Global Academic Nursing Journal

ORIGINAL ARTICLE

Contribution of software for recording, monitoring, and evaluating wounds

Contribución de software para el registro, seguimiento y evaluación de heridas

Contribuição de um software para o registro, monitoramento e avaliação de feridas

Rodrigo Madril Medeiros[1]
ORCID: 0000-0002-8483-6133
Márcio Neres dos Santos[2]
ORCID: 0000-0002-4413-9878
Vítor Monteiro Moraes[3]
ORCID: 0000-0002-3540-7818
Dagmar Elaine Kaiser[4]
ORCID: 0000-0001-5652-4653
Êrica Rosalba Mallmann Duarte[4]
ORCID: 0000-0002-1792-327X
Karin Viegas[5]
ORCID: 0000-0002-2546-9281

[1]Hospital de Clínicas de Porto Alegre. Rio Grande do Sul, Brazil.
[2]Pontifícia Universidade Católica do Rio Grande do Sul. Rio Grande do Sul, Brazil.
[3]Grupo Hospitalar Conceição. Rio Grande do Sul, Brazil.
[4]Universidade Federal do Rio Grande do Sul. Rio Grande do Sul, Brazil.
[5]Universidade Federal de Ciências da Saúde de Porto Alegre. Rio Grande do Sul, Brazil.

How to cite this article:
Medeiros RM, Santos MN, Moraes VM, Duarte ERM, Viegas K. Contribution of software for recording, monitoring, and evaluating wounds. Glob Acad Nurs. 2021;2(3):e146. https://dx.doi.org/10.5935/2675-5602.20200146

Corresponding author:
Márcio Neres dos Santos
E-mail: nerespoa@gmail.com

Submission: 03-07-2021
Approval: 03-30-2021

Abstract

The aim was to describe the construction of a software for recording, monitoring, and evaluating wounds. It is a technological production research containing software development. It was carried out in three stages: project management through the Scrum tool, software construction, content validation and pre-test. As a result, the app was built after reviewing the literature in databases. The management system allowed registering patients, performing the assessment, and monitoring of the evolution of the lesions through images and other tools, such as graphs of the results of the Braden Scale for Predicting Pressure Ulcer Risk and Pressure Ulcer Scale for Healing. In addition, information about coverage and treatment alternatives is available. The development of an initial prototype allowed the exploration of ideas, before investing in production, helping to save time and resources, modulating the final product to be developed according to the needs of the target audience. In conclusion, the present study demonstrated that the construction of the software meets the need for recording, monitoring, and evaluating wounds. The prospects are that it can also be used to carry out realistic simulation and training, in addition to having easy access and handling.

Descriptors: Nursing; Technology; Injuries; Mobile Applications; Software.

Resumén

El objetivo fue describir la construcción de un software para el registro, seguimiento y evaluación de heridas. Es una investigación de producción tecnológica que contiene desarrollo de software. Se llevó a cabo en tres etapas: gestión de proyectos a través de la herramienta Scrum, construcción de software, validación de contenido y pre-test. Como resultado, la aplicación se creó después de revisar la literatura en las bases de datos. El sistema de gestión permitió registrar a los pacientes, realizar la valoración y seguimiento de la evolución de las lesiones a través de imágenes y otras herramientas, como gráficas de los resultados de la Escala de Braden de Predicción del Riesgo de Úlceras por Presión y Escala de Curación de Úlceras por Presión. Además, se encuentra disponible información sobre la cobertura y las alternativas de tratamiento. El desarrollo de un prototipo inicial permitió la exploración de ideas, antes de invertir en producción, ayudando a ahorrar tiempo y recursos, modulando el producto final a desarrollar según las necesidades del público objetivo. En conclusión, el presente estudio demostró que la construcción del software responde a la necesidad de registrar, monitorear y evaluar las heridas. Las perspectivas son que también se puede utilizar para realizar simulaciones y entrenamientos realistas, además de tener un fácil acceso y manejo.

Descriptores: Enfermaría; Tecnología; Heridas; Aplicaciones Móviles; Software.

Resumo

Objetivou-se descrever a construção de um *software* para registro, monitoramento e avaliação de feridas. Trata-se de uma pesquisa de produção tecnológica contendo o desenvolvimento de software. Foi concretizado em três etapas: gestão do projeto através da ferramenta *Scrum*, construção do *software*, validação de conteúdo e pré-teste. Como resultado aplicativo foi construído após revisão da literatura em bases de dados. O sistema de gestão permitiu cadastrar pacientes, realizar a avaliação e o monitoramento da evolução das lesões através de imagens e de outras ferramentas, tais como gráficos de resultados das escalas *Braden Scale for Predicting Pressure Ulcer Risk* e *Pressure Ulcer Scale for Healing*. Além disso, estão disponíveis informações sobre coberturas e alternativas para o tratamento. O desenvolvimento de um protótipo inicial permitiu a exploração das ideias, antes do investimento na produção, auxiliando na economia de tempo e recursos, modulando de acordo com as necessidades do público-alvo, o produto final a ser desenvolvido. Por conclusão, o presente estudo demonstrou que a construção do software atende à necessidade para o registro, monitoramento e a avaliação de feridas. As perspectivas são de que também possa ser utilizado para realização de simulação realística e treinamentos, além de possuir facilidade de acesso e manuseio.

Descritores: Enfermagem; Tecnologia; Feridas; Aplicativos Móveis; Software.

Introduction

The construction of a line of care and funding for wound care is a challenge, especially in health systems where treatment is not recognized in its magnitude, in terms of the impact on the patient's quality of life, treatment adherence of other diseases, reduction in the risk of infections, reduction in rates of stay and hospital (re)admissions.

In the United States of America (USA) chronic wounds affect about 6.5 million patients, and the annual expenditure on treatment can reach approximately 25 billion dollars[1,2]. This fact is also reflected in the pharmaceutical industry's billion-dollar profit from wound care products[3]. In developing countries, like Brazil, there are still other challenges to be overcome, such as: reimbursement for procedures specialized in wound care by the public health system and through supplementary health. As well as the accreditation of nursing professionals to private and public health plans and the use of guidelines for best wound care practices by professionals.

