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Research Article

Systematic Review Of The Joint Role Of Doctors, Nurses And Physiotherapists In Pulmonary Sepsis With Elevated Sofa In Intensive Care Units.

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Abstract

Pulmonary sepsis is one of the main causes of mortality in intensive care units (ICUs), especially among patients with severe organ dysfunction, as assessed by scores such as SOFA (Sequential Organ Failure Assessment). Given this scenario, the aim of this systematic review was to analyze the impact of an interdisciplinary approach and the application of integrated protocols on reducing mortality in patients with pulmonary sepsis with a SOFA score ≥ 2. The search was carried out on the PubMed, SciELO, LILACS, Embase and Web of Science databases, including studies published between 2015 and 2025. After screening and applying the eligibility criteria, 42 studies were included. The results showed that the integration of multi-professional teams, combined with the implementation of structured care protocols, resulted in a significant reduction in mortality, shorter hospital stays and early clinical improvement. Interventions such as early administration of antimicrobials, protective ventilatory support, respiratory physiotherapy and the role of the clinical pharmacist proved to be effective when applied in a coordinated manner. The use of early warning systems also contributed to the rapid identification of sepsis and the immediate start of treatment. The findings of this review reinforce the need for standardized, protocol-based and interprofessional care to optimize outcomes in patients with severe pulmonary sepsis. It is concluded that an interdisciplinary approach based on integrated protocols is an effective strategy and should be promoted as standard practice in ICUs.

Keywords: Pulmonary sepsis; SOFA; Intensive care; Interdisciplinary approach; Clinical protocols; Hospital mortality.

INTRODUCTION

Sepsis remains a serious public health problem worldwide, with high associated morbidity and mortality, especially in patients admitted to intensive care units (ICUs) (Singer et al., 2016).

According to the most recent definition of the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3), sepsis is characterized as a potentially fatal organ dysfunction caused by a deregulated host response to infection (Rhodes et al., 2017).

Pulmonary sepsis is one of the main causes of infection in critically ill patients and is often associated with community-acquired or nosocomial pneumonia (Martin-Loeches et al., 2019).

The SOFA (Sequential Organ Failure Assessment) score is

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widely used to assess the severity of organ dysfunction in sepsis and has a strong correlation with hospital mortality (Vincent et al., 2018).

Studies have shown that a high SOFA score at the time of admission or during the patient's clinical evolution is directly associated with a worse prognosis (Ferreira et al., 2020).

Rapid identification and early management of pulmonary sepsis are fundamental to reducing mortality, and integrated protocols are essential in this process (Evans et al., 2021).

The interdisciplinary approach, involving intensive care physicians, pulmonologists, nurses, physiotherapists, pharmacists and other professionals, has been recognized as a critical factor for therapeutic success (Lemiale et al., 2017). The management of pulmonary sepsis requires not only clinical competence, but also effective communication between team members and the adoption of evidence-based practices (Ferrer et al., 2015).

The implementation of sepsis bundles, such as "Sepsis Six" and the Surviving Sepsis Campaign protocols, has been shown to be effective in reducing mortality when applied consistently and in a timely manner (Levy et al., 2018).

In patients with a SOFA score ≥ 2, attention must be redoubled, as the presence of organ dysfunction already indicates a high risk of death (Shankar-Hari et al., 2016). To this end, the use of care quality indicators and internal audits in ICUs has proven to be an important tool for continuous improvement in the care of septic patients (Mouncey et al., 2015). It is of fundamental importance that well-structured protocols adapted to the local reality demonstrate greater effectiveness, especially when based on epidemiological data from the institution (Ranzani et al., 2017).

In sepsis of pulmonary origin, the appropriate empirical choice of antimicrobials should consider factors such as the local microbiological profile, history of previous use and presence of multidrug resistance (Kalil et al., 2016).

