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**SPECIALISED INTERVENTIONS ON CRITICALLY ILL
PERSON WITH SEPTIC SHOCK:
A SYSTEMATIC REVIEW OF THE LITERATURE**

**INTERVENÇÕES ESPECIALIZADAS À PESSOA
EM SITUAÇÃO CRÍTICA EM CHOQUE SÉPTICO:
REVISÃO SISTEMÁTICA DA LITERATURA**

**INTERVENCIONES ESPECIALIZADAS PARA EL ENFERMO
CRÍTICO CON SHOCK SÉPTICO:
UNA REVISIÓN SISTEMÁTICA DE LA LITERATURA**

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ABSTRACT

Introduction: Sepsis is a worldwide problem that affects all countries in the world, it is estimated that it affects about 49 million people per year. It is important to know how to characterize sepsis from septic shock, so that we can understand the pathophysiological process, identify signs, symptoms and possible signs of instability. This pathology has an easy progression, and time is an essential factor for its prognosis. The aim is to identify the specialized interventions that the multidisciplinary team should perform.

Methodology: Research was carried out on the EBSCO platform, using the Boolean equation: septic AND critical care AND nursing AND patient. Through the application of the inclusion and exclusion criteria, after the studies have been analyzed according to the Joanna Briggs Institute evaluation guides, we obtained a selection of 7 articles.

Results: All authors obtained important findings regarding the intervention bundles that are recommended by the "hour-1 bundle". They identify the importance of assessing serum lactate; despite the low rate of positive blood cultures, these continue to be an essential role in the intervention of antibiotic de-scaling; these are still not administered during the first hour; the importance of fluid resuscitation was identified and should be carefully monitored; and vasopressor therapy was also identified as being essential every time MAP is not adequate.

Conclusion: Training and capacity of multidisciplinary teams is essential, as the insecurity and lack of knowledge of professionals, directly affect the provision of their care and the expected outcomes.

Keywords: Critical care; Specialised Interventions; Septic Shock.

RESUMO

Introdução: A sépsis é uma problemática global que atinge todos os países do mundo, estimando-se que afete cerca de 49 de milhões de pessoas por ano. Torna-se importante saber distinguir sépsis de choque séptico, de modo a entender o processo fisiopatológico, identificar sinais, sintomas e possíveis focos de instabilidade. Esta, tem uma fácil progressão, sendo o tempo, um fator imprescindível ao seu prognóstico. O seu objetivo visa identificar as evidências científicas sobre as intervenções especializadas, que a equipa multidisciplinar deve realizar perante a pessoa em situação crítica em choque séptico.

Metodologia: Foi realizada pesquisa na plataforma EBSCO e uso da equação booleana: *septic AND critical care AND nursing AND patient*. Através da aplicação dos critérios de inclusão

e exclusão e após análise segundo as grelhas de avaliação de Joanna Briggs Institute, obtivemos uma seleção de 7 artigos.

Resultados: Todos os autores obtiveram achados importantes relativamente aos feixes de intervenção preconizados pela “hour-1 bundle”. Identificaram a importância da avaliação do lactato sérico; apesar da diminuta taxa de hemoculturas positivas, continuam a ter um papel essencial na descalção de antibióticos; estes continuam a não ser administrados durante a primeira hora; foi identificada a importância da ressuscitação volémica; e também a terapia vasopressora foi identificada como essencial sempre que a pressão arterial média (PAM) não seja adequada, de modo a permitir a perfusão dos órgãos e tecidos.

Conclusão: É fundamental a formação, treino e capacitação das equipas multidisciplinares, pois a insegurança e a falta de conhecimento dos profissionais, afeta diretamente a prestação dos seus cuidados e dos *outcomes* esperados.

Palavras-chave: Choque Séptico; Doente Crítico; Intervenções Especializadas.

RESUMEN

Introducción: La sepsis es un problema global que afecta a todos los países del mundo y se estima que afecta a alrededor de 49 millones de personas al año. Es importante saber distinguir la sepsis del shock séptico, para que podamos comprender el proceso fisiopatológico, identificar signos, síntomas y posibles focos de inestabilidad. Este tiene una fácil progresión, y el tiempo es un factor fundamental para su pronóstico. El su objetivo es identificar qué intervenciones especializadas debe realizar el equipo multidisciplinario.

Métodos: La investigación se realizó en la plataforma EBSCO, utilizando la ecuación booleana: séptico Y cuidados críticos Y enfermera Y paciente. Mediante la aplicación de los criterios de inclusión y exclusión, y después de analizados de acuerdo con las tablas de evaluación del Instituto Joanna Briggs, se obtuvo una selección de 7 artículos.