Although there is no consolidated data on the number of people who are affected by chronic or acute wounds in developing countries, it is known that the prevalence and incidence is high and likely to continue to increase. As in developed countries, this fact is due, in part, to the increase in life expectancy of the population, which is aggravated by the increase in the prevalence of obesity, diabetes and cardiovascular diseases[1,2,4]. People with wounds, especially chronic ones, suffer from comorbidities such as diabetes and hypertension. In a way, these pathologies seem to have, by themselves, overshadowed the meaning of the chronic wound as a health problem.

Assessment is one of the bases of wound treatment, as it will be used to make decisions about the different resources (physical, technological, and human) to be used in the care context. The assessment performed by the nurse is not only given to what is seen, as the unseen can lead to a wrong assessment or be the reason to delay the healing process[5].

For the assessment of a wound, the support of semiology is necessary to carry out the clinical examination (history and physical examination), which aims to help nurses in making decisions regarding the best available treatment. In addition, the clinical examination is the basis for the interrelationship of the other stages of the nursing process[5,6].

The development of support tools for recording, assessment and monitoring is an important step towards a systematic approach to wound care. The incorporation of new technologies entails new demands, in some situations, increasing the intensity of work and fostering interdisciplinary work[7,8]. Technology is embedded in innovation. Thus, innovation with the generation of new ideas or the application of ideas to a new situation results in the improvement of a service, program, structure, products and/or processes[7].

In the context of information technologies, the use of software is a resource that has been expanding and has been presented as an innovative area with a great contribution to accessing information efficiently and reducing time. Information systems can be inserted in the praxis of care, assisting in all stages of the nursing process, also contributing to the formatting of management indicators[9].

Building software that addresses nursing practices can impact the qualification of care in different areas, as deficiencies in the care process for patients with wounds are strongly linked to inadequate assessment, faulty records, and the lack of monitoring of these wounds, among others[2,10,11]. Thus, the present study aims to describe the construction of a software for recording, monitoring, and evaluating wounds.

Methodology

It is a technological production research. It is a type of investigation whose objective is to develop a new product, program or model[12,13]. It was carried out from April to December 2018, carried out in three stages: project management through the Scrum tool, software construction, content validation and pre-test.

The Scrum tool helped in the management of the application software construction, in the possibility of checking the risk of failure in advance, in addition to making the process more agile. Its best advantage was the use of several techniques and processes previously used and approved in an organized manner for product development[12].

The Scrum tool systematized project management by creating a list containing all the desired features for the product, and the list was not complete at the beginning of the project, as it was updated according to the needs of product development (Product Backlog); work meetings (Sprint and Daily Meeting) aiming to delimit the period of development of product features that occurred in each stage completed and delivered (Sprint-Sprint). Each item defined for the Sprint was distributed in the form of tasks (Kanban Board)[13]. These tasks were distributed in the Sprint organizational chart, where each team member assumed and performed the tasks for which they were responsible, one after the other until they were all completed within the agreed period.

In addition, an election was carried out by the team to define the score for each Sprint task, aiming at meeting deadlines (Planning Poker). Burndown was also adopted, a graph used to monitor the progress of Sprint execution. At the end of each Sprint, retrospective meetings were held, conducted by the Scrum Master (project coordinator), together with the other members, whose objective is to identify positive and negative points of the Sprint[13].

The main technologies that were used for the software development were the PHP (Hipertext Preprocessor), JavaScript and Bootstrap languages. The database chosen was MySQL, which is an Open-Source SQL database management system developed and distributed by MySQL AB, which is the most common standard used to access databases and is defined by Standard No. ANSI /ISO SQL46.

The validation was performed by 18 experts, nine nurses and nine information technology (IT) professionals. The selection of initial participants and those nominated by their peers followed the following selection criteria: having a specialist title in dermatological nursing or nursing in stomatherapy or having knowledge in the area of prevention and treatment of wounds (nurses); have a degree in the area of information technology and knowledge in operating systems in relation to software functionality, reliability and usability, and also have at least one year's experience in the area of programming or systems analysis (IT professionals).

The number of participants for each group complies with NBR ISO/IEC No. 14598-648 (Brazilian Standard (International Organization for Standardization / International Electrotechnical Commission), which indicates a minimum of eight evaluators for each group to obtain reliable results. Participants were chosen using the snowball methodology, in which the identification of expertise was carried out by recognizing their peers, that is, the initial participants indicated new participants, who in turn indicated others, and so on. until the recommended number is reached. Thus, it is not possible to determine the probability of selection of each participant[14].

The evaluators were invited by email sent by the researcher, requesting their participation in the study. This email also contained instructions: if the person agreed to participate, they should access the link corresponding to the address of their questionnaire and accept the Informed Consent Form (TCLE). The message also stated that the software link should only be accessed after the term was accepted, inserting the username and password provided by the researcher for each evaluator.

To guide the evaluators, a document with guidelines for accessing the system was sent, as well as a tutorial, presented in the software itself, which contained a fictitious clinical case with all the respective data needed to complete the instrument (physical examination, indicators, prescription care, among others). The filling out of the evaluation questions was carried out by nurses and information technology professionals by accessing the link, using the Google® form. The answers to the questionnaires were automatically received by this tool, from the conclusion of the assessment, forming a database for further analysis.

The reference adopted in this project was described in ISO/IEC Standard No. 2501050, comprising eight characteristics, which are subdivided into sub-characteristics, capable of providing consistent terminology to specify, measure and evaluate systems and product quality. These evaluation criteria have already been tested on similar products[15,16]. All responses applied to each characteristic and sub-characteristic were received, as judged by the evaluators. After obtaining the data, they were organized and analyzed in a spreadsheet in the Microsoft Excel® software.

To carry out this study, all ethical precepts determined by Resolution No. 466, of December 12, 2012, of the National Health Council were respected[17]. This research project was submitted and approved by the Research Ethics Committee of the Federal University of Health Sciences of Porto Alegre, under Opinion CEP/UFCSPA No. 1. 500. 677 and CAAE: 54748216.3.0000.5345.

The application is in the process of registering at INPE.

Results

Wounds Monitoring software is intended to be a working tool for nurses or other health professionals, whose purpose is to monitor skin lesions. In this management system, it is possible to register patients, carry out the assessment and monitoring of the evolution of lesions through images and other tools, such as graphs of the results of the Braden Scale (Braden Scale for Predicting Pressure Ulcer Risk) and PUSH (Pressure Ulcer Risk) Scale for Healing). In addition, information about coverage and treatment alternatives is available.

