Review Article

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Management of Sepsis Bundle by Nurses in Hospitals: A Scoping Review

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ABSTRACT

Background: *Sepsis is one of the leading causes of mortality in hospitals, with a significant death rate. The management of sepsis bundles was developed by the Surviving Sepsis Campaign (SSC). Sepsis bundles include early identification, lactate measurement, antibiotic administration, and fluid resuscitation, and have been effective in reducing mortality rates. Nurses play a strategic role in implementing these bundles, as they are often the first to recognize the early signs of sepsis. However, implementation in clinical settings often faces challenges, including high workloads, limited resources, and insufficient understanding of protocols.*

Methods: *This study used a scoping review method to explore the implementation of sepsis bundles by nurses in hospitals. Literature searches were conducted in PubMed, CINAHL/MEDLINE, Scopus, and ScienceDirect, using the following inclusion criteria: English-language articles with free full-text access and published from January 2014 to June 2024.*

Results: *Of the 211 identified articles, 9 met the inclusion criteria and were analyzed. The findings reveal that effective implementation of sepsis bundles can improve nurses' adherence to protocols and reduce mortality rates. Factors such as continuous education, protocol revisions, leadership support, and optimal staffing policies are key to successful implementation.*

Conclusion: *This study concludes that nurse-led sepsis bundles require a multidimensional approach to enhance clinical outcomes and operational efficiency for hospital sepsis patients.*

INTRODUCTION

Sepsis is one of the leading causes of mortality in hospitals, with a death rate reaching up to 15% [1]. It is defined as a systemic inflammatory dysregulation and immune response to microbial invasion that leads to organ failure [2]. This condition represents an uncontrolled systemic response to infection, which can result in organ failure and death if not managed

appropriately. The impact of sepsis extends beyond the patient, placing a significant burden on the healthcare system, including increased treatment costs and intensive resource utilization [3].

Improving nurses' understanding is crucial for the proper management of sepsis [4]. One strategy to reduce sepsis-related mortality is implementing the sepsis bundle, a set of clinical actions developed by the Surviving Sepsis Campaign (SSC) for the management of sepsis patients. This bundle comprises a series of time-sensitive interventions that must be implemented promptly upon sepsis diagnosis [5]. The core components of this bundle include early identification of sepsis, measurement of lactate levels, blood culture testing, administration of antibiotics within the first hour, fluid resuscitation, and vasopressor therapy. Effective implementation of the sepsis bundle has been shown to significantly reduce mortality and complications in patients with sepsis [6].

Nurses play a strategic role in implementing the sepsis bundle in hospital settings. This is because nurses are often the first to recognize signs and symptoms of infection [7]. Proper execution of the sepsis bundle by nurses has been shown to improve adherence to sepsis management standards and enhance patient clinical outcomes [8].

However, implementing the sepsis bundle at the clinical level often faces various challenges. These include a lack of in-depth understanding of the protocols, high workload, limited resources, and communication barriers within the care team. These factors not only hinder consistent application of the sepsis bundle but may also affect the quality and safety of the care provided [9,10].

In hospital-based care, it is essential to systematically evaluate how nurses implement the sepsis bundle and the factors that influence its success. Previous studies have shown that trained resources, policy-maker support for change, leadership engagement, and appropriate incentives are critical to the successful implementation of the sepsis bundle in hospitals [11]. However, these studies often focus on specific populations or regions, highlighting the need for broader analyses to understand variations in implementation across different healthcare settings.

This study is a scoping review that examines how nurses manage the sepsis bundle in hospital settings.

METHODS

The method used in this study is a scoping review, with the primary focus of providing an overview of how nurses manage the sepsis bundle in hospital settings. The formulation of keywords was guided by the Participant, Concept, Context (PCC) framework, as outlined in Table 1. The literature search was conducted using major research databases, including PubMed, CINAHL/MEDLINE, Scopus, and ScienceDirect.

Table 1. Keyword Framework Using the PCC Format

P	C	C
Nurse OR Nurse Practitioners OR Nurse Clinicians	sepsis bundle management OR sepsis bundle implementation OR sepsis bundle compliance OR Sepsis bundle protocol	hospital OR hospitals OR hospital medicine OR ward

The inclusion criteria for this review include articles on the implementation of the sepsis bundle by nurses in hospital settings, available as free full text, written in English, and published between January 2014 and June 2024. The authors analyzed the titles and abstracts and read the full texts of the articles. The review analysis involved summarizing the content of each journal and identifying key findings in alignment with the objectives of this scoping review.