Resultados: Todos los autores obtuvieron hallazgos importantes en relación con el paquete de intervención recomendados por el “paquete de hora – 1”. Identificaron la importancia de evaluar el lactato sérico; a pesar de la baja tasa de hemocultivos positivos, estos tienen un papel fundamental en la desincrustación antibiótica; estos aún no se administran durante la primera hora; se identificó la importancia de la reanimación con líquidos; y la terapia vasopresora fue identificada como esencial cuando la PAM no es adecuada.

Conclusión: La formación y capacitación de equipos es fundamental, ya que la inseguridad y el desconocimiento de los profesionales afectan directamente la prestación de sus cuidados y los resultados esperados.

Descriptores: Intervenciones Especializadas; Paciente Crítico; Shock Séptico.

INTRODUCTION

According to the World Health Organization (WHO), sepsis is defined as a response of the human body to any infectious process and, if it is not recognized and treated early, it can progress to septic shock, multiorgan failure and even death. This is a global problem that affects all countries in the world, it is estimated that it affects about 49 million people per year, where 11 million of them end up dying⁽¹⁾.

With this, it becomes important to know how to distinguish sepsis from septic shock, so that it is possible to better understand the pathophysiological process and identify signs, symptoms and possible foci of instability in the face of the person in a critical situation. This health problem has an easy progression, and time is an essential factor in its prognosis.

According to Vaughan & Parry⁽²⁾, sepsis is normally caused by bacterial, viral or fungal infections, with the respiratory tract being the most affected, followed by the abdominal and urinary tract. All this is a complex process that involves several inflammatory responses resulting in tissue injuries that, due to vascularization deterioration, are unable to perfuse the organs, thus causing damage to them. This hypoperfusion and/or even tissue ischemia causes arterial hypotension which in turn leads to organic damage. The same authors define septic shock as the most severe version of sepsis, always associated with organic dysfunction, arterial hypotension, hypoperfusion or altered state of consciousness.

It was in 2016 that the Sepsis-3 Consensus⁽³⁾ defined septic shock as a subvariant of sepsis, where there are severe changes with organ dysfunction, characterized by persistent hypotension that is refractory to volume resuscitation and lactacidemia > 2 mmol/L.

According to the International Classification for Nursing Practice (ICNP)⁽⁴⁾, septic shock is considered a nursing diagnosis, characterized as a “rapid peripheral circulatory failure, caused by a generalized infection, accompanied by purulence and bacillaemia”. Both sepsis and septic shock are considered to be the main health problems currently existing⁽⁵⁾.

In this context, it is considered pertinent by us to carry out this review, in order to list the possible interventions, justifying their importance, with the person in a critical situation.

METHODOLOGY

Review objectives

The main objective of this review is to identify the scientific evidence on the specialized interventions that the multidisciplinary team must carry out before the person in a critical situation in septic shock.

Research strategies

This is a systematic literature review (SLR) of quantitative studies. According to Joanna Briggs Institute (JBI)⁽⁶⁾, an SLR aims to provide a comprehensive and impartial synthesis on a given topic, using some of the most current studies on it, in order to summarize all the knowledge about the topic in question. This is a document prepared according to strict criteria and methods.

The first step carried out for the construction of this review was the elaboration of the research question. According to Apostle⁽⁷⁾, this question must be clear and feasible, in order to guide the entire implementation of this process.

Thus, the following research question was defined: What are the specialized interventions for the person in critical condition in septic shock?

This was identified and developed through the PICOD methodology, from which some of the inclusion and exclusion criteria were extracted, thus limiting the investigation (Table 1⁷).

After identifying all these factors, the research was carried out on the EBSCO platform, having been selected from the following databases: business Source Complete, CINAHL Plus with Full Text, ERIC, Library, Information Science & Technology Abstracts, MedicLatina, MEDLINE with Full Text, Psychology and Behavioral Sciences Collection, Regional Business News, SPORTDiscus with Full Text.

As descriptors Medical Subject Headings (MeSH), in English, were defined: septic; critical care; nursing; and patient. Through these, the Boolean equation was elaborated: septic AND critical care AND nursing AND patient.

The full text and the time period between 2016 and 2021 were the delimiters used for the research.

The following inclusion criteria were defined: adulthood (from 18 years-old) and the place of intervention of the studies: the Intensive Care Unit (ICU). Regarding the exclusion criteria: studies without thematic relevance, those that did not present full text and even all literature reviews, were thus excluded from the research.

Thus, according to all these criteria, 548 articles were initially selected, and after applying the delimiters and inclusion and exclusion criteria, only 7 of them were analyzed and read in full. Here, the Joanna Briggs Institute evaluation grids were applied, which classified the articles according to their level of scientific evidence⁽⁶⁾.

To better represent this entire process, we used the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) model, which outlines the entire selection of studies (Fig. 1⁷).

RESULTS

This was the stage in which the selected studies were analyzed and the methodological quality of each one of them was evaluated, through the use of the JBI evaluation grids (Tables 2⁷ and 3⁷).

