

SEPSISCARE: EVALUATION OF A MOBILE APPLICATION IN NURSING CARE TO PATIENTS WITH SEPSIS*

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ABSTRACT: Objective: Evaluate a mobile application for the prevention, identification and nursing care of septic patients. **Method:** Descriptive study that used the Product Development Process to develop the application. Six nurses from the Intensive Care Unit of a public hospital in Santa Catarina participated in the study. Data was collected through interviews from September 2016 to January 2017, and content analysis was used to analyze the data. **Result:** The SepsisCare application was developed at the Mobincube® platform, with 28 screens, which was considered a valuable resource in the care of patients with sepsis by the participants. **Conclusion:** It is believed that the development of this mobile application will facilitate the identification, prevention and management of sepsis care and will contribute to the updating of these professionals, thus enabling safer and better quality care. **KEYWORDS:** Nursing care; Sepsis; Mobile applications; Intensive Care Unit.

SEPSISCARE: AVALIAÇÃO DE APLICATIVO MÓVEL NO CUIDADO DE ENFERMAGEM AO PACIENTE COM SEPSE

RESUMO : Objetivo: Avaliar um aplicativo móvel para a prevenção, identificação e cuidados de enfermagem ao paciente séptico. **Método:** Estudo descritivo que utilizou o Processo de Desenvolvimento de Produtos como método para desenvolvimento do aplicativo. Participaram do estudo seis enfermeiras da Unidade de Terapia Intensiva de um hospital público de Santa Catarina. A coleta dos dados ocorreu por meio de entrevistas nos meses de setembro de 2016 a janeiro de 2017, e utilizou-se a análise de conteúdo para análise dos dados. **Resultado:** O aplicativo *SepsisCare* foi desenvolvido na plataforma Mobincube®, com 28 telas, que na concepção dos enfermeiros é um recurso importante para a prática do enfermeiro no cuidado ao paciente com sepse. **Conclusão:** Acredita-se que o desenvolvimento deste aplicativo móvel facilitará a identificação, prevenção e gerência dos cuidados em torno da sepse, e contribuirá para a atualização desses profissionais, possibilitando, assim, um atendimento mais seguro e de qualidade. **DESCRIPTORIOS:** Cuidados de enfermagem; Sepse; Aplicativos móveis; Unidades de Terapia Intensiva.

SEPSISCARE: EVALUACIÓN DE APLICACIÓN MÓVIL EN EL CUIDADO DE ENFERMERÍA AL PACIENTE CON SEPSIS

RESUMEN: Objetivo: Evaluar una aplicación móvil para la prevención, identificación y cuidados de enfermería al paciente séptico. **Método:** Estudio descriptivo que utilizó el Proceso de Desarrollo de Productos como método para desarrollar la aplicación. Participaron del estudio seis enfermeras de la Unidad de Terapia Intensiva de un hospital público de Santa Catarina. Los datos fueron recolectados mediante entrevistas entre septiembre del 2016 y enero del 2017, y se utilizó el análisis de contenido para analizar los datos. **Resultado:** La aplicación *SepsisCare* fue desarrollada en la plataforma Mobincube®, con 28 pantallas, que según los enfermeros es un recurso importante para la práctica del enfermero en el cuidado al paciente con sepsis. **Conclusión:** Se cree que el desarrollo de esta aplicación móvil facilitará la identificación, prevención y gestión de los cuidados relacionados a la sepsis, y contribuirá hacia la actualización de esos profesionales, possibilitando así una atención más segura y de calidad. **DESCRIPTORIOS:** Atención de enfermería; Sepsis; Aplicaciones móviles; Unidades de cuidados intensivos.

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● INTRODUCTION

Technological advances in healthcare over the past decades have led to improvements in the treatment of serious illnesses. Access to technological resources has facilitated the care of critical patients in intensive care units, encouraging health professionals to seek knowledge and ensure better patient care. It is hoped that this improvement will result in the delivery of safe treatment and high quality care to critically ill patients ⁽¹⁾.

Intensive Care Units (ICUs) provide care to critically ill patients that require constant monitoring from a highly trained healthcare team. The patients more susceptible to infections and worsening of their conditions are admitted to these units, as they are often immunocompromised older patients with chronic diseases that lead to a poor nutritious status and prolonged hospital stays. Moreover, these patients require several invasive procedures, such as invasive mechanical ventilation, drains, catheters, and surgical probes or incisions, which favor the onset of infection ⁽²⁻⁴⁾.

