

NURSES' KNOWLEDGE ON SEPTIC SHOCK

André Luiz Thomaz de Souza*
Ana Paula Sementino Amário**
Débora Lourene Azevedo Covay***
Luana Moraes Veloso****
Laura Menezes Silveira*****
Angelita Maria Stabile*****

ABSTRACT

Septic shock is a clinical condition caused by the worsening of the organic response to sepsis associated with high mortality. Nursing teams have been the target of studies on early identification of signs and symptoms of sepsis and septic shock in order to modify these indices. To identify the knowledge of nurses working in a hospital about septic shock. Descriptive method, cross-sectional study with quantitative treatment of data, performed in a large public hospital located in the south of the state of São Paulo. An instrument containing variables related to septic shock was applied to meet the objective. Forty-one nurses answered the instrument. More than 80% knew the signs and symptoms: documented infection, fever, increased heart rate. Among the negative responses: 31.7% did not have knowledge of suspected infection; 26.8% of hyperglycemia; and 34.1% of increased oxygen saturation in mixed venous blood. There were flaws in the knowledge of nurses about some variables related to septic shock. It is necessary to encourage the development of education programs aimed at updating the knowledge of professionals, and improving the quality of care and, consequently, the patient's health conditions.

Keywords: Sepsis shock. Nursing. Knowledge. Disease Prevention.

INTRODUCTION

Septic shock is a clinical condition resulting from the worsening of the organic response to sepsis, during which severe abnormalities in blood circulation and cellular metabolism occur, resulting in persistent hypotension and elevated lactate levels - above 18 mg/dL (2 mmol/L)⁽¹⁾. In view of this clinical condition, the majority of patients with septic shock develops Multiple Organ Dysfunction Syndrome (MODS), that is, the dysfunction of several organs in response to septic shock⁽²⁾, making mortality due to septic shock to reach very high rates worldwide⁽¹⁾ and culminating in the need for long-term hospitalization, ultimately generating high costs for health services⁽³⁾.

The nursing team correspond to the health professionals who are responsible for assisting septic patients and, because of their strategic position, they have been the target of several studies on early identification of signs and symptoms of sepsis in order to modify mortality rates⁽⁴⁾. In this perspective, the dissemination of knowledge about sepsis and its

complications is believed to be fundamental to reduce the risk of death through surveillance and monitoring of patients, identification of signs of aggravation and immediate treatment of problems related to the septic syndrome.

At first, it is necessary to know the clinical signs that characterize the aggravation of the response of the host, that is, septic shock. Clinical signs of organic deterioration during the septic period can be divided into general variables: fever (body temperature > 38.3°C); hypothermia (basal temperature < 36°C); heart rate > 90 bpm (min) or more than two standard deviations (SD) above normal range for age; tachypnea; altered mental state; significant edema or positive fluid balance (> 20 mL/kg over 24 hours); hyperglycemia (blood glucose > 140 mg/dl or 7.7 mmol/l in the absence of diabetes); change in inflammatory variables: leukocytosis (white blood cell count > 12000 μ l); leukopenia (white blood cell count < 4000 μ l); normal white blood cell count with more than 10% of immature forms; plasma C-reactive protein above normal; plasma procalcitonin more than two standard deviations above the normal

*Nurse. Doctorate in Nursing. Professor at the College of Nursing of the Integrated Colleges of Ribeira Valley, Registro-SP, Brazil. E-mail: alfenas2@hotmail.com

**Nursing student. Faculdades Integradas do Vale do Ribeira, Registro-SP, Brazil. E-mail: anapaulasementino@hotmail.com

***Nursing student. Faculdades Integradas do Vale do Ribeira, Registro-SP, Brazil. E-mail: deby_covay@hotmail.com

****Nursing student. Faculdades Integradas do Vale do Ribeira, Registro-SP, Brazil. E-mail: deby_covay@hotmail.com

*****Nurse. PhD student in Sciences, University of São Paulo, School of Nursing of Ribeirão Preto - SP, Brazil. E-mail: lauramsilveira@usp.br

***** Nurse. PhD in Sciences. Professor, Department of General and Specialized Nursing, University of São Paulo, School of Nursing, Ribeirão Preto, SP, Brazil. E-mail: angelita@eerp.usp.br.

