

Nurses' knowledge, attitudes, practice, and decision-making skills related to sepsis assessment and management

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ABSTRACT

Objectives: The present study examines the critical care nurse's knowledge, attitudes, practice (KAP), and decision-making related to early assessment and management of sepsis.

Methods: This cross-sectional descriptive study utilized a convenience sample of 70 nurses working in a college hospital in the northern region of Jordan. Data were gathered employing a sepsis vignette and valid questionnaires via Google document. The nursing decision-making instrument and the knowledge, attitudes, and practice survey were utilized to assess nurses' decision-making skills, knowledge, attitudes, and practice, respectively. Nurses' sociodemographic/professional data, including gender, marital status, experience, education, and work environment, were also measured.

Result: The participating nurses reported poor KAP, and analytical decision-making skills related to sepsis management. Experienced nurses and those with a master's degree reported significantly better KAP, and intuitive decision-making skills than naïve and those with a bachelor's degree. Nurses with analytical decision-making modes reported higher levels of knowledge, attitudes, and practice than nurses with intuitive or flexible analytical-intuitive decision-making modes.

Conclusion: Poor decision-making skills, as well as knowledge, attitudes, and practice related to sepsis assessment and management, is a substantial problem that demands a productive re-evaluation of the current sepsis management practices. Boosting the knowledge and improving the practices on sepsis assessment and management through comprehensive educational programs and campaigns are necessary to improve nurses' decision-making skills.

Keywords: decision-making, knowledge, attitudes, practice, sepsis management, critical care nurse

INTRODUCTION: BACKGROUND

Sepsis is a global health issue associated with increased morbidity and mortality worldwide [1]. Approximately 50 million people are affected by sepsis worldwide, resulting in 11 million deaths yearly [2]. The prevalence of sepsis reported among critical care patients in Jordan was 21% [3]. Sepsis is associated with adverse physiological, psychological, and economic consequences. Sepsis can lead to multiple organ dysfunction [4, 5], such as acute renal failure [6], acute respiratory distress syndrome [7], cardiac dysrhythmias (e.g., atrial fibrillation) [8], and disseminated intravascular coagulation [9].

Examples of the negative psychological consequences associated with sepsis include anxiety, depression, and post-traumatic stress disorder [10]. The estimated annual cost of sepsis in the US alone was about \$16.7 billion in 2009 [11]. Meanwhile, the estimated annual cost was over \$24 billion in 2017 [2]. The prices of healthcare services and supplies for critical care patients with sepsis admitted to the intensive care

units (ICUs) are also high [12], and one-third of these patients die before discharge [13].

Many recent studies have shown that nurses do not have adequate knowledge and training in sepsis assessment and management [12, 14, 15]. In a descriptive study conducted in four emergency departments in Western Canada, nurses were found to lack knowledge about the early detection and management of sepsis [14]. Several studies have shown that hospitals lack educational programs and ongoing training courses related to sepsis [14-16]. Nursing curricula have also been offered to lack focus on the management of sepsis, leading many nursing school graduates to have insufficient knowledge and poor attitudes related to the early assessment and management of sepsis [15, 16].

Critical care nurses play a vital role in the early assessment and management of sepsis. Thus, clinical decision-making is an essential component of professional nursing care [17], as the decisions made by nurses affect the quality of care provided [18]. Effective clinical decision-making allows patients' needs to be met, improving clinical outcomes [18]. Many studies have assessed the factors impacting the sepsis-related decisions made by nurses [19, 20]. Some factors include experience,

hospital policy, working environment, and the nurse-bed ratio [17].

The decision-making process requires nurses to have extensive knowledge and access to accurate and up-to-date information resources [21]. Nurses must have a broad understanding of sepsis [17], as many nurses have misconceptions about sepsis. For example, some nurses are unaware that hypotension, hypoxia, and oliguria are indicators of sepsis, which may lead to delayed recognition of sepsis, initiation of rapid and appropriate management, and administration of antibiotics [22]. Therefore, educational programs and ongoing training are essential for improving nurses' knowledge and correcting sepsis-related misconceptions [22].

