

Software programs developed to operationalize the nursing process in health services: scoping review

Softwares desenvolvidos para operacionalizar o processo de enfermagem nos serviços de saúde: revisão de escopo
Softwares desarrollados para operacionalizar el proceso de enfermería en servicios de salud: revisión de alcance

Rafaela Cavalcanti de Albuquerque Nascimento¹

ORCID: 0000-0003-0609-4813

Bárbara Coeli Oliveira Silva Aquino^{2,3}

ORCID: 0000-0002-2933-0930

Dayvison Nascimento de Oliveira⁴

ORCID: 0000-0002-4030-4055

Alexsandra Rodrigues Feijão¹

ORCID: 0000-0002-8686-9502

Abstract

Objective: To map the software programs developed to operationalize the nursing process in patient care in health services. **Methods:** This is a scoping review developed within the recommendations of the Joanna Briggs Institute and PRISMA Extension for Scoping Reviews. A search was carried out in seven databases, a library, eight databases and an academic search engine with no time limit. **Results:** 19,645 studies were found, of them were included 35. 51% addressed Nursing Theory and 20% of the studies covered the entire nursing process. In addition, 82% used the Nursing Process in a fragmented way. The highlighted target audience for which the software programs were developed: adults (26; 74.2%), and the hospital service (33; 94%). **Conclusion:** It was understood through this study that Brazilian nursing seeks systems that can provide subsidies regarding the application of knowledge in nursing care and process.

Descriptors: Nursing process; Nursing records; Nursing informatics; Software; Nursing.

¹Universidade Federal do Rio Grande do Norte. Natal, Rio Grande do Norte, Brasil

²Secretaria de Estado da Saúde Pública do Rio Grande do Norte. Natal, Rio Grande do Norte, Brasil.

³Secretaria Municipal de Saúde de Parnamirim. Parnamirim, Rio Grande do Norte, Brasil.

⁴Universitätsklinikum Schleswig-Holstein. Kiel, Alemanha.

Corresponding author:
Rafaela Cavalcanti de Albuquerque Nascimento
E-mail:
rafaelacavalcanti1998@gmail.com

What is already known on this?

In the literature there are isolated publications of software development to operationalize the nursing process, so there is no compiled with the information of these technological productions.

What this study adds?

The study points to a mapping of technological development research as support at various levels of complexity, and may help to incorporate software programs into various health services.



How to cite this article: Nascimento RCA, Aquino BCOS, Oliveira DN, Feijão AR. Software programs developed to operationalize the nursing process in health services: scoping review. Rev. enferm. UFPI. [internet] 2024 [Cited: ano mês abreviado dia];13:e3180. DOI: 10.26694/reufpi.v13i1.3180

Resumo

Objetivo: Mapear softwares desenvolvidos para operacionalizar o processo de enfermagem no cuidado ao paciente nos serviços de saúde. **Métodos:** Trata-se de uma revisão de escopo desenvolvida dentro das recomendações do Joanna Briggs Institute e PRISMA Extension for Scoping Reviews. Realizou-se busca em sete bases de dados, uma biblioteca, oito bancos de dados e um buscador acadêmico sem limite temporal. **Resultados:** Encontrou-se 19.645 estudos, tendo-se incluído 35 deles. 51% abordaram Teoria de Enfermagem e 20% dos estudos contemplaram todo o processo de enfermagem. No mais, 82% utilizaram o Processo de Enfermagem de forma fragmentada. O público-alvo destaque para qual foram desenvolvidos os softwares: adultos (26; 74,2%) e o serviço de foi hospital (33; 94%). **Conclusão:** Compreendeu-se por meio desse estudo que a enfermagem brasileira busca sistemas que podem fornecer subsídios quanto à aplicação de conhecimentos na assistência e no processo de enfermagem

Descritores: Processo de enfermagem. Registros de enfermagem. Informática em enfermagem. Software. Enfermagem.

Resumén

Objetivo: Mapear software desarrollado para operacionalizar el proceso de enfermería en la atención al paciente en servicios de salud. **Métodos:** Esta es una revisión de alcance desarrollada dentro de las recomendaciones del Instituto Joanna Briggs y PRISMA Extension for Scoping Reviews. Se realizó una búsqueda en siete bases de datos, una biblioteca, ocho bases de datos y un buscador académico sin límite de tiempo. **Resultados:** Se encontraron 19,645 estudios, de los cuales se incluyeron 35. El 51% abordó Teoría de Enfermería y el 20% de los estudios abarcó todo el proceso de enfermería. Además, el 82% utilizó el Proceso de Enfermería de forma fragmentada. El principal público objetivo para el cual se desarrolló el software fue: adultos (26; 74,2%) y el servicio hospitalario (33; 94%). **Conclusión:** Se entendió a través de este estudio que la enfermería brasileña busca sistemas que puedan brindar apoyo en la aplicación del conocimiento en el cuidado y en el proceso de enfermería.

Descriptoros: Proceso de enfermería. Registros de enfermería. Informática aplicada a la enfermería. Programas informáticos. Enfermería.

INTRODUCTION

The Nursing Process (NP) consists of a methodological instrument originated to support care practice and support nursing decision-making, and its function is to direct, structure and document care, assisting nurses in the perception of individuals' health problems, in the planning and implementation of their actions and in the evaluation of results, thus favoring a safer care process.⁽¹⁾

In this sense, the NP is organized into five interrelated stages: Nursing Data Collection or Nursing History; Nursing Diagnosis (ND); Nursing Planning; Nursing Implementation and Evaluation. Theoretical support is needed to guide data collection, the establishment of nursing diagnoses and the planning of actions or interventions, as well as to provide the basis for the evaluation of the nursing outcomes achieved.⁽²⁾

The first stage of the NP is to investigate personal, family or human collective information to obtain a relationship with the health-disease process in which the person is. The second stage is to interpret and group the collected data, this results in the decision making of the ND. The third stage determines the results expected to be achieved and nursing interventions that will be carried out for the benefit of the clients, identified in the ND stage. In the fourth stage, the determined actions or interventions are implemented. Finally, the process of change in the persons' responses in the health and disease process is evaluated, which determines whether the nursing actions or interventions achieved the expected result, when verifying the need for changes or adaptations in the stages of the NP.⁽²⁾

Several Nursing Classification Systems are used during these phases of the NP, the best known are: Nanda - International (NANDA-I), Nursing Outcomes Classification (NOC), Nursing Interventions Classification (NIC), Clinical Care Classification System (CCC) and the International Classification for Nursing Practice (ICNP®).⁽³⁾