RESULTS

The initial search yielded 211 articles. Of these, 24 were duplicates, and 168 were excluded. A full-text review was conducted on 19 articles; 10 were excluded for not meeting the inclusion criteria. The remaining nine articles met the inclusion criteria and were included in this review for analysis.

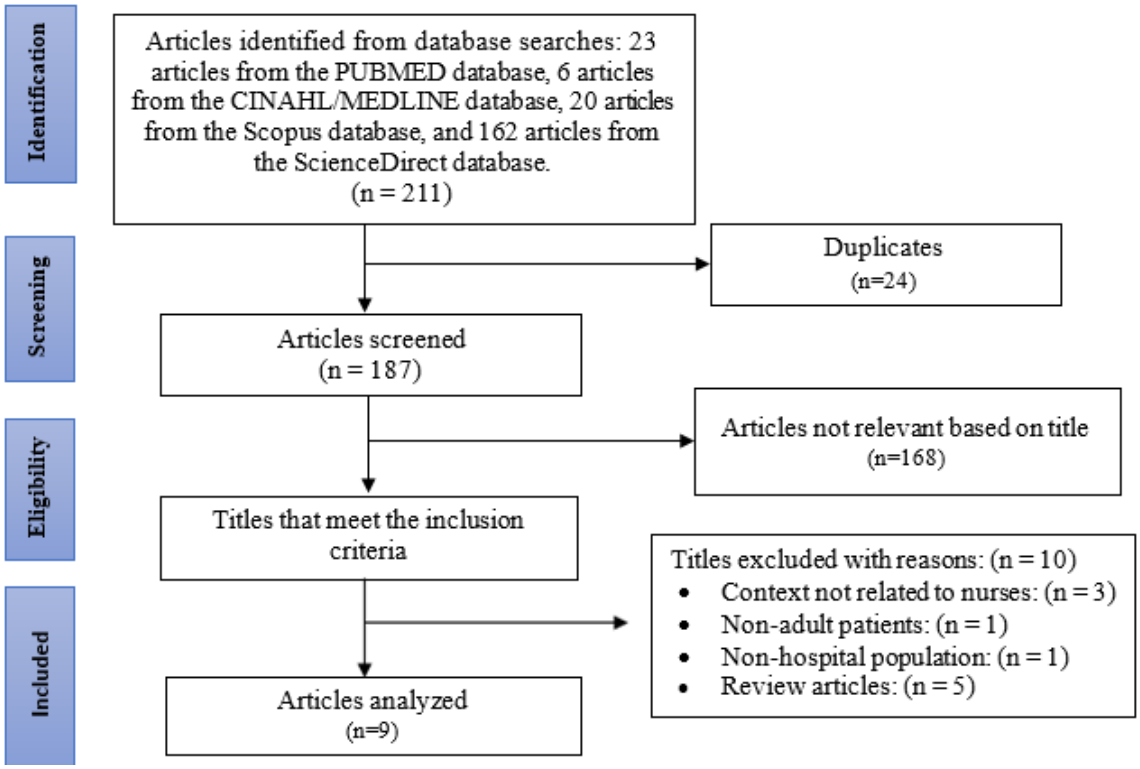

Figure 1. Article Selection Process

No	Title	Authors (years)	Objective	Country and setting	Research Method	Key Findings
1	Association of Registered Nurse Staffing with Mortality Risk of Medicare Beneficiaries Hospitalized with Sepsis	Jeannie P. Cimiotti, et.al (2022)	To identify the relationship between registered nurse (RN) staffing and mortality in sepsis patients receiving acute care in hospitals	United States Acute care units	Cross-sectional study	• Hospitals that provide more hours of Registered Nurse (RN) care can improve compliance with the SEP-1 bundle and reduce mortality rates in sepsis patients receiving care. Specifically, each additional hour of nursing care per patient day (HPPD) was associated with a 3% reduction in the likelihood of death within 60 days of hospital admission (odds ratio, 0.97; 95% CI: 0.96–0.99). • The sepsis bundle follows SEP-1, developed by the Centers for Medicare & Medicaid Services (CMS)
2	Developing an Adult Sepsis Protocol to Reduce the Time to Initial Antibiotic Dose and Improve Outcomes among Patients with Cancer in the Emergency Department	Mustafa Z. Bader et. al (2020)	To develop a sepsis protocol for adult oncology patients to reduce time to first antibiotic dose in the ED, enhance early recognition, and reduce hospital mortality	Qatar Emergency Department	Quasi-experimental	• Increasing nurses' awareness of sepsis patients was achieved through education and training conducted over two months, including monthly journal clubs and face-to-face education on a developed sepsis protocol consisting of assessment, diagnosis, and management of sepsis. The educational content was based on the Surviving Sepsis Campaign, specifically the *International Guidelines for Management of Sepsis and Septic Shock: 2016 International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)*. • Sepsis assessment time decreased from 20 minutes to 6 minutes, blood collection time reduced from 44 minutes to 20 minutes, fluid resuscitation administration time shortened from 53 minutes to 20 minutes, and the time to initial