The development of an initial prototype allowed the exploration of ideas, before investing in production, helping to save time and resources, modulating the final product to be developed according to the needs of the target audience.

In the area of software development, prototypes are recognized for their fidelity, and can be classified into low, medium, and high fidelity. Since high fidelity is the closest thing to the final product, as it performs most of the desired functions[18]. Wounds Monitoring software is classified as high fidelity, as, in addition to being highly functional, it is close to the final product to be developed.

To put Wounds Monitoring up and running, it was necessary to register a domain and, later, sign a contract with a server to host the system. Once these steps were completed, it was possible to make the prototype available for access via the Web, from anywhere and anytime. For this to happen and to carry out the assessment, the professional must have a device with internet access and have a username and password, after its acceptance (TCLE).

The software was developed in a modular format, concurrently with the steps in the process of evaluating wounds and other skin lesions. The modules are called: Patients, Product Guide, Health Care, Tutorial, Help and About Us.

When entering the domain, the user is directed to the first screen, called Wounds Monitoring initial screen, which serves to log in to the system. The second screen has the function of welcoming Wounds Monitoring users and accessing the medical records of registered patients and the possibility of registering a new patient (Figure 1).

Figure 1. Wounds Monitoring welcome screen and access to the Registered patient record and the icon to register a new patient. Porto Alegre, RS, Brazil, 2021

Source: Wounds Monitor.

In addition, as shown in Figure 2, the icons are available on the top bar of this screen:

About its function to present clearly and objectively what it is and what is the function of the software.

Help that has the function of being a direct communication channel with the developer to clarify doubts and send suggestions and criticisms.

Tutorial that presents the step by step of how Wounds Monitoring works.

Health care that is unavailable in the prototype version, but in the future, in the final version, it will provide service tips, such as pharmacies, professionals, laboratories, among others.

Product guide that summarizes some suggestions for wound care products available on the market; and

Utilities that provide some wound classification tools, prognostic indices, predictive scales, among others.

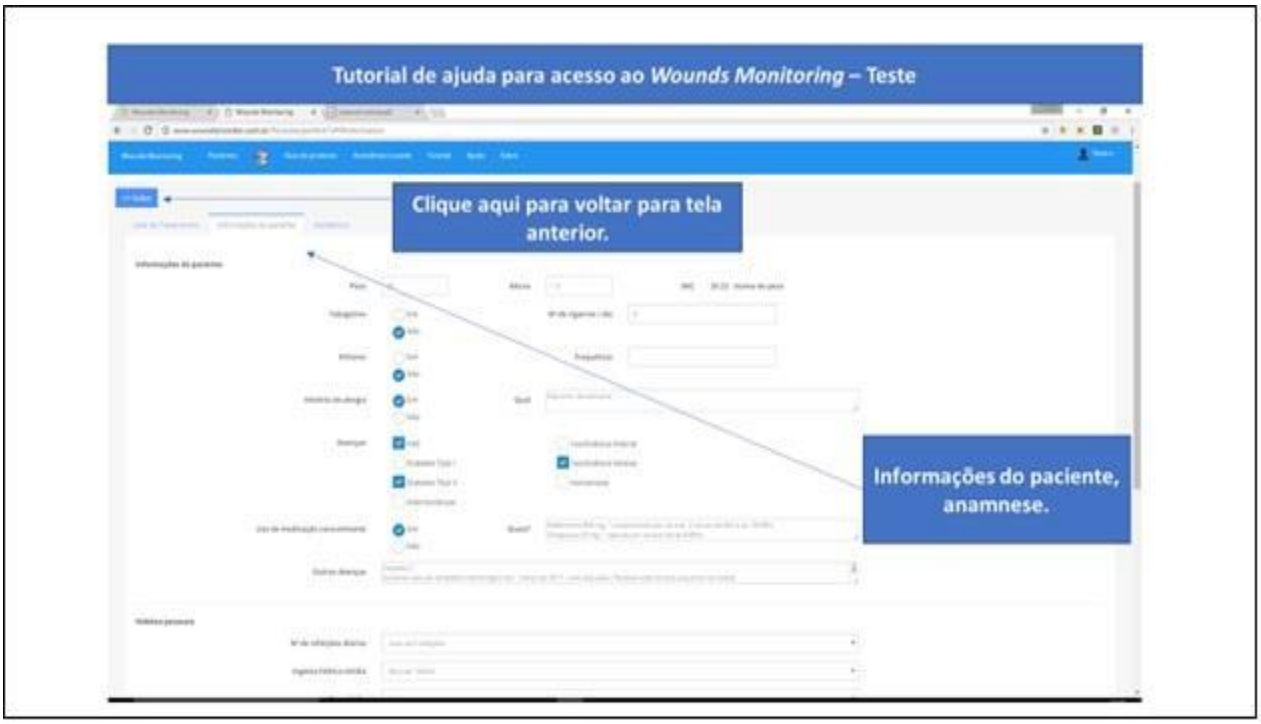
Figure 2. Access screen to the registered patients' records and the icon to register a new patient. Toolbar. Porto Alegre, RS, Brazil, 2021

Source: Wounds Monitor.

By clicking on “new patient”, the system is directed to the patient registration and anamnesis screen (Figure 3). After registering the patient, the user is directed to the screen of their respective treatments. The module consists of three tabs that must be filled in with information obtained by performing a physical examination and attaching wound

images for monitoring. On this screen, the user finds information regarding treatments and wound location. If it is necessary to open a new treatment for this patient, the "new treatment" icon must be clicked (Figure 4).

