

Factors influencing the knowledge, attitude, and belief practice of nurses with sepsis and septic shock

Factores que influyen en el conocimiento, la actitud, la práctica y las creencias de las enfermeras sobre la sepsis y el choque séptico

Xiaofeng Xu^{1#}, Ying Li^{1#}, Shuai Liu², Wenyue Zhang¹, Yi Li¹, Xin Liu¹, and Huan Mai^{1*}

¹Department of Infectious Diseases; ²Department of Emergency. Peking University People's Hospital, Beijing, China

[#]These authors contributed equally and share first authorship.

Abstract

Objective: The aim of this study was to investigate the current awareness status of nurses on the "Treatment Guidelines for Sepsis and Septic Shock." **Methods:** According to the "International Guidelines for Management of Sepsis and Septic Shock 2021," a self-made questionnaire on nursing knowledge related to sepsis and septic shock was used to evaluate nurses' level of knowledge-attitude-belief-practice (KAP) in sepsis and septic shock, and to explore the influential factors on their awareness level. **Results:** The awareness rate of nurses was 46.67% toward the treatment guidelines for sepsis and septic shock. Nurses' mastery rate was < 60.00%; and 85.00% of nurses scored 10-18 points using the sepsis and septic shock-related questionnaire. The power order of related factors affecting the KAP level of nurses on sepsis and septic shock was listed as follows: years of service > guideline-related training duration > guideline-related training or not > professional title > degree of education. The years of service had the most significant impact on nurses' level of KAP in sepsis or septic shock ($r = 0.521$). **Conclusion:** Nurses have poor awareness of the "Treatment Guidelines for Sepsis and Septic Shock." The findings suggest that guidelines- and standards-based training with longer duration should be carried out to improve the KAP level of nurses.

Keywords: Nurse. Infectious shock. Sepsis. Knowledge-attitude-belief-practice.

Resumen

Objetivo: El objetivo de este estudio fue investigar el estado actual de conocimiento de las enfermeras sobre las "Directrices para el tratamiento de la sepsis y el shock séptico". **Métodos:** De acuerdo con las "Directrices internacionales para el tratamiento de la sepsis y el shock séptico 2021", se utilizó un cuestionario elaborado por nosotros mismos sobre los conocimientos de enfermería relacionados con la sepsis y el shock séptico para evaluar el nivel de conocimientos, actitudes, creencias y prácticas (KAP) de las enfermeras en materia de sepsis y shock séptico, y para explorar los factores que influyen en su nivel de conocimiento. **Resultados:** El índice de conocimiento de las enfermeras sobre las directrices terapéuticas para la sepsis y el shock séptico fue del 46.67 %. El índice de dominio de las enfermeras fue < 60.00 %; y el 85.00 % de las enfermeras obtuvieron una puntuación de entre 10 y 18 puntos en el cuestionario relacionado con la sepsis y el shock séptico. El orden de importancia de los factores relacionados que afectan al nivel de KAP de las enfermeras sobre la sepsis y el shock séptico se enumeró de la siguiente manera: años de servicio > duración de la formación relacionada con las directrices > formación relacionada con las directrices o no > título profesional > grado de educación. Los años de servicio tuvieron el impacto más significativo en el nivel de KAP de las enfermeras en sepsis o shock séptico ($r = 0.521$).

*Correspondence:

Huan Mai

E-mail: maihuan123@163.com

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Conclusiones: *Las enfermeras tienen baja conciencia de las pautas de tratamiento de la sepsis y del choque séptico. Se recomienda formación a largo plazo basada en pautas para mejorar los niveles de CACP de las enfermeras.*

Palabras clave: *Enfermeras. Choque séptico. Sepsis. Conocimientos, actitudes, prácticas y creencias.*

