Enhancing Critical Care Nurses' Sepsis Management: The Role of Educational Program

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Abstract

Background: Sepsis is an important global healthcare problem that is a key challenge faced by healthcare professionals face worldwide.Nurses who care for critically ill patients need to know a lot about sepsis so they can recognize it early and help prevent it. **Aim:** This study aimed to evaluate the effect of educational program on critical care nurses' sepsis management. **Research design:** To conduct the study's aim, a quasi-experimental research design was utilized. **Setting:** The study was conducted at critical care (ICU) and emergency department) and at intensive care units (acute care (med-surg) of Sohag University Hospital, Egypt. **Subjects:** A convenience sample included (**100**) of all available critical care staff nurses. **Tools:** Two tools were used ; Tool(I): Critical care nurses' knowledge regarding sepsis and Tool (II): Critical care nurses' practices regarding sepsis management. **Results:** Less than two thirds of the nurses had unsatisfactory knowledge about sepsis management pre-implementation of the educational program compared with highest majority of them showed satisfactory total knowledge post implementation; As well, nurses' total practices regarding sepsis management were significantly improved post implementation of the educational program. **Conclusion:** The study results concluded that educational program implementation has a positive effect on improving critical care nurses' sepsis management. **Recommendations:** In-service training program is recommended for ICU nursing staff.Incorporating active learning strategies into sepsis education interventions has the potential to improve learners' long-term outcomes. In addition, sepsis education and a protocol-based sepsis care bundle act in synergy to augment greater improvements in care processes and patient benefits.

Keywords: Critical care nurses, Educational program, Sepsis management

Introduction:

It is crucial for nurses to identify the initial signs and symptoms of sepsis. According to **Evans et al., (2020),** the swift diagnosis and effective management of sepsis indicators are vital for successful patient care. Healthcare organizations expect nurses to detect the early symptoms of sepsis and to initiate suitable therapeutic measures while attending to patients **(Laux et al., 2023).**

Sepsis is a critical condition that occurs when the body's reaction to infection triggers widespread inflammation, resulting in tissue damage, organ failure, and potentially death. It is a leading cause of mortality globally, responsible for around 11 million deaths each year, which represents approximately 20% of all deaths worldwide **(World Health Organization, 2024).**

Severe sepsis is a potentially lethal condition that continues to pose a significant

threat to global health, impacting millions of individuals each year. Organ dysfunction arises from a dysregulated host response to infection in this complex disease. It is a significant contributor to global morbidity and mortality, placing a substantial financial burden on healthcare systems and increasing healthcare costs. Sepsis affects over 50 million people worldwide and is responsible for 11 million deaths annually. To mitigate the spread of sepsis and enhance patient survival rates, timely diagnosis and appropriate treatment are imperative **(Guarino et al., 2023).**

Worldwide, sepsis impacts an estimated 48.9 million individuals each year, with 11 million sepsis-related deaths recorded in 2020. The incidence rate varies considerably across different regions, with the highest rates found in low- and middle-income countries. In these areas, sepsis frequently results from infections acquired in healthcare environments, particularly among immunocompromised patients **(World Health Organization, 2024).**

Sepsis is associated with adverse physiological, psychological, and financial consequences. Acute kidney failure, sudden respiratory issues, and irregular heart rhythms are among the complications linked to this condition, and widespread blood clotting issues. are only a few of the various organ dysfunctions that can result from sepsis. Sepsis can lead to significant emotional repercussions, including anxiety, sorrow, and stress following a negative experience. For patients in critical care suffering from sepsis who are admitted to intensive care units (ICUs), the expenses associated with medical supplies and services are substantial, with thirty percent of these patients succumbing before they can be discharged from the ICU **(Bodinier et al., 2021).**

The essential aspect of effectively managing sepsis is the prompt identification of the condition and the immediate initiation of robust and appropriate treatment. To effectively address the illness, it is vital to administer fluids to the patient and ensure adequate blood circulation. Additionally, it is imperative to commence antibiotic therapy as soon as possible. Nurses must possess extensive knowledge about sepsis, as many hold misconceptions regarding the condition. For instance, some nurses may not recognize that low blood pressure, diminished oxygen levels, and scant urine output can indicate sepsis. This lack of awareness can lead to delays in recognizing sepsis, initiating timely treatment, and administering antibiotics **(Patnaik, et al., 2020).**

The healthcare landscape is continuously evolving, with ongoing advancements in clinical practices, technology, and research. Regularly assessing the knowledge and skills of critical care nurses is vital to ensure they are up-to-date with the latest evidence-based guidelines and best practices for sepsis management. By identifying knowledge gaps, healthcare institutions can develop targeted educational interventions and training programs, ultimately enhancing patient outcomes **(Baghela et al., 2022).**