						antibiotic administration was reduced from 95 minutes to 45 minutes. Following the intervention, the mortality rate decreased to 11.7%.
3	Emergency nurses' experiences of the implementation of early goal-directed fluid resuscitation therapy in the management of sepsis: a qualitative study	Gladis Kabil et.al (2021)	To explore ED nurses' experiences with early fluid resuscitation initiation for sepsis patients	Australia Emergency Department	Qualitative exploratory study	• Barriers to Therapy Initiation: Nurses face challenges in the early recognition of sepsis and heavy workloads in the emergency department, which hinder the initiation of fluid resuscitation therapy. • Differences in Experience: Experienced nurses are more likely to make intuitive decisions and initiate fluid therapy, while less experienced nurses feel constrained by scope-of-practice limitations. • Practice Change Recommendations: Many nurses, especially Clinical Initiative Nurses, recommend that nurse-initiated fluid resuscitation be included within their scope of practice. • Need for Protocol Evaluation: There is a need to re-evaluate existing protocols and practice guidelines to enhance nurses' ability to independently initiate fluid therapy and improve outcomes for patients with sepsis.
4	Evaluation of hospital nurse-to-patient staffing ratios and sepsis bundles on patient outcomes	Karen B. Lasater et.al (2021).	To evaluate whether nurse-to-patient ratios impact clinical outcomes in hospitalized sepsis patients	United States Medical-surgical units	Cross-sectional study	• Each additional patient per nurse is associated with a 12% higher likelihood of in-hospital mortality, a 7% higher chance of death within 60 days, a 7% greater likelihood of adverse outcomes, and a longer hospital stay. • Compliance with the SEP-1 bundle is associated with lower in-hospital mortality and shorter

						lengths of stay, although its impact is considerably smaller compared to the effect of staffing levels.
5	Impact of nurse-initiated ED sepsis protocol on compliance with sepsis bundles, time to initial antibiotic administration, and in-hospital mortality	Heather Rose Bruce et.al (2015)	To evaluate the impact of timely nurse-initiated sepsis protocols in the emergency department on the early administration of antibiotics, ensure compliance with the 3-hour targets of the Surviving Sepsis Campaign (SSC), and identify predictors of in-hospital sepsis mortality.	United States Emergency Department	Retrospective chart review	• There was a significant improvement in lactate level measurement and the timing of initial antibiotic administration following the implementation of the protocol. However, one-quarter of the antibiotic administrations still exceeded the 3-hour target. • Significant predictors of in-hospital mortality include respiratory dysfunction, central nervous system dysfunction, urinary tract infection, vasopressor administration, and patient body weight. • Patient mortality in this study showed no difference between the pre- and post-protocol implementation periods.
6	Providing education and tools increases nurses' and midwives' assessment for puerperal sepsis in a regional referral hospital in South Western Uganda	Rachel Luwaga et.al (2022)	To assess the impact of educational intervention and the implementation of a screening tool on maternal sepsis screening at a Regional Referral Hospital in Southwestern Uganda.	Uganda Obstetric gynecology, and maternal wards	Quasi-experimental	• There was an increase in knowledge scores after the educational intervention, with the average score rising from 5.78 to 7.13. • There was a statistically significant difference in the documentation of observed vital signs between the retrospective chart review and the screenings conducted after the educational intervention.
7	Study on the clinical nursing pathway to promote the effective implementation of the sepsis bundle in septic shock	Chun-Xia Liu et.al(2021)	To develop a clinical nursing pathway for the management of septic shock clusters in the Intensive Care Unit (ICU) and to promote the effective implementation of septic shock	China ICU	by means of an evidence-based method, quality control index requirements, and on-site investigation	• Before implementation, training and mentoring were conducted for all staff regarding the clinical nursing pathway for the sepsis bundle in septic shock management. • After the implementation of the clinical nursing pathway for the sepsis bundle in septic shock,

