Self-reported practices of sepsis and septic shock among healthcare providers working at intensive care units at tertiary hospitals in Jordan

Saleh Al Omar,[1] Jafar Alasad Alshraideh,[2] Islam Ali Oweidat,[3] Sajeda Alhamory[1]

[1]Faculty of Nursing, Al-Balqa Applied University, Salt, Jordan; [2]Clinical Nursing Department/School of Nursing, the University of Jordan, Amman, Jordan; [3]Faculty of Nursing, Zarqa University, Zarqa, Jordan

Abstract

Self-reported practices of sepsis and Septic Shock (SS) among healthcare providers were rarely discussed in the literature. The aim of the study was to describe the level of adherence among nurses and physicians to the self-reported practices of sepsis and SS treatment in six Intensive Care Units (ICU) of two tertiary hospitals in Jordan. A cross-sectional descriptive design was used. A questionnaire was administered to 119 nurses and physicians. Descriptive statistics were used to describe sample characteristics and practices of sepsis treatment. The results showed that most nurses and physicians reported they "often" or "always" adhere to these practices. However, there was insufficient adherence to using a prone position in patients with sepsis-induced acute respiratory distress syndrome. Moreover, there was insufficient practice of testing serum lactate levels within one hour of diagnosing patients. Nurses' and physicians' self-reported adherence to sepsis and SS treatment is satisfactory, but further improvement is required.

Correspondence: Saleh Al Omar, Faculty of Nursing, Al-Balqa Applied University, Salt, 19117, Jordan
Tel.: +962776114184.
E-mail: alomarsaleh@yahoo.com

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Introduction

Sepsis is a life-threatening illness characterized by extreme body response to an infection.[1] It is essential to screen patients for sepsis and Septic Shock (SS) and respond instantly by implementing the necessary treatment. Physicians can suspect sepsis in its early stages.[2] Likewise, nurses have a vital role in the early identification and treatment of sepsis.[3,4] However, it was shown that late diagnosis was the most reported obstacle in treating patients with sepsis.[4] There are 48.9 million sepsis cases annually and 11 million related deaths, globally.[5] However, having a standardized protocol for sepsis treatment can decrease mortality rate,[6-8] patients' morbidity,[9] costs of sepsis treatment,[10,11] improve recognition of sepsis,[12] and increase compliance with the overall sepsis treatment.[12-15]

In 2016, a committee of 55 international sepsis experts from the Surviving Sepsis Campaign (SSC) initiative agreed on recommended guidelines for treating patients with sepsis and SS.[16] These guidelines were adopted by the Centers for Medicare and Medicaid Services.[17] However, out of ten diagnostic and treatment interventions chosen from the SSC bundle, only four or five were administered to 58.4% of adult Intensive Care Unit (ICU) patients,[18] and only one-third of patients with sepsis received antibiotics on time.[19] In China, only 14.2% of anesthesiologists described that they always comply with the SSC guidelines (n=971).[20] Other researchers indicated deficits in nurses' capacity to screen, respond to, and recognize sepsis in Australia.[21]

In Jordan, a Middle Eastern country, the sepsis and SS prevalence among patients in ICUs was 16.6.[22] The mortality rate among patients with sepsis in Jordan was 57.8%.[23] Rababa, Bani-Hamad[24] investigated Knowledge, Attitudes, and Practice (KAP) among Jordanian critical care nurses related to early assessment and management of sepsis. The results showed that the mean score of practice was 78.0 (Standard Deviation, SD, 18.3), below the average KAP scale score. Nevertheless, no studies reported details about practices of sepsis treatment based on the SSC guidelines when used by nurses and physicians working in ICUs in Jordan.

As noted from the reviewed literature, sepsis and SS among adults did not receive enough focus and research studies. No similar study was conducted in the country. Therefore, to increase focus on screening and treating patients with sepsis and SS, background information is needed about the treatment of sepsis and SS among adults.