RESULTS EXTRACTION/ DATA SYNTHESIS

After analyzing the entire veracity of the selected studies and classifying them according to their level of evidence, a results extraction Table⁷ was prepared, with some of the essential and most relevant data about the articles.

DISCUSSION

After reading and analyzing the selected studies, there were several findings related to specialized interventions for the person in critical condition in septic shock. In 2021, Evans *et al*⁽⁵⁾ launched the most recent international guidelines for the management of patients with sepsis and septic shock. For this reason, we decided to organize this discussion having as a guideline your work, both for the care, interventions or procedures to be used in this clinical situation.

As Singer *et al*⁽³⁾ mention, sepsis is one of the main health concerns worldwide, being one of the main causes of ICU admissions, mortality and patient morbidity. Evans *et al*⁽⁵⁾ mention that the appropriate and early identification of both sepsis and septic shock, in the first hours after the development of signs and symptoms, improves all the results that can be expected. It is for this reason that this review is carried out in order to compile studies that demonstrate which are the most specialized interventions in the face of this entire clinical picture.

Pinto *et al*⁽⁹⁾ observed that there is a greater risk of developing septic shock in patients coming from the ED than in those transferred from other hospitals, and the signs and symptoms most regularly presented in the first 6 hours were: tachycardia > 90 bpm; tachypnea > 20cpm; leukopenia < 4000/mm³; leukocytosis > 12,000/mm³; SpO₂ < 90%; hyperthermia > 38.3°C; and hypothermia < 36°C. As indicators of septic shock, the following were also identified: hypotension; VMI support; hypothermia; lactates > 2 mmol/L; radiotherapy associated with chemotherapy; SOFA score > 3; and admission by the US. These authors also identified in their study that patients with septic shock had a SOFA score that was 2 times higher when compared to patients with sepsis. The SOFA score and the assessment of the serum lactate level are diagnostic and prognostic indicators of this pathology.

Associated with septic shock, the most affected organ is the cardiovascular one, which is why hypotension is one of the most common symptoms⁽⁹⁾. This is also verified by Jeganathan *et al*⁽¹⁵⁾ who, in their study, reported that 52% of their patients in septic shock had cardiovascular dysfunction.

The data described in the previous paragraphs are in line with the Sepsis Consensus 3⁽³⁾, which defines sepsis as an organ dysfunction to a dysregulated host response to a given infection. This organ failure can be identified through SOFA (score > 2 mmol/L) which, as we have seen, is one of the main tools to be used by the multidisciplinary team with regard to the diagnosis of the pathology. The higher this score, the greater the probability of mortality associated with the patient.

In 2018, intervention bundles were created with the nomenclature of “hour-1 bundle”⁽¹⁶⁾. These recommend performing a set of interventions within one hour, after the recognition of sepsis or septic shock, in order to improve the results obtained and thus reduce the high mortality rate that is associated with this type of patients.

The first intervention mentioned by these same authors focuses on the assessment of the serum lactate level to assess, confirm and identify the progression of the disease. Martin *et al*⁽¹⁰⁾, refer in their study that lactates are biomarkers of tissue injury and that they are even more important when diagnosing patients in septic shock without organ dysfunction. These identified that lactacidemia > 2 mmol/L was one of the indicators of shock and that, when present, it is associated with a higher mortality rate in patients. These authors also recognized that patients with septic shock have higher serum lactate levels as well as multiorgan dysfunction compared to patients with sepsis.

Martin *et al*⁽¹⁰⁾, in their study on the usefulness of the new biomarker pentraxin 3 (PTX 3), reported that the serum lactate level is the best predictor of in-hospital mortality in patients with septic shock.

The previously referenced studies are in line with what is presented by several authors. Not only is its assessment part of the specialized intervention recommended by Levy *et al*⁽¹⁶⁾, but it is also part of the definition developed by Sepsis 3⁽³⁾ which defines septic shock as a subvariant of sepsis with severe alterations, organic dysfunction and characterized especially by hypotension refractory to volume resuscitation and lactacidemia > 2 mmol/L. These studies thus confirm not only the importance of the serum lactate assessment, but also confirm its importance both in monitoring and in achieving results.

Regarding the second bundle of action, referring to the collection of blood cultures⁽¹⁶⁾, there are several studies that address the issue.

Jeganathan *et al*⁽¹⁵⁾ reported in their study that 37.9% of the patients with sepsis admitted to the ICU had positive blood cultures. Likewise, Salahuddin *et al*⁽¹³⁾ presented in their study only 49.3% of patients with positive cultures.

Despite the low value presented, this was one of the essential factors that led to the adaptation and/or de-escalation of antimicrobials. As Evans *et al*⁽⁵⁾ recommend, the de-escalation of antibiotic therapy should be evaluated daily and, after the source of sepsis or septic shock has been controlled, its reduction is recommended. Levy *et al*⁽¹⁶⁾ also mention that antimicrobials must be adapted after obtaining microbiological results.

