] pointed out that health team members should prevent secondary contamination of people affected by such events. This measure can be achieved through the proper use of PPE and the establishment of decontamination and contamination control procedures with the use of detection devices for those affected.

As for the planning of air transport foreseeing the use of materials, care and equipment during pre-flight, flight and post-flight, some studies[15,17,19,22–26] demonstrate the importance of carrying out air transport in line with victims' clinical needs, regardless of the CBRN agent involved, and maintaining measures that promote team safety. To this end, (re)knowing the specificities and potential clinical effects of the CBRN agents involved allows for a greater possibility of controlling contamination and damage to the health of the people affected[14,15,17,18,22,27–29].

Competencies related to working relationships between members of air transport teams for patients, especially the ability to integrate multidisciplinary actions and establish effective communication, must be permeated by powerful strategies in order to obtain the best possible response pattern, given the complexity and logistical and care difficulties involved[14,17–19,24].

It is noteworthy that risk communication within the organization (institution) is strategic in the sense of keeping all members of the health teams involved and informed not only about the organizational guidelines themselves, but also on the most recent data on the event, including its direct and indirect effects that may have an impact on teams' work[24].

PAT generally reduces the time to access adequate assistance in certain situations involving CBRN agents and may lessen potential risks due to the criticality of some patients residing in inhospitable regions or in a state of lack of assistance. However, potential operational risks must be considered before making a decision for this mode of transport. This involves efficiency and assertiveness in decision-making and knowing how to diagnose and solve problems in the face of dynamic situations of emergencies and CBRN disasters[14,18,30].

The importance of developing and managing specific knowledge is highlighted with regard to patient care during air transport and patient care management[13,16,18] as well as acting in different scenarios in carrying out emergency care[9,14,16–18,23,24,29,30].

In addition to the competencies of an operational nature, aspects related to assistance and coordination of care through the appointment of specialists and researchers in such situations are aspects that tend to strengthen local governance regimes, based on the definition of responsibility matrices[14,16–19,24].

The constant training for qualification and for operational maintenance was highlighted in information sources, which pointed out that the benefits of simulated exercises and the training of practices in pre-flight, flight and post-flight allow the teams to be ready to operate in a real situation, which tends to provide a safer flight for everyone involved. Trainings were described as essential so

that teams can put theoretical knowledge into practice as well as become familiar with the attire and the use of specific PPE in the exercise of their functions, as they can help to correct any discrepancies and procedural deviations and contribute to promoting a flight safety culture, including the observance of standard operating protocols[14,16,18,19,22,30,31].

Given the above, the framework of identified competencies may positively enhance the organization of training processes for PAT, in the understanding that, when an emergency/disaster situation involving CBRN agents occurs, the fundamental premise that governs the mission of health operators is to save/maintain as many lives as possible. In this sense, systematizing training/qualification practices based on scientific evidence is to remain permanently prepared in favor of better response standards from services dedicated to PAT.

As limitations of this study, we point out the intersection of thematic axes still little explored in the scientific field: PAT in emergency situations and disasters involving CBRN agents. This operation gave us access to a still limited number of information sources, despite the fact that those mapped have addressed specificities that support the review of qualification/training processes on the subject.

CONCLUSION

From the mapping of competencies developed by this study, 11 competencies were identified and categorized, distributed into four domains related to air transport practices for patients in emergency situations and disasters involving CBRN agents.

The mapping indicated that, for PAT to be successful, health professionals need to develop skills and competencies for decision-making, effective risk communication and development of specific technical knowledge related to safe care so that its performance can be as successful as possible, even in the face of the challenges imposed by the complex context of responding to emergencies and disasters involving CBRN agents.

The mapping also identified the importance of investing in qualification/training strategies based on competencies, in order to achieve better standards of practices for transporting patients by air in the face of events of this nature, especially with regard to care quality and safety as well as protection of the members of the health teams involved.

It is noteworthy that the sources do not emphasize competencies related to the psycho-emotional preparation of health team members, since air transport practices in emergencies and CBRN disasters commonly demand actions of psychosocial care and mental health of patients and professionals involved.

The operationalization of protocols to improve training processes is revealed in the sources as fundamental to guarantee the effectiveness of these practices. Moreover, competency-based training is expressed as a strategy to ensure knowledge management and the development of skills applicable in such situations.

The alignment of specific competencies has the potential to contribute to the review and improvement of training strategies for such practices in the civil and military spheres, in order to maintain operability for this type of activity. In this regard, this work contributes to the approach of professional performance in an area that is still little explored by nursing, whether in undergraduate or graduate programs, since “disaster nursing” still constitutes, in some countries, a science in the process of being made and made known.

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NOTES

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CONFLICT OF INTEREST

There is no conflict of interest.

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