

Critical Care Nursing to Acute Respiratory Distress Syndrome Patients Undergoing Extracorporeal Membrane Oxygenation: A Scoping Review Protocol.

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Abstract

Objective: The objective of this scoping review is to map and understand the extent of the available scientific evidence regarding critical care nursing to acute respiratory distress syndrome (ARDS) patients undergoing extracorporeal membrane oxygenation (ECMO).

Introduction: At a first approach, the evidence about critical care nursing to ARDS patients undergoing ECMO, appears that falls short to identify and describe nursing care interventions.

Inclusion criteria: This scoping review research strategy is based on the definition of the participants, concept and context (PCC), the main elements used to establish inclusion and exclusion criteria (Peters et al., 2020). Concerning the participants, this research will focus on critically ill patients with ARDS undergoing ECMO. The inclusion criteria pondered will reflect only on adult patients. The concept considered will be critical care nursing. Studies involving ECMO cardiac support (VA-ECMO) will be excluded. Finally, the central context will be adult intensive care units (ICU).

Methods: This protocol articulates a pathway and is based on The Joanna Briggs Institute (JBI) methodology guidelines. All studies included regardless of language will consider a timeline limit of five years. The first approach is based on a digital research, in order to identify the relevant vocabulary. Afterwards a scientific data bases research will be conducted in Medical Literature Analysis and Retrieval System Online (MEDLINE[®]), in Cumulated Index to Nursing and Allied Health Literature (CINAHL[®]) and in PubMed[®] (Public/Publisher search engine accessing primarily MEDLINE database and others, present at the United States National Library of Medicine), using the keyword expression, that will best serve the sensitivity for the search. The studies selection will be based on the prior established headings, considering the inclusion and exclusion criteria set previously. The list of references will ponder articles, reviews and international guidelines. The data extraction will involve two independent reviewers, and if necessary, a third one will be considered. The results will be presented in a descriptive approach, with statistical charts and graphics.

Introduction

For the last few decades technology advances have grown faster than ever in human history. It's health applications gives us hope, specially when facing the challenge of life-threatening diseases. Extracorporeal membrane oxygenation (ECMO) is relatively recent, this very specialised, complex and expensive technique is available in many countries, although it's not yet universally accessible. In terms of concept, it is best described by Extracorporeal Life Support Organization (ELSO), ECMO "is the use of mechanical devices to support heart and/or lung function in severe heart or lung failure, unresponsive to optimal conventional care" (Brogan, 2019, p. 31). Accordingly, this technique can assume mainly two different types, venoarterial ECMO and venovenous ECMO, even though other hybrid combinations can also be found. The decision of which modality to provide lays on a variety of factors, such as physiopathology, urgency of implementation and institutional experience (Chan-Dominy et al., 2015, p. 291). Thus, respiratory or circulatory support provided by ECMO allows the damaged organ, either the heart or the lung, to rest, recover or it can also provide extra time when waiting for transplant. Therefore, although not being a cure, it has been recognised as a bridge to many different outcomes for patients. To sum up, ECMO allows cardiac and/or respiratory support in order to help the patient reach for a better chance of survival.

As a result of its complexity, ECMO requires the utmost level of monitoring of the patient, which usually can only be guaranteed by the intensive care units. In concept, "an ICU is an organized system for the provision of care to critically ill patients that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of life-threatening organ system insufficiency" (Marshall et al., 2017). These units are staffed with highly trained and specialised healthcare professionals. In this particular framework, nurses have an important role, mainly due to their permanent presence during the 24 hours. There are two types of nurses that might be involved, ECMO specialist nurse and critical care nurse. The first one, ECMO specialist, is a title not exclusive to the nursing staff, it can also be performed by a physician or a perfusionist depending on local health policies. Considered the most relevant to this review is critical care nursing's concept, a "specialised nursing care of critically ill patients who have manifest or potential disturbances of vital organ functions" (Goldsworthy, Kleinpell, & Williams, 2017, Chapter 1). According to the World Federation of Critical Care Nurses (WFCCN), an evidence-based practice focusing care on building a therapeutic relationship, considering the patient's multiple dimensions, while also preventing harm, managing advanced and complex techniques applied to the patient. s

An extremely demanding ambience is characteristic of ECMO support. For the purpose of the present scoping review, the relevant context is respiratory support. More specifically, in acute respiratory distress syndrome (ARDS) patients. This condition is characterised by an "acute onset of pulmonary oedema of non-cardiogenic origin, along with bilateral pulmonary infiltrates and reduction in respiratory system compliance" (Umbrello, Formenti, Bolgiaghi, & Chiumello, 2017) associated with lower levels of oxygen available in the blood and/or to the cells, hypoxemia and/or hypoxia, respectively. Different levels of severity are possible, therefore different treatments may be needed in order to stabilise and/or reverse the situation. It's a very intricate acute inflammation of the lungs, that may progress in time simultaneously with one or more organs failure, transforming itself into a systemic critical disorder.