However, antibiotic de-escalation is not always different in groups of patients with positive or negative cultures⁽¹³⁾.

Jeganathan *et al*⁽¹⁵⁾ document the existence of significant differences in the result of positive blood cultures in relation to the source of infection, but they do not correlate with a higher mortality rate. However, de-escalation was associated with a decrease in the mortality rate in the ICU when compared with no change⁽¹³⁾. These authors also identify in their study, as one of the variables associated with failure to discontinue antibiotic therapy, the insecurity of the medical profession when faced with patients in a critical situation, complications or even resistance to antimicrobials. Thus, this de-escalation was observed in only 48% of patients, after obtaining microbiological results.

Levy *et al*⁽¹⁶⁾ list the administration of broad-spectrum antimicrobials as a third specialized intervention.

Roberts *et al*⁽¹¹⁾ state in their study that there are three classes responsible for the delay in antibiotic administration: physicians, whose reasons include a lack of leadership when choosing and implementing them, with lack of compliance and knowledge about hospital protocols; pharmacists, who mention as obstacles the verification of medical orders, preparation and distribution of antibiotics; and also the nurses who claim that the lack of recognition of medicines as well as the lack of knowledge of international protocols and guidelines, lead to underrecognition and lack of awareness, regarding the result that the delay in their administration can cause. They also refer as influencing factors: excessive workload; non-communication between doctor-nurse; and also the lack of venous access for infusion of antibiotics. However, 98% answered that they knew that the start of antibiotic therapy should be performed within the first hour after recognizing the situation, even though the majority answered that they prefer to stabilize hemodynamic parameters through volume resuscitation instead of starting antimicrobials⁽¹¹⁾.

Other important data were provided by the authors Li *et al*⁽¹²⁾ who tell us that nurses with more educational qualifications and more years of professional experience are those with the highest rate of adherence to antibiotic therapy in the first hour. 51.4% of the nurses surveyed mentioned the administration of antibiotic therapy in the first hour, in patients with sepsis and/or septic shock.

This data is a problem that needs intervention as the recommendations of the guidelines and the international bundle are the opposite. Levy *et al*⁽¹⁶⁾ tell us that broad-spectrum antimicrobials should be administered immediately and within a maximum period of 1 hour. Evans *et al*⁽⁵⁾ also developed a new recommendation compared to 2016, where they recommend the immediate administration of antibiotic therapy. They refer that its early administration is one of the most effective interventions in reducing the mortality rate of patients, and should be considered as an emergency.

Defined as the fourth intervention by Levy *et al*⁽¹⁶⁾, volume resuscitation appears.

Latham *et al*⁽¹⁴⁾ refer in their study that the fluid balance is less positive when it comes to volume resuscitation with the objective of optimizing the systolic volume and, consequently, the cardiac output.

As Vaughan & Parry⁽²⁾ refer, the fluid balance must be carefully monitored throughout the fluid replacement process, which is a fundamental indicator in the management of patients in septic shock, as it is an indicator of tissue perfusion and renal function. This can be harmful to the patient admitted to the ICU, and therefore fluid resuscitation should be carefully evaluated⁽¹⁶⁾.

Following the previous study, Evans *et al*⁽⁵⁾ agree with these findings. They refer that recently dynamic measures have been used with better accuracy of evaluation of the result of the administration of fluid therapy. One of these measures includes the non-invasive cardiac output monitor. The fluid balance is therefore lower in patients with this type of monitoring as there is a better assessment of its need and overdose. This monitoring showed results such as: decrease in the length of stay in the ICU; decreased need for vasopressors; decreased need to use RRT; and also a decrease in the need to use IMV⁽¹⁴⁾.

These data are also reported by Evans *et al*⁽⁵⁾ who report that dynamic assessment as a model for monitoring fluid therapy was associated with reduced mortality, length of stay in ICU and duration of IMV. Positive fluid balance was associated with an increased risk of acute kidney injury and tended to increase the need for RRT.

Levy *et al*⁽¹⁶⁾ presented the administration of vasopressors as the last specialized intervention when approaching a patient in septic shock.

Roberts *et al*⁽¹¹⁾ showed in their study that 23% of the nurses surveyed stated that the institutional protocol recommended that blood pressure (BP) be regularized using a vasopressor agent before the start of antibiotic administration. This is a study that shows outdated or even incorrect practices insofar as Levy *et al*⁽¹⁶⁾ refer that the urgent restoration of vital organs perfusion is essential for the resuscitation of the individual, and cannot be postponed. Therefore, if MAP is not restored after initial fluid resuscitation, vasopressor agents should be started within the first hour, aiming at MAP 65 mmHg.