Despite the importance of the NP, there are still some managerial, institutional and material obstacles found in the daily applicability of the NP, such as: excess work of the nurses, consequently the lack of time; lack of knowledge; inadequate theoretical framework; non-computerization of the nursing history; lack of computers; non-compliance with nursing prescriptions; non-use of diagnostic taxonomy; incomplete stages of the NP.⁽⁴⁾

Thus, the initiatives that propose to add elements of technology, information and communication to the NP, enhance research, teaching, individualization of care, assist in decision making and generate indicators for evaluating the care provided to the patients, thus providing rapid, systemic and quality care.⁽⁵⁾

Therefore, software programs, which consist of the grouping of data and interpreted instructions that will be processed by an internal electronic system and aim to simplify the working mechanism, are accurate and complete ways to standardize information, having the potential to speed up the collection and recording, store and retrieve data and eliminate redundancies.⁽⁶⁾

The use of software programs has direct implications for nursing, since it is considered an innovative, interesting, useful and simple technology to use. There are several advantages of its applicability in care practice, such as: the product can be suitable for the operation of the institution; reduction of the time of elaboration of nursing diagnoses; assistance in the management of care; strengthens evidence-based practice, by consolidating nursing as a science; and can assist both nursing professionals and students in the development of clinical judgment and the diagnostic reasoning process.⁽⁷⁻⁸⁾

In view of the above, elements that facilitate the incorporation of NP, such as software programs, become a crucial point for the health field, and should be seen as an effective strategy that facilitates work during care practices. In this context, it is necessary to know scientific productions of the literature in relation to the use of software programs in the NP.⁽⁷⁾

Thus, the study aimed to map software programs developed to operationalize the nursing process in patients' care in health services, through the guiding research question: "What software programs have been developed to operationalize the nursing process in patient care in health services?".

METHODS

This is a scoping review developed based on the recommendations of the Joanna Briggs Institute and PRISMA Extension for Scoping Reviews (PRISMA-ScR).⁽⁹⁻¹⁰⁾ The study was developed in five stages: 1) identification of the research question; 2) identification of relevant studies; 3) selection of studies; 4) data extraction, separation, summarization and reporting of results; 5) communication of results.⁽¹¹⁻¹²⁾

Initially, a preliminary search was carried out during June 2020 to verify if there was a scoping review on the subject in the Open Science Framework and Cumulative Index to Nursing and Allied Health Literature (CINAHL) and it was found that there was no published study.

After that, a protocol was built as recommended by the Joanna Briggs Institute (JBI) manual⁽⁹⁾ being adapted, which included the following items: reviewers; title; mnemonic Population, Concept and Context (PCC); objective; research question; inclusion and exclusion criteria; search strategy; databases, data extraction (title, author(s), year of publication, database/library/database/academic searcher, type of study (article, dissertation and thesis), country of origin, place of study, objective(s), desktop or mobile ELEFANTE, nursing classification system, nursing theory, patient, health service, main findings). After the preparation of said protocol, it was registered as suggested in (PRISMA-ScR)⁽¹⁰⁾ under no. <https://osf.io/3w6fu>.

The Participant, Concept and Context (PCC) mnemonic was applied to construct the research question, in which the Participant corresponds to "patient", the Concept to "software programs to operationalize the nursing process" and the Context to the "health services".

The study was guided by the following question: "What software programs have been developed to operationalize the nursing process in patient care in health services?".

Then, the following inclusion criteria were stipulated: articles from primary and secondary studies, dissertations and theses available in full, without time limitation, published in any language, and that address software programs developed to operationalize the nursing process in patient care for the various health services. Reflections, editorials and abstracts published in annals of scientific events were excluded.

Following the recommendations of the Joanna Briggs Institute manual⁽⁹⁾, for the choice of descriptors, a search was carried out in the CINAHL, US National Library of Medicine (PubMed) databases, then an analysis of the words in the text contained in the title and abstract and the index terms used to describe the study was carried out. Thus, the following search strategy was defined: (patients OR clients) AND (ELEFANTE OR "nursing informatics" OR "medical informatics" OR "electronic health records" OR "information technology") AND ("nursing process" OR "systematization of nursing care") AND ("health services" OR "patient care services").

A search was carried out from August to September 2020 in the following data sources: CINAHL, PubMed, Web of Science, Scopus, Scientific Electronic Library Online (SciELO), Latin American and Caribbean Literature in Health Sciences (LILACS), Nursing Database (BDENF), Spanish Bibliographic Index of Health Sciences (IBECS), Catalog of Theses and Dissertations of the Coordination for the Improvement of Higher Education Personnel (CAPES), DART-Europe, Electronic Theses Online Service (EThOS), South African National ETD Portal, Theses Canada, Open Access Scientific Repository of Portugal (RCAAP), Cybertesis, Trove, Digitala Vetenskapliga Arkivet (DiVA), New Zealand theses, Google Scholar.

Data sources were accessed through the CAPES Journal Portal from the Federated Academic Community through access from the Federal University of Rio Grande do Norte, with the exception of data sources (DART-Europe, Electronic Theses Online Service (EThOS), South African National ETD Portal, Theses Canada, Open Access Scientific Repository of Portugal (RCAAP), Cybertesis, Trove, Digitala Vetenskapliga Arkivet (DiVA), New Zealand theses, Google Scholar) that were accessed directly on their own websites.