Sepsis is an infectious process caused by bacteria, viruses or protozoa leading to organ dysfunction and death. The signs and symptoms of Systemic Inflammatory Response Syndrome (SIRS) are headache, nausea and vomiting, sweating, chills, diarrhea, tachypnea, tachycardia, hyperthermia or hypothermia, leukocytosis or leukopenia. These predictors and the presence of infection characterize sepsis. In turn, sepsis combined with organ dysfunction considered a severe sepsis, and when combined with cardiovascular instability, requiring vasopressors, it is defined as septic shock ⁽⁵⁻⁶⁾.

According to epidemiological data on sepsis in Brazil, 17% of ICU beds are occupied by septic patients. Moreover, 600,000 Brazilians develop sepsis annually, and the incidence of mortality due to SIRS is 24.2%; due to sepsis, 33.9%; due to severe sepsis, 46.9%; and 52.2% due to septic shock ^(4, 7-8). The incidence of this condition is estimated in 300 cases per 100,000 people, with an increase of 13% per year. The severity of this disease is demonstrated by the high mortality rates of Brazilians (20-50%) and the incidence of 30 cases per thousand patients/day ⁽⁹⁾.

Approximately 1,000 people die of sepsis every hour in the world. A study conducted in the United States revealed that in 2003 there were 415,000 cases of sepsis and in 2007, 700,000 cases, a significant increase in the rate of sepsis in the world ⁽¹⁰⁾.

Thus, it is understood that sepsis is admittedly a public health problem that can be avoided. Therefore, the healthcare teams should have proper knowledge about the signs and symptoms of the onset of sepsis and provide specialized nursing care to the patients in order to avoid their development, especially through the use of mobile technologies. In this regard, health technology can improve the quality of care and procedures used to treat critical patient, making them more effective and accurate, and reducing the incidence of human errors ⁽¹¹⁾.

The use of computer tools was introduced in the nursing area more than 40 years ago and keeps growing, since they facilitate the decision-making process and provide quick responses. The use of mobile technologies improve professional performance and optimize care, resulting in the prompt identification, diagnosis and treatment of diseases. This real revolution requires a new type of nursing professional, who are not only able to use these new tools, but able to design new care tools ⁽¹²⁻¹³⁾.

It is also believed that the development of a mobile application to assist nurses and their team in the early identification of sepsis, prevention and quick delivery of care will contribute to the updating on the latest advances regarding this condition. The application can provide nursing professionals with knowledge about the care of septic patients in this environment of high technology and complex care.

Thus, the present study aimed to evaluate a mobile application (App) for the prevention, early identification and planning of nursing care for critical patients with sepsis.

METHOD

Descriptive and technological production study that used Product Development Process (PDP) as a method⁽¹⁴⁾. The referred method consists of phases, tasks and organized activities with the purpose of planning, developing and building a new product or the improvement of an existing product.

The PDP is the way in which activities and tasks progress to product development. This process is related to the management of the set of activities carried out to develop a product. It begins with the planning macrophase where the objectives to be achieved are established, the advantages and disadvantages and the functionality and feasibility of the product to be developed are defined. When this phase is completed, the development macrophase begins. This phase involves activities of product development and sizing. Prior to completing this macrophase, a final test must be run and finalize production product launch. Subsequently, the product launch macrophase is initiated, which involves marketing, distribution/publication and product support and finally the proposed activities can be conducted⁽¹⁵⁻¹⁶⁾.

The study was carried out in an ICU of a public hospital linked to the Department of Health of the State of Santa Catarina, in the city of Florianópolis, which provides health services to individuals from different social classes and from all over the State. The ICU has 14 beds and receives patients with all types of diseases, but the most frequent conditions are Polytrauma, Traumatic Brain Injury (TBI) and Stroke (CVA). The referred ICU was selected because it was the hospital site with the highest number of sepsis cases.

Nurses who were performing their duties in the ICU of the referred hospital participated in the study. The inclusion criteria was nurses performing their duties at the hospital during data collection. The exclusion criteria was nurses away from their activities on holiday, sick leaves or who were given medical statements.