Thus, and after reviewing all these authors, we assume that there are not enough primary studies to reach conclusions and specific interventions for patients with septic shock. However, according to the five intervention bundles mentioned by Levy *et al*⁽¹⁶⁾, some conclusions were possible. Regarding the assessment of the serum lactate level, it was

Martin *et al*⁽¹⁰⁾ who addressed this issue, referring not only to the importance of this biomarker as a diagnosis of sepsis, but also to its association between the increased value and possible organ dysfunction. The second intervention beam refers to the collection of blood cultures, where Jeganathan *et al*⁽¹⁵⁾ and Salahuddin *et al*⁽¹³⁾ both refer in their studies, a low percentage of positive blood cultures. However, it was through the results of these cultures that there was adaptation and/or de-escalation of antimicrobials, essential for the control and treatment of sepsis and septic shock. Regarding the third bundle⁽¹⁶⁾, the administration of broad-spectrum antimicrobials, Roberts *et al*⁽¹¹⁾ refer that doctors, nurses and pharmacists are responsible for the delay in its execution, as well as the lack of knowledge about the Hospital guidelines and protocols directly influence their care delivery to this type of patients. Li *et al*⁽¹²⁾ also report that it is the most qualified and qualified nurses who have the highest rate of adherence to antibiotic administration in the first hour after their diagnosis is recognized. The fourth intervention presented by Levy *et al*⁽¹⁶⁾ refers to the patient's volume resuscitation. Regarding this intervention bundle, Latham *et al*⁽¹⁴⁾ and Vaughan & Parry⁽²⁾ refer to the importance of monitoring the fluid balance during and after volume resuscitation, in order to avoid complications arising from a positive balance. Finally, the fifth intervention beam refers to the administration of vasopressors, where Roberts *et al*⁽¹¹⁾ showed that nurses, due to lack of knowledge, do not act in a way that is congruent with the international indications and guidelines, denoting the poor practice regarding the administration of vasopressor therapy.

CONCLUSION

After analyzing and discussing all these studies and their interconnection with so many other authors on the subject, some conclusions are drawn from this review. However, and due to the difficulty encountered, we concluded that more primary studies on the subject are needed, since its scarcity has been an important barrier to carrying out this systematic literature review. With this, we strongly recommend its implementation, not only for its relevance and importance, but also due to the numerous added values regarding the existence of a systematized organization of all the specialized interventions to be developed by the multidisciplinary team, regarding the patient in septic shock.

Taking into account all the difficulties encountered, we chose to present the main interventions contextualizing them with the five bundles mentioned by Levy *et al*⁽¹⁶⁾, thus systematizing the main procedures to be developed, based on the most recent scientific evidence.

Through the varied bibliography consulted, we were able to perceive that this typology of patients is lately transferred to the ICUs. Its cause may be related to late diagnosis, lack of ICU beds or even the delay of all health systems in providing a response to sick people. Thus, this is one of the factors that promotes the critical condition and instability of the patient, requiring advanced means of therapy, support and treatment.

Due to the obstacles encountered, the authors on which this review focuses reveal some gaps in terms of diagnosis, intervention and monitoring, especially of medical and nursing teams. When questioned, there are many who still show insecurity due to poor knowledge about protocols, guidelines or even scientific evidence about the interventions and procedures to be carried out.

With this, we understand some of the interventions developed by the multidisciplinary team, in the face of the performance of the critical patient in septic shock, having also extracted the need for training and training of these teams, due to their weak capacity and knowledge about all the procedures to be carried out, especially concerning the main intervention bundles.

Not only is this a problem related to the person in a critical situation, but it is also a problem that causes various social, financial and organizational damages, as the care and interventions provided, when inadequate, lead to an increase in the hospitalization of patients in ICU as well as an increase in the use of expensive organ support techniques.

However, further research is needed on the subject as it is still little addressed and still contains little scientific evidence to support it.

Authors' contributions

MB: Study design and coordination, data collection, storage and analysis, review, and discussion of results.

LL: Study design and coordination, data collection, review, and discussion of results.

MM: Study design and coordination, data collection, review, and discussion of results.

All authors have read and agreed to the published version of the manuscript.