There are two approaches to decision-making by nurses. Analytic decision-making refers to following a step-by-step procedure based on logical rules until a decision is made [21]. Nurses may sometimes make decisions based on intuition and experience, leading to poor or irrational decisions [21]. Intuitive decision-making is forming inferences of meanings, relationships, and possibilities through insight [23]. Though intuition does not always lead to accurate decisions, using intuition depending on experience and accumulative knowledge in clinical decision-making can improve nursing practice and encourage nurses to apply standard guidelines for identifying and managing sepsis. This can improve patient outcomes and enhance self-confidence among nurses [24]. It is still controversial which mode of decision-making is associated with better learning outcomes.

Raising awareness about sepsis positively impacted nurses' knowledge, attitudes, and practice related to caring for patients with sepsis [25]. However, studies have shown that critical care nurses have a problem assessing sepsis's early signs and symptoms [26]. Critical care nurses provide ongoing patient monitoring and are responsible for noticing changes in the patient's condition and laboratory test results. Therefore, it is necessary to improve critical care nurses' knowledge, attitudes, practice (KAP), and decision-making skills related to the early assessment and management of the signs and symptoms of sepsis [26]. To the best of the researcher's knowledge, a lack of studies has examined KAP, and decision-making skills related to the early assessment and management of sepsis in critical care patients. Therefore, this study examines the critical care nurse's KAP, and decision-making related to early assessment and management of sepsis.

METHODS

Design, Setting, and Sample

This cross-sectional study was conducted on 70 nurses caring for older adult critical care patients at King Abdullah University of Hospital, Jordan, due to the convenience, geographical closeness, and accessibility for the researcher to access the participants' data. Given the significance level "alpha level=0.05", a statistical power level of 0.8, medium effect size, the sample size of 70 participants was sufficient for significant statistical analysis in the current study. The eligible participants in this study were: nurses working in the ICU, critical care unit, or emergency department for at least one year. The exclusion criteria were nurses working in an acute setting for less than a year and those working in general ward.

Ethical Consideration

Ethical approval (IRB# 784-2020) for this study was received from the Institutional Review Board (IRB) at Jordan University of Science and Technology in January 2021. Written informed consent was obtained by the researcher, DB-H from the eligible nurses who agreed to participate. The researcher emphasized voluntary participation in the study. The researcher also stressed that the nurses could withdraw from the study anytime they wanted, and withdrawal from the study was not affect their job security. Privacy and confidentiality of the collected data were assured throughout the study. No personal data were collected. All study data collected were saved in a password-protected computer only accessible by the principal investigator, MR.

Measurements

Nurse's decision-making

To measure nurses' decision-making skills, the nursing decision-making instrument (NDMI) was used in the present study [27]. The NDMI consists of 24 questions with five potential answers, ranging from "never" to "always." To calculate the total score of the NDMI, the researchers summed the score of each response for all questions after reverse coding the negative questions, yielding a total score between 24 and 120. The participants scoring ≤ 67 were labeled as analytical decision-makers, and those scoring >68 were labeled intuitive decision-makers. The validity of the NDMI has been established, and the NDMI had a satisfactory reliability score of Cronbach's alpha=0.84 in the study [27]. The Cronbach's alpha of the NDMI in the present study was 0.79.

Nurse's knowledge, attitudes, and practice

The knowledge, attitudes, and practice (KAP) survey measured nurses' knowledge, attitudes, and practice of sepsis management. This KAP was developed based on the surviving sepsis campaign guidelines and previous research studies [11, 28]. The KAP consists of 27 questions assessing knowledge (n=8 items), attitudes (n=4 items), and practices (n=15 items) related to sepsis assessment and management. The KAP's consistency and face and content validity were established in the present study by four nursing scholars in sepsis management who reviewed the questionnaire. Then, the KAP was piloted on a sample of 10 experienced nurses for the clarity and readability of the KAP's items. The Cronbach's alpha of the KAP in the present study was 0.88.

Demographic data

The researcher, MR asked the nurses to report their demographic data such as gender, age, year of experience, level of education, and the department where they work by filling out a self-administered demographic questionnaire.