Assessing the sepsis knowledge and practices of critical care nurses is essential not only for their professional development but also for ensuring that patients with sepsis receive safe and effective care. Given the complexity of sepsis, nurses must be well-informed about its causes, diagnostic criteria, and management strategies. Healthcare organizations can evaluate nurses' knowledge to identify areas that require additional education and training, thereby improving their ability to provide evidence-based care **(Sinha et al., 2023).**

Critical care nurses are essential in the prompt detection and treatment of sepsis. Numerous nurse-led initiatives centered on sepsis care illustrate the vital role nurses play in assisting patients afflicted with sepsis. For instance, when nurses adhere to specific protocols to swiftly identify and address sepsis, initiate blood tests promptly, and lead response teams, it has been demonstrated to be beneficial. This collaborative effort among nurses can decrease mortality rates, reduce the duration of ICU stays, and diminish the likelihood of readmission to the ICU **(Santacroce et al., 2024).**

Significance of the Study

Evaluating the knowledge and practices of critical care nurses concerning sepsis is essential for enhancing patient care and outcomes

(Santacroce et al., 2024). By assessing their comprehension of sepsis and their capability to execute vital sepsis-related procedures, healthcare organizations can identify areas requiring improvement and implement targeted measures to enhance sepsis care **(Salama et al., 2021).** The results of this study will inform the creation of customized educational programs, guidelines, and policies that support evidence-based sepsis management, ultimately leading to better patient outcomes and an overall enhancement in the quality of care within critical care environments. The importance of researching sepsis is underscored by its high prevalence, particularly in low- and middle-income nations, and the possibility of prevention through timely identification and suitable treatment. Despite its seriousness, sepsis is often not recognized or reported adequately, especially in areas with limited healthcare facilities. Gaining insight into its epidemiology, risk factors, and outcomes can guide public health initiatives and clinical practices aimed at alleviating its impact (**Rudd et al., 2020).**

In Egypt, there is a scarcity of specific national statistics regarding the incidence of sepsis. Nevertheless, the healthcare system in the country encounters obstacles such as restricted access to advanced medical services, which may lead to increased morbidity and mortality rates associated with sepsis. Initiatives to enhance infection prevention, early identification, and prompt treatment are essential to tackle this concern.

The estimated incidence stands at 270 sepsis cases per 100,000 individuals annually, with a mortality rate of 26%. Over the past thirty years, significant efforts have been made to enhance the recognition and management of sepsis **(Madkour et al., 2022).** Increasing awareness about sepsis has enabled nurses to better understand and refine their skills in caring for patients afflicted with this condition. Critical care nurses maintain direct contact with patients and are responsible for detecting changes in their health status and test results. Therefore, it is imperative to assist critical care nurses in acquiring more knowledge regarding the early detection and treatment of sepsis symptoms. Hence, this study aimed to evaluate the effect of educational program on critical care nurses' sepsis management.

Aim of the Study:

This study aimed to evaluate the effect of educational program on critical care nurses' sepsis management

Research hypothesis:

Application of mind mapping regarding infection control precautions is expected to improve nurses' performance at critical care units.

Patients and Methods:

Study design:

To conduct the study's aim, a quasi-experimental research design was utilized

Setting:

The study was conducted at critical care (ICU) and emergency department) and at intensive care units (acute care (med-surg) of Sohag University Hospital, Egypt

Sampling:

A convenience sample included (100) of all available critical care staff nurses.

Tools for Data Collections:

Two tools were used:

Tool(I): Critical care nurses' knowledge regarding sepsis; It was developed by the researcher after conducting a thorough review of both national and international literature related to the subject **(Jeffery et al., 2014; Sepsis Alliance. 2020; Rudd et al., 2020; & Morgan, 2020; World Health Organization, 2024)**. The tool is divided into two parts as follows:

Part (1): Included critical care nurses personal data, it was consisted of (age, gender, education level, years of experience, and receiving previous education regarding to sepsis).

Part (2): Critical care nurses' knowledge regarding sepsis;

This questionnaire was designed to evaluate the knowledge of critical care staff nurses regarding sepsis. It comprised fifty items presented in a multiple-choice format, organized into five primary dimensions: Case scenarios for sepsis identification (6 items), sepsis indicators (17 items), diagnostic tests (9 items), and criteria used to objectively assess patient experiences of sepsis (16 items).

Participants' responses were scored as (1) for a correct answer and (0) for an incorrect answer or a response of 'do not know'. The highest possible total score was fifty. The scores were classified into two categories: satisfactory (≥75%) and unsatisfactory (< 75%).