Figure 3. Screen for registering a new patient, anamnesis. Porto Alegre, RS, Brazil, 2021



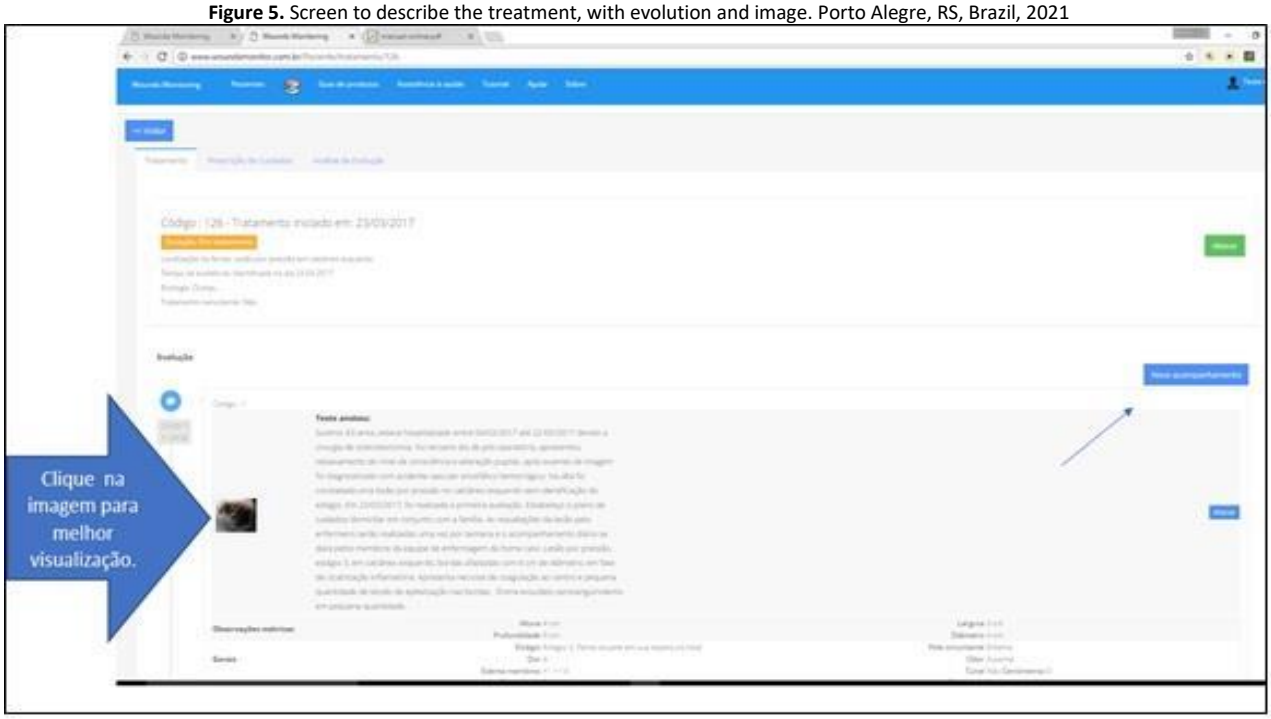
Source: Wounds Monitor.

Figure 4. Screen for entering a new treatment for the selected patient. Porto Alegre, RS, Brazil, 2021

Source: Wounds Monitor.

The treatment screen offers the user a summary of the monitoring of interventions, evolution, and images of the lesions (Figures 5).

Figure 5. Screen to describe the treatment, with evolution and image. Porto Alegre, RS, Brazil, 2021



Source: Wounds Monitor.

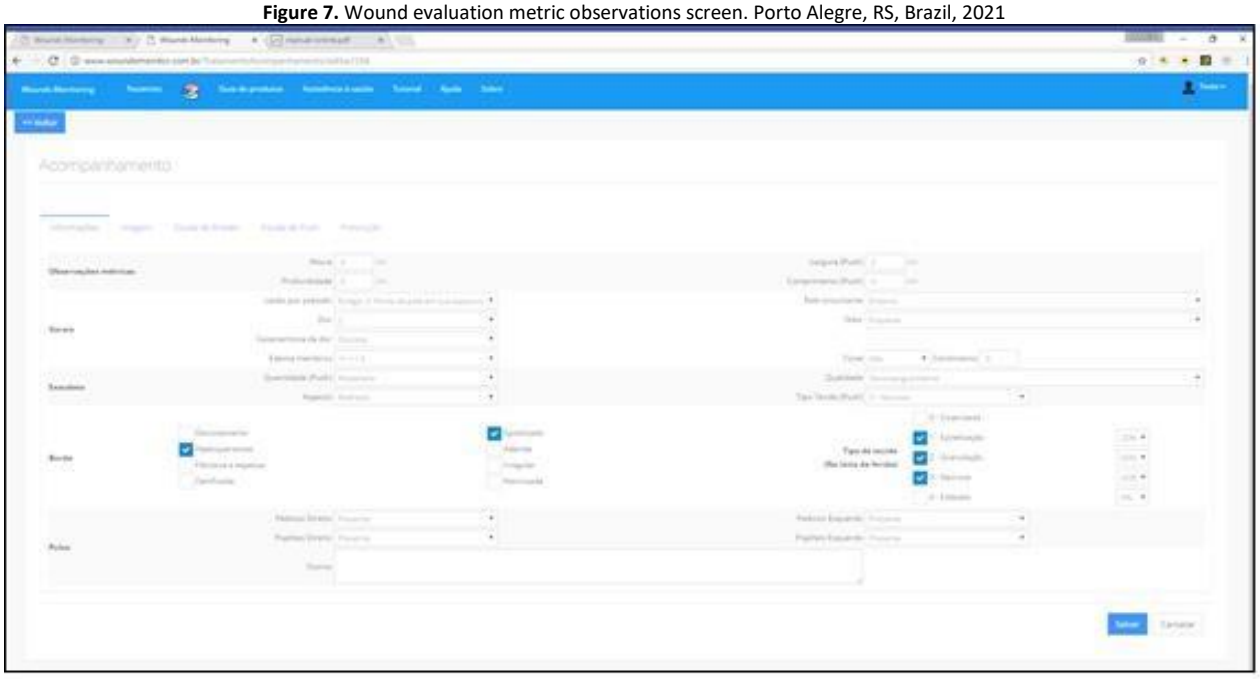
On the screen shown in Figure 6, the follow-up of injuries can be checked according to the chronological order of the evaluation. This facilitates the evolution of each lesion.

Figure 6. Summary screen of proposed treatments, with image of the lesion. Porto Alegre, RS, Brazil,2021

Source: Wounds Monitor.