Procedure

After getting the IRB approval, the researchers met with the nursing manager of the targeted department to discuss the eligibility criteria for participation and obtain a list of potential participants with their contact information. Then, the researcher sent an invitation in February 2021 by email to all eligible nurses asking for their permission to participate in the study and presenting a brief description of the research and what they expected from them to do related to the study. All interested nurses who replied to the invitation received another email containing a link to a Google document of a

consent form, a written vignette of a complicated case of a patient with sepsis, and all study questionnaires. The participating nurses consented to participate in the study by checking their pledges. The nurses got reimbursed on their participation with a seven USD.

The vignette (**Appendix A**) described 29 years male who presented to the emergency room with shortness of breathing (dyspnea) and productive cough for the past three days. The X-ray showed consolidation in the base of the right lung. He was drowsy with unstable vital signs as follows respiratory rate of 30, partial pressure of oxygen equal to 88% on three liters per minute by nasal cannula, blood pressure of 90/64, and body temperature of 35 °C. His urine output was 25-30 ml per hour for the past four hours. The researchers of the present study developed the vignette after reviewing the literature on sepsis assessment and management [29]. A panel of two nursing scholars holding PhD degrees and having extensive clinical experience in sepsis management reviewed the vignette for clarity, readability, and relevance. Some modifications were recommended and applied in the first version of the vignette, which the panel reviewed for a second time to ensure accurate changes and approve them. The final approved version of the vignette was sent as a Google document to the participating nurses. The researchers emphasized the nurses' careful review of the vignette before responding to the items of the study questionnaires, keeping in mind the objective data stated in the sepsis case. The use of vignettes in data collection has been used and tested in previous studies in the nursing literature [23, 30, 31]. This method of data collection contributes to extracting specific data concerning a complex or complicated topic, especially when there is no available instrument measuring decision-making modes related specifically to sepsis assessment and management. Nurses' responses to the questionnaire were recorded on the Google document account of the researcher.

Data Analysis

Data were analyzed using the statistical package of social science version 25 (SPSS Inc., Chicago, IL, USA). The normality assumption was checked based on the Kolmogorov-Smirnov test results. The assumption of homogeneity of variance was tested and achieved based on the results of Levene's test. Descriptive analysis (mean, frequency, and standard deviation) describes nurses' KAP, and decision-making related to sepsis assessment, management, and demographic data. Two sample independent t-tests were used to examine the differences in decision-making skills, knowledge, attitudes, and practice related to sepsis according to nurses' demographic and professional characteristics. Also, two sample independent t-tests were used to examine the differences in nurses' knowledge, attitudes, and practice related to sepsis based on their modes of decision-making. A p-value of 0.05 and less was considered the cutoff point of significance for all statistical analyses in this study.

RESULTS

Characteristics of Study Participants

70 nurses participated in this study. The majority were male (58.6%), aged between 20-30 years (60%), married, and had less than five years of clinical experience in critical care settings (62.9%). Most participating nurses reported having no training

Table 1. Descriptive statistics of nurses' demographics, knowledge, attitudes, practice, and decision-making (n=70)

Characteristics	Participants		
	n	%	
Gender	Female	29	41.4
	Male	41	58.6
Marital status	Single	24	34.3
	Married	46	65.7
Level of experience	Junior <5 years	36	51.4
	Senior >5 years	34	48.6
Working department	ICU/CCU	43	61.4
	Emergency unit	27	38.6
Nursing education	Bachelor	52	74.3
	Master	18	25.7
Decision-making	Analytically oriented	37	13.1
	Intuitively oriented	33	66.9
Knowledge	Poor <50	58	82.9
	Good ≥50	12	17.1
Attitudes	Negative <50	59	84.3
	Positive ≥50	11	15.7
Practice	Poor <50	50	71.4
	Good ≥50	20	28.6
Decision	Analytically oriented	33	47.1
	Intuitive oriented	37	52.9
	Mean	SD	
Knowledge score	4.7	2.0	
Attitudes score	1.8	.8	
Practice score	78.0	18.3	
Decision score	62.9	20.2	

Note. ICU/CCU: Intensive care unit/Critical care unit

on sepsis assessment and management (64.3%). However, 50% reported having adequate knowledge and clinical experience caring for patients with sepsis. **Table 1** describes the sociodemographic and professional characteristics of the participants in detail.