Introduction

Sepsis and septic shock are two clinical syndromes characterized by systemic infection-induced organ dysfunction, both of which have been accepted to be major causes of death in critically ill patients in the Infectious Disease Department, Emergency Department, and Intensive Care Unit (ICU). It has been reported that the morbidity and mortality of septic shock were 8.2% and 60.1%, respectively, significantly higher than those of severe infection¹. The high mortality of septic shock has long been a challenge in clinical practice². In October 2002, the European Society of Intensive Care Medicine, the Society of Critical Care Medicine, and the International Forum on Infections jointly launched a global initiative, surviving sepsis campaign (SSC), in Barcelona, Spain, calling on healthcare professionals, health institutions, and government organizations worldwide to attach great importance to sepsis. SSC proposed an action goal of reducing the mortality rate of sepsis patients by 25% within 5 years. In 2004, experts in critical care and infectious diseases from 11 international organizations jointly developed the "Guidelines for the Treatment of Sepsis and Infectious Shock."³ In 2021, it was revised and renamed the "International Guidelines for Management of Sepsis and Septic Shock 2021"⁴ (hereinafter referred to as the guidelines). The guidelines are international programmatic documents, supported by evidence-based medicine, aimed at raising global awareness of sepsis and septic shock, and striving to improve prognosis. The guidelines have been gradually popularized in China recently, leading to significant changes in the control concepts and treatment principles for sepsis in clinical practice. Nurses are important participants and practitioners in the implementation of the guidelines, suggesting that it is particularly important for nurses in the Infectious Disease Department, Emergency Department, and ICU to understand and master the Guidelines. It has been reported that nurses' knowledge-attitude-belief-practice (KAP) toward the guidelines have a direct impact on the treatment and nursing practices for patients with sepsis⁵. Therefore, this study was performed to investigate the current

status of KAP toward septic shock among nurses in the Infectious Disease Department, Emergency Department, and ICU, and explore specific measures to play a positive role of nurses in SSC nursing practice, so as to provide theoretical reference for the nursing of patients with sepsis and septic shock clinically.

Subjects and methods

Subjects of study

Using convenience sampling, this study enrolled 240 nurses in the Infection Department, Emergency Department, and ICU of Peking University People's Hospital. Inclusion criteria: (1) nurses received training in critical care in hospitals; and (2) nurses worked in the department for at least 2 years. This study was approved by the Ethics Committee of Peking University People's Hospital, and informed consent was provided from the respondents. All data collected were strictly confidential for the purpose of this study only.

Methods of study

A self-made questionnaire on nursing-related knowledge that nurses should be aware of was developed in this study based on the Guidelines. The questionnaire consisted of three parts: (1) general data: age, gender, years of service, years of service in the infectious disease department/emergency department/ICU, degree of education, professional title, awareness of the guidelines, receiving guideline-related training on sepsis and septic shock or not, guideline-related training duration, etc. (2) Questionnaire on knowledge that should be mastered by nurses in the treatment of septic shock: four major dimensions of fluid resuscitation, anti-infection treatment, mechanical ventilation, and other monitoring (e.g., vital signs, lactate, and blood glucose). Each dimension respectively consists of 11, 8, 4, and 5 items, with each item scoring 1 point for correct answers and 0 points for incorrect or no answers. The total score is the sum of each item. The

respondents with higher scores might have better knowledge mastery. The researchers were responsible for questionnaire distribution, explanation of the purpose of the survey to the respondents, and questionnaire collection the next day. The respondents were informed to truthfully fill out the questionnaire anonymously. A total of 250 questionnaires were distributed and 246 were collected, including 240 valid questionnaires.

A total of 40 copies of the questionnaire were distributed in the pilot survey. As shown in the analysis of reliability and validity of the questionnaire, the item-content validity index (CVI) was 0.754 ~ 1.00, the scale-level CVI/average was 0.858, and the scale-level CVI/universal agreement was 0.846; besides, the Cronbach's α of the total questionnaire was 0.854, and that of each dimension ranged between 0.886~0.962; the split-half coefficient of the total questionnaire was 0.693, and that of each dimension ranged between 0.827 ~ 0.934; additionally, the test-retest reliability of the total questionnaire was 0.932 ($p < 0.001$). It supported that the self-made questionnaire had good content validity and internal consistency.

Statistical analysis

Data analysis in this study adopted Statistical Package for the Social Sciences 25.0 statistical software. Measurement data that met the normal distribution were expressed by mean \pm standard deviation ($\bar{x} \pm s$), and inter-group comparison used an independent sample t-test. In univariate analysis, linear correlation analysis was used to calculate the Pearson correlation coefficient for measurement data, and rank correlation analysis was used to calculate Spearman's rank correlation coefficient for clarifying the correlation between rank variables. In addition, multiple regression analysis was employed for multivariate analysis. $p < 0.05$ was considered to have a statistically significant difference.