Tool (II): Critical care nurses' practices regarding sepsis management:

This instrument was created by the researcher following a literature review of **(World Health Organization, 2024; Sepsis Alliance. 2020; Lino, et al., 2019 & Taylor et al., 2011)** to evaluate the sepsis practices of critical care nurses. It comprised (39 items) categorized into nine primary dimensions, which are: initial assessment and recognition (5 items), sepsis screening and scoring (2 items), communication and documentation (2 items), fluid resuscitation (3 items), antibiotic administration (3 items), hemodynamic monitoring and support (3 items), ongoing assessment and interventions for sepsis (3 items), patient and family education (3 items), and infection control practices (15 items).

Participants' responses were assessed using a three-point Likert scale. The items were rated as "done correctly" for 2 points, "done incorrectly" for 1 point, and "not done" for zero points. The total scores were calculated and converted into percentages. Practices were deemed incompetent if they scored less than 75%, while those scoring more than 75% were considered competent.

Method:

Tools validity :

The validity of the tools was established and presented to five nursing experts: three from the field of critical nursing, one from medical-surgical nursing, and one from the medical specialty. Their task was to evaluate the tools for clarity, relevance, comprehensiveness, and understandability. The researcher requested their opinions regarding the face and content validity of the proposed tool. The feedback and suggestions from the experts were considered, leading to necessary modifications, corrections, and clarifications of the items.

Tools Reliability:

The reliability assessment was conducted to ensure consistency, evaluating the strength of the relationships among the attributes and the overall composite score. The reliability of the tools was measured using the Cronbach Alpha Coefficient test, which yielded a value of 0.976 for critical care nurses' knowledge of sepsis. In contrast, the value for critical care nurses' skills in sepsis assessment was 0.879. Both results indicate an acceptable level of internal consistency for the tools.

Pilot Study:

A pilot study was conducted involving 10% of the nursing staff, which comprised 5 nurses. This study was performed prior to data collection to assess feasibility, timing, and to identify any potential issues. This process contributed to enhancing the study before the full research was undertaken. Necessary adjustments were implemented, and ten nurses were included in the pilot study sample.

Ethical Consideration

The research proposal received approval from the Ethical Committee of the Faculty of Nursing at Sohag University, under approval code [27], in February 2023. The study complied with widely recognized ethical standards in clinical research, which include respect for autonomy, beneficence, non-maleficence, and justice.

Informed written consent was secured from all nurses and, when applicable, from management after a comprehensive explanation of the study's nature, objectives, and the voluntary aspect of participation. Confidentiality and anonymity were rigorously maintained, with no personal identifiers gathered or revealed in any manner. Nurses were entitled to refuse participation or withdraw from the study at any point without the obligation to provide a reason and without facing any consequences. Furthermore, the privacy of all participants was diligently safeguarded during data collection to ensure a secure and ethical research setting.

Administrative design

For conducting the study, an official letter from the Dean of the Faculty of Nursing, Sohag University was issued to the administrative authority of study setting to obtain permission and cooperation to conduct the study after explaining the aim of the study.

Field work:

The researcher attended the study setting three days weekly (Saturday, Monday and Thursday) until the calculated sample size was obtained. This study was carried out in the period from July 2023 to December 2023. The researcher introduced herself the nurses, checked her legibility for the study by filling the tools and obtained the consent to participate in the study after explaining the aim.

The study was carried out through the following phases:-

Preparatory phase:-during this phase, data collection tools was developed based on reviewing of recent relevant literature. The researchers reviewed the current and past available literature the available textbooks, articles, magazines, and internet searches to develop the tools for data collection and prepare the educational package.

Assessment phase (pre- test): -After finalization of the tools, the researcher was assess nurses' knowledge regarding sepsis .

Implementation phase (nursing educational program):- developing an educational program regarding practices about sepsis management based on the results of the assessment phase (pre-test) through distributing an illustrated booklet on all nurses who participated, using PowerPoint presentations at the training rooms and demonstration of sepsis management procedure on job training at their units. The schedule of teaching sessions was implemented as one session weekly for each hospital during the day and night shifts.

The researchers designed the nursing educational program package based on initial assessment information and pertinent literature. The nursing educational program package addressed nurses' practices regarding sepsis management.

Sessions were performed in the Arabic language to ensure that all study subjects were understood, which included (five practical sessions). The duration of sessions for each practical session ranged from 45-55 minutes.