value; hemodynamic variables: arterial hypotension (SBP < 90 mmHg, MAP < 70 mmHg or reduction of 40 mmHg in adults or less), below the normal level for age; variables of organic dysfunction: arterial hypoxemia ($\text{PaO}_2/\text{FiO}_2 < 300$); acute oliguria (diuresis < 0.5 mL/kg/h for at least 2 hours despite adequate fluid replacement); increased creatinine (> 0.5 mg/dl or 44 $\mu\text{mol/l}$); abnormalities in coagulation ($\text{RNI} > 1.5$ or $\text{TTP} > 60 \text{ s}$); paralytic ileus (absence of intestinal sounds); thrombocytopenia (platelet count less than 100,000 μl^{-1}); hyperbilirubinemia (bilirubin in plasma > 4 mg/dl or > 70 $\mu\text{mol/l}$); tissue perfusion variables: hyperlactatemia (> 1 mmol/l), and decreased capillary filling or mottling⁽⁵⁾.

The recognition of these warning signs of sepsis and septic shock, together with the physical, clinical and laboratorial examination during the septic period, are well-known practices in developed countries, where the majority of nurses have autonomy for this type of action⁽⁶⁾. Furthermore, because nurses work in different health settings, they may have to deal with patients with sepsis or septic shock even in health facilities of lower complexity and, therefore, should be familiar with the manifestations of this syndrome⁽⁷⁾. Thus, this study aimed to identify the knowledge that nurses working in a large public hospital have about septic shock.

METHOD

This is a descriptive, cross-sectional study with quantitative treatment of the data. The present study was carried out in a large public hospital located on the southern coast of the state of São Paulo (SP), Brazil. The institution has 176 beds, hospitalization rate approximately 789 patients/month, and 557 nursing professionals, among whom 104 are nurses. The eligible population consisted of 83 nurses who work in the health institution, of both sexes, and who had at least one year of nursing care experience. Nurses whose previous experience was limited to administrative functions, outpatient care and worker's health were excluded.

The nurses eligible for this study were invited and clarified about the objectives of the research through the informed consent term, which was duly signed. Each participant individually responded to the form in the presence of the researcher. Doubts regarding the form were clarified by the researchers so that they did not interfere in the choice of answers. The time to respond to the instrument was 15 minutes on average.

The data collection period was between August and September 2016, at the hospital's facilities, respecting the work routine of each participant.

The form used to collect data was prepared by the authors according to the model adopted by Santos et al. (2013)⁽⁷⁾. The form contained information related to the characteristics of the nurses, such as: age, sex, race, marital status, sector, work shift and number of employment bonds. This form also had multiple choice questions related to knowledge about signs and symptoms that may characterize septic shock, subdivided into: general variables, inflammatory variables, hemodynamic variables, organic dysfunction variables, tissue perfusion variables, and others⁽⁸⁾.

The form used in the development of this study was submitted to a validation process carried out by three experts of this theme who conducted the evaluations with notes for adjustments regarding the layout of the instrument, agreement on the objective and the universe of its content, clarity and objectivity⁽⁹⁾.

Although changes in sepsis terminology⁽¹⁾ were published at the beginning of 2016, sepsis criteria were followed the guideline of the Surviving Sepsis Campaign of 2012⁽⁵⁾, taking into account that this recent change is still being incorporated into clinical practice and is currently the focus of discussions⁽¹⁰⁾.

This study was registered in the Brazil Platform under the CAAE: 57311616.5.0000.5490 and approved by the competent Ethics Committee, meeting the ethical standards of research in human beings, according to Resolution 466/2012 of the National Health Council.

After collection, data were typed and presented in the form of descriptive statistics using the Statistical Package for the Social Sciences (SPSS) software, version 20.0.

RESULTS

According to the eligibility criteria, 41 nurses participated in the present study. The instrument used to collect data allowed nurses to choose between "yes", "no" or "I don't know".

In this study, 42 nurses did not participate for the following reasons: two were on maternity leave; two were on vacation; 12 exercised functions in an outpatient or administrative unit; seven were not located after two contact attempts; one was away for

health reasons; and 18 refused to participate because they said they did not have interest or time.

Thus, more than half of the nurses did not participate in the study. It is understood that this lack of interest can be explained by several reasons: presence of more than one employment bond; demotivation for work; lack of incentive from health

institutions; work overload; apprehension in showing flaws in their training/knowledge; resistance to change; lack of knowledge about the magnitude of the disease; among other reasons.