Results

Baseline data of the respondents

This study included 240 female nurses, with an average age of 25.9 ± 4.8 years old (22 ~ 43 years). Their average years of service in nursing and years of service in the department were 7.42 ± 4.36 and 2.96 ± 1.55 years, ranging between 1~20 and 1-18 year(s),

Table 1. Nurses' awareness of relevant content of the Guidelines (n = 240)

Items	Number of awareness	Awareness rate (%)	Sequence
Fluid resuscitation and fluid therapy	240	100.00	1
Antibiotic therapy	210	87.50	2
Mechanical ventilation	200	83.33	3
Use of vasopressors and cardiotoxic drugs	190	79.17	4
Pathogenic diagnosis and control of infection sources	182	75.83	5
Bicarbonate therapy	180	75.00	6
Glucose control	168	70.00	7
Use of glucocorticoids	158	65.83	8
Use of blood products	150	62.50	9
Use of sedatives, analgesics, and muscle relaxants	142	59.17	10
Renal replacement therapy	140	58.33	11

respectively. In terms of the degree of education, there were 44 nurses with vocational school degrees, 166 with college degrees, and 30 with bachelor's degrees or above. Besides, as for professional titles, there were 22 nurses, 202 nurse practitioners, and 16 supervisor nurses or above.

Nurses' awareness of relevant content of the guidelines

Among all respondents, 130 nurses were aware of the content of the guidelines, with an awareness rate of 54.17%. A survey was further conducted on the 11 treatment items mentioned in the guidelines. The results showed that only 112 nurses (46.67%) believed that all 11 items were related to the treatment of sepsis and septic shock, while the remaining respondents had varying degrees of cognitive misunderstandings. Furthermore, according to the survey on the ways in which nurses were aware of the guidelines, only 8.93% (10/112) received relevant training; 44.64% (50/112) reviewed the guidelines; 41.07% (46/112) only heard and never reviewed; and 5.36% (6/112) were aware through other channels. Nurses' awareness of the relevant content of the guidelines is shown in table 1.

Table 2. Nurse's mastery of guideline-related knowledge

Dimensions	Total score	Score	Accuracy (%)
Fluid resuscitation	11	7.67 ± 1.72	59.65
Anti-infection	8	5.23 ± 1.22	55.34
Mechanical ventilation	4	1.89 ± 0.72	48.77
Other monitoring	5	2.11 ± 1.03	29.33

Table 3. Nurse's mastery of septic shock-related knowledge

Score range	Number of respondents	Proportion (%)
1~9	6	5.00
10~18	102	85.00
19~28	12	10.00

The score of nurses on the KAP questionnaire for sepsis and septic shock

The average score of the respondents was 15.30 ± 4.22 points (26 ~ 5 points). The total accuracy rate of the four dimensions of knowledge that nurses in the Infectious Disease Department, Emergency Department, and ICU of our hospital should master in the treatment of sepsis and septic shock was < 60% (Table 2). In addition, concerning nurses' mastery of relevant knowledge, the score ranged between 10 and 18 points in the majority of nurses (85.00%) (Table 3).

Correlation analysis of nurses' mastery of septic shock-related knowledge

This study further carried out a univariate analysis of the influential factors of sepsis and septic shock-related knowledge mastery among nurses in the Infectious Disease Department, Emergency Department, and ICU. The score of the questionnaire was positively correlated with nurses' age, years of service, professional title, guideline-related training or not, and guideline-related training duration. It showed the strongest correlation with the years of service in the department ($r = 0.53$, $t = 4.102$, $p < 0.001$; Table 4).

Table 4. Analysis of factors influencing nurses' mastery of guidelines

Factors	r-value	t/Z	p-value
Age	0.31	3.454	< 0.001
Years of service	0.29	3.231	< 0.001
Years of service in the department	0.53	4.102	< 0.001
Degree of education	0.32	3.231	< 0.001
Professional title	0.35	3.122	< 0.001
Guideline-related training or not	0.43	4.512	< 0.001
Guideline-related training duration	0.44	4.642	< 0.001