The content of the an educational program is presented in the following table

Session NO	Subject content	Teaching methods
1	An introductory session that emphasized establishing rapport between the researchers and the studied nurses participating in the study and explanation of the purpose of the program	Discussion
2	Education about sepsis identification , sepsis indicators , diagnostic tests, and criteria used to objectively determine patient experiences sepsis	Powerpoint presentation Discussion
3	Educate critical care nurses' sepsis management. It included practices of initial assessment and recognition, sepsis screening and scoring, communication and documentation, fluid resuscitation, antibiotic administration, and hemodynamic monitoring and support.	Powerpoint presentation Discussion
44	Education about ongoing assessment and interventions of sepsis (3 items), patient and family education (3 items), and infection control practices	Powerpoint presentation Teaching videos
5	Summary of the program and the studied nurses were asked to answer the questionnaire post educational program and during follow up.	Discussion

Evaluating the educational program:

The educational program instructions were evaluated by a jury of 5 nursing and medical experts in the field of Medical Surgical Nursing, Critical Care and Emergency Nursing . The research experts in the fields ensured clarity and appropriateness by reviewing the educational program and contents regarding sepsis management.

The general objectives of the educational program were to improve nurses' knowledge and practices in intensive care units regarding sepsis management.

Specific objectives: At the end of the educational program the studied women were able to:

- Define sepsis
- List sepsis indicators
- Enumerate diagnostic tests
- List criteria used to objectively determine patient experiences sepsis
- Know initial assessment and recognition
- Discuss sepsis screening and scoring
- Identify communication and documentation
- Know fluid resuscitation
- Know antibiotic administration
- Discuss Hemodynamic monitoring and support
- Apply Ongoing assessment and interventions of sepsis
- Know patient and family education

- Apply infection control practices

Evaluation phase (immediate post-phase):- the researcher was reassess for critical care nurses' sepsis management), comparing the findings at the post-test with those at the pre- test that was indicate the effect of the nursing educational program on the nurses' knowledge and practices.

Follow-up phase (after two months):- the researcher was reassess critical care nurses' sepsis management, comparing the findings at the follow-up test with those at the pre- test and post-test that was indicate the effect of the nursing program on the critical care nurses' sepsis management.

Statistical design:

All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL). Continuous data were normally distributed and were expressed in mean ±standard deviation (SD). Categorical data were expressed in number and percentage. One-way analysis of variance (ANOVA) test was used for comparison among more than two for variables with continuous data. Chi-square test (or fisher's exact test when applicable) was used for comparison of variables with categorical data. Correlation co-efficient test was used to test for correlations between two variables with continuous data. The reliability (internal consistency) test for the questionnaires used in the study was calculate. Statistical significance was set at $p<0.05$.

Result:

Table 1 indicates that 72% of the nurses surveyed belonged to the age group of 20 to under 30 years, 70% were female, 64% possessed diplomas from technical health institutes, and 38% of the nurses studied had less than six years of experience.

Figure 1 reveals that 94% of the nurses examined had not participated in any training courses related to sepsis.

Figure 2 shows that half of the nurses surveyed (50%) had experience in acute care units (both medical and surgical), while 40% had experience in critical care units, and some had experience in the emergency department.

Table 2 presents a statistically significant difference in the overall knowledge of the nurses regarding sepsis indicators before, immediately after, and at follow-up following the implementation of the educational program, with a significance level of $p < 0.001$.

Figure 4 demonstrates that 90% of the nurses studied had an unsatisfactory level of knowledge regarding sepsis indicators before the educational program was implemented, in contrast to 2% and 10% who had an unsatisfactory level of knowledge immediately after and at follow-up, respectively, post-implementation of the educational program.

Table 3 illustrates a statistically significant difference in the total practice level of the nurses concerning sepsis across various dimensions before, immediately after, and at follow-up following the educational program, with a significance level of $p < 0.001$.

Figure 4 further shows that 54% of the nurses surveyed had a competent level of practice regarding sepsis indicators before the educational program was implemented, compared to 90% and 94% who achieved a competent level of practice regarding sepsis immediately after and at follow-up, respectively, post-implementation of the educational program.

Table 4 highlights a statistically significant positive correlation between the total knowledge and practice scores of nurses regarding sepsis before, immediately after, and at follow-up following the educational program among critical care nurses.

Table (1): Personal data of the Critical Care Nurses (N = 100)

Nurses'Characteristic		No	%
Gender	Male	30	30.0
	Female	70	70.0
Age Group	< 20 Years	8	8.0
	From 20 to < 30 Years	72	72.0
	30 to < 40 Years	10	10.0
	40 Years and More	10	10.0
Educational Qualification	Diploma	24	24.0
	technical health institute diplomas	64	64.0
	Bachelor's Degree	12	12.0
Critical Care Nurses Experience Years	< 6 months	8	8.0
	From 6 Month – < 2 Years	22	12.0
	From 2- < 5 Years	28	28.0
	5- <10 Years	28	38.0
	10- <15 Years	8	8.0
	15- ≤ 20 Years	6	6.0