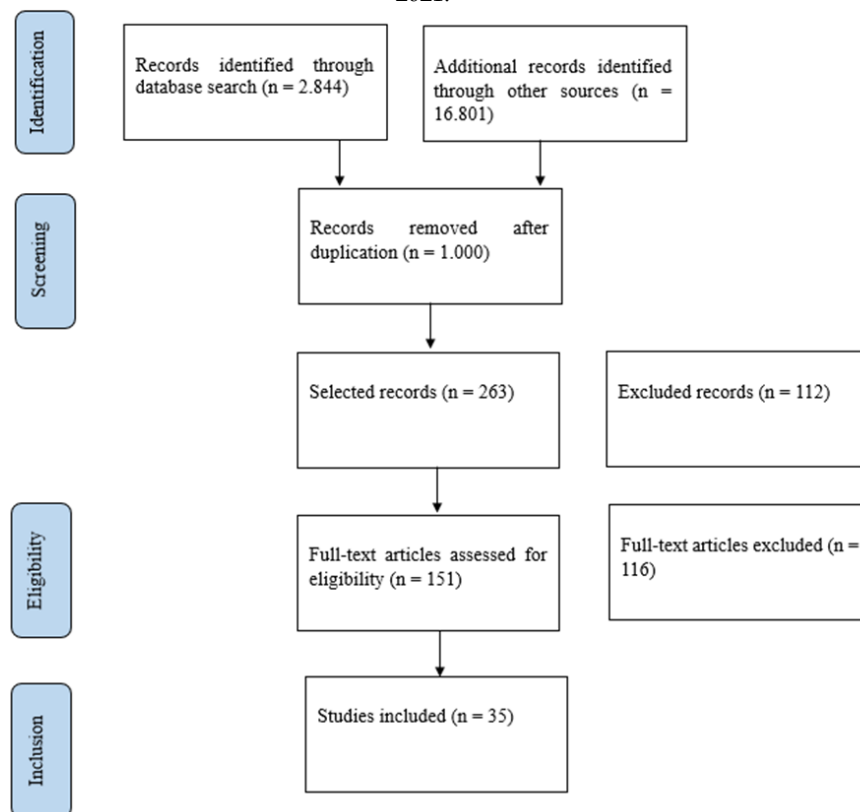
The search was carried out independently by two authors, and the initial screening of the materials was standardized, carried out by reading the title and abstract, then the duplicates were excluded, then the selected ones were read in full, after said reading, the studies relevant to the aforementioned adopted criteria were included. Subsequently, there was double confirmation of the articles selected by a third author.

Data were extracted according to the protocol, inserted in a spreadsheet in Microsoft Excel, analyzed using descriptive statistics using absolute and relative frequency and relevant literature.

RESULTS

The searches in the databases totaled 19,645 studies, of which 263 publications were pre-selected by reading the title and abstract. After full reading, 151 studies were included by eligibility criteria. According to the inclusion criteria, the publications that fit the research totaled a sample of 35 studies (Figure 1).

Figure 1. Flowchart of selection of studies adapted from PRISMA-ScR and JBI recommendations. Natal, RN, Brazil, 2021.



Source: research data, 2021.

Regarding the characterization of the studies, of the search locations, the CAPES Catalog of Theses and Dissertations was where the scientific publications selected in this scoping review were concentrated (51.4%), followed by Google Scholar (17.1%), BDENF (11.5%), CINAHL (11.5%), LILACS (5.7%) and PubMed (2.8%).

Regarding the year of publications, there is a highlight for the year 2018, with 7 studies (20%); followed by 2015 (6; 17%); 2016 (4; 11.5%); the years 2013, 2002 and 2008 obtained 3 studies each (8.5%); 2019 and 2012 (2; 5.7%) each; the other years presented 1 study 2017, 2014, 2010, 2009, 2005, (1; 2.8%) each.

Regarding the type of study, 16 were articles (45.7%) and 19 were concentrated in Graduate Programs (54.3%), of which 14 were dissertations (73.7%) and 5 were theses (26.3%). The methodological design of technological production was the most addressed (22; 62.9%). The country of origin where the studies were most concentrated was Brazil (34; 97.1%), with the southeast region being the most covered (14; 40%) with the municipalities of São Paulo, Ribeirão Preto, Belo Horizonte and Viçosa (Box 1).

Box 1. Characterization of the studies. Natal, RN, Brazil, 2021.

First Author	Year	Study type	Study design	Country origin	Country location
Moura ¹³	2015	Master Master dissertation	Intervention description	Brazil	Santana - Amapá
Silva ¹⁴	2014	PhD thesis	Methodological	Brazil	Ribeirão Preto - São Paulo
Santos ¹⁵	2019	PhD thesis	Methodological	Brazil	Florianópolis, Santa Catarina
Santana ¹⁶	2018	Article	Technological production	Brazil	Cabedelo - Paraíba
Menezes ¹⁷	2013	Master dissertation	Exploratory-descriptive	Brazil	Manaus - Amazonas
Silva ¹⁸	2015	Master dissertation	Technological production	Brazil	Porto Alegre, Rio Grande do Sul
Sperandio ¹⁹	2008	PhD thesis	Exploratory-descriptive	Brazil	Ribeirão Preto - São Paulo
Rosa ²⁰	2016	Master dissertation	Technological production	Brazil	Florianópolis, Santa Catarina
Silva Júnior ²¹	2015	Master dissertation	Technological production	Brazil	Belém - Pará
Schwengber ²²	2008	Master dissertation	Convergent care research	Brazil	Rio Grande, Rio Grande do Sul, Brazil.
Domingos ⁶	2018	Master dissertation	Methodological	Brazil	Viçosa, Minas Gerais.
Araújo ²³	2018	Master dissertation	Action research	Brazil	Vitória (Espírito Santo)
Guitierrez ²⁴	2013	Master dissertation	Methodological	Brazil	São Paulo - São Paulo
Queiroz ²⁵	2018	Master dissertation	Technological production	Brazil	Salvador - Bahia
Mello ²⁶	2017	Master dissertation	Technological production	Brazil	Florianópolis, Santa Catarina
Lima ²⁷	2012	Master dissertation	Technological production	Brazil	João Pessoa - Paraíba
Sperandio ²⁸	2002	PhD thesis	Technological production	Brazil	São Paulo - São Paulo
Barra ²⁹	2008	Master dissertation	Technological production	Brazil	Florianópolis, Santa Catarina
Carita ³⁰	2010	Article	Technological production	Brazil	São Paulo - São Paulo
Rezende ³¹	2016	Article	Methodological	Brazil	São Paulo - SP
Staub ³²	2016	Article	Technological production	United States	Portland - Oregon
Paese ³³	2018	Article	Technological production	Brazil	Florianópolis, Santa Catarina
Lima ³⁴	2018	Article	Technological production	Brazil	Fortaleza - Ceará
Veríssimo ³⁵	2013	Article	Technological production	Brazil	Maceió - Alagoas
Lima ³⁶	2015	Article	Cross-sectional study	Brazil	São Paulo - São Paulo
Menezes ³⁷	2019	Article	Technological production	Brazil	Manaus- Amazonas

Rezende ³⁸	2015	Master dissertation	Technological production	Brazil	João Pessoa - Paraíba
Crossetti ³⁹	2002	Article	Methodological	Brazil	Brasília, Distrito Federal
Tannure ⁴⁰	2012	PhD thesis	Technological production	Brazil	Belo Horizonte - Minas Gerais
Martins ⁴¹	2016	Article	Technological production	Brazil	Belo Horizonte - Minas Gerais
Sperandio ⁴²	2005	Article	Technological production	Brazil	São Paulo - São Paulo
Dalri ⁴³	2002	Article	Case study	Brazil	Ribeirão Preto - São Paulo
Soares ⁴⁴	2018	Article	Technological production	Brazil	Fortaleza - Ceará
Peres ⁴⁵	2009	Article	Technological production	Brazil	São Paulo - São Paulo
Silva ⁴⁶	2015	Article	Technological production	Brazil	Ribeirão Preto, SP

Source: research data, 2021.