Multiple linear regression analysis of nurses' mastery of knowledge related to sepsis and septic shock

$$Y = 5.833 + 0.521X_1 + 0.322X_2 + 0.418X_3 + 0.442X_4 + 0.355X_5$$

Using knowledge-related scores of the respondents as the dependent variable and variables with statistically significant differences in univariate analysis as independent variables, a stepwise regression analysis was performed to further explore factors affecting the mastery of septic shock-related knowledge among nurses in the Infectious Disease Department, Emergency Department, and ICU. The assignment of variables with statistically significant differences in univariate analysis was as follows: degree of education: primary school and below = 1, middle school = 2, vocational school = 3, college and above = 4; professional title: primary = 1, intermediate = 2, senior = 3; and guideline-related training or not: yes = 1, no = 2. All other variables were included as continuous variables. The stepwise regression was used to include and exclude independent variables ($\alpha_{\text{entry}} = 0.05$, and $\alpha_{\text{removal}} = 0.1$) to eliminate influential factors with interactive effects. Age and years of service were excluded during the inclusion and exclusion of variables. The determination coefficient was $R^2 = 0.699$ in the regression model, indicating that nurses' years of service in the department, degree of education, and other independent variables could explain 69.9% of nurses' mastery of knowledge related to sepsis and septic shock ($F = 356.73$, $p < 0.001$). It suggested that the dependent variable of mastery of sepsis and septic shock-related knowledge among nurses in the Infectious Disease

Table 5. Multiple linear regression model for influential factors

Variables	Standard error	Partial regression coefficient	p	95% confidence interval	Variance inflation factor
Constant	5.833	-	< 0.001	-	-
Years of service in the department	1.323	0.521	< 0.001	0.465~1.322	1.002
Degree of education	1.319	0.332	< 0.001	0.165~0.422	1.057
Guideline-related training or not	1.520	0.418	< 0.001	0.355~0.512	1.064
Guideline-related training duration	1.612	0.442	< 0.001	0.248~0.731	1.055
Professional title	1.192	0.355	< 0.001	0.121~0.440	1.087

Department, Emergency Department, and ICU had a good fit with the five independent variables. Furthermore, the Durbin-Watson index was 1.995, indicating no correlation among independent variables in the model. As indicated by the significance test results, the five independent variables should be retained considering the presence of statistically significant differences in the model (all $p < 0.05$). Moreover, four independent variables had VIF values of far < 10 , suggesting no collinearity between individual variables. The fitted multiple linear regression equation (I) was:

$$Y = 5.833 + 0.521X_1 + 0.322X_2 + 0.418X_3 + 0.442X_4 + 0.355X_5$$

According to the partial regression coefficients in the model, the power order of related factors affecting the KAP level of nurses on sepsis and septic shock was as follows: years of service in the department $>$ guideline-related training duration $>$ guideline-related training or not $>$ professional title $>$ degree of education (Table 5).

Discussion

Sepsis and septic shock, with a mortality of up to 28.6%⁶, are a high concern globally in Critical Care Medicine and are also nursing challenges worthy of in-depth research^{7,8}. Patients with septic shock have relative or absolute hypovolemia in general and may further suffer from injuries of major organs and metabolic disorders due to tissue ischemia and hypoxia resulting from unstable hemodynamics and tissue hypoperfusion⁹. Resuscitation therapy offers a key strategy for circulatory support to improve hemodynamic status and reverse organ dysfunction, exhibiting significant roles in the rescue and treatment of

septic shock patients. Nurses are front-line personnel in early identification of critically ill patients at the initial stage of disease onset¹⁰. Clinical effects may be compromised if nurses are not familiar with septic shock and have a low KAP level. In this study, nurses in the Infectious Disease Department, Emergency Department, and ICU had low awareness of knowledge related to resuscitation therapy for septic shock, with an awareness rate of only 54.17%. It is consistent with the findings of Edwards and Jones¹¹. At the same time, only 8.93% (10/112) of the knowledge providers received relevant training, 41.07% of them only heard and never reviewed the guidelines, and the total accuracy of nurses in the infectious diseases department, emergency department, ICU, and other departments in mastering the four dimensions related to this guideline was $< 60\%$. Among them, the accuracy of the 'other monitoring' dimension is the lowest, only 29.33%. A study from Switzerland¹² also pointed out that the lack of awareness and knowledge of sepsis reflects the lack of sepsis-specific continuing education. The training and education of septic shock may be affected by many factors, such as insufficient attention, backward training content and methods, insufficient teachers, nurses' own factors, and imperfect training evaluation and feedback mechanism. To improve the quality of training and education of septic shock, it is necessary for medical institutions, training institutions and nurses to work together to strengthen training investment, update training content and methods, improve teachers' strength, stimulate nurses' learning motivation, and improve training evaluation and feedback mechanism.

