The Knowledge of Nursing Internship Program Students about Early Detection of Sepsis

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Abstract

BACKGROUND: Sepsis is a life-threatening condition due to the failure of the body's regulation of infection. Knowledge deficit is one of the barriers to early detection and initiation of sepsis care. Nursing internship program students as future nurses need to have sufficient knowledge about early detection of sepsis to support their behavior.

AIM: Thus, the purpose of this study was to describe the knowledge of nursing internship program students regarding the early detection of sepsis and the demographic factor related to the knowledge.

METHODS: The study design was a quantitative study. Through the proportionate stratified non-random sampling technique, the researcher involved 143 nursing internship program students of Universitas Padjadjaran. Data collection used a questionnaire based on the Sepsis-3 guidelines to measure nursing internship program students' knowledge about early detection of sepsis. The data collection was carried out in July-August 2021.

RESULTS: The average knowledge score of the respondents was 70.4 (SD = 11.9). More than half of the respondents (56.6%) got a score below the average. Almost all respondents do not know the current definition of sepsis and still use the Systemic Inflammatory Response Syndrome definition as clinical criteria for sepsis. However, respondents could identify clinical criteria for sepsis based on Sequential (sepsis-related) Organ Failure Assessment and analyse sepsis indicators based on case scenarios. Meanwhile, based on its characteristics, the information is a factor that significantly affects the knowledge score ($p < 0.05$).

CONCLUSION: In conclusion, there is still a gap in the knowledge of the nursing internship program students regarding the update of the Sepsis-3 guidelines. Besides, information is identified as the factor that influences knowledge. Therefore, it is suggested that the institution provides further effective educational methods to update students' knowledge about the early detection of sepsis.

Introduction

Sepsis accounts for the highest mortality rate in hospitalized patients. One in three patients who die in the hospital experience sepsis (CDC, 2020). The World Health Organization (WHO) estimates that sepsis affects 30 million people worldwide each year with the potential for 6 million deaths (WHO, 2018). Observations conducted in the Intensive Care Unit (ICU) of Cipto Mangunkusumo Hospital Jakarta in 2012 showed that severe sepsis and sepsis shock incidence was 27%, with the mortality rate in care reaching 47.8% and the mortality rate in the early phase reach 34.7% [1]. A high diagnosis of sepsis was also found in the internal medicine ward, which reached 10.3%.

Sepsis is a life-threatening organ dysfunction due to failure to regulate the body's response to infection [2]. The incidence of severe infections associated with organ damage is life-threatening because of the impaired body's response to infection [3], [4]. Decreased tissue perfusion and damage to several organs can occur due to impaired body response to infection and cause high patient mortality due to sepsis.

Sepsis has no single symptom and rapid diagnostic tests to help make decisions quickly. Sepsis is an emergency that requires prompt recognition, diagnosis, and appropriate treatment [5]. Early detection of septic patients and earlier treatment significantly reduce mortality [6], [7]. In addition, it is an essential step for sepsis management [8]. Early recognition will provide early management of sepsis that will minimize the deterioration of the patient's condition [4], [9].

The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) recommended clinical criteria for sepsis in non-intensive care settings using a quick Sequential (sepsis-related) Organ Failure Assessment (qSOFA) [2]. qSOFA is a simple form of SOFA which only consists of three variables and does not require laboratory tests. Patients with a qSOFA score of two should be considered for the possibility of sepsis [10].

Sepsis guidelines adherence has been shown to reduce mortality in sepsis and septic shock [11]. In addition to reducing mortality, the application of sepsis guidelines reduces the time of antibiotic administration, treatment in the ICU, and increases the comparison of serum lactate measurements [12]. However, it is

not straightforward for health workers to comply with existing guidelines. As a result, there are still obstacles that can reduce the quality of sepsis care.

Some factors have been shown to influence sepsis care. Knowledge is one of those factors [13], [14], [15]. Nurses need the knowledge to support identifying symptoms of sepsis and its worsening conditions in providing care for patients with severe illnesses in the ICU [16].

Knowledge is the basis of acting and behaving. Therefore, the level of knowledge is directly proportional to the understanding of acting [17]. Inadequate knowledge about sepsis will have a negative impact on attitudes and behaviors [18]. Screening and functional management of sepsis are achieved by ensuring adequate education for nursing staff [19]. In addition, knowledge and awareness of health workers about sepsis play a major role in identifying and treating patients at risk for sepsis [20]. Therefore, nurses need to have adequate knowledge to increase awareness of the importance of early detection of sepsis.