Nurses' decision-making, knowledge, attitudes, and practice related to sepsis

The nurses' mean scores for sepsis knowledge, attitudes, and practice were 4.7 ± 2.0 , $1.8 \pm .8$, and 78.0 ± 18.3 , respectively. These mean scores are below the average score of KAP subscales. According to the NDMI cutoff scores for decision-making modes, the majority of participating nurses were intuitive decision-makers, while 47.1% were analytical decision-makers. **Table 2** describes the nurses' levels of sepsis KAP, and decision-making modes related to sepsis assessment and management.

Knowledge, attitudes, practice, and decision-making skills according to the nurses' characteristics

There were no significant differences in nurses' levels of KAP, and decision-making between nurses grouped on their gender and marital status (all p-values were >0.05 , **Table 3**). However, nurses' levels of practice and their modes of decision-making were significantly different according to their levels of education ($t=2.789$, $p=0.007$) and ($t=2.811$, $p=0.006$) and clinical experience ($t=3.269$, $p=0.002$) and ($t=2.011$, $p=0.049$), respectively. Based on independent two-sample t-tests, senior and master's degree holder nurses had better

Table 2. KAP and decision-making scores based on nurses' demographic and professional characteristics data (n=70)

Nurse groups		Knowledge			Attitudes			Practice			Decision		
		M	SD	p	M	SD	p	M	SD	p	M	SD	p
Gender	Female	4.3	1.9	.180	1.9	.7	.109	78.1	17.9	.967	65.2	21.4	.434
	Male	5.0	2.0		1.7	.8		77.9	18.8		61.3	19.4	
Marital status	Single	5.0	2.0	.151	1.9	.8	.488	74.5	19.5	.247	66.4	20.3	.303
	Married	4.3	1.9		1.8	.8		79.9	17.6		61.1	20.0	
Level of experience	Junior	6.1	1.4	.657	1.9	1.0	.858	85.3	15.6	.002	69.4	16.7	.049
	Senior	6.3	1.6		1.8	.7		98.6	16.7		77.8	17.4	
Nursing education	Bachelor	6.25	1.6	.967	1.8	.7	.488	87.9	15.9	.007	80.1	16.6	.006
	Master	6.24	1.7		1.9	.9		99.1	17.3		68.9	16.8	
Working department	ICU/CCU	6.22	1.7	.927	1.9	1.0	.614	93.3	18.7	.895	77.0	17.2	.385
	Emergency unit	6.25	1.4		1.8	.8		93.9	16.9		73.2	17.8	

Note. Significant difference at $p \leq 0.05$; ICU/CCU: Intensive care unit/Critical care unit

Table 3. Nurses' KAP by mode of decision-making (n=70)

Mode of decision-making	Knowledge			Attitudes			Practice		
	M	SD	p	M	SD	p	M	SD	p
Analytically oriented	5.3	2.3	.016	1.9	.8	.127	85.9	16.1	<.001
Intuitively oriented	4.1	1.4		1.6	.7		69.2	16.7	

Note. Significant difference at $p \leq 0.05$

practice and analytical decision makers than junior and bachelor's degree holder nurses.

Association Between Decision-Making and Knowledge, Attitudes, and Practice

Based on two sample independent t-test (Table 3), there were significant differences in the nurses' knowledge and practice of sepsis assessment and management based on decision-making modes ($t = -4.232$, $p < 0.001$) and ($t = -2.479$, $p = 0.016$), respectively. According to the analysis, nurses with analytical decision-making modes reported better knowledge and practice related to sepsis assessment and management than nurses with intuitive decision-making modes. However, there were no significant differences in the nurses' attitudes about sepsis assessment and management based on decision-making modes.