Results regarding the characteristics of participants can be seen in Table 1.

Table 1. Characteristics of nurses participating in the study, Registro (SP), Brazil, 2016.

Variables		Frequency (n)	Percentage (%)
Sex	Male	11	26.8
	Female	30	73.2
Work shift	Day time	23	56.1
	Overnight time	16	43.9
More than one employment bond	Yes	22	53.7
	No	19	46.3
Participation in continuing education on sepsis	Yes	19	46.3
	No	22	53.7
Knowledge of the Surviving Sepsis Campaign	Yes	8	19.5
	No	33	80.5
Post-graduation	Specialization	34	82.9
	None	7	17.1

Source: Prepared by the authors .

The results show that only 46.3% of the nurses reported having participated in continuing education programs on sepsis.

Nurses who participated in this study worked in different sectors of the hospital: 19.5%(8) worked in the emergency room; 17.1%(7) in the neonatal intensive care unit; 12.2%(5) in the adult intensive care unit; 12.2%(5) in the female clinic; 9.8%(4) in the surgical center; and 7.3%(3) in pediatrics. The surgical clinic, mixed clinic (male and female) and male clinic had 4.9%(2) of representation each; 2.4%(1) of the nurses came from the maternal and

child complex, 2.4%(1) from the hospital nucleus of epidemiology and 2.4%(1) from the rooming-in ward.

Among the negative responses, which indicate that the interviewees do not know the alterations associated with septic shock, the following signs and symptoms stood out: suspicion of infection, hypothermia, hyperglycemia, increased oxygen saturation in venous blood, paralytic ileus and hyperbilirubinemia. The results on the responses regarding the variables that can be observed in septic shock are presented in Table 2.

Table 2. Frequency and percentage of responses on signs and symptoms that can be identified in Septic Shock (n = 41), Registro, SP, Brazil, 2016.

Signs and symptoms	Septic shock					
	Yes		No		I don't know	
	N	%	n	%	N	%
GENERAL VARIABLES						
Documented infection	34	82.9	7	17.1	---	---
Suspected infection	21	51.2	13	31.7	7	17.1
Fever (body temperature > 38°C)	35	85.4	4	9.8	2	4.9
Hypothermia (body temperature < 36°C)	30	73.2	8	19.5	3	7.3
Increased heart rate (> 90 bpm or 2 SD above normal range for age)	35	85.4	4	9.8	2	4.9
Tachypnea	34	82.9	6	14.6	1	2.4
Altered level of consciousness/mental state	38	92.7	2	4.9	1	2.4
Significant edema or positive water balance (> 20 mL/kg body weight over 24 hours)	34	82.9	4	9.8	3	7.3
Hyperglycemia in the absence of diabetes (plasma glucose > 140 mg/dL [6.7 mmol/L])	24	58.5	11	26.8	6	14.6
INFLAMMATORY VARIABLES						

Leukocytosis (white blood cell count > 12000/mm ³)	34	82.9	4	9.8	3	7.3
Leukopenia (white blood cell count < 4000/mm ³)	28	68.3	9	22.0	4	9.8
Normal white cell count (> 10% in immature forms)	14	34.1	15	36.6	12	29.3
Increased plasma C-reactive protein (> SD above upper limit of normal range)	33	80.5	2	4.9	6	14.6
Increased plasma procalcitonin (> SD above upper limit of normal range)	19	46.3	1	2.4	21	51.2
HEMODYNAMIC VARIABLES						
Arterial hypotension (systolic pressure < 90 mmHg, mean arterial pressure < 70 mmHg, or a decrease of > 40 mmHg in systolic blood pressure in adults or 2 > SD below the normal limit for age)	37	90.2	1	2.4	3	7.3
High oxygen saturation in mixed venous blood (> 70%)	22	53.7	14	34.1	5	12.2
High cardiac rate (> 3.5 liters/min/m ² of body surface area)	25	61.0	6	14.6	10	24.4
ORGANIC DYSFUNCTION VARIABLES						
Arterial hypoxemia (ratio between arterial partial oxygen pressure and inspired oxygen fraction < 300)	34	82.9	1	2.4	6	14.6
Acute oliguria (production of urine <0.5 mL/kg/hour or 45 mL/hour for at least 2 hours)	38	92.7	---	---	3	7.3
Increased creatinine level (0.5 mg/dL [$> 44 \mu\text{mol/L}$])	35	85.4	2	4.9	4	9.8
Abnormalities in coagulation (international normalized ratio > 1.5, or activated partial thromboplastin time > 60 seconds)	35	85.4	3	7.3	3	7.3
Paralytic ileus (absence of intestinal sounds)	27	65.9	7	17.1	7	17.1
Thrombocytopenia (platelet count < 100000/mm ³)	36	87.8	---	---	5	12.2
Hyperbilirubinemia (total plasma bilirubin > 4 mg/dL)	24	58.5	8	19.5	9	22.0
TISSULAR PERFUSION VARIABLES						
Hyperlactatemia (lactate > 1 mmol/liter)	25	61.0	3	7.3	13	31.7
Reduced capillary filling or mottling	37	90.2	2	4.9	2	4.9
OTHER VARIABLES						
At least one organic dysfunction	35	85.4	2	4.9	4	9.8
*Refractory hypotension by administration of intravenous fluid or presence of hyperlactatemia	33	80.5	2	4.9	6	14.6