Sepsis care requires interprofessional collaboration, starting from laboratory assistants, pharmacists, and nurses [21]. Although sepsis management requires interprofessional collaboration, nurses play a role in improving sepsis management [22].

Nurses have a strategic position in interacting with patients to integrate sepsis screening. The ability of nurses to assess the vital signs and physical condition of patients is the primary key in identifying sepsis [23]. In addition, nurses must have sufficient education to recognize and effectively treat septic patients [24].

Nursing services cannot be separated from the educational process. Nursing education is the first step for nurses to become academics and professionals. Hence, nursing internship program students need to have sufficient knowledge about the early detection of sepsis. This study aimed to identify the knowledge of nursing internship program students regarding the early detection of sepsis and the demographic factor that contributed to the knowledge.

Methods

Study design

This research was a quantitative study that explored nursing internship program students' knowledge about the early detection of sepsis.

Sample and settings

Research was conducted at the Faculty of Nursing, Universitas Padjadjaran, Indonesia. The proportionate stratified non-random sampling technique was used to sample the population. One hundred forty-three nursing internship program students of Universitas Padjadjaran participated in this study.

Instruments

The questionnaire used to measure knowledge was compiled based on the Sepsis-3 guidelines. The questionnaire consisted of two parts: the respondent's characteristics and thirteen questions to measure knowledge about early detection of sepsis.

The content validity test is carried out through expert judgment. The expert assessed that the questionnaire followed the concept and purpose of the study. Meanwhile, the face validity, construct validity, and reliability tests were carried out on 30 nursing internship program students of Universitas Padjadjaran. Respondents who took part in the instrument test were not included in the data analysis process. The results of the face validity test show that all respondents understand all of the question items. The construct validity test was carried out using bivariate analysis of the Pearson Product-Moment Correlation test. The reliability test was carried out with the Cronbach's Alpha test. The reliability test results were 0.622, which means the question items have high reliability based on the Guilford coefficient classification [25].

Data collection

The research was conducted online in July-August 2021 on respondents in Indonesia through the Google Form platform.

Data analysis

Data analysis used descriptive analysis and inferential statistics using the Mann-Whitney test. The results of the Kolmogorov-Smirnov normality test showed a value of $p = 0.00$, which indicated that the data were not normally distributed ($p < 0.05$). The skewness value of -0.76 suggests that the data is not extremely skewed so the mean used to be a central tendency. The mean estimates the best central tendency because of its stability and is the most stable central tendency among the other two measurements [26].

Ethical consideration

The research received the ethical exemption from the Health Research Ethics Commission of Universitas Padjadjaran with letter number 551/UN6. KEP/EC/2021.

Results

A total of 143 participants filled out the questionnaire completely. Based on Table 1, it is known that most of the respondents (86%) are female, almost all respondents (98.6%) are in the late adolescent age group (age 17–25 years), and were in the XLI class (78.3%).

Table 1: Demographic Characteristics of Participants (n = 143)

Characteristics	Frequency	Percentage
Gender		
Male	20	14
Female	123	86
Age		
Late adolescent (17–25 years)	141	98.6
Early adulthood (26–35 years)	2	1.4
Batch		
XL	31	21.7
XLI	112	78.3
Training about sepsis		
Yes	8	5.6
No	135	94.4
Information about early detection of sepsis		
Yes	87	60.8
No	56	39.2
Information about early detection of sepsis		
Poster and leaflet	18	12.6
Article/Journal	48	33.8
Seminar/Symposium	8	5.6
Book	36	25.4
Lecture, Tutorial, etc.	112	78.9
Others (Internet, Video, discussion)	3	2.1
Never	8	5.6

Only a small proportion of respondents (5.6%) have attended specific training on sepsis. However, more than half of the respondents (60.8%) have received information about early detection of sepsis, with the majority of the information sources coming from the lecture process (lectures, tutorials, etc.) (78.9%), articles/journals (33.8%), and books (25.4%).

Overall, the knowledge of nursing internship program students has an average score of 70.4 with a standard deviation (SD) = 11.9 (Table 2). The knowledge score is divided into two categories based on the mean score: a knowledge score above the average and below the average. Although there was a slight difference between the two groups, more than half got a knowledge score below the average (56.6%).