The professionals were approached and invited individually in their work environment to participate in the study. Of the eleven nurses who worked in the ICU in this period, five did not participate, as follows: one was on vacation, another refused to participate and three did not respond to the data collection instrument. Thus, six nurses participated in the study.

The mobile application was developed in a free online platform available for IOS and Android, called Mobincube®. The researchers named it as SepsisCare. The organization of the application prototype occurred according to the phases of the PDP that are described below:

Phase 1 - Analysis: Literature survey on the theme "Sepsis";

Phase 2 - Design: structuring of the content and interface of the App based on the Mobincube® platform;

Phase 3 - Development: production of the prototype of the App;

Phase 4 - Implementation: the flowchart of the application was printed and made available to the nurses for use during a period of 15 days.

After the application was developed, a questionnaire for the evaluation of the content was prepared. The mobile application was presented to the nurses who used it. The printed flowchart with the content was delivered to the participants and the questionnaire was administered to them. The questionnaire contained the following questions: 1) What is your perception of the prototype of the printed application?; 2) Is the language adequate?; 3) Did the tables help you understand the topics?; 4) Did you notice lack of needed information about sepsis in this application prototype? Did you have any difficulty in searching for information? 6) Do you have any suggestions that might help improving the application?

After the questionnaire was returned by the participants, the considerations regarding the use and handling of the mobile device application flowchart were analyzed, and the requested adjustments were made. After the necessary improvements and adjustments, the application was again made available to the participating nurses for their re-evaluation.

Data collection and analysis were performed from September 2016 to January 2017, and data analysis was used to analyze the data⁽¹⁷⁾.

The study was approved by the Human Research Ethics Committee of Universidade Federal de Santa Catarina (UFSC) and of the hospital where the study was conducted under the no. 1,539,079 dated May 11, 2016. The participants signed the Free and Informed Consent Form in two copies. To ensure anonymity, each participant had his or her name replaced by letter E followed by a number corresponding to the order of receipt of the data collection instrument.

● RESULTS

The sample consisted of six nurses working in the ICU of a large public hospital in the South of the country. The participants were aged between 30-40 years, and all of them were female individuals who have been working in an ICU for 5 and 10 years.

The mobile application prototype comprised the following items: Introduction and Sepsis Statistics; Concept of Sepsis; Risk Factors and Clinical Disorders; Nursing Interventions; Bundles: 3 and 6 hour bundles; Campaign “Surviving Sepsis”; Videos and References.

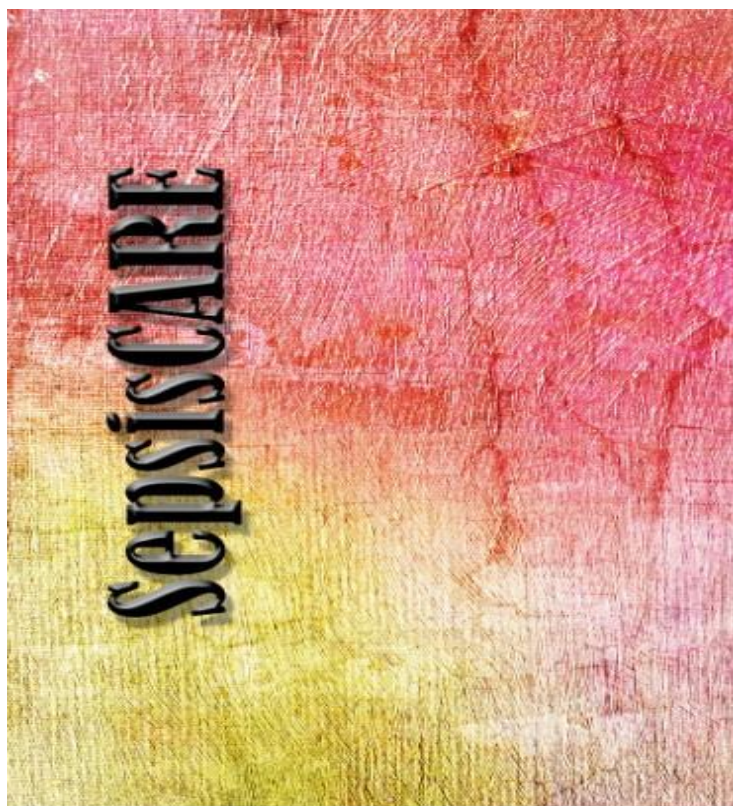


Figure 1 - Application cover. Florianópolis, Santa Catarina, Brazil, 2017



Figure 2 - Main menu. Florianópolis, Santa Catarina, Brazil, 2017

The following two categories are presented below: Evaluating Application Content and Enhancing Application Content.