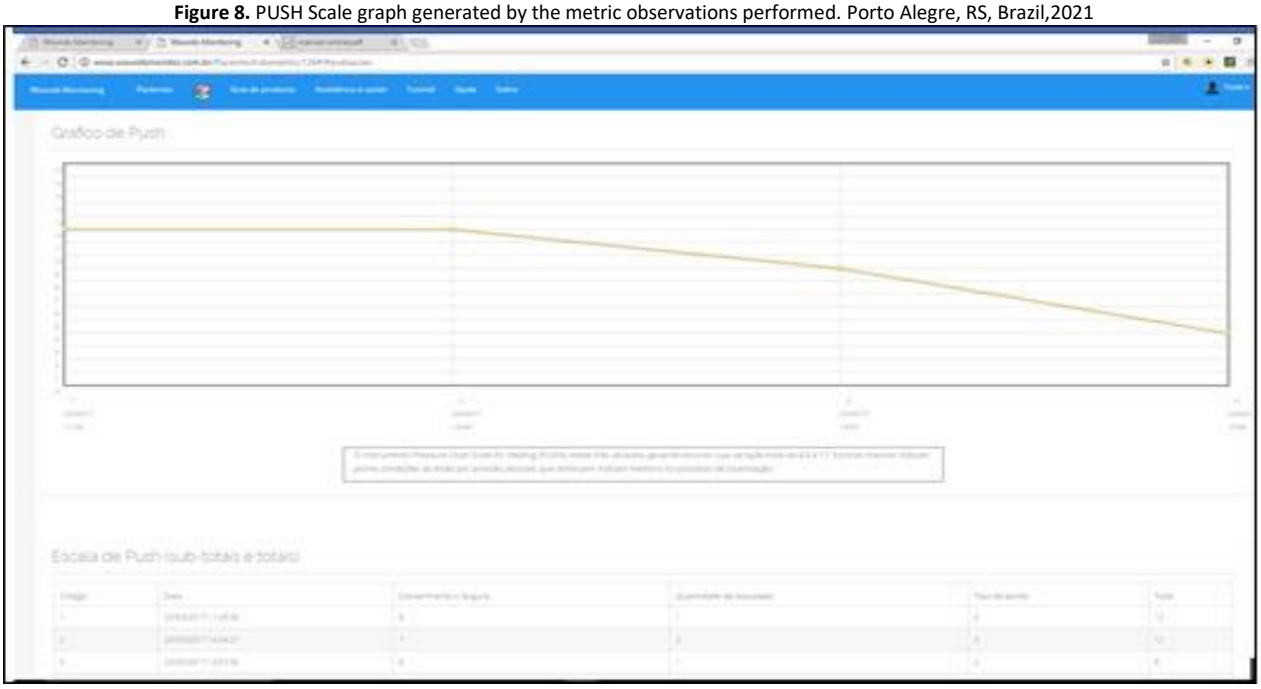
On the screen shown in Figure 7, the user must fill in the metric observations, according to their assessment, which will make it possible to generate the PUSH monitoring graph. Through the generated graph, the user can monitor the patient's PUSH and Braden scales in real time (Figure 8).

Figure 7. Wound evaluation metric observations screen. Porto Alegre, RS, Brazil, 2021



Source: Wounds Monitor.

Figure 8. PUSH Scale graph generated by the metric observations performed. Porto Alegre, RS, Brazil,2021



Source: Wounds Monitor.

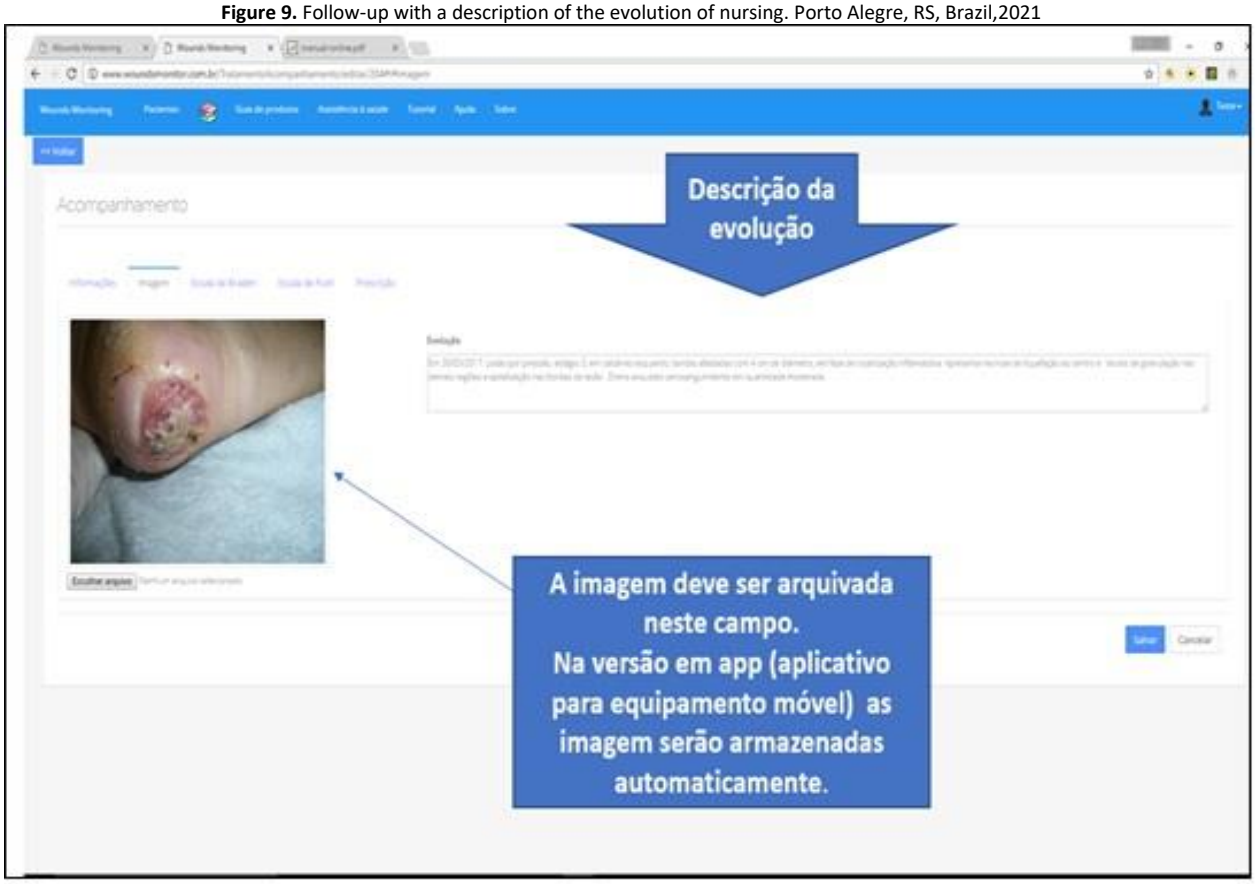
Since nursing records are the responsibility of technicians, nursing assistants and nurses, the evolution of nursing is a private attribution of the nurse, in addition to being a duty, in accordance with the Code of Ethics and other relevant legislation[19].

