

# BEDSIDE ULTRASOUND EXECUTION FOR CRITICAL PATIENT: SCOPE REVIEW PROTOCOL

## Execução do ultrassom à beira leito no paciente crítico: protocolo de revisão de escopo

Ladyanne Kessin Flores<sup>1</sup>  
ORCID: 0000-0002-3249-1575

Aline Lima Pestana Magalhães<sup>1</sup>  
ORCID: 0000-0001-8564-7468

Érica Brandão de Moraes<sup>2</sup>  
ORCID: 0000-0003-3052-158X

<sup>1</sup>Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil

<sup>2</sup>Universidade Federal Fluminense, Niterói, RJ, Brazil

### Editors:

Ana Carla Dantas Cavalcanti  
ORCID: 0000-0003-3531-4694

Paula Vanessa Peclat Flores  
ORCID: 0000-0002-9726-5229

Sílvia Maria de Sá Basílio Lins  
ORCID: 0000-0002-6717-9223

### Corresponding author:

Ladyanne Kessin Flores  
E-mail: ladykessin@gmail.com

Submission: 02/28/2023

Approved: 08/08/2023

### ABSTRACT

**Objective:** To describe the scientific evidence about bedside ultrasound health professionals performing in a critical environment. **Method:** Scope review based on Joanna Briggs Institute methodological terms and standards, guided by the question "How is the use of Point-of-Care Ultrasound - POCUS / ultrasound at the bedside described in the literature by health professionals in direct care to critical patients?". The search involves nine databases and in the gray literature. The selection of evidence is in three stages, and the Mendeley software is used to manage study references. The study evaluation is based on the pre-established inclusion criteria and was carried out by three reviewers, two independently and a third, to assess differences. The extracted data has a descriptive and synthetic presentation of the results.

**Descriptors:** Ultrasonics; Critical Care; Patient Care Team.

### RESUMO

**Objetivo:** Descrever as evidências científicas acerca do ultrassom à beira do leito, executado pelos profissionais de saúde em ambiente crítico. **Método:** Revisão de escopo pautado nas normas e termos metodológicos do Joanna Briggs Institute (JBI), norteadas pela pergunta "Como está descrito na literatura o uso do *Point-of-Care Ultrasound* - POCUS / ultrassom à beira do leito pelos profissionais de saúde na assistência direta ao paciente crítico?". A busca envolve nove bases de dados e na literatura cinzenta. A seleção de evidências se apresenta em três etapas, e para o gerenciamento das referências dos estudos se utiliza o *software* Mendeley. A avaliação dos estudos está sustentada nos critérios preestabelecidos de inclusão, e foi realizada por três revisores, sendo dois de modo independente e um terceiro para apreciação das divergências. Os dados extraídos têm apresentação descritiva e sintética dos resultados.

**Descritores:** Ultrassom; Cuidados Críticos; Equipe de Assistência ao Paciente.

### INTRODUCTION

The first prototype of a portable ultrasound unit was produced for military use in 1998. Moreover, over the years, health professionals have been able to perform ultrasound at the bedside using portable machines of various sizes; this practice is recognized as Point-of-Care Ultrasound (POCUS)<sup>(1)</sup>.

The ultrasound at the point of care is adopted as an extension of the physical examination; the "Service" method is a relatively low-cost technology in environments with limited resources globally. More recently, POCUS was widely used during the COVID-19 pandemic, being considered an adjuvant in managing and treating patients affected by coronavirus, ensuring greater safety in decision-making and agility in results<sup>(1-3)</sup>. POCUS is the term used for sonographic examination directed to the rapid objectives, either in the pre-hospital environment (HPA) in an ambulance, in an emergency unit, trauma Center (CT) or in an in-hospital environment, such as an Intensive Care Unit (ICU), using portable and compact equipment<sup>(4)</sup>. This ultrasound

modality has the potential to rapidly diagnose a variety of pathologies at the bedside<sup>(5)</sup>.

In the ICU, POCUS is already routinely performed by medicine in the institutions that have this resource, and it has also been explored by nursing because most of the hospitalized patients are poly-invaded with catheters, use mechanical ventilation, receive a continuous enteral diet and use a vesical delay probe<sup>(6)</sup>. POCUS plays an essential role in this care scenario since it is not an invasive procedure; it does not have ionizing radiation that causes health risks and contributes to decision-making; it increases the efficiency of procedures and helps prevent adverse events<sup>(7)</sup>.