Evaluation of the application content

Regarding the prototype, all the participants emphasized that it is an interesting application and excellent resource for obtaining quick guidance, which also includes valuable information for nurses in their practice

The application is interesting, providing valuable information. (E2)

Excellent, easy and quick access. Contains information relevant to nursing practice. (E3)

Contains summarized information and concepts about sepsis. (E4)

Regarding the language used and the tables and figures made available in the application, all participants reported that they were adequate and contributed to a better understanding of the topics.

Asked whether they missed any information on sepsis or had any difficulty in consulting or seeking information on the prototype, all the nurses said the prototype was adequate and easy to use.

Enhancing application content

As a suggestion for the improvement of the application, the nurses emphasized the importance of adding nursing diagnoses and prescriptions, particularly those based on the International Classification of Nursing Practice (CIPE®), since it is the terminology used in the study scenario.

List nursing diagnoses to care. (E1, E2 and E6)

Add the nursing diagnoses and prescription according to the ICNP. (E3)

List nursing diagnoses and associate them with care. (E4)

After the evaluation stage of the application, some improvements were made, such as: changing some segments of text by figures, images and graphs, facilitating the visualization and quick understanding of the content; Improved application design; Inclusion of CIPE® and NANDA® (North American Nursing Diagnosis Association) nursing diagnoses with menu, allowing the alternation between them, so that other working contexts of nurses, including in other hospital units, could make use of the application; Addition of individual secondary menus (clinical disorders, nursing diagnoses and videos), in which the user can select in the menu of clinical disorders, the disorders of interest, or, else when entering the menu of videos, click on the video of interest, and this video will open in a specific video software. Access to articles, journals and studies used in the application in the main menu (Figure 3, and 4).



Figure 3 - Menu of nursing diagnoses. Florianópolis, Santa Catarina, Brazil, 2017



Figure 4 - Video files menu. Florianópolis, Santa Catarina, Brazil, 2017

After the improvements, the application was again made available to the six nurses for their reevaluation. Some of these reports are described below:

It is now more interesting and useful. The photos and multimedia certainly facilitated the understanding of the tool. (E1)

The application was great, providing easy access and quick searches, and offering video options to add and enhance knowledge. The pictures are excellent because they facilitate the understanding of the content and the videos provide additional information. The topics, videos and the links of the references, which refer to the article used, facilitated the search of information. (E3)

The application is great, efficient and interesting. CIPE® and NANDA®, videos and references that lead to articles have made it easier to search for information. (E5, E2)

● DISCUSSION

Regarding the characteristics of the participants, these findings were consistent with data from other studies, which characterize the profile of ICU nurses, as follows: the population is predominantly formed by young female adults ⁽¹⁸⁾, who have been working in the health service for 5-10 years ⁽¹⁹⁾

Information technologies are often more prevalent in hospitals around the world and are often considered indispensable for quality health care. In this context, mobile applications offer many advantages they can be easily moved and carried due to their portability, consisting in a more rational investment. Consistently, national and international studies suggest that mobile applications will be increasingly used by healthcare professionals for agile decision-making and better quality care in clinical settings ⁽²⁰⁻²²⁾.

The application was designed to prioritize functionality, but without neglecting the graphic presentation, aiming at an aesthetic simplicity without neglecting the technical content. Navigation of the application is made through the menus that organize the content in a didactic and easily accessible way, as reported in a recent study ⁽¹²⁾.

After the evaluation of the prototype by the participating nurses, the possibility of improvements in the flow and content of the application to make it more intuitive was perceived. The use of the application in real life brought information not foreseen in theory. Based on these suggestions and critical comments of the participants, modifications were made and content more applicable to real life was included. Even before the modifications, the participants were satisfied with the design of the application. A new item related to nursing diagnoses (NANDA® and CIPE®) not foreseen in the original model and which is routinely used by nurses in ICUS was included.