The responsibility of the professional may occur in the ethical sphere, the legal, administrative, civil, and criminal. Due to this aspect, a specific space for the nursing record on the injury and nursing evolution is provided on the monitoring screen, as well as a field for archiving the images, with visual monitoring of the wound (Figure 9).

The Wounds Monitoring prescription screen offers the possibility to choose the type of product to be used in the wound treatment, as well as the care prescription. All data described and marked are selected for the development of nursing prescription.

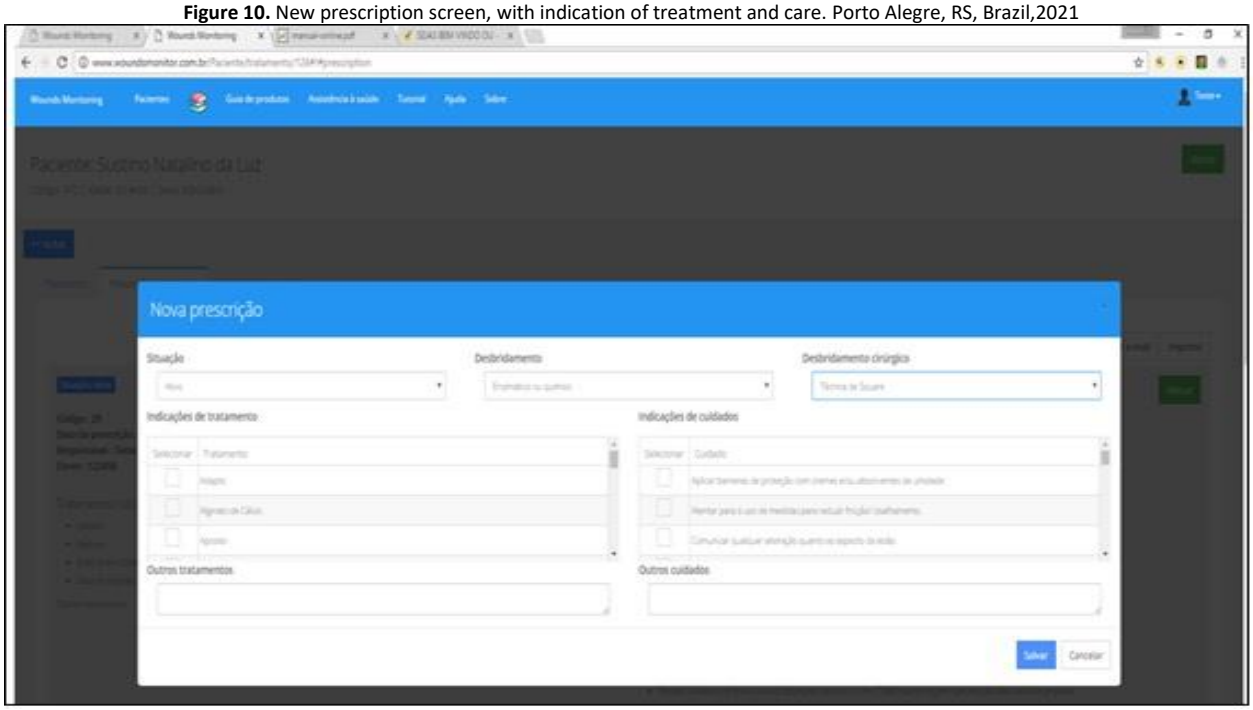
The products are established according to the user's evaluation, considering the types of tissues and exudate identified in the lesion. An indication of the change time for each type of dressing is also presented. By clicking on "save", the data is automatically stored on the server and can be accessed through the software (Figure 10).

Figure 9. Follow-up with a description of the evolution of nursing. Porto Alegre, RS, Brazil,2021



Source: Wounds Monitor.

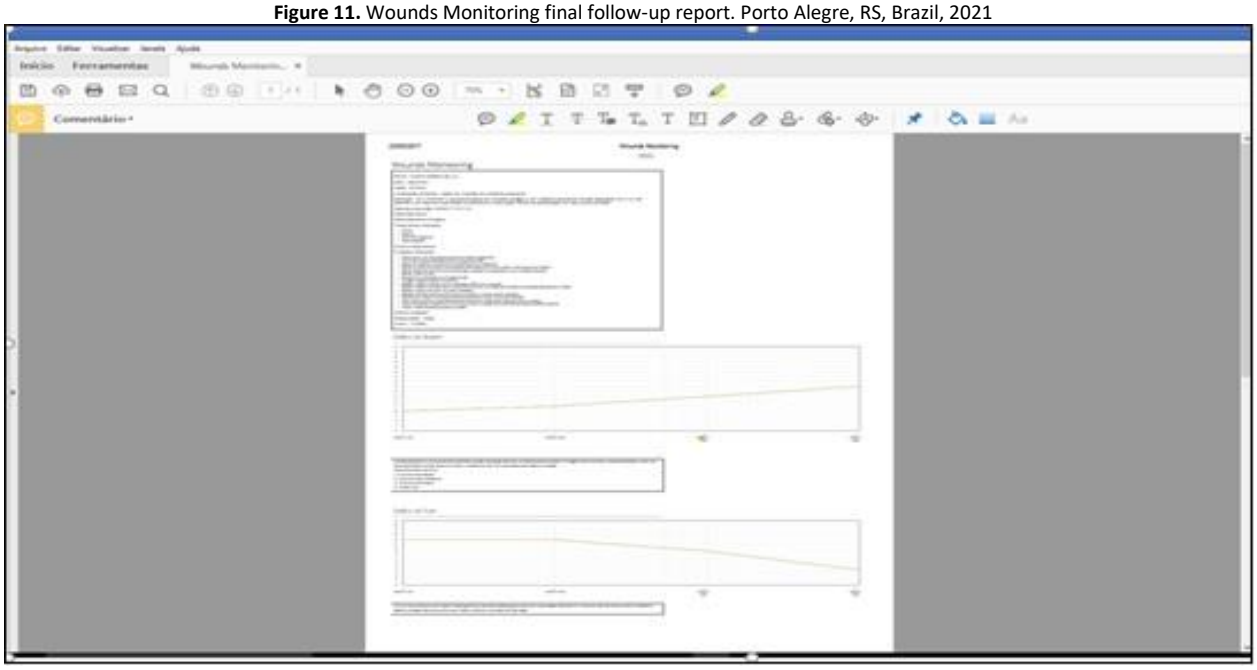
Figure 10. New prescription screen, with indication of treatment and care. Porto Alegre, RS, Brazil,2021



Fonte: Wounds Monitor.