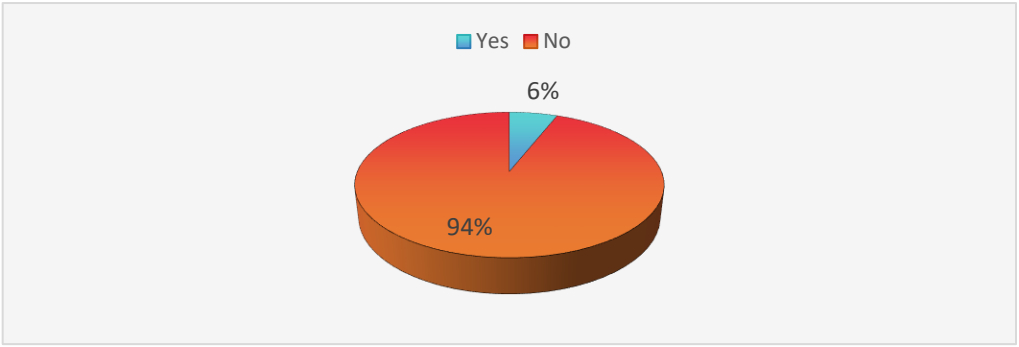

Figure (1): Percentage Distribution of Studied Nurses' Receiving Educational Program Regarding Sepsis (N = 100)

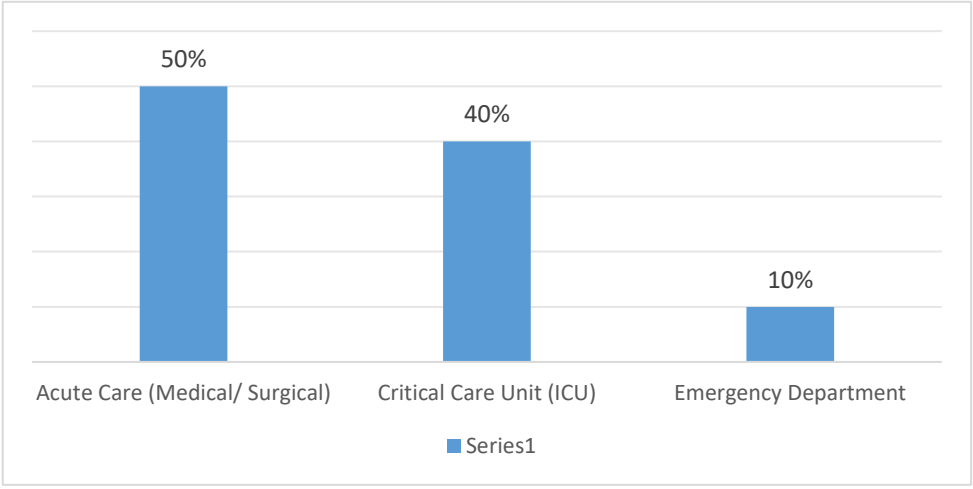

Figure (2): Percentage Distribution of Studied Nurses Regarding their Experience Years in Different Areas (n = 100)

Table (2): Comparison of the critical care nurse's sepsis knowledge scores regarding their dimensions pre, immediately post, and follow-up after implementing the educational program (n = 100)

Dimensions	Pre	Post	Follow-up	P-value
	NO, (%)	NO, (%)	NO, (%)	
Case scenarios for sepsis identification	35 (35%)	95 (95%)	92 (92%)	X^2=27.233, P<0.001**
Sepsis indicators	42 (42%)	93 (93%)	90 (90%)	
Diagnostic test	25 (25%)	98 (98%)	94 (94%)	
Criteria used to objectively determine patien experiences	57 (57%)	96 (96%)	92 (92%)	