The population relevant to the present review are adult critically ill patients with ARDS and undergoing ECMO. By definition "critical illness is a life-threatening multisystem process that can result in significant morbidity or mortality" (Robertson & Al-Haddad, 2013). Prompt recognition of signs and symptoms of patient's deterioration is crucial and plays a role in early treatment decisions, enhancing the possibilities of more positive outcomes. Meaning that the critically ill patient demands time sensitive therapeutic measures, with the purpose of survival, with a total or partial recovery of the physical and mental state that had before the disruptive critical illness, to return to his daily routine as a functional and active member.

At present, it is widely recognized that critical care nursing interventions are relevant to the patient's outcomes and this remains important in critically ill patients with ARDS and undergoing ECMO, since the severity rises proportionally considering patients previous morbidities and/or the level of impairment of other organs function during ARDS, due to the overall inflammatory process.

Nevertheless, the role of critical care nurses remains quite unclear, besides the efforts of international guidelines orienting the ECMO team. Therefore, this scoping review is aiming to map the knowledge of the most recent evidence available.

A preliminary search of MEDLINE®, the Cochrane Database of Systematic Reviews® and *JBI Evidence Synthesis*® was conducted and no current or underway systematic reviews or scoping reviews on the topic were identified.

In summary, the objective of this scoping review is to assess the extent of the recent literature regarding critical care nursing to ARDS patients undergoing ECMO.

Review Question

What is the available scientific evidence about critical care nursing to acute respiratory distress syndrome patients undergoing extracorporeal membrane oxygenation?

Keywords

Acute Respiratory Distress Syndrome; Critical Care Nursing; Extracorporeal Membrane Oxygenation; Intensive Care Units; Nursing Interventions.

Eligibility Criteria

Participants

The present scoping review will consider studies that include patients with acute respiratory distress syndrome undergoing extracorporeal membrane oxygenation.

Concept

This scoping review will consider the concept of critical care nursing to acute respiratory distress syndrome patients undergoing extracorporeal membrane oxygenation. Critical care nursing definition relevant for this review is a "specialised nursing care of critically ill patients who have manifest or potential disturbances of vital organ functions" (Goldsworthy et al., 2017, Chapter 1). Studies concerning ECMO venoarterial will be excluded.

Context

For the matter of this scoping review, studies involving adult intensive care unit's context will be explored.

Types of Sources

This scoping review will consider both experimental and quasi-experimental study designs, including randomized controlled trials, non-randomized controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control studies and analytical cross-sectional studies will be

considered for inclusion. This review will also consider descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies for inclusion. Qualitative studies will also be considered that focus on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, qualitative description, action research and feminist research.

In addition, systematic reviews that meet the inclusion criteria will also be considered, depending on the research question.

At last, this scoping review will also consider books and international guidelines set by recognised international organisations relevant to this topic. Any other unpublished material will be excluded. Language barriers will not be set for the present scoping review. Although, the timeline considered will include the last five years of scientific evidence available, considering that a first approach to databases about this subject exposed that there was a boom of scientific evidence produced recently.

Methods

"A scoping review protocol is important, as it pre-defines the objectives, methods, and reporting of the review and allows for transparency of the process" (Peters et al., 2020).

The proposed scoping review will be conducted in accordance with the JBI methodology for scoping reviews, therefore the present protocol will be registered at the Open Science Framework digital platform, which allows a primary literature gestalt view. Enabling the first analysis of the available evidence, that for this purpose will consider the main concepts of the rationale, while also reflecting the inclusion and exclusion criteria set, as presented before in this protocol.

Search Strategy

The search strategy will aim to locate both published and unpublished studies, initially in a limited form throughout MEDLINE[®], CINAHL[®] and PubMed[®], in order to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles and the index terms used to describe the articles, were used to develop a full search strategy with the help of a research librarian for PubMed[®] and is presented in Appendix 1. The search strategy, including all identified keywords and index terms, will be adapted for each included database and/or information source. The reference list of all included sources of evidence will be screened for additional studies.

Studies published in any language will be included. Also, studies published since 2016 will be included, taking in consideration that the first approach to scientific databases revealed that there was an explosion of scientific evidence produced recently.

The databases to be searched include MEDLINE[®], CINAHL[®] and PubMed[®]. Sources of unpublished information to be searched include international guidelines recognized among professional peers, regarding the topic.