Wounds Monitoring generates a prescription that can be printed or emailed to professionals enabled in the system. The items generated for printing are: Patient identification; Wound location; Evolution; Prescription of care; Indicated treatment; and Braden and PUSH monitoring charts. This prescription can be printed by any professional, however the system has a block, allowing it to be modified only by the nurse or physician qualified in the system. The final Wounds Monitoring follow-up report for each evaluated patient can be printed out (Figure 11).

Figure 11. Wounds Monitoring final follow-up report. Porto Alegre, RS, Brazil, 2021



Source: Wounds Monitor.

Discussion

The guidelines, protocols, booklets, and algorithms are the main guidelines for nurses in the development of greater accuracy in the assessment of chronic and acute wounds. According to current legislation, it is up to the nurse to coordinate the nursing team, conduct and enable the quality of care and patient rights in a dignified, safe, legal, and ethical manner[20].

The role of nurses in the dermatological area is linked to a specific technological arsenal, requiring knowledge and skills related to the handling of materials and equipment and the needs of patients who depend on them. The wound care nurse performs five essential functions in the context of health practices: caring, educating, coordinating, collaborating, and supervising. Such functions are developed in an integrated and concomitant way. However, sometimes they are more centered on one, sometimes on another, sometimes on all of them, that is, they do not dissociate.

The construction of the Wounds Monitoring software arose from reflections on the difficulties professionals have in systematizing wound care actions, as well as in the effective monitoring of these actions. In the case of patients with wounds, the indicators of quality of care can be increased based on the systematization of the care provided, since in most cases, care for wounds (change of dressings, evolution of lesions, complications) are not properly recorded[11,19].

The software is a care support tool and is not intended to replace the professional's critical thinking and clinical reasoning. It is necessary to reinforce that proper documentation guarantees the success of the treatment and evolutionary follow-up of the wound. In this context, Wounds Monitoring is a health technology to be used by nurses in different care contexts that welcome patients with wounds.

There is a perspective that the software can be used in primary health care and in the hospital environment, as it offers the possibility of being consulted on mobile devices and, in the future, offline. The tool was created from a database composed of two records. Like the device constructed by study[21], the first or main one is the patient's record that contains their personal data, as well as the professional's assessment in relation to the patient's clinical aspects. The second, linked to the first, is the injury assessment record, where the assessment is recorded (type of wound, measurement of the wound area in cm2, type and amount of exudate, tissue type, and the anatomical location where the injury lies.

The software development was based on the literature and on the best clinical evidence, which can provide greater technical and clinical support. As for the prototype validation process, contributions from experts were included, which provided relevant information for modifying the writing and even the graphic presentation. Reaching the percentage of 89% of expertise, agreed with the applicability of the software in clinical practice, that is, they consider it a tool with relevant potential capable of supporting the professional's decision in the assessment, monitoring and choice of wound treatment.

In recent decades, several standardized methods have been developed to allow professionals to monitor injuries and, consequently, assess the effect of an intervention. Assessment instruments improve and encourage communication between health team professionals and make it possible to achieve the expected goals more quickly[11]. However, what is observed are instruments developed for the assessment of pressure ulcers and not chronic wounds.

An integrative review study indicated that different classification systems were developed to assess pressure injuries, using staging, such as the EPUAP system (European

Pressure Ulcer Advisory Panel). Other tools were developed to assess wound healing, such as the PSST (Pressure Score Status Tool) and the PUSH (Pressure Ulcer Scale for Healing), both cross-culturally adapted to the Portuguese language, among other scales and scores already published internationally. The purpose of these tools is to provide professionals with information that demonstrates whether the treatment was effective and whether the lesion is evolving properly. Wounds Monitoring was designed and validated, considering the minimum and necessary items to assess a wound (wound measurement, tissue type, exudate, amount of exudate, signs of inflammation and/or infection, among others), using already validated scales[22-24].

Furthermore, the software allows the user to choose different types of coverage that can be used in the treatment. Most of the assessments made by the experts surpassed the initial expectations of the study, reaching percentages above 94% of approval. The software was evaluated as a tool capable of helping the healthcare professional in the assessment and monitoring of wounds, as well as in choosing the appropriate coverage.

Coverage can be defined as a therapeutic means that consists of cleaning and applying material over a wound for its protection, absorption, and drainage, with the aim of improving the conditions of the wound bed and assisting in its resolution. Dressings can sometimes be the definitive treatment itself; in others, just an intermediate step for surgical treatment[25]. The software presents some coverage possibilities, whether passive (inert) or those with active ingredients. A variety of dressings and other wound care devices are on the market today. However, it is up to health professionals to make the best choice, without ever forgetting the systemic condition that is involved in the treatment of a wound[25].

It is noteworthy that the software facilitated the systematic recording of the wound, its evolution and monitoring. From the records in Wounds Monitoring, it was possible to identify the ongoing treatment and some factors that could interfere with the healing process. Inadequate records in medical records make care more susceptible to an adverse event and compromise patient safety[26,27]. Software becomes a means that can help ensure effective communication.

Conclusion

Technologies such as Wounds Monitoring strengthen the culture of using scientific evidence in the decision-making process, influencing concepts and languages adopted in clinical deliberations by health professionals. From the technological propositions carried out by this study, it will enable nurses to access information, as well as allow the formation of a database. In addition to the possibilities and benefits for professionals already discussed throughout this study, it is important to emphasize that the tool enables the assessment and monitoring of wounds in an agile and systematic way, through a system with a user-friendly and self-explanatory interface, with the possibility of having a low cost.

The present study demonstrated that the construction of the software meets the need for recording, monitoring, and evaluating wounds. The perspectives are that it can also be used to carry out realistic simulation and training, in addition to having easy access and handling.