			cluster management.			the completion rate of the 1-hour sepsis bundle for septic shock increased from 66.4% to 81.4%, the 3-hour bundle completion rate rose from 77% to 89.4%, and the 6-hour bundle completion rate improved from 82.3% to 95.5%. All of these improvements showed statistically significant differences (p < 0.05) compared to the control group.
8	The Implementation of Sepsis Bundles on the Outcome of Patients with Severe Sepsis or Septic Shock in Intensive Care Units	Shu-Lien Chou et. al (2014)	To implement a sepsis bundle and evaluate its effects on patients with severe sepsis or septic shock in the ICU.	Taiwan ICU	Prospective observational cohort	• Sepsis bundle compliance rates increased from 20% in the pre-intervention phase to 43.3% during the education phase, 84.6% in the operational phase, and 79.2% in the post-intervention phase. • The mortality rate decreased from 43.6% to 24.5%. • Predictors of mortality between the pre-intervention and post-intervention phases were lactate levels in the ICU and urinary tract infections. • In addition to reduced mortality, there was also a trend toward shorter ICU and hospital stays, as well as lower hospital costs following the implementation of the sepsis bundle.
9	Time Is Survival: Continuing Education on Sepsis for Neurosurgical Critical Care Nurses	Emily Marguerite Rios and Karen Lucas Breda (2023)	To implement ongoing education for critical care neurosurgical nurses on the early signs and symptoms of sepsis and the management of sepsis in accordance with SSC (Surviving Sepsis	United States ICU		• Prior to the education program, nurses reported a notably low level of agreement with their understanding of the SSC guidelines, with a score of 2.70. After the education, their knowledge of the SSC guidelines increased significantly to 4.46. • There was an improvement in the routine assessment of sepsis patients, with a

	Campaign) guidelines.	post-education score of 4.44. • Self-assessment of engaging in discussions about sepsis assessment with care providers increased by 0.82. • However, the practice of initiating the 1-hour sepsis bundle from the SSC guidelines remained low.

DISCUSSION

Compliance with Sepsis Bundle Implementation in Patient Care

Compliance with the implementation of the sepsis bundle in patient care has been proven to be one of the most effective approaches to improving clinical outcomes in patients with sepsis. The sepsis bundle, which includes early detection, lactate measurement, blood culture testing, administration of antibiotics within the first hour, fluid resuscitation, and vasopressor therapy, is a well-established standard of care in sepsis management [6]. Implementing these steps as a unified standard protocol enables care teams to provide faster, more targeted interventions, directly contributing to reduced mortality rates.

The study by Chou et al. provides strong evidence of the effectiveness of the sepsis bundle in reducing mortality [12]. In their study, Chou et al. reported a decrease in mortality from 43.6% to 24.5%, accompanied by an increase in compliance from 20% to 72.9% [12]. This finding is supported by Shiramizo et al, who reported a reduction in sepsis-related mortality from 54% to 16.2% following completion of the 6-hour sepsis bundle, with an increase in compliance from 6% to 13.7% [13]. These reductions in mortality clearly demonstrate that adherence to sepsis bundle implementation improves clinical management and directly enhances patient survival rates.

Nurse Workload and Its Impact on Sepsis Bundle Implementation

A high nurse workload is a critical factor influencing the implementation of sepsis bundles in hospital settings. Studies by Cimiotti et al. and Lasater et al. highlight the significant impact of high nurse-to-patient ratios on nurses' ability to complete the sepsis bundle promptly. A higher ratio reduces the time available for nurses to focus on each step of the sepsis bundle protocol, such as administering antibiotics within the first hour, performing fluid resuscitation, and monitoring patients' vital signs [14,15].

Lasater et al. found that a high nurse-to-patient ratio negatively affects implementation of the sepsis bundle [15]. Each additional patient per nurse was associated with a 12% increase in the risk of in-hospital mortality. Meanwhile, Cimiotti et al. also found that increased hours of care provided by registered nurses (RNs) could reduce the likelihood of death by 3% [14]. A high workload often limits nurses' ability to execute all components of the bundle on time, especially

in high-demand settings such as emergency departments (EDs) and intensive care units (ICUs). These findings align with those of Dierkes et al, who reported that a high nurse workload increases the risk of mortality, ICU admission, prolonged hospitalization, and hospital readmission in sepsis patients [16]. Therefore, the nurse-to-patient ratio must be carefully considered in patient care, as it significantly affects treatment outcomes—particularly patient mortality during hospitalization [17].