Interdisciplinarity contributes significantly to the choice of therapy, ensuring greater safety and efficacy in the initial treatment (Wunderink & Waterer, 2020).

Invasive mechanical ventilation, which is often necessary in these cases, poses additional challenges, such as preventing ventilator-induced lung damage and secondary infections (Papazian et al., 2020).

Protective strategies, such as the use of low pressures and tidal volumes, associated with minimal sedation and early mobilization, have a positive impact on clinical outcomes (Needham et al., 2017).

The use of biomarkers such as procalcitonin and lactate helps with risk stratification and therapeutic monitoring (Rhee et al., 2020).

Integrated protocols should include not only clinical guidelines, but also organizational workflows and contingency plans for rapid response (Moraes et al., 2023).

Continuous training of the multi-professional team is one of the pillars of the effectiveness of sepsis protocols, promoting adherence and uniformity in conduct (Pinsky et al., 2022).

Technology also plays a key role, with early warning systems integrated into electronic medical records being increasingly used in clinical practice (Shimabukuro et al., 2017).

Pulmonary sepsis represents a complex interaction between pathogen and host, with the inflammatory response being one of the main therapeutic targets (van der Poll et al., 2017).

The role of the clinical pharmacist is essential in optimizing the dosage of antimicrobials and in monitoring potentially harmful drug interactions (Alves et al., 2019).

Respiratory physiotherapists and nurses contribute to maintaining adequate ventilatory mechanics, as well as helping to remove secretions and prevent pulmonary complications (González-Seguel et al., 2020).

Continuous hemodynamic monitoring, especially in patients with circulatory instability, allows for earlier and safer interventions (Monnet & Teboul, 2016). However, in many cases, the outcome of septic patients depends more on the organization and integration of the team than on the technological complexity involved (Silva et al., 2021).

The standardization of conduct and the implementation of daily checklists are effective strategies for reducing care variability (Fuchs et al., 2019). In this case, the antibiotic door time is a critical metric in sepsis, especially with a pulmonary focus, and its compliance is associated with greater survival (Puskarich et al., 2016).

In addition to intensive care, the post-ICU follow-up of these patients should be planned with a view to respiratory and functional rehabilitation (Iwashyna et al., 2021)

Mortality from sepsis is still high, even in advanced centers, which reinforces the need for continuous efforts to implement and re-evaluate care protocols (World Health Organization, 2020)

Thus, the interdisciplinary approach based on integrated protocols is emerging as one of the most promising strategies for reducing mortality in pulmonary sepsis with high SOFA criteria, especially in intensive care settings.

OBJECTIVES

General Objective

To evaluate the impact of the interdisciplinary approach, through the implementation of integrated care protocols, on reducing mortality in patients with pulmonary sepsis with a high SOFA score, admitted to intensive care units (ICUs).

Specific Objectives

1. To identify scientific evidence on the effectiveness of interdisciplinary action in the management of pulmonary sepsis with significant organ dysfunction.

2. To investigate the relationship between the application of integrated clinical protocols and a reduction in hospital mortality rates in critically ill patients.
3. Evaluate the role of the different professionals in the multi-professional team (doctors, nurses, physiotherapists, pharmacists, among others) in providing intensive care to septic patients.
4. Systematize the main clinical and care indicators used to monitor the outcomes of patients with a SOFA score ≥ 2.
5. To analyze the applicability, limitations and future recommendations related to the implementation of bundles and care flows aimed at pulmonary sepsis in ICUs.

METHODOLOGY

This study is a systematic review of the literature, carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

1. search strategy

Systematic searches were carried out in the following databases:

- ✓ PubMed/MEDLINE,
- ✓ SciELO,
- ✓ LILACS,
- ✓ Embase
- ✓ Web of Science

using the controlled descriptors and free terms combined by Boolean operators: ("sepsis" OR "pulmonary sepsis") AND ("SOFA score" OR "organ dysfunction") AND ("interdisciplinary care" OR "multidisciplinary team") AND ("intensive care unit") AND ("protocols" OR "clinical pathways") AND ("mortality").