As the application can be easily moved and carried, it can be used at bedside, facilitating the classification of the patient according to their vital parameters and clarifying doubts in real time during patient assessment. This real-time evaluation allows standardization and improvement of the communication among the health professionals involved in patient care, providing faster care-related decision-making ⁽²⁰⁾.

Regarding the communication interface between the application and the user, because it is an application intended for use in real health care situations, the objective is clarity in the transmission of information. Therefore, the language used is intended to be easy to understand and objective, avoiding a far-fetched style and excessive non-practical information, though providing access to more in-depth information on the topics, through links to scientific articles and free data repositories available on the internet.

The most important information is summarized in an illustrative way with multimedia resources, including figures, graphs, tables and videos. These didactic resources facilitate the understanding of complex concepts in a short period of time.

In the sections of the application there is more ordered information, such as in the Nursing Diagnostics, where they are arranged in alphabetical order, facilitating the search for individual items.

Nursing diagnoses are essential tools to guide the clinical judgment of nurses in the analysis of the health problems detected in critically ill patients, enabling the prompt elaboration of a comprehensive care plan ⁽²³⁾. Thus, the correct identification of the prevalent Nursing Diagnoses undoubtedly favor optimized nursing interventions to achieve the expected results ⁽²⁴⁾. Regarding patients diagnosed with sepsis, studies show that early identification associated with accurate decision-making and proper care can bring favorable prognosis to the septic patient ⁽⁴⁾.

Given the objective of universal access to information, the nursing diagnoses of NANDA® and CIPE® were included in the application. The availability of the two classification systems together provides access not only to the target hospital of the study, but to several Brazilian institutions and realities.

It should be stressed that the significant use of health technologies aims to guarantee quality and safety, providing improved communication and management of care ⁽²⁵⁾. These mobile applications have been used in a variety of contexts, including in universities to help the students understand a given content ⁽²²⁾, in the training of a technique such as cardiopulmonary resuscitation ⁽²⁶⁾ and in society, in general, to help self-management of some disease such as asthma ⁽²⁷⁾.

The current mobile application ecosystems allow the fast distribution of the application in several platforms simultaneously, at a low cost to the developer. The application is also available free of charge, facilitating its use within Brazil's Unified Health Care System, which is known to have scarce funding.

● CONCLUSION

Following an extensive literature review consistent with the complexity of the topic, there is no doubt that sepsis has been a syndrome with very high mortality rates in the past decades, despite advances in medicine regarding its diagnosis and therapeutics. Therefore, the concern of all those involved, directly or indirectly, with the issue should be the prevention and reduction of sepsis mortality, through the acquisition of knowledge about the care provided.

Therefore, the application developed and described in the study facilitates the quick recognition of septic patients in the Intensive Care Unit, favoring the delivery of proper care, standardizing the information and reducing its subjectivity.

The mobile application was constructed based on suggestions of the nurses who participated in the study, such as the inclusion of nursing diagnoses for septic patients to help the professionals in their daily routine at the ICU. Given the positive response to the application and the positive evaluations of its functionality by the nurses participating in the study, it is believed that the main objective of the study was successfully achieved.

The present study has some limitations, such as the small number of nurses who evaluated the pilot application and the fact that the test was performed in only one institution. Such limitations can be corrected in a more comprehensive study.

In the future, it will be possible to incorporate other functionalities into the application, such as risk and prognostic scores at bedside. It will also be possible to include a specific checklist for sepsis, increasing patient safety.

Similarly, the development of an information inclusion module for the construction of a remote database of the patients, facilitating the collection of epidemiological information on sepsis, can be visualized for future studies on the subject.

The next stage of this application, to be performed in future studies, will be naturally its validation in real life, compared to traditional methods of assessment of septic patients.