Effectiveness of Education and Training in Supporting Sepsis Bundle Implementation

Continuous education is an effective intervention for enhancing nurses' competencies in sepsis management. Studies by Luwaga et al. and Rios & Breda demonstrated that intensive training significantly improved nurses' knowledge of the Surviving Sepsis Campaign (SSC) guidelines [18,19]. Additionally, Bader et al. found that a two-month training program focused on sepsis protocols reduced the time to sepsis detection from 20 minutes to 6 minutes and decreased mortality to 11.7% [20]. These findings are consistent with those of Edwards et al, who reported that training improved nurses' knowledge, skills, and attitudes regarding early detection and management of sepsis [4]. Such training has been shown to increase nurses' confidence in performing sepsis screening, potentially reducing sepsis-related mortality by ensuring faster recognition and more accurate treatment.

Barriers to Sepsis Bundle Implementation

In the study by Kabil et al., it was identified that experienced nurses were more likely to promptly initiate fluid resuscitation, whereas less experienced nurses often felt constrained by a lack of authority and limitations within their scope of practice [21]. High workloads and the lack of evaluation of existing protocols further exacerbated these barriers. Another study conducted by Abutheraa et al. found that the main barriers to sepsis bundle implementation included difficulties in diagnosing sepsis, the appropriateness of the sepsis bundle in maternity care settings, and insufficient staff training [22].

Similarly, Breen et al reported that a lack of knowledge, limited resources, and practical challenges in implementing the sepsis bundle were major obstacles identified by healthcare professionals [23]. Specific barriers faced by nurses included insufficient knowledge and experience, resource constraints, and the complexity of protocols.

Impact of Sepsis Bundle Implementation on Patient Outcomes

The effective implementation of the sepsis bundle significantly impacts patient outcomes. This was demonstrated in the study by Chou et al., which showed that compliance with the sepsis bundle reduced mortality, length of hospital stay, and overall hospital costs [12].

These findings are consistent with the study by Rhodes et al, which reported that adherence to the sepsis bundle could reduce the likelihood of in-hospital mortality by 36% to 40% [24].

Furthermore, the study by Leisman et al. found that adherence to the protocol significantly reduced mortality and treatment costs [25]. These findings affirm that evidence-based interventions are beneficial not only clinically but also economically.

The Role of Nurses in the Successful Implementation of the Sepsis Bundle

Nurses play a crucial role in ensuring the timely implementation of the sepsis bundle. This was highlighted in a study by Bruce et al, which showed that active nurse involvement in emergency department protocols improved compliance with the SSC (Surviving Sepsis Campaign) guidelines [8]. However, the study also noted that one-quarter of antibiotics were still administered beyond the 3-hour window, indicating the need for further monitoring to ensure timely interventions. Moore et al also found that nurse-driven protocols could improve compliance with sepsis bundle components, such as lactate level measurement, blood culture collection, and earlier antibiotic administration [26].

Furthermore, a study by Liu et al revealed that compliance with sepsis bundle implementation could be achieved through the application of a clinical nursing pathway [27]. This was evidenced by increased completion rates of the 1-hour, 3-hour, and 6-hour sepsis bundles following the implementation of the pathway. Therefore, the critical role of nurses in the success of sepsis bundle implementation lies in their active involvement in sepsis bundle protocols.

A limitation of this scoping review is that the primary articles used were not subjected to critical appraisal, which may introduce potential bias.

CONCLUSION

Based on the nine reviewed articles, nurse-led implementation of the sepsis bundle in hospitals is a key component in effective sepsis management. Additionally, several factors such as nurse-to-patient ratios, ongoing training, protocol revisions, and systemic support play a crucial role in determining the success of bundle implementation. To improve clinical outcomes and operational efficiency, healthcare institutions should focus on strengthening nurses' capacity through evidence-based education, optimal staffing policies, and supportive technologies. A multidimensional approach to sepsis bundle implementation can be further enhanced to ultimately reduce mortality rates and improve the quality of patient care.

DECLARATIONS

Ethics approval

None

Conflict of interest.

The authors declare no conflict of interest.

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