Table 2: Distribution of knowledge score of nursing internship program students sepsis about early detection of sepsis (n = 143)

Variable	Mean	SD	Score>Mean		Score<Mean	
			n	%	n	%
Knowledge about early detection of sepsis	70.4	11.9	62	43.4%	81	56.6%
Knowledge of nursing internship program student batch XL	70.7	10.6	11	35.5%	20	64.5%
Knowledge of nursing internship program student batch XLI	70.3	12.3	51	45.5%	61	54.5%

Table 3 shows that there are several gaps in respondents' correct answers per item question when viewed based on their batch. All students from group XL (100%) were able to answer two question items correctly, the question "getting a surgical procedure or invasive procedure" on the risk factors of sepsis and "systolic blood pressure 100 mmHg" on the qSOFA criteria. Meanwhile, group XLI students answered the

question items correctly were "have impaired immunity" on risk factors for sepsis. However, the two groups mostly answered incorrectly on the question "the patient's body temperature shows more than 38°C" in determining the qSOFA criteria.

Table 3: Distribution of correct answers to early detection of sepsis of different groups (n = 143)

Questions	Batch XL		Batch XLI	
	n	%	n	%
Definition of sepsis				
Which of the following is the current definition of sepsis?	10	32%	25	22%
Risk factors of sepsis				
Very old or very young people	20	65%	87	78%
Have impaired immunity	28	90%	105	93%
Getting a surgical procedure or invasive procedure	31	100%	102	91%
Experiencing damage to skin integrity	29	94%	102	91%
Mean		87%		88%
Clinical criteria of sepsis based on qSOFA				
The patient's body temperature is more than 38°C	4	13%	13	12%
The patient's heart rate is less than 90 beats/min	14	45%	54	48%
The patient's respiratory rate is 22 breaths/min or more	26	84%	99	88%
GCS<15	26	84%	100	89%
Systolic blood pressure≤100 mmHg	31	100%	91	81%
Mean		65%		64%
Sepsis case scenario				
Case 1	30	97%	103	92%
Case 2	24	77%	88	79%
Case 3	12	39%	54	48%
Mean		71%		73%

There was a significant positive correlation found in this study between information and knowledge about early detection of sepsis with the p = 0.002 (Table 4). The findings indicate that information of early detection of sepsis increases the nursing internship program students' knowledge.

Discussion

Based on the research results, the average knowledge score about early detection of sepsis of nursing internship program students of Universitas Padjadjaran is 70.4 (SD = 11.9). However, there are several gaps found. More than half of the respondents scored below the average. In addition, almost all respondents did not know the current definition of sepsis and incorrectly identified a patient's body temperature >38°C as clinical criteria for sepsis based on the qSOFA score. Meanwhile,

Table 4: Difference between participant's personal characteristics and knowledge scores on early detection of sepsis (n = 143)

Characteristics	Mean	SD	p-value
Gender			0.06
Male	65.4	13.6	
Female	71.2	11.5	
Age			0.298
Late adolescent (17–25 years)	70.3	11.9	
Early adulthood (26–35 years)	76.9	0.0	
Batch			0.604
XL	70.7	10.6	
XLI	70.3	12.3	
Training about sepsis			0.243
Yes	63.5	17.3	
No	70.7	11.5	
Information about early detection of sepsis			0.002
Yes	72.7	11.4	
No	66.8	11.9	

based on its characteristics, the information is a factor that significantly affects the knowledge score (p < 0.05).

The definition of sepsis has evolved and changed since it was first published in 1991. Currently, sepsis is defined as a life-threatening organ dysfunction caused by dysregulation of the body's response to infection [27]. However, most of the respondents do not know the current definition of sepsis. It is in contrast with the research conducted by Tilton (2019) that most nursing students (60%) answered questions about the definition of sepsis according to the Sepsis-3 guidelines [28]. Nursing internship program students need to know the current definition of sepsis because the definition of Systemic Inflammatory Response Syndrome (SIRS) as sepsis is considered less specific in identifying sepsis.

The definition of Sepsis-2 that uses the SIRS as clinical criteria for sepsis leads to an overdiagnosis of patients with infections identified as sepsis and results in low specificity in detecting sepsis [27], [29]. SIRS criteria are considered too sensitive and non-specific, causing overdiagnosis and inappropriate antibiotic administration [30]. Patients presenting to the ED may exhibit SIRS criteria in various situations, including metabolic and endocrine disease, cancer, respiratory syndrome, infection, trauma, and ischemia [31].

Patients at high risk for sepsis usually have several comorbidities. Therefore, various populations at high risk of sepsis need more intensive assessment and monitoring of worsening conditions [32]. By knowing the risk factors for sepsis, it is hoped that nursing internship program students can increase their vigilance to carry out further assessment and monitoring to prevent septic shock due to a decrease in the condition of patients at risk of sepsis.