Regarding the results obtained from the selected publications, of the 35 studies, 18 addressed the Nursing Theory of Basic Human Needs, by Wanda Horta (51%), being the only theory covered in the selected studies.

Regarding the NP, seven studies covered the entire process (20%), in which the interaction NANDA-I, NOC, NIC was used as a nursing classification. Twenty-nine (29) used NP in a fragmented manner. Eleven (11) addressed only the nursing diagnoses phase of the NP (31.4%), using the NANDA-I and/or ICNP taxonomies, 14 addressed nursing diagnoses and interventions using NANDA-I and NIC or ICNP (40%), one addressed only nursing outcomes, using NOC (2.8%) and two did not specify taxonomies (5.7%).

The type of ELEFANTE was also evidenced, 26 for desktop (74%) and nine for mobile (26%). The target audience for which the software programs were developed is adults (26; 74.2%), followed by newborns (7; 20%), postpartum women (1; 2.8%) and children and adolescents (1; 2.8%). In addition, the health service that appeared most in the sample was hospital (33; 94%), followed by Family Health Strategy (1; 2.8%) and outpatient (1; 2.8%). The studies focused mainly on patients hospitalized from the medical clinic to the Intensive Care Unit (ICU) (Box 2).

Box 2. Results obtained from the selected publications. Natal, RN, Brazil, 2021.

First Author	Desktop or mobile	Nursing Classification	Nursing Theory	Target audience	Health Care Service
Moura ¹³	Desktop	NANDA-I; NIC	Did not address	Adults	Hospital
Silva ¹⁴	Desktop	ICNP	BNT	Children and adolescents	Hospital
Santos ¹⁵	Mobile	NANDA-I	BNT	Newborns	Hospital
Santana ¹⁶	Desktop	ICNP	Did not address	Adults	Primary Healthcare
Menezes ¹⁷	Desktop	NANDA-I; NOC; NIC	BNT	Adults	Hospital
Silva ¹⁸	Desktop	ICNP	BNT	Adults and children	Hospital
Sperandio ¹⁹	Mobile	NANDA-I	BNT	Adults	Hospital
Rosa ²⁰	Desktop	NANDA-I	BNT	Newborns	Hospital
Silva Júnior ²¹	Desktop	NANDA-I; NOC; NIC	BNT	Adults	Hospital
Schwengber ²²	Desktop	NANDA-I	BNT	Adults	Hospital
Domingos ⁶	Desktop	NANDA; NOC; NIC	BNT	Adults	Hospital
Araújo ²³	Mobile	ICNP	BNT	Newborns	Hospital
Guitierrez ²⁴	Desktop	NOC	Did not address	Adults	Hospital

Queiroz ²⁵	Desktop	NANDA-I NOC; NIC	Did not address	Adults	Outpatient Clinic
Mello ²⁶	Mobile	NANDA-I; ICNP	Did not address	Adults	Hospital
Lima ²⁷	Desktop	ICNP	Did not address	Newborns	Hospital
Sperandio ²⁸	Desktop	Did not specify	BNT	Adults	Hospital
Barra ²⁹	Mobile	ICNP	Did not address	Adults	Hospital
Carita ³⁰	Desktop	NANDA-I; NIC	Did not address	Adults	Hospital
Rezende ³¹	Mobile	ICNP	Did not address	Newborns	Hospital
Staub ³²	Desktop	NANDA-I; NOC; NIC	Did not address	Adults	Hospital
Paese ³³	Desktop	ICNP	Did not address	Adults	Hospital
Lima ³⁴	Mobile	NANDA-I; NIC	BNT	Newborns	Hospital
Veríssimo ³⁵	Desktop	ICNP	Did not address	Postpartum women	Hospital
Lima ³⁶	Desktop	NANDA-I	BNT	Adults	Hospital
Menezes ³⁷	Desktop	NANDA-I	BNT	Adults	Hospital
Rezende ³⁸	Mobile	ICNP	Did not address	Newborns	Hospital
Crossetti ³⁹	Desktop	NANDA-I	BNT	Adults	Hospital
Tannure ⁴⁰	Desktop	NANDA-I; NIC	BNT	Adults	Hospital
Martins ⁴¹	Desktop	NANDA-I	BNT	Adults	Hospital
Sperandio ⁴²	Desktop	Did not specify	BNT	Adults	Hospital
Dalri ⁴³	Desktop	NANDA-I	Did not address	Adults	Hospital
Soares ⁴⁴	Mobile	NANDA-I	Did not address	Adults	Hospital
Peres ⁴⁵	Desktop	NANDA-I; NOC, NIC	Did not address	Adults	Hospital
Silva ⁴⁶	Desktop	ICNP	Did not address	Adults	Hospital

ICNP: International Classification for Nursing Practice; Nanda I: International Nanda; NIC: Classification of Nursing Interventions; NOC: Classification of Nursing Outcomes; BNT: Wanda Horta's Theory of Basic Human Needs.

Source: research data, 2021.

In the present study, 22 (61%) studies aimed at software development were found, of which 14 (39%) demonstrated the applicability of software programs to the NP. Only two studies reported some kind of difficulty during software handling. All studies pointed out the potential of using software programs as a system that supports nursing care and increases the quality of service.

DISCUSSION

Based on the research results, it was analyzed that all studies presented software development based on NCS. Most software programs took a comprehensive approach, integrating patient data collection, nursing diagnoses, and the implementation of nursing care. These systems automate the generation of nursing diagnoses and the definition of interventions based on Nanda, NIC or ICNP taxonomies. This results in the formulation of personalized therapeutic plans for each patient and standardization of language in electronic records, improving the efficiency of the electronic nursing record and evidence-based practice.

