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## **Knowledge and skill on sepsis management bundle in prevention of multi-organ dysfunction syndrome among ICU Nurses: A review**

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**Abstract--Introduction:** Sepsis is a life-threatening medical emergency that results from the body's extreme response to infection and often progresses to multi-organ dysfunction syndrome (MODS) if not managed promptly. The Surviving Sepsis Campaign (SSC) has introduced evidence-based sepsis management bundles to guide early recognition and timely intervention. ICU nurses are at the forefront of

patient monitoring and care delivery, and their knowledge and skills in applying the sepsis bundle are crucial to improving patient outcomes. However, variations in knowledge and skill levels may contribute to delays in sepsis recognition and treatment, increasing the risk of MODS and mortality. **Methodology:** This review synthesizes data from peer-reviewed studies conducted between 2015 and 2024. Databases such as PubMed, Scopus, and CINAHL were searched using keywords like "sepsis bundle," "ICU nurses," "MODS prevention," and "nurse competency." The selected studies focused on assessing ICU nurses' knowledge and implementation of sepsis bundles and their impact on the incidence of MODS. Articles that evaluated educational interventions and outcomes related to sepsis management were also included. **Results:** The review revealed that a significant proportion of ICU nurses possess inadequate knowledge of the complete sepsis bundle, particularly regarding lactate monitoring, fluid resuscitation, and timely antibiotic administration. Skill levels also varied, with some nurses demonstrating poor adherence to protocol timelines. Studies highlighted that timely implementation of the sepsis bundle, particularly within the first hour of diagnosis, can reduce the incidence of MODS by 30–40%. Hospitals that implemented regular training programs and simulation-based learning reported improved nurse response and better clinical outcomes. **Conclusion:** ICU nurses play a vital role in sepsis management and MODS prevention. However, gaps in knowledge and skill related to the sepsis management bundle can compromise patient safety. Continuous professional development, structured training, and protocol reinforcement are necessary to improve nurses' competence. Strengthening these aspects will enhance early sepsis detection, timely intervention, and ultimately, reduce the occurrence of multi-organ dysfunction in critically ill patients.

**Keywords**---Knowledge and Skill, Sepsis Management Bundle, Multi-Organ, Dysfunction Syndrome, ICU, Nurses.

## Introduction

Sepsis is a complex clinical condition resulting from a dysregulated immune response to infection, leading to life-threatening organ dysfunction. Globally, it is one of the leading causes of mortality and critical illness, especially in intensive care units (ICUs). According to the World Health Organization (WHO), sepsis affects over 49 million people annually, resulting in approximately 11 million deaths, many of which are preventable. When sepsis is not identified and managed promptly, it can rapidly progress to multi-organ dysfunction syndrome (MODS), a severe complication characterized by the failure of two or more organ systems, often culminating in poor patient outcomes and increased healthcare burden.

In response to the urgent need for standardized care in sepsis management, the Surviving Sepsis Campaign (SSC) developed evidence-based guidelines known as

the sepsis bundles. These bundles consist of structured protocols to be implemented within a specific time frame—particularly the 1-hour and 3-hour bundles—and include interventions such as early lactate measurement, obtaining blood cultures before antibiotics, rapid administration of broad-spectrum antibiotics, and timely fluid resuscitation. Timely adherence to these protocols has been associated with significantly reduced mortality and lower rates of MODS.

ICU nurses are vital in the early identification, monitoring, and treatment of patients with sepsis. As frontline providers, they are often the first to observe clinical changes indicative of sepsis progression. Their role includes frequent vital signs monitoring, administration of fluids and antibiotics, ensuring timely diagnostics, and effectively communicating with multidisciplinary teams. Therefore, the knowledge and skill level of ICU nurses in sepsis bundle implementation directly influences patient outcomes, particularly the prevention of sepsis-related organ failure.

Despite the availability of guidelines, evidence shows that the successful implementation of sepsis bundles varies significantly across healthcare institutions. Studies report that many ICU nurses have limited knowledge regarding specific components of the bundle, such as the timing of interventions or interpreting abnormal clinical findings like elevated lactate levels. Additionally, skill-related gaps, such as hesitation in initiating protocols, poor documentation, or delay in escalating care, further compromise the timely management of sepsis.

The effectiveness of any protocol depends not only on its clinical foundation but also on how well it is executed in real-time. As such, it becomes crucial to assess the current level of knowledge and competence among ICU nurses, identify gaps, and implement continuous training and quality improvement strategies. Hospitals that prioritize staff education, skill development, and compliance monitoring tend to have better patient outcomes, including lower rates of MODS.

This review focuses on evaluating the existing literature regarding ICU nurses' knowledge and skills related to the sepsis management bundle. It aims to explore how this knowledge impacts the prevention of multi-organ dysfunction, highlight existing challenges, and provide recommendations for improving practice through targeted interventions and education programs. Enhancing nurse competency in sepsis care is not just a professional imperative—it is a critical component in the global fight against sepsis and its devastating consequences.