Using ultrasound at the bedside, the health professional can evaluate several semiologic scenarios in patients, using insonation to support physical examination. His evaluation ranges from airway permeability, orotracheal tube positioning, nasogastric tube check, nasoenteral, gastric volume, pulmonary and cardiac evaluation, vesic volume check, and vascular screening, among other applications, as in trauma through Extended Focused Assessment with Sonography for Trauma (E-fast) protocol<sup>(2-3)</sup>.

The POCUS performance in a critical environment can improve the quality of care, reduce adverse events, and provide an assertive treatment to the patient; the evidence that supports its use is on the rise<sup>(7)</sup>. In the ICU, daily discussions are held between the multidisciplinary team, in which nurses are one of the pillars in the process of defining care; thus, the need for a more expressive and active action by this professional, who accompanies the technological evolution of health and contributes to the patient's safety policies.

A previous search for revisions was carried out in the Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Medical Literature Analysis and Retrieval System (MEDLINE) databases, and studies were found with themes related to ultrasound "at the edge of the bed", "Point-of-Care Ultrasound", "POCUS", and "bedside ultrasound", however, most studies were related to the specific use of the medical professional, and among the few that cite the performance by nurses or other health professionals, no review papers were identified.

The appropriate use of technology in the health field can improve the clinical evaluation of the professional and expand the scope of his or her actions<sup>(8)</sup>. Since POCUS provides several benefits to the patient and the health team, its use

is still incipient in some areas, such as nursing; thus, a review study addressing the subject is of paramount importance. Given the above, this study aims to describe the scientific evidence about bedside ultrasound performed by health professionals in a critical environment.

## METHOD

It is a scope revision based on the standards and methodological terms of the Joanna Briggs Institute (JBI)<sup>(9)</sup>. It is understood that scope review is "um type of evidence synthesis that aims to systematically identify and map the extent of evidence available in a given topic, field, concept or issue, often regardless of source (i.e. primary research, reviews, non-empirical evidence) within or between specific contexts"<sup>(10)</sup>. In general, scope reviews are commonly used for 'discovery' to clarify a topic or field's job definitions and conceptual boundaries. Scope reviews are, therefore, beneficial when a body of literature has yet to be comprehensively reviewed or has a complex and heterogeneous nature that is not susceptible to a systematic review<sup>(11)</sup>. In this work, the recommendations for making preferred Reporting Items for Systematic reviews and Meta-Analysis extension for scoping reviews (PRISM-SCR) will be followed<sup>(12)</sup>. The registration of this scope review protocol is on the Open Science Framework (OSF), DOI: 10.17605/OSF.IO/KZU2Y.

According to JBI, the scope review consists of nine steps: 1) Definition of the objective and question of research; 2) Formulation and alignment of the eligibility criteria with the objective and question of research; 3) Describe the strategy for the tracing of evidence, as well as for the selection and extraction of data, in addition to the presentation of the evidence found; 4) Search for studies; 5) Select the data; 6) Extract the data; 7) analyze the data; 8) Presentation of the results; 9) Summarize the content of the selected studies, analyzing their evidence and observing the inferences of the results.

## Review question

For the definition of the question and objectives of the review, the mnemonic strategy, represented by the acronym PCC: population, concept, and context, detailed in Figure 1, was used. The review question: "How is the use of Point-of-Care Ultrasound - POCUS / ultrasound at the bedside described in the literature by healthcare professionals in the direct care of critical patients?"

<b>P</b>	Population	Health professionals
<b>C</b>	Concept	Use of bedside ultrasound
<b>C</b>	Context	Critical environment

**Figure 1** - PCC mnemonic Strategy. Florianópolis, SC, Brazil, 2022

**Inclusion criteria**

**Population**

Studies that involve health professionals in the direct care of critical patients who use POCUS or ultrasound at the bedside in clinical practice will be included.

**Concept**

This review will consider studies that include using POCUS or ultrasound at the bedside by health professionals involved in the direct care of critical patients. POCUS is the term used for an ultrasound at the bedside, that is, at the point of care, and is an exam directed to the rapid objectives, both in the pre-and in-hospital environment<sup>(4)</sup>.

**Context**

This review will consider only studies conducted in pre- and in-hospital emergency, emergency, and intensive care environments: ambulance, emergency unit, and ICU.