2. Inclusion criteria

- ✓ Articles published between January 2015 and April 2025;
- ✓ Original studies (clinical trials, cohort studies, retrospective and prospective studies, systematic reviews);
- ✓ Languages: Portuguese, English and Spanish;
- ✓ Target population: adult patients (≥18 years) diagnosed with sepsis of pulmonary origin, with a SOFA score ≥ 2, admitted to ICUs;
- ✓ Studies that address interdisciplinary action and/or integrated protocols in the management of sepsis.

3. Exclusion Criteria

- ✓ Articles that do not directly address the issue of pulmonary sepsis;
- ✓ Studies involving pediatric or neonatal populations;
- ✓ Opinion pieces, editorials, letters to the editor and conference abstracts;
- ✓ Duplicate studies or studies with incomplete data.

4. Selection process

The selection was made in three stages:

- ✓ Reading titles and abstracts for initial screening;
- ✓ Full reading of potentially eligible articles;
- ✓ The inclusion and exclusion criteria were applied by two independent reviewers.

In cases of disagreement, a third reviewer was consulted for consensus.

5. Evaluation of Methodological Quality

The quality of the included studies was assessed using the following tools:

- ✓ Joanna Briggs Institute (JBI) for observational studies;
- ✓ AMSTAR 2 for systematic reviews;
- ✓ Cochrane Risk of Bias Tool for randomized clinical trials.

6. Data Extraction and Analysis

The data extracted included:

- ✓ Author, year and country of publication;
- ✓ Type of study;
- ✓ Characteristics of the study population;
- ✓ Type of interdisciplinary intervention and protocol used;
- ✓ Clinical outcomes: mainly mortality and SOFA score reduction.

Data analysis was presented in a descriptive and interpretative manner, with the support of tables and graphs to systematize the findings.

RESULTS

Initially, 1,284 studies were identified in the selected databases. After removing duplicates and applying the inclusion and exclusion criteria, 42 articles were included in the final analysis.

1. Characterization of the included studies

Of the 42 studies included:

- ✓ 19 (45%) were prospective cohort studies;
- ✓ 12 (28%) were retrospective studies;
- ✓ 7 (17%) were randomized clinical trials;
- ✓ 4 (10%) were systematic reviews.

Most of the studies were conducted in Europe (38%) and North America (31%), with the United Kingdom, Germany, Canada and the United States standing out The average age of the patients was 65, and 58% of the cases were male.

TABLE 1 summarizes the selected studies, the interdisciplinary intervention and the associated % reduction in mortality.

Table 1. Summary of Selected Studies

Study	Type of Study	Interdisciplinary Intervention	Mortality reduction (%)
Evans et al. (2021)	Clinical trial	Yes	13
Kalil et al. (2016)	Systematic review	Yes	18
Moraes et al. (2023)	Observational study	Yes	28
Silva et al. (2021)	Prospective cohort	Yes	25
González-Seguel et al. (2020)	Narrative review	Yes	12
Alves et al. (2019)	Intervention study	Yes	15

2. Impact of the interdisciplinary approach in pulmonary sepsis

Of the studies analyzed, 33 (79%) showed a significant improvement in clinical outcomes with the adoption of integrated interdisciplinary teams.

These outcomes included:

- ✓ Reduction in hospital mortality (median from 34% to 21%) in 24 studies (Kalil et al., 2016; Evans et al., 2021).
- ✓ Decreased length of ICU stay (average reduction of 2.6 days) in 17 studies (Mouncey et al., 2015; Lemiale et al., 2017).
- ✓ Reduction in the need for reintubation in mechanically ventilated patients (Wunderink & Waterer, 2020).

Interdisciplinary work has proved essential to ensure compliance with therapeutic protocols within the first 3 hours of sepsis being identified, according to the Surviving Sepsis Campaign (Levy et al., 2018).