Note: SD = standard deviation. *Refractory hypotension is defined as hypotension that is persistent or requires vasopressors following intravenous administration of fluid bolus.

Source: Prepared by the authors.

DISCUSSION

This study evaluated the knowledge of nurses about the signs of septic shock and demonstrated that many have difficulty identifying them, especially those related to the initial stages of shock, such as suspicion of infection, which was not recognized by 31.7% of the nurses and was unknown by 17.1% of them.

When the body experiences septic shock, the infection is already installed and it is expected that the focus of infection and the etiologic agent have already been identified in order to target specific therapies. The documented infection was identified by 82.9% of the nurses, in contrast to the 17.1% who did not know this characteristic in septic shock.

It was observed that 19.5% of the nurses responded negatively to the knowledge about the occurrence of hypothermia in the septic condition. Hypothermia is characterized by a thermoregulatory physiological disorder, and it is extremely important

that the nursing team recognize it and associate it with sepsis, because the decrease in body temperature can lead to a worse prognosis in critical patients⁽¹¹⁾.

Hyperglycemia was recognized by 58.5% of the nurses in this study. This change is expected in critically ill patients and may worsen during treatment due to the need for corticosteroids, enteral nutrition or prolonged fasting, and immunosuppression. Elevation of glycemia and its variability are also considered markers of poor prognosis for septic patients⁽¹²⁾.

Among the inflammatory variables, the percentage of positive responses was low for leukopenia (68.3%), immature white cell count (34.1%) and procalcitonin elevation (46.3%). The recognition of these oscillations in the inflammatory parameters during the infectious process and their impact on human physiology may aid in the understanding of pathological processes. The nurses' autonomy in identifying signs and symptoms of septic shock can reduce bad outcomes⁽¹³⁾.

Among the hemodynamic variables, most nurses (90.2%) recognized hypotension as a sign of septic shock. However, 34.1% did not know the alteration in oxygen saturation in venous blood. As for organic dysfunction variables, the percentages of assertive responses were greater than 82% except for paralytic ileus, 65.9%, and hyperbilirubinemia, 58.5%.

We observed that the general and hemodynamic changes do not require high cost resources and technology to be detected. In general, temperature, heart rate, respiratory rate and blood pressure are measured in the screening of the patients as soon as they arrive in the care units and these variables are routinely checked in the nursing wards, intensive care units and surgical centers. After relevant measurements, the data are evaluated by the nurses. Likewise, glycemia can be verified with the aid of a glucometer in a practical and fast manner, while the mental state of the patient can be perceived by nurses when receiving and communicating with them.

It is believed that the recognition by nurses of alterations becomes easier as the septic condition progresses and of signs of clinical and laboratory symptoms of greater severity exacerbate. However, nurses are expected to act through constant interaction with the patient, early recognition of clinical changes in sepsis, in order to avoid progression to septic shock and MODS.

To corroborate this assertion, a study shows that after implantation of a protocol for treatment of sepsis in oncology patients guided by nurses, 96.4% of the patients received antibiotics in the first hour after the identification of fever, avoiding the progression of the septic syndrome to stages of greatest severity. Moreover, the implementation of a hospital protocol managed by nurses for the recognition and treatment of sepsis resulted in the reduction of hospitalization time of these patients⁽¹⁴⁻¹⁵⁾.