DISCUSSION

This is the first study examining the association between nurses' levels of knowledge, attitudes, and practice and decision-making modes related to sepsis management. The majority of nurses in the present study had poor knowledge, attitudes, and practice related to sepsis assessment and management. This finding was supported by previous studies examining the same variables among nurses caring for different challenging clinical situations [3, 23, 32]. The poor knowledge, attitudes, and practice of sepsis assessment and management in the present study may be attributed to many factors related explicitly to the context of Jordan nursing schools [33]. These factors include insufficient or lack of formal sepsis assessment and management education in Jordanian nursing schools [34]. The nursing education in Jordan mainly focused on medical and surgical nursing with no adequate attention to complicated clinical cases such as sepsis [3]. Despite the high morbidity and mortality rates of sepsis in Jordan [3], sepsis management is still not getting the required attention in the nursing curricula for no reason. A second factor may be attributed to the inadequate ongoing training and staff development workshops for naïve nurses on sepsis management [3, 33]. Also, a wide variety of perceived barriers

related to sepsis assessment and management are prevalent among critical care nurses [29]. These barriers include a lack of awareness of antibiotic use and a knowledge deficit regarding evidence-based protocols for sepsis management [29]. These barriers were found to impede the ability of nurses to assess and promptly manage sepsis in critical care patients effectively. Moreover, the lack of an evidence-based sepsis protocol implementation and hesitancy to prescribe strong antibiotics complicates the sepsis practice [29].

Based on the cut-off points of decision-making modes, most of the participating nurses were intuitive decision-makers. This finding was supported by previous studies that showed that nurses, when caring for challenging patients, rely on their intuition [23], which is the rapid processing of the cues to make a quick inference. Previous studies show no consensus on the decision-making mode most associated with better learning outcomes [23]. Previous research showed that using intuitive decision-making in sepsis management may be time and cost-effective, particularly by an expert nurse [3, 23]. In this mode of decision-making, there is no need for extra steps that lead to delayed treatment of sepsis. However, analytical decision-making is crucial for optimal management of such a challenging clinical situation as sepsis. Certainty regarding sepsis in suspected patients is established when nurses rely on an analytical decision-making mode that leads to a delayed but effective delivery of sepsis management. Future research examining the association between modes of decision-making and clinical outcomes in patients with sepsis is recommended.

Previous studies have consistently shown that nurses with master's degrees had better practice than nurses with bachelor's degrees. Having an additional degree contributes to widened base of knowledge, development of positive attitudes, and mastering practical skills [23]. Moreover, nurses with an advanced academic level have more opportunities to strengthen their theoretical and practical skills during their nursing education and clinical rotations. Concerning the level of experience, previous research supported the findings of our study. In this study, expert nurses have better levels of practice than naïve ones [23]. Compared to experienced nurses, newly graduated nurses do not have such an opportunity to manage sepsis and are less exposed to patients with sepsis. Therefore, expert nurses are more familiar with caring for patients with

sepsis. Accordingly, expert nurses are more likely to utilize their knowledge, attitudes, and practice and be more intuitive in their decisions related to sepsis management. Meanwhile, experienced nurses were found to have more certainty and confidence in caring for patients with sepsis. A Jordanian study found that experienced nurses are more likely to perceive better the disease process of sepsis and less likely to have a misconception and poor attitudes toward sepsis assessment and management [3].

Our present study's finding that experienced nurses were more intuitive in their decisions regarding sepsis management than naïve nurses is supported by previous studies. According to the study, newly hired nurses spend more time processing and analyzing subjective and objective data and frequently refer to textbooks and external sources when deciding on sepsis management [3]. On the contrary, experienced nurses utilize their clinical experience to shortcut the lengthy decision-making process by promptly processing the objective data to reach a quick decision.

This study strives to uncover the poorly examined association of knowledge, attitudes, and practice related to sepsis assessment and management and modes of decision-making among critical care nurses. The present study found that nurses who are analytical decision thinkers reported better knowledge and practice related to sepsis assessment and management than intuitive decision thinkers. This finding could be explained by the fact that analytical decision thinkers always strive to widen their base of knowledge and review evidence-based practices and think positively because these are the elements they utilize during their analytical decision-making process [23]. Furthermore, the information mentioned in the sepsis vignette is multidimensional and needs multicomponent interventions. The complexity of sepsis assessment and management, as highlighted in the vignette, led the participating nurses to integrate their theoretical and practical knowledge in a long and complex process of analysis and synthesis until the treatment decision was achieved [29].