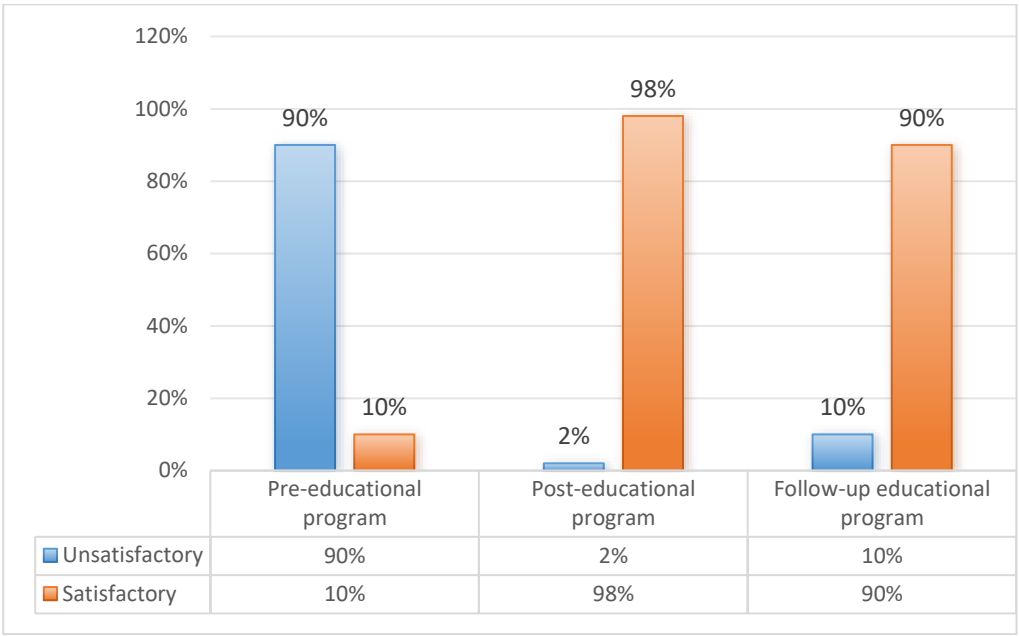

Figure (3):Total nurses knowledge levels regarding sepsis pre, immediately post, and follow-up after implementing the educational program (n = 100)

Table (3): Comparison of the critical care nurse's sepsis practices scores regarding their dimensions pre, immediately post, and follow-up after implementing the educational program (n = 100)

Dimensions	Pre	Post	Follow-up	P-value
	NO, (%)	NO, (%)	NO, (%)	
Initial Assessment and Recognition	27 (27%)	22 (88%)	21 (86%)	X^2=44.925, P<0.001**
Sepsis screening and scoring	28 (28%)	93 (93%)	90 (90%)	
Communication and Documentation	26 (26%)	92 (92%)	89 (89%)	
Fluid Resuscitation	31 (31%)	93 (93%)	88 (88%)	
Antibiotic Administration	37 (37%)	89 (89%)	85 (85%)	
Hemodynamic Monitoring and Support	25 (25%)	91 (91%)	87 (87%)	
Ongoing Assessment and Interventions	35 (35%)	90 (90%)	93 (93%)	
Patient and Family Education	25 (25%)	87 (87%)	92 (93%)	
Infection control practices	23 (23%)	95 (95%)	90 (90%)	

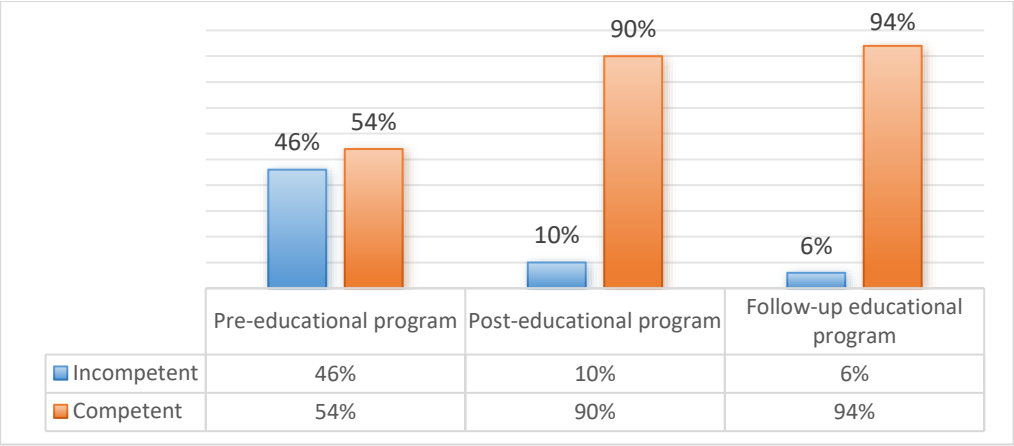

Figure (4): Total Nurses' practices Levels Regarding Sepsis pre, immediately post, and follow-up after implementing the educational program (n = 100)

Table (4): Correlation between total nurses' knowledge and total practices score regarding sepsis pre, immediately post, and follow- up after the educational program (n=100).

Total knowledge score	Total practice score					
	Pre		Post		Follow-Up	
	r	p-value	r	p-value	r	p-value
Pre-intervention	0.179	0.027	0.426	0.116	0.108	0.203
Post-intervention	0.158	0.059	0.629	<0.001	0.238	0.003
Follow-up	0.067	0.428	0.217	0.015	0.431	<0.001

Discussion:

Sepsis is a critical condition in which the body's reaction to an infection results in complications affecting its organs. In cases of septic shock, there is a significant reduction in blood flow throughout the body, potentially leading to severe issues with various organs, such as the lungs, kidneys, and liver. Preventing sepsis can be occurred by ensuring that your vaccinations are up to date, which includes receiving immunizations for influenza, pneumonia, and other prevalent diseases. It is advisable to avoid contact with individuals who do not reside with you, and to refrain from traveling or engaging in non-essential activities. **(Amrollahi, 2023)**. Therefore, the study was done to evaluate the effect of educational program on critical care nurses' sepsis management

The results of the current study indicated that fewer than three-quarters of the surveyed nurses were within the age range of 20 to under 30 years and were female. This outcome may be attributed to the historical context wherein nursing education in Egyptian institutions was primarily accessible to females until recent years, which likely explains the significant female representation.