This study aimed to describe nurses' and physicians' self-reported adherence to practices based on the SSC guidelines for the treatment of sepsis and SS in medical and surgical ICUs of two tertiary hospitals in Jordan. We present this article in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist

Materials and Methods

Research design, settings, and sample

A descriptive cross-sectional design was used in this study. It was conducted in two tertiary hospitals in Jordan. Hospital setting number one has eight ICUs, and hospital setting number two has seven ICUs. The total bed capacity of the first and the second hospitals was 582 beds and 651 beds, respectively. A census sample was enrolled from nurses and physicians working in the selected ICUs. A questionnaire was administered to 80 nurses in hospital number one, 78 nurses in hospital number two, and 20 physicians in the two hospitals combined.

Measurement and data collection

Data were collected between April 13 and August 2, 2019. The inclusion criterion was being a nurse or physician working in the medical and surgical ICUs of the selected hospitals. The participants were excluded if they withdrew or rejected to participate in the study. After explaining the purpose of the study, the researchers informed the participants that they could ask for any clarifications if required and asked them to handle the filled questionnaires directly. Participants' anonymity and confidentiality were maintained.

The researchers developed the instrument. It is a five-point Likert scale that assesses nurses' and physicians' self-reported adherence to the practices of treating patients with sepsis or SS. This instrument had 16 items, with scores ranging from one, "never", to five, "always". Items number five and nine indicate practices that should be avoided, but all the other items indicate recommended practices. Two researchers checked these items for clarity, simplicity, and face validity.

The items were based on the SSC guidelines for the treatment of sepsis and SS, which some researchers used to guide the assessment of knowledge and adherence of nurses and physicians with these internationally applied evidence-based guidelines.[13,25-29] Rhodes, Evans[16] described items number two, number six, and number eight as best-practice statements, and item number 15 as weak recommendations.[16] However, item 16 was adapted from the hour-one bundle, an update from the SSC in 2018.[17] The remaining 11 items reflect strongly recommended SSC guidelines for treating patients with sepsis and SS.[16]

Data analysis

Data were analyzed using SPSS version 23.[30] Descriptive statistics (mean, median, percentage, and frequency) were used to describe sample characteristics and self-reported practices. Alpha level of significance was at 0.05. The dataset was checked for inconsistencies and missing values. Imputation was used to replace missing values.

Ethical considerations

Approval to conduct the study was obtained from the hospitals' Institutional Review Board (IRB). The researchers asked the participants to sign an informed consent indicating their agreement to participate.

Results

The study sample comprised 158 nurses and 20 physicians working in the medical and surgical ICUs of the two hospital settings. A total of 119 (104 nurses and 15 physicians) participants filled out the questionnaire with a response rate of 67%. Of the participants, there was a number of 58 (48.7%) nurses and physicians working in hospital one, and 61 (51.3%) nurses and physicians working in hospital two. Regarding gender, 67 (56.3%) participants were males, and 52 (43.7%) were females. Also, the mean length of clinical experience was 6.7 (SD=4.2) years, ranging between one year and 27 years. Specifically, the mean length of ICU clinical experience was 4.5 (SD=3.0) years, ranging between one month and 20 years (Table 1).

Regarding item number one, 41 (34.5%) nurses and physicians reported they always administer intravenous crystalloid fluid rapidly, at a rate of 30 milliliter/Kg in case of hypotension. Regarding the second item, 47 (39.2%) nurses and physicians indicated that following initial fluid resuscitation and before administration of additional fluids, they always perform frequent reassessments of hemodynamic status and fluid balance. The findings showed that the median score of the first two items was "four", indicating that

Table 1. Sociodemographic characteristics of nurses and physicians working in Intensive Care Units (ICUs) (N=119).