Source of Evidence Selection

Following the search, all identified citations will be collated and uploaded into Mendeley Desktop Version 1.19.8 (© 2008-2020 Mendeley Ltd.) and duplicates removed. Subsequently a pilot test, titles and abstracts will be screened by two or more independent reviewers for assessment against the inclusion criteria for the review. Potentially relevant sources will be retrieved in full, and their citation details imported into the Rayyan Qatar Computing Research Institute[®] (QCRI) intelligent systematic review software for the unified management, assessment and review of the studies collected. The full text of selected citations will be assessed in detail against the inclusion criteria by two or more independent reviewers. Reasons for exclusion of sources of evidence at full text that do not meet the inclusion criteria, will be recorded and reported in the scoping review. Any disagreements that arise between the reviewers at each stage of the selection process, will be resolved through discussion, or with an additional reviewer. Critical and methodological evaluation

of the selected studies is not required in this kind of review (Peters et al., 2020). The results of the search and the study inclusion process will be reported in full in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-Analyses[®] extension for scoping review (PRISMA-ScR) flow diagram, in order to improve quality and facilitate complete and transparent reporting (Tricco et al., 2018).

Data Extraction

Data will be extracted from papers included in the scoping review by two or more independent reviewers using a data extraction tool developed by the reviewers. The data extracted will include specific details about the participants, concept, context, study methods and key findings relevant to the review question. A draft extraction form is provided (see Appendix 2). The draft data extraction tool will be modified and revised as necessary during the process of extracting data from each included evidence source. Modifications will be detailed in the scoping review. Any disagreements that arise between the reviewers will be resolved through discussion, or with an additional reviewer. If appropriate, authors of papers will be contacted to request missing or additional data, where required.

Data Analysis and Presentation

The evidence presented should directly respond to the review objective and question. The data will be presented graphically or in diagrammatic, or even in a tabular form. A narrative summary will accompany the tabulated and/or charted results and will describe how the results relate to the reviews objective and question.

Acknowledgements

This scoping review relates directly to the ongoing Masters in Specialized Critical Care Nursing, therefore, a relevant contribution comes from Health Sciences Institute of Universidade Católica Portuguesa (Lisbon), more specifically through the resources made available for the students, such as remote access to scientific data bases. Also, considering the human resources, the library team managed by João Dias (PhD), with the help of Claudia Catanho (PhD) and Maria Perdigão (PhD), are a valuable asset.

Funding

No funding was received for this research.

Conflicts of interest

None of the authors have relevant conflict of interests to declare.

Ethics approval

Ethics approval is not required for this type of research.

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Appendices

Appendix I: Search Strategy

The search strategy presented here, was conducted in PubMed®. It regards mainly four of the keywords mentioned earlier in this document.

Search	Query	Records retrieved
#1	"respiratory distress syndrome"[MeSH Terms]	37,098
#2	"critical care nursing"[MeSH Terms]	2,512
#3	"intensive care units"[MeSH Terms]	94,766
#4	#2 OR #3	96,357
#5	"extracorporeal membrane oxygenation"[MeSH Terms]	12,710
#6	ECMO	19,071
#7	#5 OR #6	19,071
#8	#7 NOT venoarterial[All Fields]	16,226
#9	#1 AND #4 AND #8	181
#10	#9 Limited to #2016 #abstract available #adults 19 years +	70

Appendix II: Data Extraction Instrument

Scoping Review Details	
Title	Critical care nursing to acute respiratory distress syndrome patients undergoing extracorporeal membrane oxygenation.
Objective	The objective of this scoping review is to map and understand the extent of the available scientific evidence regarding critical care nursing to acute respiratory distress syndrome (ARDS) patients undergoing extracorporeal membrane oxygenation (ECMO).
Question	What is the available scientific evidence about critical care nursing to acute respiratory distress syndrome patients undergoing extracorporeal membrane oxygenation?
Inclusion/Exclusion Criteria	
Participants	Patients with acute respiratory distress syndrome undergoing extracorporeal membrane oxygenation.
Concept	Critical care nursing to acute respiratory distress syndrome patients undergoing extracorporeal membrane oxygenation. Studies concerning ECMO venoarterial will be excluded.
Context	Adult intensive care unit's context will be explored.
Types of evidence source	Experimental and quasi-experimental study designs including randomized controlled trials, non-randomized controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control studies and analytical cross-sectional studies will be considered for inclusion. Also, descriptive observational study designs including case series, individual case reports and descriptive cross-sectional studies will be pondered. Qualitative studies will also be considered that focus on qualitative data including, but not limited to, designs such as phenomenology, grounded theory, ethnography, qualitative description, action research and feminist research.
Evidence source Details and Characteristics	
Authors	
Title	
Keywords	

Objectives/Aims			
Publication Date			
Country/Language			
Methodology Adopted			
Participants	Number		
	Age range		
	Gender		
	ARDS and ECMO	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	ECMO Support Type		
Concept	Critical Care Nursing	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	ECMO Specialist Nurse	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Context	Adult ICU	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Details/Results extracted from source of evidence			
Critical Care Nursing Activities/Interventions			
Key Findings			
Gaps in the Research			