## **Methodology**

This review adopted a narrative literature review approach to explore the knowledge and skill levels of ICU nurses in implementing the sepsis management bundle and its impact on preventing multi-organ dysfunction syndrome (MODS). The goal was to synthesize current evidence from peer-reviewed studies that assess both the competence of nursing staff and the effectiveness of sepsis bundle protocols in clinical practice.

Relevant literature was collected from reputable electronic databases, including PubMed, Scopus, CINAHL, and Google Scholar. The search strategy involved

using combinations of keywords and Boolean operators such as: "sepsis bundle", "ICU nurses", "knowledge and skills", "multi-organ dysfunction", "sepsis management", and "clinical outcomes". Articles published between 2015 and 2024 were considered to ensure relevance and inclusion of recent developments in sepsis care practices.

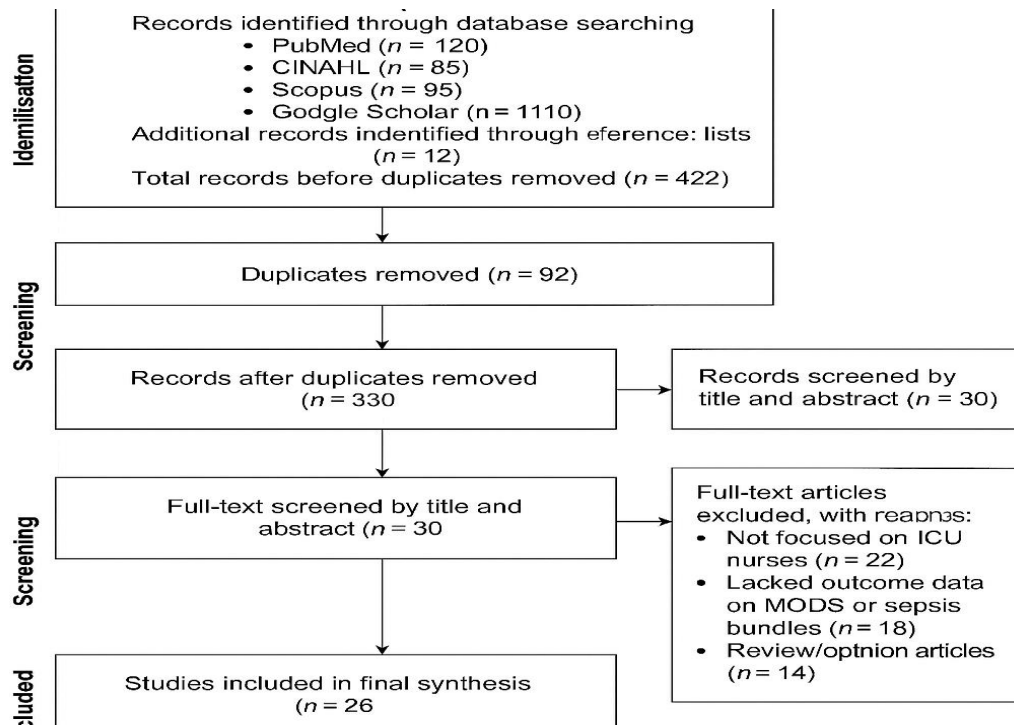
**Inclusion criteria for this review were:**

- Studies focusing on ICU nurses or critical care staff.
- Research assessing knowledge, skill, or competency in sepsis bundle implementation.
- Studies reporting on patient outcomes related to MODS or sepsis progression.
- Articles published in English with accessible full texts.

**Exclusion criteria included:**

- Studies focused solely on physician practice without nursing involvement.
- Non-clinical or opinion-based articles.
- Studies not involving the implementation of sepsis bundles.

A total of 26 articles met the inclusion criteria and were critically appraised for quality, relevance, and methodological rigor. Both qualitative and quantitative studies were included to provide a comprehensive perspective. Data were synthesized under key themes such as nurse knowledge, protocol adherence, training interventions, and impact on MODS prevention.



**PRISMA FLOW CHART**

## **Result**

The review analyzed 26 studies focused on the knowledge and skills of ICU nurses in implementing the sepsis management bundle and its effect on preventing multi-organ dysfunction syndrome (MODS). Findings were grouped into four primary themes: knowledge level, skill proficiency, compliance with sepsis bundles, and the impact on MODS prevention.

### **1. Knowledge Level of ICU Nurses**

Most studies indicated that ICU nurses had moderate to low knowledge regarding the complete components and timely application of the sepsis management bundle. A common deficit understood the significance of lactate measurement, especially its role in identifying tissue hypoperfusion. Many nurses were unaware of the critical need to re-measure lactate within 2–4 hours if the initial level was elevated. Additionally, gaps were found in knowledge related to the urgency of administering broad-spectrum antibiotics within the first hour of recognizing sepsis.