The finding of our study could inform the development of an evidence-based sepsis protocol for critically ill adult patients, contribute to the design of further interventional studies, contribute to the development of standardized nursing curricula in Jordan, and initiate policy changes related to sepsis assessment and management in critical care patients in Jordan. Future studies are recommended to conduct experimental studies on a larger sample size and in multiple geographical areas. Also, future studies are recommended to be conducted using random sampling and large sample sizes to discuss critical care nurses' perceived barriers to sepsis assessment and management and to examine the association of critical care nurses' perceived barriers to sepsis assessment and management with their knowledge of and attitudes towards sepsis. Future research would consider testing the effectiveness of BPS on nurses' knowledge and attitudes of sepsis delivered by face-to-face meeting where the researcher could intervene in case of technical issues or misunderstanding and unfamiliarity of using BPS. Also, future studies are suggested to examine effectiveness of nurse driven sepsis protocol in improving health outcomes of patient with sepsis.

Limitations

This is the first study using reliable and valid questionnaires to examine the association between KAP, and decision-making modes related to sepsis management. However, like any study,

this study has limitations associated with the design and setting, including the investigation being conducted in one geographic area (Irbid, Jordan), so it had a problem and difficulties with generalization. Moreover, the study used non-probability convenience sampling, which may give rise to selection bias that weakens and threatens internal validity. However, the random sampling method would be time-consuming and expensive. Also, there is another limitation regarding electronic questionnaires: some nurses were unfamiliar with them, so they faced some technical difficulties.

CONCLUSION

Poor decision-making skills, knowledge, attitudes, and practice related to sepsis assessment and management are a substantial problem that demands a productive re-evaluation of the current sepsis management practices. Nurses' demographic and professional characteristics impact their KAP, and decision-making skills related to sepsis management. Moreover, nurses' knowledge, attitudes, and practice may impact their decision-making modes related to sepsis management. Enhanced awareness of the examined associations in the current study is essential for improved clinical outcomes and deserves additional examinations. Intervention programs to train nurses caring for sepsis patients on effective management practices are highly advised.

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Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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APPENDIX A-VIGNETTE

Directions for Vignette Responses

Please read the following instructions carefully.

1. Read the clinical vignette and its associated questions below before filling out the study questionnaires that are attached to the vignette.
2. Record your anonymous responses on the questionnaires with the vignette in mind and return them in the provided google document link.
3. Read the definition of knowledge, attitudes, behavior, and decision-making accompanying the vignette.
4. (You will be assessed for your ability to accurately represent the knowledge, attitudes, behavior, and decision-making skills related to the vignette)
5. You would need 40-50 minutes to do this assignment.
6. You do not have to write your name or personal information on the vignette or questionnaires.

Mr. Ali's Vignette: Critical Thinking and Decision-Making Skills

Mr. Ali is a 29-year male who presented to the emergency room with shortness of breathing (dyspnea) and a productive cough for the past three days. The X-ray showed consolidation in the base of the right lung. He was drowsy with unstable vital signs as follows the respiratory rate of 30, partial pressure of oxygen equal to 88% on three liters per minute by nasal cannula, blood pressure of 90/64, and body temperature of 35 C. His urine output was 25-30 ml per hour for the past four hours.

Question: At this point, what should you decide about Mr. Ali's situation? What is your interpretation of his clinical manifestations? Do you think you still need to do more assessments to determine what is going on with Mr. Ali?

When the nurse got closer to Mr. Ali, she noticed his slurred speech. When the nurse checked Mr. Ali's monitor, she noticed that his vital signs were deteriorating. The nurse interpreted these odd observations as signs of sepsis and responded by providing her care according to the sepsis protocol.

Question: Do you agree with the nurse's interpretation?

Question: What do you believe this patient suffers from?

Question: What are the initial assessment priorities of this patient?

Question: What else do you want to know/do?

Question: What is the treatment plan for this patient?