Foreign research has emphasized the importance of clinical reflection and self-reflection to improve professional abilities¹³. In this study, most nurses in the Infectious Disease Department, Emergency

Department, and ICU had a moderate level of mastery (85.00%), while those with poor mastery accounted for 5.00%. The study of Chua et al.¹⁴ also found that nurses have a general knowledge of sepsis and are confident in identifying and coping with sepsis patients. However, only 52.0% of them could correctly define sepsis. This result underscores the need for systematic and multi-level on-the-job training of knowledge not yet mastered by nurses' care managers and educators. Among the four dimensions of the survey, nurses had the worst mastery of "other monitoring" related knowledge, which, however, is a hot-spot issue of concern in Critical Care Medicine at present. It in turn proposes a requirement for improving nurses' ability to identify and acquire new knowledge.

Furthermore, foreign reports also revealed that factors such as learning duration and years of service might affect the development of nurses' professional abilities¹⁵. Consistently, in this study, younger and junior nurses as well as those with junior professional titles had significantly lower mastery of the guidelines compared to older and senior nurses as well as those with senior professional titles. It may be explained by the lack of clinical experience, limited opportunities to participate in relevant training, and insufficient proactive learning ability and needs of the former group. This is consistent with the research results of Yuan and Xiaoying¹⁶. Due to the short working hours, junior nurses have no contact with many new knowledge and new theories, and lack the enthusiasm of active learning⁵. In clinical nursing, only passive monitoring can be achieved, rather than taking the initiative to manage patients, unable to achieve target management, let alone predictive nursing. Due to the lack of relevant knowledge, it seriously affects the early observation and timely and effective nursing of sepsis patients by low-level nurses, which will delay the overall treatment and affect the prognosis. Therefore, younger and junior nurses as well as those with junior professional titles and insufficient work experience in the department should receive more training actively, thereby improving the overall professional and technical level of nursing in the Infectious Disease Department, Emergency Department, and ICU¹⁷. Therefore, in the training of nurses, there is a need to fully consider the differences in their mastery of existing knowledge and skills among different departments and disease entities. A diversified training model stratified by age, departments, and administrative levels should be adopted when formulating training programs¹⁸. Meanwhile, nurses in the Infectious Disease

Department, Emergency Department, and ICU should also learn actively to improve their understanding and mastery of the guidelines by reviewing the latest professional journals and utilizing abundant online resources¹⁹. In this way, nurses can make full use of their own value in the nursing practice of the "Guidelines for the Treatment of Sepsis and Infectious Shock."

Without a doubt, this study still has several limitations. It was a single-center study with a smaller sample size, resulting in potential selective bias and poor universality of the results. In the future, multi-center randomized controlled trials with larger sample sizes should be conducted to objectively and effectively evaluate nurses' mastery of the guidelines.

This study has important practical significance for improving nurses' understanding and mastery of sepsis and septic shock treatment guidelines. We identified the key factors affecting nurses' mastery of relevant knowledge, such as service years, education level and training experience, and provided targeted training directions for nursing managers and educators. According to the differences between different departments and disease entities, a hierarchical and diversified training model should be developed. Future research can further explore the optimization of training programs, design refined courses, combine clinical cases and simulation exercises, and improve nurses' practical ability and ability to respond to emergencies. At the same time, multi-center, large-sample randomized controlled trials are important directions for evaluating the effects of different training strategies. With the progress of medical technology and the development of clinical practice, the treatment guidelines will be constantly updated. Future research needs to pay attention to the update of the guidelines, adjust the training content and methods in time, ensure that nurses master the latest clinical knowledge and skills, and provide better nursing services for patients.

Conclusion

Higher requirements have been placed on the knowledge and skills of nurses in the Infectious Disease Department, Emergency Department, and ICU with the development of Critical Care Medicine. However, the present study reveals a relatively low KAP level among nurses toward septic shock at present. Therefore, it is necessary to strengthen continuing education and training of nurses in the Infectious Disease Department, Emergency Department, and ICU, so as to improve their understanding and correct

mastery of knowledge related to resuscitation treatment of septic shock. In addition, outdated and/or incorrect concepts, knowledge, and practices should be updated and corrected among nursing staff in a timely manner.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that the procedures followed complied with the ethical standards of the responsible human experimentation committee and adhered to the World Medical Association and the Declaration of Helsinki. The procedures were approved by the Institutional Ethics Committee.

