REVISIONES

The application of computerized nursing process: integrative review

A aplicação do processo de enfermagem informatizado: revisão integrativa
La aplicación del proceso informático de enfermería: revisión integradora

Camila Santana Domingos [1]
Gabriela Tavares Boscarol [2]
Lídia Miranda Brinati [3]
Alessandro Custódio Dias [4]
Cristiane Chaves de Souza [5]
Patrícia de Oliveira Salgado [5]

[1] Nurse. Specialist. Master student. Higher-Level Technician of the Federal University of Viçosa. Viçosa, Brazil.
[2] Student of the undergraduate Nursing course. Federal University of Viçosa. Viçosa, Brazil.
[3] Nurse. Master student. Federal University of Viçosa. Viçosa, Brazil.
[4] Nurse. Specialist. Teixeiras City Hall. Viçosa, Brazil..
[5] Nurse. PhD. Adjunct Professor. Federal University of Viçosa. Viçosa, Brazil.

E-mail: camilasantanadomingos@gmail.com

ABSTRACT:
Objective: To identify in the literature evidences about the nursing process (NP) applied to softwares.
Method: Integrative review, search performed in PubMed, LILACS and CINAHL databases and reverse search, from August 28 to September 9, 2016. The descriptors used were nursing, nursing process, hospital information systems, medical informatics, medical informatics application, public health informatics, and informatics in nursing. The sample consisted of 23 articles.
Results: There was an increase in productions from 2000 onwards; most of the publications originated in Brazil and were characterized as descriptive studies. There were two categories of analysis: development and use of softwares. Most studies contemplated all stages of the NP, two cite the theoretical reference and three use the system for the assistance and management dimensions. The taxonomies used were the ICNP, NANDA, NIC, NOC.
Conclusion: The use of softwares with NP strengthens evidence-based practice and consolidates nursing as a science.
.
Key-words: Nursing; Nursing Process; Nursing Informatics; Software.

RESUMO:
Objetivo: Identificar na literatura evidências sobre o processo de enfermagem (PE) aplicado à softwares.

Metodologia: Revisão integrativa, busca realizada nas bases de dados PubMed, LILACS e CINAHL e busca reversa, no período de 28 de agosto a 09 de setembro de 2016. Os descritores foram enfermagem, processo de enfermagem, sistemas de informação hospitalar, informática médica, aplicação de informática médica, informática em saúde pública, e informática em enfermagem. Amostra composta por 23 artigos.

Resultados: Houve aumento nas produções a partir de 2000, a maioria das publicações originada do Brasil e caracterizados por estudos descritivos. Evidenciou-se duas categorias de análise: desenvolvimento e utilização de softwares. A maioria contemplava todas as etapas do PE, dois citam o referencial teórico e três utilizam o sistema para as dimensões assistencial e gerencial. As taxonomias utilizadas foram a CIPE, NANDA, NIC, NOC.

Conclusão: o uso de softwares com o PE fortalece a prática baseada em evidência e consolida a enfermagem como ciência.

Palavras-chaves: Enfermagem; Processo de Enfermagem; Informática em Enfermagem; Software.

RESUMEN:

Objetivo: Identificar en la literatura la evidencia del proceso de enfermería (PE) que se aplica al software.

Metodología: Una revisión integradora, la búsqueda se realizó en las bases de datos PubMed, Lilacs y CINAHL y búsqueda inversa en el período de 28 de agosto al 09 de septiembre de 2016. Se utilizaron los descriptores enfermería, proceso de enfermería, sistemas de información en hospital, informática médica, aplicaciones de informática médica, informática en salud pública e informática aplicada a la enfermería. Muestra de 23 artículos.

Resultados: Hubo un aumento en la producción a partir de 2000, la mayor parte se originó en Brasil, se caracterizaron por estudios descriptivos. Nos mostraron dos categorías de análisis: el desarrollo y uso del software. La mayoría de las publicaciones contemplan todas las etapas del PE, dos mencionan la teórica y tres utilizan el sistema para las dimensiones de atención y gestión. Las taxonomías utilizadas fueron CIPE, NANDA, NIC, NOC.