From the intensification of technology in the twentieth century, worldwide health services try to follow the advancement of computerized processes, automating their operational, managerial or care systems, to increase the quality of medical care, increasing the efficiency and security of patient data, in addition to technologically supporting all procedures in the health area.⁽⁴⁷⁾

Therefore, the development of software programs for this purpose becomes increasingly necessary in the health field. It was observed that the productions selected for the study were carried out from 2002 to 2019, especially in 2018. This demonstrates that the creation of software programs aimed at nursing care followed the evolution of computerized systems.⁽⁴⁸⁾

Implementing the NP in software programs is considered a strategy to favor the incorporation of this methodological instrument in health services, since it can provide support for the practice of Nursing Care Systematization (NCS), at all stages of the NP, providing information at the appropriate time for clinical decision-making, in addition to making the practice more agile and simplified.⁽⁶⁾

The main means for which the software programs were developed in this study were Desktop and then Mobile. These means facilitate the operationalization of the stages of the NP, and proved to be adequate, providing assistance planning in a reduced time, standardizing language in the records, reducing the physical space occupied by the records.⁽³⁸⁾

This study demonstrated that a greater number of productions found for the final sample were concentrated in the Graduate Nursing Programs in Brazil, demonstrating that the development of software programs offers the possibility of progress in the scientific area, consequently theses and dissertations are considered important sources in this line of research.⁽⁴⁹⁾ For this reason, most of the selected studies were found in the CAPES repository, which deals with master's and PhD publications.

Still on the types of study, a greater number of master dissertations were observed when compared to PhD theses, this is due to the fact that Brazil has 57 Graduate Nursing programs, 37 master's and PhD degrees, 2 professional master's and PhD degrees, 16 academic master's degrees, 22 professional master's degrees and 2 PhD degrees. Regarding the courses, there are 117, 52 master's degrees, 39 PhDs, 24 professional master's degrees and 2 professional PhDs.⁽⁵⁰⁾

Regarding the methodologies of the analyzed researches, there was an emphasis on the studies of technological production with the objective of software development. The methodological design of technological production is the product of applied and experimental research, which aims to generate knowledge associated with practical applicability, resulting in new technologies.⁽⁵¹⁾

Brazil, predominantly in the south and southeast, stands out for the number of publications on the construction and applicability of the software programs selected in the study, demonstrating growth and dissemination of the commitment of Brazilian nursing.⁽⁷⁾ However, it is noteworthy that the finding means that Brazilians describe more the methodological stages of software development, not meaning a predominance of the production of software technologies.⁽⁵²⁾

When analyzing the selected studies, the following Nursing Classification Systems stood out: NANDA-I, NOC, NIC and ICNP, in the production of software programs. These systems qualify the NP, enable the unification of a language related to clinical nursing care, facilitating the sharing of information in the fields of nursing practice and records.⁽¹⁴⁾

The NANDA-I taxonomy facilitates the incorporation of the ND stage organized into domains and classes, using a multiaxial structure for diagnostic concepts, serving as a systematic guide that presents defining characteristics and related factors of each ND. ICNP is also used in the ND stage, and in the nursing outcomes (NO) stage, nursing interventions (NI), aiming to homogenize existing vocabularies and terminologies that contribute to nursing practice.⁽⁵³⁻⁵⁴⁾

The NOC taxonomy contains expected results for NANDA nursing diagnoses, with the objective of measuring the development of these standardized results for the evaluation of health care and the NIC aims to build a standardized language for the development of actions to be performed by the nursing team with regard to the treatments and conducts provided.⁽⁵⁵⁻⁵⁶⁾

In this context, communication technologies in nursing, such as taxonomies, have been used as support for the development of NP, based on the logic of data, information and knowledge for decision-making in nursing care, integrating its stages.⁽⁵⁷⁾

Nursing Theories also establish scientific bases for nursing care, addressing the theoretical phenomena that constitute a domain of interest in the practice of the profession. They describe key ideas of the essence of nursing, events, people or objects, which are interrelated, with the main objective of defining, characterizing and understanding the nurse-patient interaction, taking into account all intrinsic and extrinsic factors.⁽⁵⁸⁾

Wanda Horta's Theory of Basic Human Needs, which was the most addressed in the studies, consists of holistic principles, which are interrelated with the environment and the person. In which biological, psychosocial and psycho-spiritual needs are guided, according to this theory, if it is healthy and

disease is avoided if the needs are fully met.⁽⁵⁹⁾ The software programs that addressed nursing theories articulated the stages of the system to basic human needs.

It is of paramount importance that the concepts of nursing theories are articulated to clinical practice; however, it was found that most of the selected studies did not cover these theories, and thus there is a need to encourage the development of these technologies in an associated way that address the care and management dimension of nursing, and measure/describe the impact of the nursing process.⁽⁷⁾

It is possible to attribute the non-use of theories to some complex factors, such as: the fact that nursing throughout the historical process describes its procedures based on the experience of clinical practice, lacking evidence-based practice, and it was only in the 1950s and 1960s that there was a greater dedication to reflect more deeply on the profession, its object of work and the theoretical framework for the domain of care, when, then, the nursing theories themselves began to be elaborated, consequently, consolidating themselves as a science in the health area.⁽⁶⁰⁾ Or also, because theories comprise complex and multifaceted phenomena, which may represent subjectivity of interpretation on the part of developers, making it difficult to interface theory with software programs.

In addition, the Federal Council of Nursing states that the NP must be supported by a theoretical support that guides its stages. Since nursing theories represent one of the elements that make up the specific language of the profession and assist nurses in obtaining data related to the patient's needs, they are strictly necessary.⁽²⁾

It was observed that the software programs addressed in the study were mainly aimed at the medium and high levels of complexity, in ICUs or hospitalization units of medical clinic, whose largest target audiences were neonates and adults. This fact may be due to the fact that approximately one quarter of hospitalizations performed in SUS refer to delivery, pregnancy and puerperium care, in addition to hospitalizations due to perinatal conditions.⁽⁶¹⁾ From this scenario, it is possible to analyze that increasingly technological advances enable the survival of newborns.⁽⁶²⁾

Software programs aimed at adults should be commonly applied, since the distribution of the population residing in the country with the age group of 20 to 59 years is the largest and also the second age group to which it is most interned, behind only the population over 60 years old.⁽⁶¹⁾

In addition, patients admitted to intensive care units are commonly exposed to a high risk of being affected by adverse events due to the use of vasopressors, the high number of invasive interventions, due to the serious state of health, so monitoring care outcomes becomes even more necessary in sectors such as ICUs.⁽⁶³⁾

It was noticed, through these studies, that the health area has ensured an accelerated process of transformation and technological innovation in recent times, enabling considerable changes in the provision of care. Health informatics in the use of software is an articulation of concepts and ways of managing information, thus subsidizing health care.⁽⁶⁴⁾

In general, all studies highlighted the potential of using software programs in care practice, to standardize records, favoring the objectivity of clinical data, brought support for decision making, brings agility in developing and documenting NCS, generates indicators and facilitates the execution and accuracy of evidence-based NP.⁽¹⁹⁾ Only 2 studies reported difficulty in handling the software programs, which was solved after training.