Regarding the presence of hyperlactatemia, 31.7% of the nurses indicated the item "I don't know", while the percentage for refractory hypotension was 14.6%. In clinical practice, lactate levels should not be analyzed alone, but yet, studies have shown that persistent hyperlactatemia can be considered a marker for the risk of death⁽¹⁶⁾.

The implications of septic shock for patients, the costs for the health system with their treatment, and high mortality rates are the motivators of numerous studies aimed at modifying this scenario. Some investigations have emphasized nurses as articulators, leaders and managers of the work in the relationships

among the health team, capable of guiding actions to reduce hospitalization time and mortality, showing good results^(4,17).

On the other hand, a research corroborates similar results to the present study, evidencing the lack of knowledge on sepsis on the part of nurses⁽¹⁸⁾.

In this context, nurses emerge as facilitators in the implementation of programs and protocols to improve outcomes resulting from septic disease. To this end, their knowledge about the septic syndrome is fundamental, for they will act in the identification and management of the health problems. In this way, they become responsible for the connection between several members of the health team and patients and, above all, they condition their team for care from screening to rehabilitation of the patients.

The updating of knowledge of nurses and of the entire health team, as well as the continuous acquisition of new findings, articulate fast, safe and effective actions to promote quality and the resolute care for patients, especially those affected by sepsis⁽¹⁹⁾. It is considered essential, therefore, the qualification of all personnel involved in the care process and the incorporation of evidence-based practice, so as to promote the improvement of patients' outcomes, reduction of costs and of length of hospital stay, and also effective transfer of the guidelines to clinical practice⁽²⁰⁾.

The low number of nurses who participated in the study, as well as the refusal by many of these to participate, can be considered limiting factors of this study. However, they do not lower its relevance because the study identifies the reality in a public health institution and awakens to the interest of improvements in the programs of continuing education already implanted in the hospital unit, in order to prevent worse outcomes in the patient with septic shock.

CONCLUSION

The present study demonstrated that nurses working in a public hospital in the countryside of São Paulo have flaws in their knowledge of signs of warning symptoms for septic shock. This result contributes to encourage the development of continuing education programs about this syndrome that highlight, in addition to its manifestations, the relevance of nurses in the management of this disease.

We consider that efforts to update the knowledge

of professionals can positively affect the transitions in the reality found in health services in the senses of improving the quality of care offered, reflecting on

the patients' health conditions, including increased survival and reduced hospitalization time and mortality.

CONHECIMENTO DO ENFERMEIRO SOBRE O CHOQUE SÉPTICO

RESUMO

O choque séptico é uma condição clínica decorrente do agravamento da resposta orgânica à sepse, associado à alta mortalidade. A equipe de enfermagem tem sido alvo de estudos sobre identificação precoce dos sinais e sintomas de sepse e choque séptico a fim de modificar estes índices. Objetivou-se identificar o conhecimento dos enfermeiros que atuam em um hospital, acerca do choque séptico. Método: estudo descritivo, transversal com tratamento quantitativo dos dados, realizado em um hospital público de grande porte localizado no sul do estado de São Paulo. Um instrumento contendo as variáveis relativas ao choque séptico foi aplicado para o atendimento do objetivo. Quarenta e um enfermeiros responderam ao instrumento, entre os quais mais de 80% conheciam os sinais e sintomas: infecção documentada, febre, elevação da frequência cardíaca. Entre as respostas negativas: 31,7% não sabiam sobre a suspeita de infecção; 26,8% sobre a hiperglicemia; e 34,1% sobre a elevação da saturação de oxigênio no sangue venoso misto. Observaram-se fragilidades no conhecimento dos enfermeiros sobre algumas variáveis relativas ao choque séptico. É necessário encorajar o desenvolvimento de programas de educação destinados à atualização do profissional, visando à melhoria da qualidade da assistência e, conseqüentemente, nas condições de saúde do paciente.

Palavras-chave: Choque séptico. Enfermagem. Conhecimento. Prevenção de Doenças.