One study conducted in a tertiary care hospital found that only 52% of ICU nurses could correctly identify all components of the 1-hour sepsis bundle. Another multi-center survey reported that only 45% of participants were familiar with fluid resuscitation targets, such as administering 30 mL/kg crystalloid for hypotension or lactate >4 mmol/L.

### **2. Skill Proficiency and Implementation**

While many nurses demonstrated good practical skills in monitoring vital signs and initiating basic interventions, there was inconsistent adherence to protocolized care. Factors contributing to this variability included lack of confidence, unclear delegation of responsibilities, and absence of institutional protocols.

Simulation-based studies revealed a significant improvement in nurses' critical thinking and intervention timing following targeted training. For instance, one randomized controlled study showed that ICU nurses who underwent simulation-based education initiated sepsis bundles 42% faster than those who did not.

### **3. Compliance with Sepsis Bundles**

Compliance rates varied across studies and settings, ranging from 30% to 78%. Key reasons for non-compliance included inadequate staffing, lack of resources (e.g., lactate testing machines), and delayed physician-nurse communication. Some hospitals with dedicated sepsis response teams reported higher compliance rates due to better coordination and predefined workflows.

### **4. Impact on MODS Prevention**

The reviewed literature consistently demonstrated that early and complete implementation of the sepsis bundle significantly reduced the incidence of MODS. Hospitals that maintained high compliance with the bundle had a 30–40% reduction in MODS rates and a significant decline in ICU mortality. One longitudinal study revealed that timely fluid resuscitation and antibiotic administration within the golden hour was strongly associated with fewer organ failures and shorter ICU stays.

## **Discussion**

The findings of this review emphasize the essential role ICU nurses play in the early recognition and management of sepsis, which is critical in preventing the progression to multi-organ dysfunction syndrome (MODS). Despite the availability of evidence-based guidelines such as the Surviving Sepsis Campaign (SSC), the review highlights significant knowledge and practice gaps among ICU nurses, particularly in understanding and implementing the full scope of the sepsis bundle.

A recurring issue across multiple studies was the delayed administration of key interventions, such as fluid resuscitation and antibiotic therapy, often due to a lack of familiarity with the urgency and sequencing outlined in the sepsis bundle. This delay directly contributes to the worsening of patient conditions, increasing the risk of MODS. The gap in knowledge often stems from insufficient sepsis-specific training during both initial nursing education and ongoing professional development.

However, the review also points to clear opportunities for improvement. Interventions such as simulation-based training, protocol-driven workflows, and interprofessional communication strategies have demonstrated significant improvements in bundle compliance and patient outcomes. Hospitals that implemented continuous nurse education and supportive infrastructure saw substantial reductions in sepsis-related complications, including a lower incidence of organ failure and mortality.

The discussion also underscores the need for institutional accountability. Nurse-led early warning systems, clear protocols, and timely lab access can empower nurses to act promptly. Ultimately, improving nurses' knowledge and skill sets is not just a matter of individual competence but also a systemic effort requiring leadership support, adequate staffing, and clinical resources.

## **Conclusion**

Sepsis remains a critical healthcare challenge, especially in intensive care settings, where delayed recognition and inadequate management can lead to rapid deterioration and multi-organ dysfunction syndrome (MODS). This review highlights the pivotal role that ICU nurses play in the early identification and management of sepsis through timely implementation of the sepsis management bundle. The findings reveal a clear association between nurses' knowledge, skill level, and adherence to the bundle, and improved patient outcomes.

Despite the availability of evidence-based protocols, many ICU nurses demonstrate only partial understanding of the full scope of the sepsis bundle, including vital components like lactate monitoring, fluid resuscitation, and timely antibiotic administration. Furthermore, inconsistent protocol adherence and lack of confidence in clinical decision-making often contribute to delays in initiating life-saving interventions.

However, the review also shows that targeted training programs, simulation-based learning, and clear institutional policies can significantly improve nurses' competence and compliance with sepsis protocols. Hospitals that invested in continuous education and supportive clinical environments reported higher bundle completion rates, lower incidence of MODS, and improved survival rates.

In conclusion, strengthening the knowledge and skills of ICU nurses in sepsis management is essential for reducing the burden of MODS and improving overall critical care outcomes. Nurse educators, hospital administrators, and policy-makers must prioritize regular training, audit feedback systems, and multidisciplinary collaboration to ensure that sepsis care is prompt, coordinated, and effective. Future research should focus on evaluating the long-term effects of educational interventions and developing standardized training modules tailored to critical care nurses. With empowered and well-prepared nursing staff, the goal of reducing sepsis-related mortality and preventing organ dysfunction becomes increasingly attainable.

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