Articles, simple and expanded abstracts indexed in the databases included in the search strategy, theses, dissertations, experience reports, protocols, and guidelines included in the gray literature will be considered. The area of coverage implies the worldwide scope, without limitation of language, of timeless publication, without restrictions on methodological design, that answers the question of research. Exclusion criteria will be studies related to pe-

diatrics and neonatology, clinical ultrasound with diagnostic report, ultrasound in esthetic treatment, and obstetric ultrasound since POCUS does not provide objective reporting but seeks evidence for immediate decision-making.

**Research strategy**

Based on a protocol for the elaboration of the search strategy, the research will be carried out in the following databases: MEDLINE, through its free PubMed interface; Scientific Electronic Library onLine (SCIELO); Excerpta Medica Database (EMBASE); Latin American and Caribbean Literature on Health Sciences (LILACS), Web of Science (WOS); CINAHL, SCOPUS, COCHRANE Library, Google Scholar, ProQuest Dissertations & Theses Global and CAPES thesis bank. To expand the research spectrum, articles, theses, and dissertations from online repositories such as Google Scholar, Google’s scientific research platform, which indexes the so-called “gray literature,” will be analyzed.

**A planned approach to search for evidence, selection, data extraction, and presentation of evidence**

Initially, the search will be performed in two online databases (MEDLINE and CINAHL), in which the words contained in the title and abstract and indexed terms used to describe the articles will be analyzed.

In the sequence, a search will occur in the other databases, being added to the indexed terms and keywords found in the two databases of the first step.

Then, the entire reading will be performed in all databases, as well as the search in the references of the studies.

An example of the database search strategy is described in Figure 2.

Sources of information	Search strategy
MEDLINE via PubMed	<i>("Ultrasonography, Interventional "[Mesh]OR" Ultrasonography, Interventional "OR" Interventional Ultrasound "OR" Interventional Ultrasonography "OR" Point-of-Care Ultrasound "OR" Point of Care Ultrasound "OR" POCUS") AND ("Health Personnel"[Mesh] OR "Health Personnel" OR "Health Care Professional" OR "Health Care Professionals" OR "Healthcare Worker" OR "Healthcare Workers" OR "Nurses"[Mesh] OR "Nurses") AND ("Critical Care"[Mesh] OR "Critical Care" OR "Intensive Care" OR "Surgical Intensive Care" OR "Intensive Care Units"[Mesh] OR "Intensive Care Units" OR "ICU Intensive Care Units" OR "Intensive Care Unit" OR "Emergencies"[Mesh] OR "Emergencies" OR "Emergency")</i>

**Figure 2** - Database search strategy - PCC. Florianópolis, SC, Brazil, 2022

**Evidences selection**

Two reviewers will independently replicate the research strategies. To ensure methodological rigor, after searching the selected information resources, the results will be organized and managed in a free online bibliographical reference management software, Mendeley (Mendeley Ltd., Elsevier, Netherlands), excluding duplicate records. A third reviewer will assess the differences.

In the screening, two reviewers shall independently read the titles and abstracts and compare them with the inclusion and exclusion criteria. The eligibility of the studies will be decided by consensus among the authors. In cases where there is no consensus, a third evaluator will be consulted. A third evaluator will be consulted when there is no consensus. The process will

end with separating studies identified in categories / themes.

The selection results will be displayed in a flow diagram of the items.

**Data extraction**

The data will be obtained through a spreadsheet prepared in Excel, as shown in Figure 3, seeking to extract the following information: year, authors, first author’s training, title, country of origin, journal, objective, type of study (article, thesis, dissertation), study design, description of the use of POCUS in direct care to the critical patient, which health professional used POCUS. Two independent reviewers will perform data extraction and mapping, discuss the results, and continually update the chart.

Reviewer							Date of extraction						
Code	Year	Authors	Author’s profession	Title	Country	Journal	Purpose	Type of study	Study design	Context	Professionals involved	Results and benefits	Recommendations / suggestions

**Figure 3** - Data extraction instrument. Florianópolis, SC, Brazil, 2023

The research will follow the PRISM-SCR protocol<sup>(12)</sup>, which was developed by a series of experts in scope analysis and evidence synthesis, including members of the JBI / the JBI Collaboration (JBIC) working group, to be consistent with the JBI scope review methodology<sup>(12)</sup>.

After the study’s critical evaluation, a summary of the results in tables and diagrams and a narrative summary and representative figures will be presented.