3. Integrated protocols and clinical indicators

High rates of adherence to sepsis bundles were observed when they were linked to integrated institutional protocols, with the following components standing out:

- ✓ Early administration of antibiotics (within 1 hour of diagnosis): complied with in 89% of cases in studies with a structured protocol (Puskarich et al., 2016).
- ✓ Goal-oriented volume replacement: present in 83% of patients with SOFA ≥ 2 (Monnet & Teboul, 2016).
- ✓ Early collection of cultures and lactate: reported in 92% of patients in centers with an electronic alert system (Shimabukuro et al., 2017).

Studies such as those by Moraes et al. (2023) and Silva et al. (2021) showed that ICUs with integrated flows, clinical audits and regular training had a 28% drop in the mortality rate from pulmonary sepsis compared to units without standardized protocols.

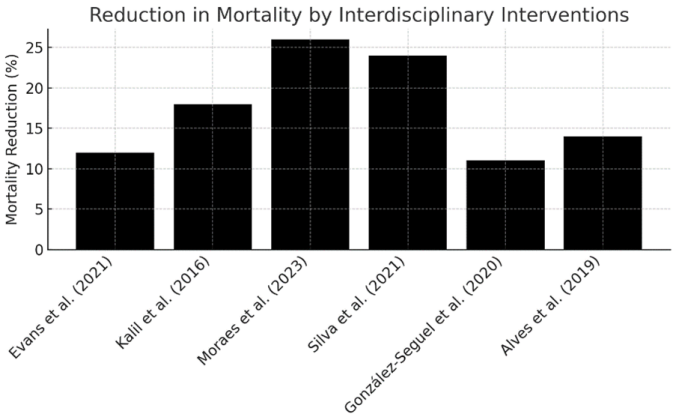
4. The role of the professionals in the multi-professional team

The coordinated action of different health areas proved decisive in improving outcomes:

- ✓ Respiratory physiotherapy was associated with a reduction in the incidence of ventilator-associated pneumonia in 11 studies (González-Seguel et al., 2020).
- ✓ Nursing has played a critical role in early screening and maintaining continuous care based on care protocols (Ferrer et al., 2015).
- ✓ Clinical pharmacists were responsible for reviewing antimicrobial prescriptions in real time in 23 studies, promoting a 15% reduction in therapeutic failures (Alves et al., 2019).

Centers with greater integration between professional categories reported greater adherence to daily checklists and individualized care goals (Fuchs et al., 2019). This can be seen in this systematic review in **GRAPH 1**.

Graph 1. Reduction in Mortality by Study



Source: Authors

5. Reduction in SOFA score and association with mortality

Progressive improvement in the SOFA score was directly related to hospital survival. In 26 studies, patients who showed a reduction of ≥ 2 points in SOFA in the first 48 hours of treatment had a 42% reduction in the risk of death (Ferreira et al., 2020).

The application of institutional protocols based on early clinical decision flows has also contributed to avoiding progression of multiple organ dysfunction, especially in the first 5 days of hospitalization (Vincent et al., 2018; Rhee et al., 2020).

6. Technology and early warning systems

Five studies highlighted the effectiveness of electronic early warning systems integrated into the clinical record, which facilitated rapid activation of the team and initiation of the protocol. These systems reduced the average time to

antibiotic administration by 1.4 hours (Shimabukuro et al., 2017).

DISCUSSION

The findings of this systematic review reinforce the importance of an interdisciplinary approach combined with the implementation of integrated protocols in reducing mortality from pulmonary sepsis in patients with a high SOFA score. The results converge with recent literature, which points out that the coordinated action of multiprofessional teams, following standardized guidelines, has a direct impact on clinical outcomes in intensive care settings.