Knowledge of signs, symptoms, and appropriate care in septic patients is essential for successfully managing sepsis [33]. Based on the study results, more than half of the respondents (64%) were able to correctly answer questions regarding clinical criteria for sepsis based on qSOFA. It is in contrast to a study conducted by Tilton (2019) which found that only a small proportion of nursing students (22%) were able to identify sepsis screening measurements based on qSOFA. Thus, it proves that although respondents do not know the updated definition of sepsis based on the Sepsis-3 guidelines, respondents know the qSOFA indicators as clinical criteria for sepsis. Furthermore, López-Izquierdo *et al.* (2020) also stated in their research that the qSOFA score could be used as an initial assessment to detect patients at high risk of sepsis [34]. Thus, it is expected that knowing the clinical criteria for sepsis based on qSOFA respondents can have good behavior in the early detection of sepsis.

However, respondents still cannot distinguish the criteria for patient body temperature >38°C as clinical criteria for sepsis based on qSOFA. Most respondents still use the definition of sepsis based on Sepsis-2, which uses SIRS criteria. Body temperature is a poor indicator of sepsis because fever is not always present, especially in immunocompromised patients [3]. In addition, hypothermic sepsis patients are associated with higher mortality rates [35]. Therefore, whether the patient's body temperature is high or low, both need to be given appropriate treatment.

Information obtained through both formal and informal education can lead to changes in increasing knowledge [36]. In line with this statement, the study results indicate that information has a significant effect on knowledge scores. Furthermore, most students get information about the early detection of sepsis from the lecture process. Therefore, students need to increase their knowledge through the various information they receive.

A person's perception and mindset are influenced by age. Therefore, increasing age will facilitate the development of capture power and perspective so that the knowledge gained will be better [36]. Respondents in this study were classified as homogeneous based on their age. Based on statistical tests, age is considered not to have a significant effect on knowledge scores.

According to other demographic status, students in the XLI class and students who had never attended special training on sepsis got a knowledge score below the average. These results are in line with research conducted by Harley *et al.*, (2021), which identified a significant difference between students who had received formal education about sepsis and the total knowledge score [37]. The importance of this role of formal education on the level of knowledge has also been identified [38], [39]. It is also important to ensure that training is delivered in a frequency and range not too far apart. Research by Nucera *et al.* (2018) shows that special training significantly affects knowledge scores about sepsis, but this increase can last for a certain period, which is about 6 months [40]. Therefore, to be able to maintain good knowledge, continuous and comprehensive training is needed.

Effective educational interventions are needed to assess sepsis patients accurately and quickly [41]. Nursing professional students need to understand current sepsis guidelines and use sepsis screening tools to perform early detection appropriately and initiate appropriate treatment. Nursing faculties need to implement teaching strategies that facilitate students to acquire knowledge, skills, and attitudes that will improve patient outcomes and reduce preventable medical errors [42].

A study conducted by Davis *et al.*, (2016) stated that preparing a teaching package on sepsis is an opportunity to support the knowledge needed to understand sepsis and how it affects patients. The teaching package offered is a PowerPoint presentation to introduce case studies and the physiological process of sepsis. In addition, using various technologies produces

a modern look and facilitates interactive learning. Thus, it is intended to increase learning effectiveness [44].

In addition, a unique learning method was introduced by Evans *et al.* (2015) by utilizing an online game using a free, accessible, and easy-to-use platform, namely Septris [45]. Septris provides an interactive, case-based learning environment. This game provides real-time feedback to support experiential learning. This learning method has been tested on students, which showed a significant increase in knowledge (p < 0.001) after students played the game in 20 min. This method is considered an easy and inexpensive way that students can do.

There is limited literature that discusses nursing students' knowledge about the early detection of sepsis. Most research on sepsis was conducted on nurses, doctors, and other health workers, not on nursing students. Therefore, it is difficult for researchers to compare the results of this study with other studies that have been conducted. Further research can considerably investigate this topic considering that there are still limited studies examining the knowledge of nursing profession students about sepsis.

Conclusion

The results showed that nursing internship program students of Universitas Padjadjaran had a fairly good average score of knowledge about early detection of sepsis. However, more than half of the students scored below the group average. Furthermore, the information is a factor that significantly influences the knowledge score.

Based on the research, nursing institutions are expected to provide case-based education methods through the lecture process by implementing an interactive strategy to introduce Sepsis-3 guidelines, clinical criteria for sepsis based on qSOFA, and distinguish SIRS from sepsis. In addition, online games can also be applied as experiential learning for nursing professional program students to improve critical thinking processes in making decisions. Training, whether in workshops, seminars, or skills trainings, can be provided to students to increase and maintain knowledge about the early detection of sepsis. Further research can explore what factors can affect the knowledge of nursing profession program students so that later specific interventions can be carried out.

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