In fact, nurses demand many bureaucratic activities, for this reason, informatics becomes an essential ally when compared to manual processes, as it is able to optimize time during management activities, as well as in care practice, which, with the articulation of software programs, in addition to improving them, improves care.⁽⁷⁾

As limitations, it should be noted that the scoping review included only studies that were available in full, which may limit the inclusion of some relevant research on the subject.

CONCLUSION

This study allowed mapping the software programs available to operationalize the nursing process, and may encourage the development of new technologies to promote technological innovation in nursing, as well as disseminate its use in various health services.

After analyzing the profile of the proposed software programs, there was a need to build new systems aimed at the target audience of the older adults and adolescents, in addition to the gap in the incorporation of nursing theories in some software programs. It is imperative to recognize the importance of these theories in the context of the nursing process, which play a fundamental role in strengthening the

scientific and philosophical basis that guides the clinical practice of the profession. The construction of systems that incorporate theories, or innovation of existing systems, is essential to obtain more grounded software programs in the nursing area. Additional research is suggested to provide more robust data on the implementation and impact of these software programs on the nursing process.

CONTRIBUTIONS

Contributed to the conception or design of the study/research: Nascimento RCA, Aquino BCOS, Feijão AR. Contributed to data collection: Nascimento RCA, Aquino BCOS, Oliveira DN. Contributed to the analysis and/or interpretation of data: Nascimento RCA, Aquino BCOS, Oliveira DN, Feijão AR. Contributed to article writing or critical review: Nascimento RCA, Aquino BCOS, Oliveira DN, Feijão AR. Final approval of the version to be published: Nascimento RCA, Aquino BCOS, Oliveira DN, Feijão AR.

REFERENCES

1. Adamy EK, Zocche DAA, Almeida MA. Contribuição do processo de enfermagem para construção identitária dos profissionais de enfermagem. *Revista Gaúcha de Enfer.* [Internet]. 2020;41(spe):e20190143. doi: <https://doi.org/10.1590/1983-1447.2020.20190143>.
2. Conselho Federal de Enfermagem. Resolução nº 272, de 27 de agosto de 2002. Dispõe sobre a Sistematização da Assistência de Enfermagem nas instituições de saúde brasileiras [Internet]. Brasília: Conselho Federal de Enfermagem; 2002.
3. Boas MAAV, Caballero SPOS, Gryscek ALFPL, Fracolli LA, Padoveze MC. Análise crítica do potencial de utilização das nomenclaturas de enfermagem na atenção primária à saúde. *Enferm Foco.* [Internet]. 2019;10(7):50-6. doi: <https://doi.org/10.21675/2357-707X.2019.v10.n7.2471>.
4. Cardoso MLBN, Santos SVG, Silva VSS, Lucena LRC, Vieira KVNN, Gomes GG. Sistematização da assistência de enfermagem – obstáculos para sua implementação. *BJHR.* [Internet]. 2021;4(3):11149-56. Available from: <https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/30129/pdf>.
5. Barbosa LGC, Moreira AGM, Ferraz RM. A tecnologia aplicada para a sistematização de assistência em enfermagem para pacientes com doença renal crônica. *Rev Cienc Contemp.* [Internet]. 2023;1(4):18-26. Available from: <https://publicacoes.uniesp.edu.br/index.php/6/article/view/44>.
6. Domingos CS, Boscarol GT, Souza CC, Tannure MC, Chianca TMC, Salgado PO. Adaptação de software com o processo de enfermagem para unidades de internação. *Rev Bras Enferm.* [Internet]. 2019;72(2):418-25. doi: <https://doi.org/10.1590/0034-7167-2018-0579>.
7. Amaral CS, Azevedo S, Caldas WL, Souza EN. Avaliação do registro eletrônico de diagnósticos e intervenções de enfermagem em sistema informatizado. *Rev Enferm UFSM.* [Internet]. 2021;11:1-16. doi: <https://doi.org/10.5902/2179769263678>.
8. Biffi P. Satisfação de enfermeiros com a utilização de um software para registro do processo de enfermagem [monografia]. Chapecó: Universidade Federal da Fronteira Sul; 2021. 55 p.
9. The Joanna Briggs Institute. The Joanna Briggs Institute Reviewers' Manual 2015: methodology for JBI scoping reviews. Adelaide: The Joanna Briggs Institute; 2015.
10. Tricco AC, Lillie E, Zarin W, O'Brien KcK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med.* [Internet]. 2018;2169(7):467-73. doi: <https://doi.org/10.7326/M18-0850>.
11. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International J Soc Res Methodol.* [Internet]. 2005;8(1):19-32. doi: <https://doi.org/10.1080/1364557032000119616>.

12. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implement Sci.* [Internet]. 2010; 5(69):1-9. Available from: <https://implementationscience.biomedcentral.com/articles/10.1186/1748-5908-5-69>.
13. Moura TB. Criação de software para sistematização da assistência de enfermagem em um hospital geral de um município baiano [dissertação]. Santana: Universidade Estadual de Feira de Santana; 2015. 82 p.
14. Silva KL. Desenvolvimento de um Software para Identificar Diagnósticos e Intervenções de Enfermagem [tese]. Ribeirão Preto: Universidade de São Paulo; 2014. 261 p.
15. Santos SV. Neonatal SKIN SAFE: Aplicativo móvel de apoio à decisão de enfermeiros na prevenção de lesões de pele em recém-nascidos internados [tese]. Florianópolis: Universidade Federal de Santa Catarina; 2019. 337p.
16. Santana JS, Nóbrega MML, Oliveira JS, Soares MJGO. Software para consulta de enfermagem aos hipertensos da Estratégia de Saúde da Família. *Rev Bras Enferm.* [Internet]. 2018;71(5):2543-46. doi: <https://doi.org/10.1590/0034-7167-2017-0174>.
17. Menezes EG. Desenvolvimento de um software de sistematização da assistência de enfermagem em doenças tropicais [dissertação]. Manaus: Universidade Estadual do Pará; 2013. 96 p.
18. Silva KL, Évora YDM, Cintra CSJ. Desenvolvimento de software para apoiar a tomada de decisão na seleção de diagnósticos e intervenções de enfermagem para crianças e adolescentes. *Rev Latino-Am Enfermagem.* [Internet]. 2015;23(5):927-935. doi: <https://doi.org/10.1590/0104-1169.0302.2633>.
19. Sperandio DC. A Tecnologia Computacional Móvel na Sistematização da Assistência de Enfermagem: Avaliação de um Software-protótipo [tese]. Ribeirão Preto: Universidade de São Paulo; 2008. 144 p.
20. Rosa R. Sistematização da assistência de enfermagem em unidade neonatal: desenvolvimento de um software-protótipo [dissertação]. Florianópolis: Universidade Federal de Santa Catarina; 2016. 170 p.
21. Silva Júnior MG. INFOSAE: uma estratégia para implementar o processo de Enfermagem [dissertação]. Belém: Universidade Federal do Pará; 2015. 100 p.
22. Schwengber AI. Processo de enfermagem: instrumento para o enfermeiro administrar o trabalho e liderar a equipe de enfermagem [dissertação]. Rio Grande: Universidade Federal do Rio Grande; 2008. 97p.
23. Araújo JL. Aplicativo sobre processo de enfermagem em uma unidade de terapia intensiva neonatal [dissertação]. Vitória: Universidade Federal do Espírito Santo; 2018. 186 p.
24. Guitierrez BS. Um protótipo para melhoria da qualidade na assistência de enfermagem [dissertação]. São Paulo: Universidade Paulista; 2013. 69 p.
25. Queiroz PES. Desenvolvimento de aplicativo para auxílio no tratamento de feridas associado ao processo de enfermagem [dissertação]. Salvador: Escola Bahiana de Medicina e Saúde Pública; 2018. 57 p.
26. Mello GRD. Sepsiscare: Aplicativo móvel para o cuidado de enfermagem a pacientes com sepse em unidade de terapia intensiva [dissertação]. Florianópolis: Universidade Federal de Santa Catarina; 2017. 177 p.
27. Lima L.M. Registro de enfermagem em unidade de terapia intensiva neonatal: proposta de um software protótipo [dissertação]. João Pessoa: Universidade Federal da Paraíba; 2012. 111 p.

28. Sperandio DJ. Sistematização da assistência de enfermagem: proposta de um software - protótipo [dissertação]. Ribeirão Preto: Universidade de São Paulo; 2002. 75 p.
29. 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; 2008. 159 p.
30. Carita EC, Nini RA, Mello AS. Sistema de auxílio aos diagnósticos de enfermagem para vítimas de trauma no atendimento avançado pré-hospitalar móvel utilizando as Taxonomias NANDA e NIC. *J. Health Inform.* [Internet]. 2010;2(4):87-94. Available from: <https://jhi.sbis.org.br/index.php/jhi-sbis/article/view/108>.
31. Rezende LCM, Santos SR, Medeiros AL. Avaliação de um protótipo para Sistematização da Assistência de Enfermagem em dispositivo móvel. *Rev Latino-Am Enfermagem.* [Internet]. 2016; 24(2714): 1-9. doi: <https://doi.org/10.1590/1518-8345.0898.2714>.
32. Staub MM, War HG, Paans W. An Internationally Consented Standard for NursingProcess- Clinical Decision Support Systems inElectronic Health Records. [Internet]. 2016;34(11): 493-502. doi: <https://doi.org/10.1097/CIN.0000000000000277>.
33. Paese F, Sasso GTM, Colla GW. Metodologia de estruturação do Processo de Enfermagem Informatizado para as Unidades de Emergência. *Rev Bras Enferm.* [Internet]. 2018;71(3):1079-84. doi: <https://doi.org/10.1590/0034-7167-2016-0619>.
34. Lima JJ, Vieira LG, Nunes MM. Computerized nursing process: development of a mobile technology for use with neonates. *Rev Bras Enferm.* [Internet]. 2018;71(Suppl 3):1273-80. doi: <https://doi.org/10.1590/0034-7167-2017-0267>.
35. Veríssimo RCSS, Marin HF. Protótipo de sistema de documentação em enfermagem no puerpério. *Acta Paul Enferm.* [Internet]. 2013; 26(2):108-15. doi: <https://doi.org/10.1590/S0103-21002013000200002>.
36. Lima APS, Chianca TCM., Tannure MC. Assessment of nursing care using indicators generated by software. *Rev. Latino-Am. Enfermagem.* [Internet]. 2015;23(2):234-41. doi: <https://doi.org/10.1590/0104-1169.0177.2547>.
37. Menezes EG, Lopes Neto D. Software-protótipo para sistematização da assistência enfermagem em doenças tropicais e infectocontagiosas. *Enferm Foco.* [Internet] 2019;10 (5):65-72. Available from: <https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1097525>.
38. Rezende LCM. Sistematização da assistência de enfermagem em unidade de terapia intensiva neonatal: desenvolvimento de um protótipo para utilização em dispositivo móvel [dissertação]. João Pessoa: Universidade Federal da Paraíba; 2015. 104 p.
39. Crossetti MGO, Rodegher M, Ávila ML, Dias VLM. O uso do computador como ferramenta para implementação do processo de enfermagem. *Rev Bras Enferm.* [Internet]. 2002; 55(6):705-708. Available from: <https://www.scielo.br/pdf/reben/v55n6/v55n6a14.pdf>.
40. Tannure MC. Construção e avaliação da aplicabilidade de um software com o processo de enfermagem em uma unidade de terapia intensiva de adultos [tese]. Belo Horizonte: Universidade Federal de Minas Gerais. Escola de enfermagem; 2012. 327 p.
41. Martins MCT, Chianca TCM. Construção de um software com o com o Processo de Enfermagem em Terapia Intensiva. *J. Health Inform.* [Internet]. 2016; 8(4):119-125. Available from: <http://www.jhi-sbis.saude.ws/ojs-jhi/index.php/jhi-sbis/article/view/420>.