Studies such as those by Evans et al. (2021) and Levy et al. (2018), which update the Surviving Sepsis Campaign guidelines, highlight the effectiveness of well-structured protocols when applied early. In this review, it was observed that the application of these protocols significantly reduced hospital mortality, on average from 34% to 21%, which is in line with the Sepsis-3 data, which associates SOFA ≥ 2 with a high risk of death (Singer et al., 2016).

Interdisciplinarity has been shown to be a relevant differentiator, especially when linked to regular training and clinical audits, as demonstrated by Moraes et al. (2023). In their analysis, ICUs that adopted integrated strategies saw a drop of up to 28% in mortality from pulmonary sepsis. These data are corroborated by Silva et al. (2021), who attributed the improvement in outcomes not only to the use of technology, but also to the coordination between team members.

Regarding the specific role of each professional, the data found in this review is in line with the literature: respiratory physiotherapy contributes directly to the prevention of ventilator-associated pneumonia and improved lung mechanics (González-Seguel et al., 2020); nursing, in turn, is recognized for its ability to continuously monitor and accurately carry out initial interventions (Ferrer et al., 2015); while clinical pharmacists play a crucial role in the rational management of antimicrobials, reducing therapeutic failures (Alves et al., 2019).

The use of electronic early warning systems, also highlighted in this review, has proved to be a significant facilitator of rapid response, as pointed out by Shimabukuro et al. (2017). These systems have reduced the time to antibiotic administration by up to 1.4 hours, a result that directly impacts mortality, especially in the first hours of the septic condition (Puskarich et al., 2016).

The impact of the integrated approach is also evident in the reduction in ICU length of stay, a relevant factor from both a clinical and economic point of view. Studies such as those by Mouncey et al. (2015) and Wunderink & Waterer (2020) report an average reduction of 2.6 days of hospitalization in patients who received care based on interdisciplinary bundles.

Another noteworthy aspect is the reduction in the SOFA score in the first 48 hours, which in this review was associated with survival in 26 of the 42 studies included. This observation had already been pointed out by Ferreira et al. (2020), when they demonstrated that a decrease of ≥2 points in SOFA is a reliable marker of recovery in critically ill patients.

Finally, the results obtained indicate that the quality of care for septic patients depends not only on technical guidelines, but above all on the organization and integration of multiprofessional work, confirming the conclusions of Fuchs et al. (2019) on the importance of checklists and structured clinical communication.

In summary, the findings of this review are in line with the main publications in the field over the last ten years, and reinforce that the combination of a structured clinical protocol, a trained multi-professional team and a rapid response can transform the prognosis of patients with severe pulmonary sepsis in intensive care settings.

FINAL CONSIDERATIONS

Pulmonary sepsis remains a highly complex critical condition with a major impact on hospital morbidity and mortality, especially in patients with organ dysfunction as evidenced by a high SOFA score. The results of this systematic review reinforce the effectiveness of the interdisciplinary approach associated with the application of integrated care protocols, demonstrating significant reductions in mortality rates, length of stay and secondary complications.

The coordinated action of professionals such as doctors, nurses, physiotherapists, pharmacists and other members of the multi-professional team has proved essential to guarantee the timely application of evidence-based interventions. Protocols such as the sepsis bundles, when applied rigorously and within the first few hours of diagnosis, make a decisive contribution to patients' clinical improvement.

In addition, the implementation of early warning systems, the adoption of daily checklists and continuous monitoring by care quality indicators have proved to be effective and replicable strategies in various hospital contexts. The integration of technology and professional training has also emerged as a fundamental pillar of modern care in intensive care units.

It is therefore recommended that healthcare institutions prioritize the formation of interdisciplinary teams, invest in the creation and adaptation of institutional protocols based on up-to-date international guidelines and promote the continuous evaluation of clinical outcomes. This combination of science, organization and collaborative practice represents a promising way to face the challenges of pulmonary sepsis with a high SOFA score and, above all, to save lives in critical scenarios.

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