The findings of this study demonstrated that the majority of the nurses assessed had not engaged in any training courses pertaining to sepsis. From the perspective of the researchers, this underscores the necessity for the nurses involved in the study to adopt the educational program. This conclusion is further corroborated by **Singh et al. (2023),** who noted that while educational interventions resulted in some improvements, the overall impact varied considerably based on the consistency and reinforcement of the training, indicating that education alone may not consistently enhance performance without effective support mechanisms.

The results of the present study indicated a statistically significant difference in the overall knowledge of nurses concerning sepsis indicators at three different time points: before, immediately after, and during follow-up after the educational

program was implemented, with a significance level . From the perspective of the researchers, this implies a beneficial impact of the educational program and highlights the benefits of providing these instructions, which catered to the needs of the nurses and equipped them with adequate knowledge, thus demonstrating the achievement of the study's objectives. The outcome of the current study is similar to that of **Martínez-Mateo et al. (2023),** which found that over half of the nursing staff surveyed lacked sufficient knowledge regarding sepsis protocols and the criteria necessary for objectively assessing patient experiences. This observation is in line with earlier studies, such as those conducted by **Alenezi et al. (2022),** which reported inadequate knowledge levels among nurses in acute care environments, likely due to restricted access to ongoing professional development opportunities. Furthermore, the findings of this study are consistent with those of **Smith et al. (2021)**, who discovered that more than half of nurses did not possess a sufficient understanding of how to objectively assess patient experiences, particularly in identifying early warning signs like elevated lactate levels and abnormal urine output.

Other research has indicated enhanced confidence in recognizing and managing sepsis after educational interventions **(Bryant , 2019; Chimenti et al., 2020; Delaney , 2025)** as well as increased assurance in escalating potential sepsis cases to the medical team **(Breuer & Hassinger, 2020). Delaney et al. (2025)** noted a considerable enhancement in self-reported ability to mobilize medical teams for the prompt treatment of septic patients. Similarly, **Breuer & Hassinger (2021)** observed an 11.1% decrease in the reluctance to raise concerns regarding potential sepsis.

Additionally, studies assessed knowledge outcomes **(Breuer & Hassinger, 2020; Schilinski et al., 2019; Chimenti et al., 2020)** all of which reported significant advancements in sepsis knowledge post-test scores compared to baseline. Nevertheless, the findings regarding knowledge retention were inconsistent among these studies that performed follow-up assessments **(Luna et al., 2020; Vanderzwan et al., 2020).**

Three studies (**Woods et al., 2021; De Silva et al., 2021; Onawola, 2021)** although differing in their designs, reported a notable enhancement in sepsis knowledge scores from baseline during follow-up assessments conducted between 3 and 8 months after sepsis education. In contrast, two studies indicated a decline in knowledge at their follow-up assessments **(Luna et al., 2020). Chimenti et al. (2020)** noted a significant increase in sepsis knowledge scores at a three-week follow-up from baseline, achieved through an 8-hour workshop that utilized slide presentations and case study discussions.

The results of the present study indicated that there was a notable enhancement in the knowledge level concerning sepsis indicators among the majority of the nurses studied following the execution of the educational program. This finding is corroborated by **Martínez-Mateo et al. (2023),** who noted that over fifty percent of the sample studied exhibited a deficient level of knowledge regarding sepsis. This aligns with the observations of **Bloch et al. (2023),** who similarly found that more than half of the sample studied had inadequate knowledge concerning sepsis. However, this outcome contrasts with the findings of **Regina et al. (2023),** which revealed that, despite nurses demonstrating a solid understanding of sepsis, other studies have indicated higher knowledge levels among nurses.

For instance, **Green et al. (2023)** reported that a greater proportion of nurses exhibited a superior level of knowledge regarding sepsis. Their research indicated that approximately seventy-five percent of nurses possessed a commendable level of critical sepsis knowledge, likely attributable to more effective educational programs and regular sepsis training. Likewise, **Brown & Davis (2022)** noted that over fifty percent of nurses displayed a strong comprehension of sepsis management, which they attributed to thorough continuing education and consistent updates on sepsis protocols.