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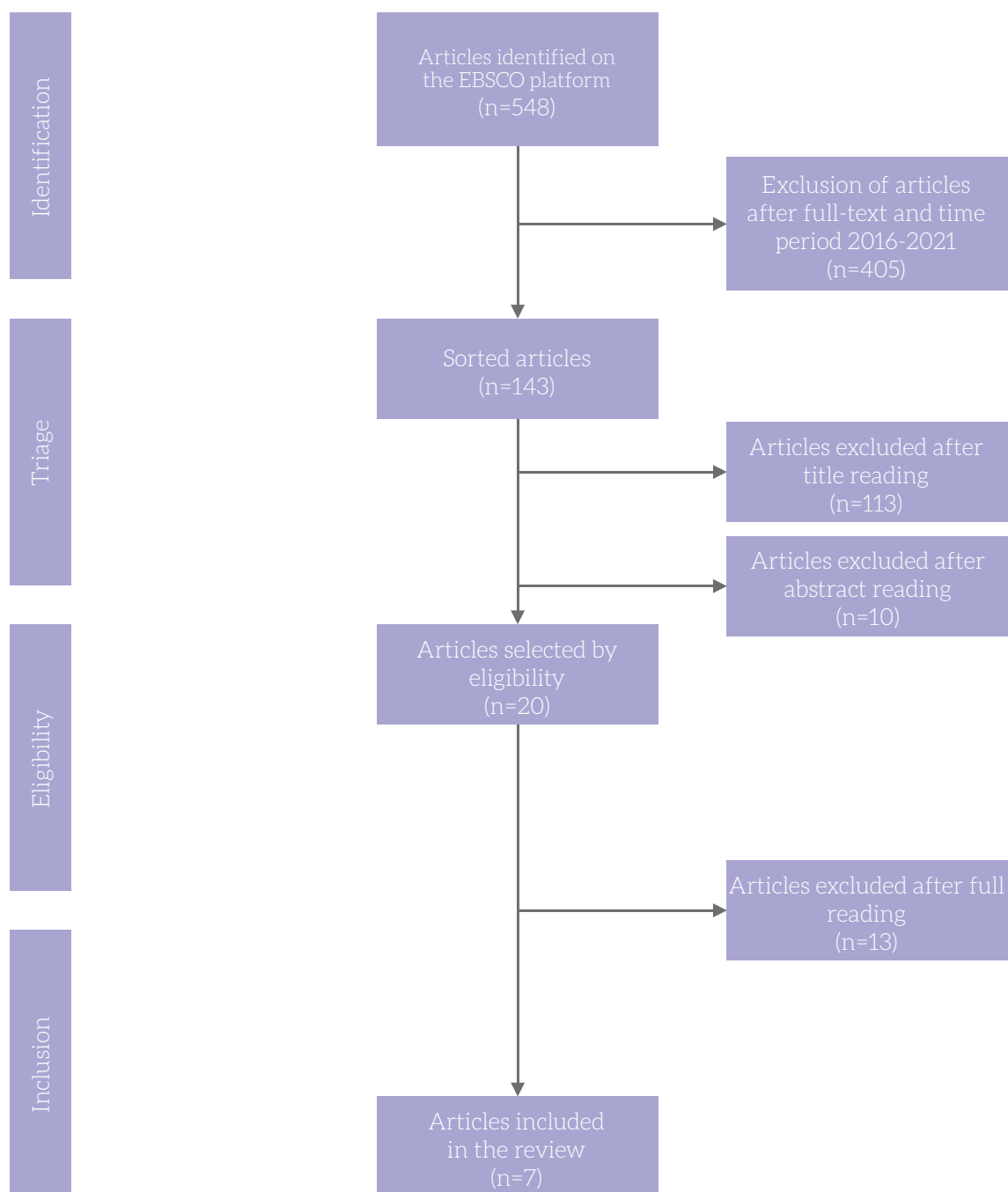


Figure 1 – Diagram adapted from the PRISMA Statement representative of the article selection process^{(8), 9}

Table 1 – PICOD Table.^κ

P	Population (participants/ structures)	Who was studied?	Adult patients in septic shock
I	Intervention (Relation of care/Process)	What was done?	Specialized interventions of the multidisciplinary team.
C	Context	Context	Intensive Care Unit.
O	Results (Intermediate and final)	What were the results or effects?	Specialized interventions of the multidisciplinary team before the adult person in septic shock.
D	Study design	How is it?	Primary studies of a quantitative nature: observational, experimental and quasi-experimental.

Table 2 – Summary of the level and quality of evidence of selected articles, according to JBI.^κ

Reference	Evidence Level
Pinto <i>et al</i> (2021)	Observational study – Descriptive study (IV – B)
Martin <i>et al</i> (2020)	Observational study – Analytical study (III – E)
Roberts <i>et al</i> (2017)	Observational study – Descriptive study (IV – B)
Li <i>et al</i> (2019)	Observational study – Analytical study (III – C)
Salahuddin <i>et al</i> (2016)	Observational study – Analytical study (III – C)
Latham <i>et al</i> (2017)	Observational study – Analytical study (III – C)
Jeganathan <i>et al</i> (2017)	Observational study – Analytical study (III – C)

Table 3 – Results of critical analysis of included studies according to JBI assessment grids.[^]