● REFERENCES

1. Rocha PRS. Fatores associados a mortalidade em pacientes com infecção da corrente sanguínea relacionada a cateter venoso central em uma unidade de terapia intensiva do Distrito Federal [dissertação]. Brasília: Universidade de Brasília; 2012.
2. da Silva PR, Campelo SMA, Sousa LRM, Ferreira AKA, Lima FF, Jacob LMS. Medidas de prevenção da pneumonia associada à ventilação mecânica: uma revisão integrativa. R. Interd. [Internet] 2014;7(2) [acesso em 14 dez 2017]. Disponível: https://revistainterdisciplinar.uninovafapi.edu.br/index.php/revinter/article/view/317/pdf_122.
3. Vieira DF, Kuplich NM, Sottomaior VS, Marona DS. Infecção associada à cateter venoso central. In: Viana RAPP. SEPSE para enfermeiros: as horas de ouro: identificando e cuidando do paciente séptico. 2ª ed. São Paulo: Ateneu; 2013. p.177-99.
4. Instituto Latino-Americano para Estudos da Sepse. Conselho Federal de Medicina (CFM). Sepse: um problema de saúde pública. [Internet] Brasília: CFM; 2015 [acesso em 11 nov 2015]. Disponível: [http://www.ilas.org.br/assets/arquivos/upload/Livro-ILAS\(Sepse-CFM-ILAS\).pdf](http://www.ilas.org.br/assets/arquivos/upload/Livro-ILAS(Sepse-CFM-ILAS).pdf).
5. Baracho NCV, Lopes GF, Araujo TD, Buissa T, Yano WK. Fatores de risco associados à mortalidade em pacientes com sepse grave e choque séptico na unidade de terapia intensiva de um hospital escola do sul de Minas Gerais. Revista Ciências em Saúde. [Internet] 2011;1(1) [acesso em 11 nov 2015]. Disponível: <http://dx.doi.org/10.21876/rcsfmit.v1i1.17>.
6. Oliveira JB, Viana RAPP. Definições e condutas baseadas em evidencia. In: SEPSE para enfermeiros: as horas de ouro: identificando e cuidando do paciente séptico. 2ª ed. São Paulo: Ateneu; 2013. p.47-55.