	Job category	
	Nurses n=104 (%)	Physicians n=15 (%)
Gender	Male: 59 (56.7) Female: 45 (43.3)	Male: 8 (53.3) Female: 7 (46.7)
Hospital setting	Hospital 1: 51 (49) Hospital 2: 53 (51)	Hospital 1: 7 (46.7) Hospital 2: 8 (53.3)
Professional role	Practical nurse: 3 (2.9) Staff nurse: 101 (97.1)	Resident: 14 (93.3) Consultant: 1 (6.7)
Academic degree	Associate diploma: 3 (2.9) Bachelor's degree: 89 (85.6) Master's degree: 12 (11.5)	Bachelor's degree: 10 (66.7) Master's degree: 4 (26.6) Doctoral degree: 1 (6.7)

most nurses and physicians perform these two practices often. In addition, 55 (46.2%) nurses and physicians indicated they always administer vasopressors if a patient is still hypotensive to maintain Mean Arterial Pressure (MAP) above 65 mmHg when hypovolemia is ruled out. The median score of this item for nurses was "four", and for physicians was "five".

Twenty-four (20.2%) nurses and physicians indicated they never use Hydroxyethyl Starches (HESs) (a colloid solution) for intravascular volume replacement in patients with sepsis and SS; the median score of this item was "three" and "two" for nurses and physicians, respectively. Furthermore, 60 (50.4%) nurses and physicians indicated that appropriate routine microbiologic cultures are always obtained before starting antibiotic therapy in patients with suspected sepsis and SS. Thirty-nine (32.8%) nurses and physicians reported they always administer intravenous broad-spectrum antibiotics within one hour of recognizing sepsis and SS.

A number of 35 (29.4%) nurses and physicians reported they always identify, control, or remove the source of sepsis as rapidly as possible. In addition, 25 (21.0%) nurses and physicians indicated they never administered erythropoietin to treat sepsis-associated anemia. There was an agreement between nurses and physicians in the median score of this item equal to "two". This means they adhere to the recommendation of the SSC guidelines concerning avoiding administering this drug to patients with sepsis-associated anemia. Based on the responses, using prone over the supine position is uncommon in adult patients with sepsis-induced Acute Respiratory Distress Syndrome (ARDS). Only 11 (9.2%) nurses and physicians and 22 (18.5%) nurses and physicians indicated they "always" and "often" use this practice, respectively. While the median score of this item reported by nurses was "three", it was "two" for physicians. Thirty-one (26.1%) nurses and physicians reported they always use a weaning protocol in mechanically ventilated patients with sepsis-induced respiratory failure. In addition, 44 (37.0%) nurses and physicians reported they always use a specific protocol for blood glucose management among patients with sepsis.

A number of 47 (39.5%) nurses and physicians pointed out they always administer Venous Thromboembolism (VTE) pharmacologic prophylaxis for patients with sepsis in the absence of contraindications. Similarly, 56 (47.1%) nurses and physicians indicated they always administer stress ulcer prophylaxis to sepsis and SS patients with risk factors for Gastrointestinal (GI) bleeding. Twenty-five (21.0%) nurses and physicians reported they always start early enteral feeding in critically ill patients with sepsis and SS who can tolerate this feeding.

In general, based on the median scores of the items, physicians reported slightly more adherence to the SSC guidelines than nurses. However, most nurses and physicians reported they "often" or "always" adhere to these practices, except for items number 10 and 16, which have the lowest median scores, indicating insufficient reported adherence to prone positioning for patients with sepsis-induced ARDS and testing serum lactate level within one hour of diagnosing patients with sepsis and SS (Supplementary Materials).

Discussion

Most nurses and physicians reported they "often" or "always" comply with 14 out of the 16 practices. This finding indicated a higher adherence level than what was found by Uvizl, Adamus,[18] who indicated that out of ten diagnostic and treatment interventions chosen from the SSC bundle, only four or five of them were administered to 58.4% of adult patients with severe sepsis in an ICU in the Czech Republic. In addition, the adherence rate in the current study was higher than reported among 835 registered nurses working in wards and ICUs of tertiary hospitals in Greece. Only 57.2% reported adhering to guidelines for diagnosing and treating patients with sepsis.[31] It was comparable to the adherence level reported in a study conducted in two hospitals in Spain, which showed that adherence was adequate in more than 60% of the SSC guidelines.[32] Jordanian critical care nurses' mean practice score of sepsis management was 78.0±18.3. Which was less than the average score of the KAP subscales and less than the level reported in the current study.[24] A difference in adherence to the SSC guidelines is expected because the studies differed in the participants' settings, knowledge, and attitudes. This might affect the study findings positively.