42. Sperandio DJ, Évora YDM. Planejamento da assistência de enfermagem: proposta de um software-protótipo. *Rev Latino-Am Enfermagem*. [Internet]. 2005;13(6):937-43. doi: <https://doi.org/10.1590/S0104-11692005000600004>.
43. Dalri MCB, Carvalho EC. Planejamento da assistência de enfermagem a pacientes portadores de queimadura utilizando um software: aplicação em quatro pacientes. *Rev Latino- Am Enfermagem*. [Internet]. 2002;10(6):787-93. doi: <https://doi.org/10.1590/S0104-11692002000600006>.
44. Soares FMM, Lopes VPS, Freitas LSI, Silva AC, Mesquita KKB, Andrade IRC, Freitas JG. Construction of application for systematization of nursing assistance to the cardiovascular patient. *Braz. J Surg Clin Res*. [Internet]. 2019;25(3):32-36. Available from: https://www.mastereditora.com.br/periodico/20190206_202847.pdf.
45. Peres HHC, Cruz DALM, Lima AFC, Gaidzinski RR, Ortiz DCF, Trindade MM, et al. Desenvolvimento de Sistema Eletrônico de Documentação Clínica de Enfermagem estruturado em diagnósticos, resultados e intervenções. *Rev Esc Enferm USP*. [Internet]. 2009;43(2):1149-55. doi: <https://doi.org/10.1590/S0080-62342009000600002>.
46. Silva KL, Évora YDM, Cintra CSJ. Desenvolvimento de software para apoiar a tomada de decisão na seleção de diagnósticos e intervenções de enfermagem para crianças e adolescentes. *Rev Latino-Am. Enfermagem*. [Internet]. 2015;23(5):927-35. doi: <https://doi.org/10.1590/0104-1169.0302.2633>.
47. Albuquerque EAY, Albuquerque GA, Souza LC, Santos SS, Rêgo YLS. Prontuário eletrônico do paciente em ambientes hospitalares e certificação de software em saúde: avanços que visam maior segurança dos dados médicos. *Rev Bras Inov Tecnol Saúde*. [Internet]. 2017; 7(2):1- 14. doi: <https://doi.org/10.18816/r-bits.v7i2.11074>.
48. Oliveira NB, Peres HHC. Qualidade da documentação do processo de enfermagem em sistemas de apoio à decisão clínica. *Rev Latino-Am Enfermagem*. [Internet]. 2021;29:e3426. doi: <http://dx.doi.org/10.1590/1518-8345.4510.3426>.
49. Reis JCC, Correia MDL, Botelho MTSL, Duran ECM. Produção do conhecimento em programa de pós-graduação em enfermagem. *Rev Enferm UFPE On line*. [Internet]. 2018; 12(11):3052-9. doi: <https://doi.org/10.5205/1981-8963-v12i11a236089p3052-3059-2018>.
50. Coordenação de Aperfeiçoamento de Pessoal de Nível Superior. Relatório de avaliação 2017-202 quadrienal 2021. Brasília: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior; 2021.
51. Motta EM, Pereira JRD. Estudo sobre indicadores de produção científica versus produção tecnológica na Universidade Estadual de Maringá. *Cad Prospecç*. [Internet]. 2019;12(4):795- 809. doi: <https://doi.org/10.9771/cp.v12i4.32767>.
52. Moreira ACA, Texeira FE, Araújo TL, Cavalcante TF, Silva MJ, Cruz ATCT. Desenvolvimento de software para o cuidado de enfermagem: revisão integrativa. *Rev Enferm UFPE On line*. [Internet]. 2016; 10(Supl. 6):4942-50. doi: <https://doi.org/10.5205/reuol.8200-71830-3-SM.1006sup201629>.
53. Herdman TH, Kamitsuru, S, Lopes, CT. Diagnósticos de enfermagem da NANDA-Internacional: definições e classificação 2021-2023. Porto Alegre: Artmed; 2021.
54. Garcia, TR. Classificação Internacional para a Prática de Enfermagem (CIPE): versão 2019. Porto alegre: Artmed; 2020.
55. Moorhead S, Swanson E, Johnson M, Maas M. *NOC - Classificação dos Resultados de Enfermagem*. 6. ed. São Paulo: GEN Guanabara Koogan; 2020.

56. Butcher H, Bulechek G, Dochterman J, Wagner C. NIC - Classificação das Intervenções de Enfermagem. 7. ed. São Paulo: GEN Guanabara Koogan; 2020.
57. Molina RCM, Fonseca EL, Waidman MAP, Marcon SS. A percepção da família sobre sua presença em uma Unidade de Terapia Intensiva Pediátrica e Neonatal. *Rev Esc Enferm USP*. [Internet]. 2009;43(3):630-8. doi: <https://doi.org/10.1590/S0080-62342009000300019>.
58. Walker LO, Avant KC. *Strategies for theory construction in nursing*. 6. ed. London: Person; 2019.
59. Neves RS. Sistematização da Assistência de Enfermagem em Unidade de Reabilitação segundo o Modelo Conceitual de Horta. *Rev Bras Enferm*. [Internet]. 2006;59(4):556-9. doi: <https://doi.org/10.1590/S0034-71672006000400016>.
60. Souza MF. Teorias de enfermagem: importância para a profissão. *Acta Paul Enferm*. [Internet]. 1988;1(3):63-5. Available from: <https://acta-ape.org/en/article/teorias-de-enfermagem-importancia-para-a-profissao/>.
61. Organização Pan-Americana da Saúde. *Indicadores básicos para a saúde no Brasil: conceitos e aplicações*. 2. ed. Brasília: Organização Pan-Americana da Saúde; 2008.
62. Santos SV, Ramos FRS, Costa R, Batalha LMC. Avaliação da qualidade de um software para prevenção de lesões de pele em recém-nascidos. *Rev Latino-Am. Enfermagem*. [Internet]. 2020; 28:e3352. doi: <https://doi.org/10.1590/1518-8345.3711.3352>.
63. Oliveira JC, Vasconcelos GM, Bispo LD, Magro MC, Fonseca CD, Pinheiro FG, et al. Preditores de mortalidade e tempo médio de sobrevivência dos pacientes críticos. *Acta Paul Enferm*. 2023;36:eAPE01192. doi: <http://dx.doi.org/10.37689/acta-ape/2023AO01192>.
64. Rodriguez EOL, Guanilo MEE, Fernandes LM, Candundo. *Informática em enfermagem: facilitador na comunicação e apoio para a prática*. *Invest Educ Enferm*. [Internet]. 2008;26(2): 144-9. Available from: http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0120-53072008000300014.

Conflicts of interest: Não
Submission: 2023/05/10
Revised: 2024/02/27
Accepted: 2024/04/03
Publication: 2024/05/07

Editor in Chief or Scientific: José Wicto Pereira Borges
Associate Editor: Raquel Sampaio Florêncio

Authors retain copyright and grant the Revista de Enfermagem da UFPI the right of first publication, with the work simultaneously licensed under the Creative Commons Attribution BY 4.0 License, which allows sharing the work with acknowledgment of authorship and initial publication in this journal.