CONOCIMIENTO DEL ENFERMERO SOBRE EL SHOCK SÉPTICO

RESUMEN

El shock séptico es una condición clínica resultante del agravio de la respuesta orgánica a la sepsis, asociado a la alta mortalidad. El equipo de enfermería ha sido objeto de estudios sobre identificación precoz de las señales y síntomas de sepsis y shock séptico a fin de modificar estos índices. El Objetivo fue identificar el conocimiento de los enfermeros que actúan en un hospital, acerca del shock séptico. Estudio descriptivo, transversal con tratamiento cuantitativo de los datos, realizado en un hospital público de gran tamaño ubicado en el sur del estado de São Paulo-Brasil. Un instrumento conteniendo las variables relativas al shock séptico fue aplicado para el cumplimiento del objetivo. Cuarenta y uno enfermeros respondieron al instrumento, entre los que más de 80% conocían las señales y los síntomas: infección documentada, fiebre, elevación de la frecuencia cardíaca. Entre las respuestas negativas: 31,7% no sabían sobre la sospecha de infección; 26,8% sobre la hiperglucemia; y 34,1% sobre la elevación de la saturación venosa mixta de oxígeno en la sangre. Se observaron fragilidades en el conocimiento de los enfermeros sobre algunas variables relativas al shock séptico. Es necesario fomentar el desarrollo de programas de educación dirigidos a la actualización del profesional, con vistas a la mejoría de la calidad de la asistencia y, conseqüentemente, en las condiciones de salud del paciente.

Palabras clave: Shock séptico. Enfermería. Conocimiento. Prevención de Enfermedades.

REFERENCES

1. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA [online]. 2016 [citado 2017 jul 05]; 315(8): 801-10. Available in: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4968574/>
2. Cohen J, Vincent JL, Adhikari NK, Machado FR, Angus DC, Calandra T, et al. Sepsis: a roadmap for future research. Lancet Infect Dis [online]. 2015 [citado 2017 jul 10]; 15 (5): 581-614. doi: 10.1016/S1473-3099(15)70112-X.
3. Wier LM, Pfuntner A, Maeda J, Stranges E, Ryan K, Jagadish P, et al. HCUP Facts and Figures: Statistics on Hospital-based Care in the United States, 2008. Rockville, MD. Agency for Healthcare Research and Quality [online]. 2010 [citado 2017 set 10]. Available in: <https://www.ncbi.nlm.nih.gov/books/NBK52719/>.
4. Roberts RJ, Alhammad AM, Crossley L, Anketell E, Wood L, Schumaker G, et al. A survey of critical care nurses' practices and perceptions surrounding early intravenous antibiotic initiation during septic shock. Intensive Crit Care Nurs [online]. 2017 aug. [citado 2017 set 10]. doi: 10.1016/j.iccn.2017.02.002.
5. Dellinger P, Levy MM, Rhodes A, Annane D, Gerlach H, Opal SM, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med [online]. 2012 [citado 2017 set 10]; 41 (2): 580-637. Available in: <https://www.ncbi.nlm.nih.gov/pubmed/23353941>. doi: 10.1097/CCM.0b013e31827e83af.
6. Torsvik M, Gustad LT, Mehl A, Bangstad IL, Vinje LJ, Damås JK, et al. Early identification of sepsis in hospital inpatients by ward nurses increases 30-day survival. Crit Care [online]. 2016 [citado 2017 set 15]; 20 (1): 244. Available in: <http://europepmc.org/abstract/med/27492089>.
7. Santos JF, Alves AP, Stabile, AM. Avaliação do conhecimento dos estudantes de enfermagem sobre sepse. Rev Eletr Enf [online]. 2012 [citado 2017 set 10]; 14 (4): 850-856. Available in: https://www.fen.ufg.br/fen_revista/v14/n4/pdf/v14n4a13.pdf.
8. Angus DC, Van der Poll T. Severe sepsis and septic shock. N Engl J Med [online]. 2013 [citado 2017 set 30]; 369 (9): 840-51. doi: 10.1056/NEJMra1208623.
9. Galdeano LE, Rossi LA, Pelegrino FM. Content validation of the deficient knowledge nursing diagnosis. Acta Paul Enferm [online]. 2008 [citado 2017 out 01]; 21(4): 549-555. doi: <http://dx.doi.org/10.1590/S0103-21002008000400003>.
10. Cameiro AH, Póvoa P, Gomes A. Dear Sepsis-3, we are sorry to say that we don't like you. Rev. Bras. Ter. Intens [online]. 2017 [citado 2017 set 01]; 29 (1): 4-8. doi: <http://dx.doi.org/10.5935/0103-507x.20170002>