Forty-seven (39.5%) nurses and physicians indicated they always administer crystalloid intravenous fluid rapidly at a rate of 30 milliliter/kilogram in case of hypotension. This was less than the percentage of 80.7% of ICU nurse managers who reported administering intravenous fluid resuscitation starting from 20-40 milliliter/kilogram of crystalloid fluids for hypotensive patients in the USA. In similar, less than a percentage of 54.0% of anesthesiologists reported they always or usually administer fluid therapy according to the SSC guidelines in ICUs of China.[20] However, the population differed among these studies, leading to a variance in adherence levels.

Forty-seven (39.5%) nurses and physicians indicated that administering additional fluids following initial fluid resuscitation is always guided by frequent reassessment of hemodynamic status and fluid balance. This was less than what was reported by Mathenge (2015), who conducted a research study in Kenya and showed that 57% of nurses and physicians showed that blood pressure reading was the most frequently reported practice of assessing fluid volume. A number of 55 (46.2%) nurses and physicians and 38 (31.9%) nurses and physicians reported they "always" and "often" administer vasopressors if a patient is still hypotensive to maintain MAP above 65 mmHg when hypovolemia is ruled out, respectively. When combined, this was lower than the percentage of 92.3% of ICU nurse managers who reported administering vasopressors for patients with hypotension who do not respond to fluid resuscitation.[33] In the present study, one-third of nurses and physicians (32.8%) reported using norepinephrine "often" as the first-choice vasopressor to treat hypotension, and 37% reported performing this practice always. When combined, they become comparable to the percentage reported by Mathenge,[34] who indicated that 75% of nurses and physicians reported using Norepinephrine in ICUs for patients with sepsis.

Sixty (50.4%) nurses and physicians indicated they "always" obtain appropriate routine microbiologic cultures before starting antibiotics for patients with suspected sepsis or SS. This was higher than the percentage of 43% of nurses and physicians who reported performing blood cultures for patients with sepsis.[34] In contrast, less than 92.8% of ICU nurse managers in the USA reported collecting cultures before administering antibiotics.[33] However, the availability of recourses could affect variance in adherence, as these three studies were conducted in three countries that differ in income level.

A number 47 (39.5%) nurses and physicians and 39 (32.8%) nurses and physicians reported they "often" and "always" administer intravenous broad-spectrum antibiotics within one hour of sepsis and SS recognition, respectively. This was less than the percentage of 95%.[34] It was also less than the percentage of 92% among critical care nurses in one hospital in the USA.[35] Similarly,

it is less than the percentage of 88.5% of Greek nurses who answered that antibiotic treatment starts early after the diagnosis of sepsis (n=739).[31] However, the percentage exceeded 65.9% of ICU nurse managers who reported administering broad-spectrum antibiotics within one hour of diagnosing patients with sepsis.[33]

Only 44 (37%) nurses and physicians reported often use of a weaning protocol in mechanically ventilated patients with sepsis-induced respiratory failure who can tolerate weaning, compared to 31 (26.1%) nurses and physicians who reported always performing this practice. This was less than the rate of 89.3% of adherence to providing protective mechanical ventilation for patients with sepsis.[32] The level of measurement was different between the studies. Therefore, comparing the findings was challenging.

A percentage of 30.3% of nurses and physicians and 37% of nurses and physicians reported they "often" or "always" use a specific protocol for blood glucose management, respectively. This was higher than the adherence rate of 32.9% for maintaining glucose ≤150 milligrams/deciliter.[32] However, this study differed from the present study in the data collection method, in which the researchers reviewed patients' medical records only. Higher adherence to this practice was reported in a study conducted in the USA. Durthaler *et al.* (2009) revealed that 72.7% of ICU nurse managers reported early insulin starting to maintain serum glucose levels less than 150 milligrams/deciliter.