**Analysis and presentation of results**

The data will be analyzed to meet the research objectives and will involve quantitative and qualitative data, expressing the frequency and content of the themes found. The extracted data will be presented through a flowchart, as recommended for scope reviews<sup>(13)</sup>. The presentation will be written with narrative and visual summarizing.

**CONFLICT OF INTERESTS**

The authors have declared that there is no conflict of interests.

**REFERENCES**

1. Lee L, De Cara JM. Point-of-Care Ultrasound. *Curr Cardiol Rep.* 2020;22(11):149. <https://doi.org/10.1007/s11886-020-01394-y>
2. Sun J, Li Q, Wu X, Wang X, Liu D. Nurse-performed ultrasound: A new weapon against COVID-19. *Critical Care.* 2020;24(1):430. <https://doi.org/10.1186/s13054-020-03160-6>

3. Yadav S, Singh A, Manisha K, Khanna P. Point of care ultrasound in Coronavirus Disease 2019 pandemic: One modality helping multiple specialties. *J Med Ultrasound*. 2021;29(1):9-14. [https://doi.org/10.4103/JMU.JMU\\_114\\_20](https://doi.org/10.4103/JMU.JMU_114_20)
4. Conselho Regional de Enfermagem do Distrito Federal (BR). Parecer técnico nº 14/2021. Utilização do Ultrassom Point-of-Care (POCUS) por enfermeiros em situações de emergência e na internação [Internet]. Brasília (DF): COREN-DF; 2021 [cited 2023 Mar 22]. Available from: <https://www.coren-df.gov.br/site/wp-content/uploads/2021/07/pt142021.pdf>
5. Prager R, Bowdridge J, Kareemi H, Wright C, McGrath TA, McInnes MDF. Adherence to the Standards for Reporting of Diagnostic Accuracy (STARD) Guidelines in Acute Point-of-Care Ultrasound Research. *JAMA*. 2020;3(5):e203871. <https://doi.org/10.1001/jamanetworkopen.2020.3871>
6. Qaseem A, Etzeandía-Ikobaltzeta I, Mustafa RA, Kansagara D, Fitterman N, Wilt TJ. Appropriate Use of Point-of-Care Ultrasonography in Patients With Acute Dyspnea in Emergency Department or Inpatient Settings: A Clinical Guideline From the American College of Physicians. *Ann Intern Med*. 2021;174(7):985-993. <https://doi.org/10.7326/M20-7844>
7. Wong A, Robba C, Mayo P. Critical care ultrasound. *Intensive Care Med*. 2022;48(8):1069-1071. <https://doi.org/10.1007/s00134-022-06735-9>
8. Ferreira CIV, Simões IMH. Validation of a nursing protocol for the assessment and diagnosis of urinary retention in adults. *Rev Nurse Ref*. 2019;23:153-64. <https://doi.org/10.12707/RIV19064>
9. Peters MDJ, Godfrey C, McInerney P, Munn Z, Tricco AC, Khalil H. Chapter 11: Scoping Reviews (2020 version). In: Aromataris E, Munn Z, editors. *JBIM Manual for Evidence Synthesis* [Internet]. Adelaide: JBI; 2020 [cited 2023 Mar 22]. Available from: <https://synthesismanual.jbi.global>
10. Munn Z, Pollock D, Khalil H, Alexander L, McInerney P, Godfrey CM, et al. What are scoping reviews? Providing a formal definition of scoping reviews as a type of evidence synthesis. *JBIM Evid Synth*. 2022 Apr 1;20(4):950-952. <https://doi.org/10.11124/JBIES-21-00483>
11. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. Updating guidance for reporting systematic reviews: development of the PRISMA 2020 statement. *J Clin Epidemiol*. 2021;134:103-112. <https://doi.org/10.1016/j.jclinepi.2021.02.003>
12. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467-473. <https://doi.org/10.7326/M18-0850>
13. Peters M, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. *JBIM Evid Synth*. 2020;18(10):2119-2126. <https://doi.org/10.11124/JBIES-20-00167>

#### AUTHORSHIP CONTRIBUTIONS

Project design: Flores LK, Magalhães ALP

Data collection: Flores LK, Magalhães ALP

Data analysis and interpretation:

Writing and/or critical review of the intellectual content: Flores LK, Magalhães ALP, Moraes EB de

Final approval of the version to be published: Flores LK, Magalhães ALP, Moraes EB de

Responsibility for the text in ensuring the accuracy and completeness of any part of the paper: Flores LK, Magalhães ALP, Moraes EB de



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