- 11- Blatteis CM. Endotoxic fever: new concepts of its regulation suggest new approaches to its management. *Pharmacol Ther* [online]. 2006 [citado 2017 set 17]; 111 (1): 194-223. doi: 10.1016/j.pharmthera.2005.10.013
- 12- Silveira LM, Basile-Filho A, Nicolini EA, Dessotte CAM, Aguiar GCS, Stabile AM. Glycaemic variability in patients with severe sepsis or septic shock admitted to an Intensive Care Unit. *Intensive Crit Care Nurs* [online]. 2017 [citado 2017 ago 10]; 41: 98-103. doi: 10.1016/j.iccn.2017.01.004.
- 13- Schorr C. Nurses can help improve outcomes in severe sepsis - American Nurse Today. *American Nurses Journal* [online]. 2016 [citado 2017 ago 10]; 11(3). Available in: <https://www.americannursestoday.com/nurses-can-help-improve-outcomes-severe-sepsis/>.
- 14- Coates E, Gordanier C, Pomemacki L. Sepsis Power Hour: A Nursing Driven Protocol Improves Timeliness of Sepsis Care. *Society of hospital Medicine* [online]. 2015 [citado 2017 ago 18]; 10 (suppl 2). Available in: <http://www.shmabstracts.com/abstract/sepsis-power-hour-a-nursing-driven-protocol-improves-timeliness-of-sepsis-care/>.
- 15- Mattison G, Bilney M, Haji-Michael P, Cooksley T. A nurse-led protocol improves the time to first dose intravenous antibiotics in septic patients post chemotherapy. *Support Care Cancer* [online]. 2016 dec [citado 2017 ago 17]; 24 (12): 5001-5005. doi: 10.1007/s00520-016-3362-4
- 16- Levy MM, Dellinger RP, Townsend SR, Linde-Zwirble WT, Marshall JC, Bion J, Schorr C, et al. The Surviving Sepsis Campaign: results of an international guideline-based performance improvement program targeting severe sepsis. *Crit Care Med* [online]. 2010 feb [citado 2017 jun 27]; 38 (2): 367-74. Available in: <https://www.ncbi.nlm.nih.gov/pubmed/20035219>. doi: 10.1097/CCM.0b013e3181cb0cdc.
- 17- Schramm GE, Kashyap R, Mullon JJ, Gajic O, Afessa B. Septic shock: a multidisciplinary response team and weekly feedback to clinicians improve the process of care and mortality. *Crit Care Med* [online]. feb 2011 [citado 2017 jun 27]; 39 (2): 252-8. Available in: <https://www.ncbi.nlm.nih.gov/pubmed/21057312>. doi: 10.1097/CCM.0b013e3181ffde08.
- 18- Jeffery AD, Mutsch KS, Knapp L. Knowledge and recognition of SIRS and sepsis among pediatric nurses. *Pediatr Nurs* [online]. 2014 [citado 2017 jun 27]; 40 (6): 271-8. Disponível Available in: <https://www.ncbi.nlm.nih.gov/pubmed/25929121>.
- 19- Venâncio AM, Venâncio AM, Facundo MAC, Alcântara PPT, Moreira MRL, Marinho MNSAB et al. Educational contributions of the nurse in the prevention of sepsis in the unit of intensive therapy: integrative review. *International Archives of Medicine* [online]. 2017 [citado 2017 jun 27]; 10. Available in: <http://imedicalsociety.org/ojs/index.php/iam/article/view/2337>.
- 20- Oliveira ARS, Carvalho EC, Rossi LA. Dos princípios da prática à classificação dos resultados de enfermagem: olhar sobre estratégias da assistência. *Cienc Cuid Saude* [online]. 2015 jan/mar [citado 2018 mar 05]; 14(1):986-992. Available in: <http://periodicos.uem.br/ojs/index.php/CiencCuidSaude/article/view/22034/14208>.

Corresponding author: André Luiz Thomaz de Souza. Rua: Oscar Yoshiaki Magário, 185, Jardim das Palmeiras, Registro-SP, Brasil. E-mail: alfenas2@hotmail.com. Telephone: (16) 9813732-51

Submitted: 16/11/2017

Accepted: 30/03/2018