References	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Results
Pinto <i>et al</i> (2021)	Y	Y	Y	Y	N	N.A.	Y	Y				100%
Martin <i>et al</i> (2020)	Y	Y	Y	Y	N	N.A.	Y	Y				100%
Roberts <i>et al</i> (2017)	Y	Y	Y	Y	N	N.A.	Y	Y				100%
Li <i>et al</i> (2019)	Y	Y	Y	N	N.A.	Y	Y	Y	Y	N.A.	Y	100%
Salahuddin <i>et al</i> (2016)	Y	Y	Y	N	N.A.	Y	Y	Y	Y	N.A.	Y	100%
Latham <i>et al</i> (2017)	Y	Y	Y	N	N.A.	Y	Y	Y	Y	N.A.	Y	100%
Jeganathan <i>et al</i> (2017)	Y	Y	Y	N	N.A.	Y	Y	Y	Y	N.A.	Y	100%

Subtitle: Y – Yes; N – No; N.A. – Not applicable.

Table 4 – Summary table for extracting data from the quantitative evidence of the selected studies.→↵

Study authors	Study objective	Participants	Results	Period
Pinto <i>et al</i> (2021) ⁽⁹⁾	To identify the clinical indicators of septic shock in critically ill patients.	392 patients admitted to ICU.	- 48.5% of the patients witnessed septic shock, being 40% of respiratory origin; - Patients under chemotherapy and/or radiotherapy had a higher rate of developing septic shock; - It was observed that there is a greater risk of developing septic shock in patients coming from the emergency department (ED) than those transferred from other hospital units; - The signs and symptoms presented by patients with sepsis or septic shock in the first 6 hours were: tachycardia > 90 bpm, tachypnea > 20 cpm, leukopenia < 4,000/mm³, leukocytosis > 12,000/mm³, SpO₂ < 90%, hyperthermia > 38.3°C and hypothermia < 36°C; - The first antibiotic dose was faster in patients with septic shock than in sepsis; - In the first 24 hours, support by invasive mechanical ventilation (IMV) was in 80% of cases due to septic shock; - 55.2% of patients died in the ICU; - Patients in septic shock had a 2x higher SOFA score compared to patients with sepsis; - It was found that the organ system, which is most associated with septic shock, is the cardiovascular system.	January 2018 – January 2019.

Table 4 – Summary table for extracting data from the quantitative evidence of the selected studies.

Autores do estudo	Objetivo do estudo	Participantes	Resultados	Período
Martin <i>et al</i> (2020) ⁽¹⁰⁾	To assess the usefulness of a new marker, pentraxin 3 (PTX 3), as a prognostic marker in patients with septic shock.	75 patients admitted to ICU with septic shock.	- Pentraxin 3 (acute phase of the protein) emerged as a biomarker of sepsis for identifying inflammatory stimulation, reaching values > 2 ng/mL in inflammatory or infectious conditions; - PTX 3 increases 6-8 hours after response to infection while PCR takes 24-30 hours to respond; - 41.3% of the clinical pictures are of pulmonary origin and 32% of abdominal origin; - The best hospital mortality prediction scales were: SAPS II, SOFA and APACHE II; - PTX3 was more related to in-hospital mortality than procalcitonin and CRP, but lower than the serum lactate level; - Lactates were the biomarkers that presented statistically significant results associated with the in-hospital mortality rate; - The results suggest that PTX3 may be a potential predictor of mortality.	April 2015 – April 2016.

Table 4 – Summary table for extracting data from the quantitative evidence of the selected studies.↔↔

Autores do estudo	Objetivo do estudo	Participantes	Resultados	Período
Roberts <i>et al</i> (2017) ⁽¹¹⁾	To assess critical care nurses' knowledge, practices and perceptions of antibiotic initiation in patients with newly diagnosed septic shock.	122 nurses working in intensive care.	- Physicians report that the main barriers related to the delay in the immediate administration of antibiotic therapy are: the delay in the recognition of sepsis; failure to order antibiotics in a timely manner; and lack of leadership regarding sepsis protocol implementation and compliance; - Pharmacy-related barriers include delays in verifying medical orders and the preparation and distribution of intravenous antibiotics (ev); - Nurse-related delays: unfamiliarity with the criteria in the Surviving Sepsis Campaign guidelines and a lack of knowledge about their consequences; - 65% of nurses were able to define septic shock, 80% of them know the sepsis protocol applied in the institution and still 98% know that the start of antibiotic therapy must be performed within the first hour after recognition of the situation, 38% of nurses reported that the protocol of sepsis recommends that fluid therapy be continuous, 23% indicated that the institutional protocol recommended that the ET be normalized with a vasopressor agent before starting antimicrobials; - Only 40% correctly indicated that fluid therapy and antibiotics should be started concomitantly; 40% indicated that fluid therapy should be administered before starting antibiotics; and the vast majority of respondents (92%) stated that they start antibiotic therapy within 1 hour of recognizing septic shock; - Nurses identified as the main causes of delay in starting antibiotic therapy: excessive workload (74%); lack of knowledge about the arrival of antibiotics at the unit (69%); lack of information about the prescription of antibiotics (57%); administration of a wide variety of medications that hinders the availability of venous access (54%); lack of venous access (51%); and still delay in medical observation; - Many of the nurses surveyed prefer to stabilize the ED with fluid therapy and vasopressor therapy, before starting antibiotic therapy.	No information.