Forty-seven (39.5%) nurses and physicians and 35 (29.4%) nurses and physicians reported they "always" and "often" administer venous thromboembolism pharmacologic prophylaxis in the absence of contraindications, respectively. Together, these adherence levels were higher than the percentage of 62.3% of ICU nurse managers who reported administration of deep venous thrombosis prophylaxis within 24 hours of sepsis diagnosis.[33]

In the current study, 56 (47.1%) and 33 (27.7%) nurses and physicians reported they "always" or "often" administer stress-ulcer prophylaxis to patients with sepsis and SS who have risk factors for gastrointestinal bleeding. This was lower than the reported adherence rate of 89.1% among ICU nurse managers who reported administration of stress-ulcer prophylaxis during the first day of sepsis diagnosis.[33]

Twenty-seven (22.7%) and 43 (36.1%) nurses and physicians reported they "always" or "often" initiate early enteral nutrition for critically ill patients with sepsis and SS who can be fed enterally. When combining these two percentages, the total percentage becomes less than reported by Durthaler *et al.*[33] who indicated that 71.7% of ICU nurse managers reported early initiation of nutrition therapy within 24 hours of severe sepsis onset.

The present study's findings showed that six (5.0%) and 16 (13.4%) nurses and physicians reported they "always" or "often" measure serum lactate within one hour of diagnosing patients with sepsis and SS, respectively. This was less than the percentage of 45% of the nurses and physicians who reported the use of serum lactate, and around one-quarter (24%) of the respondents reported performing this test within the first hour of sepsis diagnosis.[34] This was also less than the percentage of 62% of anesthesiologists in China who tested lactate levels during the initial management of sepsis.[20] It is worth mentioning that the SSC guidelines are being updated every few years, which could affect how nurses and physicians respond to incorporating these guidelines into daily clinical practice.

This study added significant information about the practices that healthcare providers use in real situations while managing sepsis and septic shock among patients in ICUs. However, the study had some possible limitations. First, the findings are not generalizable to all hospitals in Jordan because only two tertiary hospitals were included. Second, the study was descriptive cross-sectional, and adherence to the treatment of sepsis was assessed using a self-reported questionnaire rather than direct observation.

The current study results added significant information to the body of nursing and medical literature about self-reported practices of sepsis and SS treatment. Furthermore, nurses and physicians are required to pay more attention to the practices that are not always implemented, as reported by the present study participants. It is recommended to undertake ongoing staff development programs, including teaching and training nurses and physicians about how to treat adult patients with sepsis and SS. Moreover, barriers to providing care for patients with sepsis and SS need to be investigated and addressed in each healthcare context.

The results could be used to benchmark the current level of treatment provided for patients with sepsis, which may help in future comparison and obtaining information for quality improvement projects. Administrators are required to improve adherence to sepsis and SS; they are required to enhance healthcare environments to facilitate implementing the SSC guidelines.

Conclusions

This study provided a base of self-reported practices of sepsis and SS among adult patients in the ICUs of Jordan. The level of nurses' and physicians' adherence to the self-reported practice of sepsis and SS treatment was satisfactory, and most nurses and physicians reported they "often" or "always" adhere to these practices. However, the scores of some items reflected insufficient adherence to the SSC guidelines for treating sepsis and SS in adult ICUs, especially for using the prone position of patients with sepsis-induced ARDS and for performing serum lactate tests. However, nurses and physicians had comparable adherence levels to the SSC guidelines for sepsis and SS treatment. Adherence to the SSC guidelines is required to be improved in ICUs.

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Supplementary Materials
Table 1. Items' frequencies, percentages, and median scores/self-reported practice of sepsis and Septic Shock (SS) treatment as reported by nurses and physicians (N=119).