References

1. Sen CK, Gordillo GM, Roy S, Kirsner R, Lambert L, Hunt TK, et al. Human skin wounds: a major and snowballing threat to public health and the economy. Wound Repair Regen. 2010;17(6):763-71.
2. Crovetti G, Martinelli G, Issi M, Barone M, Guizzardi M, Campanati B, et al. Platelet gel for healing cutaneous chronic wounds. Transfus Apher Sci. 2004;30(2):145–51. DOI: 10.1016/j.transci.2004.01.004
3. Agency for Healthcare Research and Quality. What are the best practices in pressure ulcer prevention that we want to use? Agency for Healthcare Research and Quality [Internet]. 2014 [acesso em 04 jun 2020]. Disponível em: http://www.ahrq.gov/professionals/systems/hospital/pressureulcertoolkit/putool3.html
4. Hjort A, Gottrup F. Cost of wound treatment to increase significantly in Denmark over the next decade. J Wound Care. 2010;19(5):173-84. DOI: 1.12968/jowc.2010.19.5.48046
5. Prazeres SJ. Tratamento de feridas: teoria e prática. Porto Alegre: Moriá; 2009.
6. Rabelo ER, Aliti GB. Exame Físico. In: SOUZA, EM. Casos clínicos para a enfermagem. Porto Alegre: Moriá; 2010.
7. Souza ML, Prado ML, Dal Sasso GTM, et al. A inovação tecnológica e o cuidado de enfermagem. Temperamentvm [Internet]. 2010 [acesso em 04 jun 2020];11. Disponível em: /temperamentum/tn11/t7172p.php
8. Salvador PTCO, Oliveira RKM, Costa TD, et al. Tecnologia e inovação para o cuidado. Rev. enferm. UERJ [Internet]. 2012 [acesso em 04 jun 2020];20(1):111-7. Disponível em: https://www.e-publicacoes.uerj.br/index.php/enfermagemuerj/article/view/4004/2773
9. Lima DFB, Braga ALS, Fernandes JL, Brandão ES. Sistema de informação em saúde: conceções e perspectivas dos enfermeiros sobre o prontuário eletrônico do paciente. Rev. Enf. Ref [Internet]. 2011 [acesso em 04 jun 2020];3(5):113-19. Disponível em: http://www.scielo.mec.pt/scielo. php?script=sci_arttext&pid=S0874-02832011000300012&lng=pt&nrm=iso
10. World Union of Wound Healing Societies (WUWHS). Principles of best practice: Diagnostics and wounds. A consensus document. London: MEP Ltd; 2008.
11. Cowan T. Wound Care Handbook 2014-2015. 7. ed. London: MA Healthcare; 2015.
12. Rocha PK, Prado ML, Wal ML, Carraro TE. Cuidado e tecnologia: aproximações através do Modelo de Cuidado. Rev Bras Enferm [Internet]. 2008 [acesso em 04 jun 2020];61(1):113-6. Disponível em: http://www.scielo.br/pdf/reben/v61n1/18.pdf
13. Kniberg H, Skarin M. Kanban e scrum obtendo o melhor de ambos. Estados Unidos: C4Media; 2009.

14. Biernacki P, Waldorf D. Snowball Sampling: Problems and techniques of Chain Referral Sampling. Sociological Methods & Research. 1981;2:141-63.
15. Oliveira NB. Avaliação de qualidade do registro eletrônico do processo de enfermagem. 2012. Tese (Doutorado) - Universidade de São Paulo, São Paulo, 2012.
16. Sperandio DJ. A tecnologia computacional móvel na Sistematização da assistência de enfermagem: avaliação de um software-protótipo. 2008. Tese (Doutorado) – Escola de Enfermagem, Universidade de São Paulo, Ribeirão Preto, 2008.
17. Ministério da Saúde (BR). Conselho Nacional de Saúde. Resolução n.º 466, de 12 de dezembro de 2012. Aprova as diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos [Internet]. Brasília (DF): MS; 2012 [acesso em 04 jun 2020]. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/cns/2013/res0466_12_12_2012.html
18. Pressmann RS. Engenharia de Software. São Paulo: McGraw Hill; 2011.
19. Conselho Federal de Enfermagem (COFEN). Guia de recomendações para registro de enfermagem no prontuário do paciente e outros documentos de enfermagem. Brasília (DF): COFEN; 2016.
20. Melo AF. Elaboração e validação de um instrumento de registro de feridas crônicas. Uberaba. Dissertação [Mestrado em Enfermagem] - Universidade Federal do Triângulo Mineiro; 2015.
21. Cunha DRD, Dutra RAA, Salomé GM, Ferreira LM. Construção de um aplicativo multimídia em plataforma móvel para tratamento de feridas com laserterapia. Rev. enferm. UFPE on line [Internet]. 2018 [acesso em 20 jun 2020]; 1241-1249. Disponível em: https://periodicos.ufpe.br/revistas/revistaenfermagem/article/viewFile/230676/28868
22. National Pressure Ulcer Advisory Panel. European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Quick Reference Guide. Emily Haesler (Ed.). Osborne Park: Cambridge Media; 2014.
23. Alves DFS, Almeida AO, Silva JLG, Morais FI, Dantas SRPE, Alexandre NMC. Translation and adaptation of bates-jensen wound assessment tool for Brazilian culture. Texto Contexto Enferm. 2015 jul-set;24(3):826-33. https://doi.org/10.1590/0104-07072015001990014
24. Aron S, Gamba MA. Preparo do Leito da Ferida e a História do TIME. Estima [Internet]. 2010 [acesso em 04 jun 2020];7(1):20-24. Disponível em: https://www.revistaestima.com.br/index.php/estima/article/view/264
25. Smaniotto PHDS, Ferreira MC, Isaac C, Galli R. Sistematização de curativos para o tratamento clínico das feridas. Rev. Bras. Cir. Plást. 2012;623-626. https://doi.org/10.1590/S1983-51752012000400026
26. Agência Nacional de Vigilância Sanitária (ANVISA). Assistência segura: uma reflexão teórica aplicada à prática [Internet]. 1. ed. Brasília (DF): 2013 [acesso em 20 jun 2020]. Disponível em: www20.anvisa.gov.br/segurançadopaciente/imagens
27. Santos MAQF, Santos CM, Silva ALNV, Orlandi TS, Oliveira LD. Auditoria de enfermagem: aspectos da qualidade da assistência e do seu registro no prontuário. Glob Acad Nurs. 2020;1(2):e33. https://dx.doi.org/10.5935/2675- 5602.20200033