Table 4 – Summary table for extracting data from the quantitative evidence of the selected studies.↔

Autores do estudo	Objetivo do estudo	Participantes	Resultados	Período
Li <i>et al</i> (2019) ⁽¹²⁾	To investigate the ability of the nursing team to adhere to antibiotic treatment in patients with septic shock.	113 nurses.	- Adherence to empiric antibiotic treatment administered during the day shift was significantly lower compared to the night shift; - The most qualified nurses had a higher rate of adherence than younger or less educated nurses in administering antibiotic therapy in the first hour; - The increase in adherence to antibiotic therapy was observed in the group of nurses with professional experience > 3 years; - Adherence to antibiotic therapy in 1 hour was 51.4%; - Adherence to antibiotic treatment was lower during shift change; - Low-educated nurses lack knowledge about the importance of antibiotic treatment within one hour of the diagnosis of septic shock.	January 1, 2015 – February 29, 2016.
Salahuddin <i>et al</i> (2016) ⁽¹³⁾	To identify variables that are associated with antimicrobial de-escalation failure.	395 patients with sepsis.	- Only 49.3% of patients with sepsis had positive cultures; - 75% of cases of infection were nosocomial; - Empirical antibiotics were appropriate in 57% of cases; - Antibiotic de-escalation was observed in 48% of patients, 39% without antibiotic change, 11% with therapy escalation and 2% with mixed change only; - The rates of de-escalation were not significantly different between patients with positive or negative cultures; - De-escalation was associated with a decrease in the mortality rate in the ICU when compared to no change; - De-escalation was significantly predicted by APACHE II and SAPS II; - Physicians feel uncomfortable with de-scaling antibiotic therapy when faced with more serious conditions or complications, patients with drug resistance or fungal sepsis.	January 2013 – January 2014.

Table 4 – Summary table for extracting data from the quantitative evidence of the selected studies.↔↵

Autores do estudo	Objetivo do estudo	Participantes	Resultados	Período
Latham <i>et al</i> (2017) ⁽¹⁴⁾	To determine whether stroke volume-guided fluid resuscitation in patients with sepsis and septic shock alters fluid balance and side effects in the ICU.	191 patients.	- Systolic blood pressure (SBP) and mean arterial pressure (MAP) were higher in the control group (performed volume resuscitation monitored by normal care); - Fluid balance is less positive when a resuscitation strategy aimed at optimizing stroke volume is used in patients with sepsis and septic shock; - The 4-hour fluid balance was similar between the two groups due to the fact that physicians tended to focus on fluid resuscitation to stabilize organ perfusion; - The lower fluid balance in the stroke volume (SV) group (submitted to volume resuscitation monitored by Non-Invasive Cardiac Output Monitor, in the first 4 hours in ICU), contributed to a decrease in the length of stay in the ICU, a decrease in time on therapy vasopressor, reduced need for IMV and also reduced need for renal replacement technique (RRT); - In the usual care group, there is a greater tendency for increased creatinine and, consequently, a greater need for RRT; - A positive fluid balance was associated with an increased risk of acute kidney injury and a tendency to need RRT.	1 April 2014 – 1 September 2014.

Table 4 – Summary table for extracting data from the quantitative evidence of the selected studies.↵

Autores do estudo	Objetivo do estudo	Participantes	Resultados	Período
Jeganathan <i>et al</i> (2017) ⁽¹⁵⁾	To evaluate and compare the baseline characteristics, microbiology and short-term consequences of patients admitted to the ICU with sepsis.	248 patients.	- In 37.9% of the cases, the cultures were positive; - 30.6% of patients did not have any organ failure, 29% had single organ failure and 40.4% had multiple organ failure (≥2 organs); - Patients with pulmonary sepsis had 50%–60% of patients with multiple organ failure. Patients with gynecological, urinary or skin sepsis had a lower number of patients with multiple organ failure. In abdominal sepsis it was present in 34.8% of the cases, multiorgan failure and in sepsis associated with the cardiovascular system, 42.3% presented organ dysfunction; - 40% of hospital mortality was associated with sepsis with multiple sources and causes and 92% of hospital deaths occurred in the ICU; - Pulmonary and cardiovascular sepsis had a higher mortality rate, 30%; - Risk factors such as age and comorbidities were verified; - Significant differences were found in positive blood cultures and microbiology regarding different causes of infection.	January 1, 2011 – December 31, 2011.