Additionally, nine studies incorporated the use of a sepsis screening tool and guidelines for escalating care **(O'Shaughnessy et al., 2017; Raines et al., 2019; Gallagher et al., 2019; Luna et al., 2020).** It was found that staff education regarding sepsis screening tools

enhanced the identification of sepsis and decreased the duration from the onset of sepsis symptoms to physician notification and review **(MacRedmond et al., 2020).** The results of the present study indicated a statistically significant difference in the overall practice level of nurses regarding sepsis across different dimensions before, immediately after, and during follow-up after the educational program, with a noted significance level. From the perspective of the researcher, this outcome demonstrated the effectiveness of the educational program, which resulted in an enhancement of nurses' knowledge and was associated with improvements in their practices. In a similar vein, **Choy et al. (2022)** found that over half of the nurses in their study were not aware of essential sepsis management protocols, underscoring the necessity for improved training and ongoing updates in sepsis care.

The results of the present study indicated that the majority of the nurses surveyed exhibited a competent level of practice concerning sepsis indicators following the implementation of the educational program. This aligns with the findings of **Mohamed et al. (2020),** who emphasized that insufficient clinical exposure and a lack of training lead to skill deficiencies among critical care nurses. Recent studies have reported similar outcomes; **Johnson et al. (2023)** noted a comparable trend, with nearly two-fifths of nurses displaying inadequate skills in ongoing assessment and intervention. They attributed this subpar performance to training gaps and inconsistent adherence to protocols, which is consistent with the results of the current study. Additionally, **Lee et al. (2024)** found that approximately half of nurses showed poor adherence to skills related to ongoing assessment and intervention.

Additionally, several studies have indicated varying results. **Bloch et al. (2023)** discovered that a smaller proportion of nurses displayed inadequate practices, with only one-third of nurses demonstrating poor ongoing assessment and intervention. Their research proposed improved adherence to protocols and potentially more effective training programs. In a similar vein, **Chen & Wei (2021)** noted elevated compliance rates regarding ongoing assessment and intervention within the studied sample, with just over one-quarter exhibiting poor practices.

These findings align with those of **Sinha et al. (2023),** who reported that over half of the studied sample possessed a low skill level in sepsis management. Furthermore, this study's results corroborated the findings of **Brown & Davis (2022),** who identified that more than two-fifths of the studied sample had low skill levels. The outcomes are consistent with the research conducted by **Johnson et al. (2020),** which revealed that nurses who engaged in sepsis training programs showed significantly enhanced performance in observational assessments, highlighting the beneficial effects of specialized education.

The results of the current study revealed a statistically significant positive correlation between the total knowledge and practice scores of nurses concerning sepsis, both before and immediately after the educational program, as well as during the follow-up among critical care nurses.

From the perspective of the researchers, this confirmed the substantial impact of the educational program, which enhances their knowledge and positively influences their practices. This finding suggests that as the knowledge levels of nurses increase, their practical skills in recognizing and managing sepsis also improve. Such a relationship underscores the interdependent nature of theoretical understanding and clinical application within critical care environments.

This outcome aligns with the research conducted by **Ahmed et al. (2021),** which highlighted that a robust foundational knowledge base empowers nurses with the necessary confidence and competence to perform timely assessments, identify early signs of deterioration, and execute life-saving interventions. The observed positive correlation may also indicate the success of integrative educational strategies that merge evidence-based knowledge with practical clinical experience. As noted by **Alenezi et al. (2022),** nurses who participated in specialized training sessions on sepsis not only exhibited enhanced cognitive understanding but

also effectively applied that knowledge to achieve more precise clinical assessments and prompt interventions in ICU environments. Additionally, the World Health Organization **(WHO, 2021)** has promoted the improvement of both knowledge and clinical competency as a collective objective aimed at decreasing global sepsis-related morbidity and mortality. This reinforces the idea that investing in ongoing education and competency-focused training programs is essential for enhancing both knowledge acquisition and skill application.

Conclusion:

According to the present findings, the current study concluded that the implementation of the educational program positively impacts the enhancement of critical care nurses' management of sepsis. Furthermore, Following the educational session and throughout the follow-up, a statistically significant positive association was found between nurses' overall practice score and their total knowledge score. Thus, the current research hypotheses are supported by the conclusion that the nursing educational program greatly improved nurses' knowledge and practices about sepsis.

Recommendations:

Based on the findings of the present study, the following recommendations are suggested:

- In-service training program is recommended for ICU nursing staff.Incorporating active learning strategies into sepsis education interventions has the potential to improve learners' long-term outcomes.
- Sepsis education and protocol-based sepsis care bundles work together synergistically to improve care processes and patient outcomes significantly.
- Developing educational materials like booklets and pamphlets tailored to critical care nurses' needs, skills, and qualifications can enhance their practice in arrhythmia management.
- Future Research Directions: Conducting similar studies with large probability samples across various settings is crucial for updating nurses' knowledge and practices regarding sepsis, ultimately leading to better patient care

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