7. de Carvalho RH, Vieira JF, Gontijo Filho PP, Ribas RM. Sepsis, sepsis grave e choque séptico: Aspectos clínicos, epidemiológicos e prognóstico em pacientes de Unidade de Terapia Intensiva de um Hospital Universitário. *Rev. Soc. Bras. Med. Trop.* [Internet] 2010;43(5) [acesso em 11 nov 2015]. Disponível: <http://dx.doi.org/10.1590/S0037-86822010000500025>.
8. Reinhart K, Daniels R, Machado FR. O ônus da sepsis: uma chamada em apoio ao dia mundial da sepsis 2013. *Rev. Bras. Ter. Intensiva.* [Internet] 2013;25(1) [acesso em 20 nov 2016]. Disponível: <http://dx.doi.org/10.1590/S0103-507X2013000100002>.
9. Rocha LL, Pessoa CMS, Corrêa TD, Pereira AJ, Assunção MSC, Silva E. Conceitos atuais sobre suporte hemodinâmico e terapia em choque séptico. *Rev Bras Anesthesiol.* [Internet] 2015;65(5) [acesso em 27 nov 2017]. Disponível: <https://doi.org/10.1016/j.bjan.2015.07.003>.
10. Lagu T, Rothberg MB, Shieh MS, Pekow PS, Steingrub JS, Lindenauer PK. Hospitalizations, costs and outcomes of severe sepsis in the United States 2003 to 2007. *Crit Care Med.* [Internet] 2012;40(3) [acesso em 11 nov 2015]. Disponível: <http://dx.doi.org/10.1097/CCM.0b013e318232db65>.
11. Sousa PAF, Dal Sasso GTM, Barra DCC. Contribuições dos registros eletrônicos para a segurança do paciente em terapia intensiva: uma revisão integrativa. *Texto Contexto Enferm.* [Internet] 2012;21(4) [acesso em 25 out 2016]. Disponível: <http://dx.doi.org/10.1590/S0104-07072012000400030>.
12. Grossi LM, Pisa IT, Marin HF. Oncoaudit: desenvolvimento e avaliação de aplicativo para enfermeiros auditores. *Acta paul. enferm.* [Internet] 2014;27(2) [acesso em ???]. Disponível: <http://dx.doi.org/10.1590/19820194201400031>.
13. Tibes CMS, Dias JD, Zem-Mascarenhas SH. Aplicativos móveis desenvolvidos para a área da saúde no Brasil: revisão integrativa da literatura. *Reme, Rev. Min. Enferm.* [Internet] 2014;18(2) [acesso em 13 jan 2017]. Disponível: <http://www.dx.doi.org/10.5935/1415-2762.20140035>.
14. Salgado EG, Salomon VAP, Mello CHP, Fass FDM, Xavier AF. Modelos de referência para desenvolvimento de produtos: classificação, análise e sugestões para pesquisas futuras. *Rev. prod. Online.* [Internet] 2010;10(4) [acesso em 09 ago 2016]. Disponível: <http://dx.doi.org/10.14488/1676-1901.v10i4.520>.
15. Silva GC. Modelo de referência para o processo de desenvolvimento de produto automotivo e diretrizes para seleção de protótipos virtuais e físicos [tese]. São Paulo: Escola Politécnica da Universidade de São Paulo; 2013.
16. Takahashi S, Takahashi VP. Gestão de inovação de produtos: estratégia, processo, organização e conhecimento. Rio de Janeiro: Elsevier; 2007.
17. Bardin L. Análise de conteúdo. 1ª edição. São Paulo: Edições 70; 2011.
18. Melech CS, Paganini MC. Avaliação do conhecimento de médico e equipe de enfermagem nas ocorrências de sepsis. *Rev. Méd. Paraná.* [Internet] 2016;3(3) [acesso em 03 fev 2017]. Disponível: <http://dx.doi.org/10.5380/rmu.v3i3.47544>.
19. Ramalho Neto JM, Campos DA, Marques LBA, Ramalho CROC, da Nóbrega MML. Concepções de Enfermagem que atuam em unidade de terapia intensiva geral sobre sepsis. *Cogitare Enferm.* [Internet] 2015;20(4) [acesso em 25 jan 2016]. Disponível: <http://dx.doi.org/10.5380/ce.v20i4.41963>.
20. Barra DCC. Processo de enfermagem informatizado em terapia intensiva em ambiente PDA (Personal Digital Assistant) a partir da CIPE® versão 1.0 [dissertação]. Florianópolis: Universidade Federal de Santa Catarina, Mestrado em Enfermagem, Programa de Pós-Graduação em Enfermagem; 2008.
21. Religioni U, Olejniczak D, Kajak J. Mobile health application as a modern tool of prevention and health education in Poland. *Iran J Public Health.* [Internet] 2016;45(8) [acesso em 18 jan 2017]. Disponível: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5139969/>.
22. Zhang MW, Tsang T, Cheow E, Ho CSh, Yeong NB, Ho RC. Enabling psychiatrists to be mobile phone app developers: insights into app development methodologies. *JMIR Mhealth Uhealth.* [Internet] 2014;2(4) [acesso em 14 jan 2017]. Disponível: <http://dx.doi.org/10.2196/mhealth.3425>.
23. Okuno MFP, Costa N, Lopes MCBT, Campanharo CRV, Batista REA. Diagnósticos de enfermagem mais utilizados em serviço de emergência. *Cogitare Enferm.* [Internet] 2015;20(2) [acesso em 14 jan 2017]. Disponível: <http://dx.doi.org/10.5380/ce.v20i2.38606>.

24. Dutra CSK, Silveira LM, Santos AO, Pereira R, Stabile AM. Diagnóstico de enfermagem prevalentes no paciente internado com sepse no centro de terapia intensiva. *Cogitare Enferm.* [Internet] 2014;19(4) [acesso em 20 out 2016]. Disponível: <http://dx.doi.org/10.5380/ce.v19i4.36801>.
25. Madison MP, Staggers N. Electronic health records and the implications for nursing practice. *J Nurs Regul.* [Internet] 2011;1(4) [acesso em 28 nov 2017]. Disponível: [https://doi.org/10.1016/S2155-8256\(15\)30309-4](https://doi.org/10.1016/S2155-8256(15)30309-4).
26. Kalz M, Lenssen N, Felzen M, Rossaint R, Tabuenca B, Specht M, *et al.* Smartphone apps for cardiopulmonary resuscitation training and real incident support: a mixed-methods evaluation study. *J Med Internet Res.* [Internet] 2014;16(3) [acesso em 20 out 2016]. Disponível: <http://dx.doi.org/10.2196/jmir.2951>.
27. Miller L, Schüz B, Walters J, Walters EH. Mobile Technology Interventions for Asthma Self-Management: Systematic Review and Meta-Analysis. *JMIR Mhealth Uhealth.* [Internet] 2017;5(5) [acesso em 07 dez 2017]. Disponível: <http://dx.doi.org/10.2196/mhealth.7168>.