Confidentiality, informed consent, and ethical approval. The authors have obtained approval from the Ethics Committee for the analysis of routinely obtained and anonymized clinical data, so informed consent was not necessary. Relevant guidelines were followed.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

References

1. Chahrour M, Chamseddine H, Kabbani L, Hosn MA. Regional anesthesia is associated with improved mortality and morbidity in patients with congestive heart failure undergoing lower extremity amputation. *Ann Vasc Surg.* 2024;108:206-11.
2. Garrigue P, Reber M, Perinel-Ragey S, Launay M. Personalized amoxicillin therapy in a critically ill patient undergoing renal replacement therapy: a grand round. *Ther Drug Monit.* 2024;46:559-62.
3. Peiyan W. Treatment guidelines with distinctive evidence-based medicine features - evaluation of treatment guidelines for severe sepsis and infectious shock. *Chin J Crit Care Med.* 2005;25:217-8.
4. Evans L, Rhodes A, Alhazzani W, Antonelli M, Coopersmith CM, French C, et al. Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021. *Intensive Care Med.* 2021; 47:1181-247.
5. Wei H, Duan X. Application of KTH-integrated nursing model in care of patients with multi-drug resistant tuberculosis. *Am J Transl Res.* 2021; 13:6855-63.
6. Mahapatra S, Heffner AC, Atarhi-Dugan JM. Septic Shock (Nursing). In: *StatPearls.* Treasure Island, FL: StatPearls Publishing; 2023.
7. Kleinpell RM. The role of the critical care nurse in the assessment and management of the patient with severe sepsis. *Crit Care Nurs Clin North Am.* 2003;15:27-34.
8. Bleakley G, Cole M. Recognition and management of sepsis: the nurse's role. *Br J Nurs.* 2020;29:1248-51.
9. Esposito S, De Simone G, Boccia G, De Caro F, Pagliano P. Sepsis and septic shock: new definitions, new diagnostic and therapeutic approaches. *J Glob Antimicrob Resist.* 2017;10:204-12.
10. Chellel A, Fraser J, Fender V, Higgs D, Buras-Rees S, Hook L, et al. Nursing observations on ward patients at risk of critical illness. *Nurs Times.* 2002;98:36-9.
11. Edwards E, Jones L. Sepsis knowledge, skills and attitudes among ward-based nurses. *Br J Nurs.* 2021;30:920-7.
12. Regina J, Le Pogam MA, Niemi T, Akrou R, Pepe S, Lehn I, et al. Sepsis awareness and knowledge amongst nurses, physicians and paramedics of a tertiary care center in Switzerland: a survey-based cross-sectional study. *PLoS One.* 2023;18:e0285151.
13. Kessler PD, Lund CH. Reflective journaling: developing an online journal for distance education. *Nurse Educ.* 2004;29:20-4.
14. Chua WL, Teh CS, Basri MA, Ong ST, Phang NQ, Goh EL. Nurses' knowledge and confidence in recognizing and managing patients with sepsis: a multi-site cross-sectional study. *J Adv Nurs.* 2023;79:616-29.
15. Secco ML, Woodgate RL, Hodgson A, Kowalski S, Plouffe J, Rothney PR, et al. A survey study of pediatric nurses' use of information sources. *Comput Inform Nurs.* 2006;24:105-12.
16. Yuan CF, Xiaoying W. Investigation and analysis of the cognition of ICU nurses in a tertiary hospital on the international guidelines for the treatment of sepsis and septic shock in 2016[J]. *Cardiovasc Dis J Integr Tradit Chin West Med.* 2019;7:192-3.
17. Yan, G, Chongling G. A brief discussion of quality of nurses in the department of infectious diseases. *Nursing Res.* 2005;19:1671.
18. Hodges AL, Konicki AJ, Talley MH, Bordelon CJ, Holland AC, Galin FS. Competency-based education in transitioning nurse practitioner students from education into practice. *J Am Assoc Nurse Pract.* 2019;31:675-82.
19. Hong L, Nanping S, Binghua Z, Hong X, Lihua X. Investigation on cognition of self-handling of cytotoxic drugs and evaluation of knowledge training in oncology nurses. *J Nursing Sci.* 2007;22:1-4.