Conclusión: El uso de software con el PE fortalece la práctica basada en la evidencia y consolida la enfermería como ciencia.

Palabras clave: Enfermería; Processo de Enfermería; informática aplicada a la enfermería; Software.

INTRODUCTION

Care is the essence of the nursing work and the management of this care is one of the most important functions of this professional. The Systematization of Nursing Assistance (SNA) arises to organize and direct nursing care, increasing the reliability of the activities performed by the nurse[1].

The SNA organizes the professional work regarding methods, personnel and instruments, making possible the operationalization of the Nursing Process (NP). The NP is organized in five interrelated, interdependent and recurrent stages, such as the collection of nursing data or nursing history, nursing diagnosis, nursing planning, implementation and nursing evaluation. Nurses are responsible for the leadership in the execution and evaluation of the Nursing Process, in order to achieve the expected nursing outcomes, being the nursing diagnosis and prescription of the actions to be performed their exclusive responsibility[2].

The NP improves the quality of care provided by enabling nurses to systematize their interventions in a clear and organized way, focused on the needs of clients[3]. With the NP, the continuity of information is guaranteed, allowing its effectiveness to be evaluated and modified according to the results of the client's recovery, as well as to support nursing management[4].

The implementation of the NP in health services has gained strength from the adoption of information technology (IT) in health management processes through computerized

systems[1]. However, in most health institutions in Brazil, manual annotation systems are still used in medical records, making records and storage of patient information ineffective. The reality consists of inconsistent, illegible annotations that are difficult to understand, and there is no systematization of information[5].

Nursing information systems appear in this scenario as mechanisms for collecting, processing, analyzing and transmitting the necessary information allowing the planning, organization, operationalization and evaluation of health services[6]. Thus, information technology has been used as a way to improve clinical health records and support the development of computerized NP, integrating a logical structure of data, information and knowledge for nursing care decision-making[7].

In nursing, advances in informatics also aim to increase the time available for the professional to carry out the activities related to care, allowing it to be more humanized[8]. However, the professional must not only be limited to the use of computers, but must use these technologies, integrating computer science, information and nursing in order to expand and diversify the tools for practice, teaching and research, thus strengthening the NP[6].

The implementation of the computerized NP becomes a necessary challenge, since it allows the documentation improvement and diagnostic accuracy, offering a complete and systematized care. Thus, it is necessary to know what has been produced in the literature regarding the use of NP applied to software.

Thus, the objective of this study was to identify in the literature the evidence on the use of nursing process applied to softwares.

METHODOLOGY

This is a review of the integrative type, which consists in a broad analysis of the literature, aiming at understanding the subject studied, being able to identify gaps, deepen knowledge and foster evidence-based practice[9].

This study involved six stages as described by Mendes, Silveira and Galvão (2008). These included identification of the theme and selection of the research question, establishment of inclusion and exclusion criteria of studies, definition of information to be extracted, evaluation of the included studies, interpretation of results and synthesis of the knowledge.

The guiding question was established according to the PICO strategy (P = Patient or Problem, I = Intervention, C = Comparison, O = Outcomes). The nursing process corresponded to the P; the use of softwares to I; and scientific evidences to O. Thus, the guiding question was: "What is the scientific evidence about the use of the nursing process applied to softwares?"[10].

The literature review was conducted online from August 28 to September 9, 2016, in the *US National Library of Medicine databases, National Institute of Health* (PubMed), Latin American and Caribbean Literature in Health Sciences (LILACS), *Cumulative Index to Nursing and Allied Health Literature* (CINAHL). Repeated articles among the databases were included in PubMed. The search was performed using the controlled descriptors contained in the Health Science Descriptors (DeCS) of the Virtual Health Library (VHL): *"nursing", "nursing process", "hospital information systems", "medical*
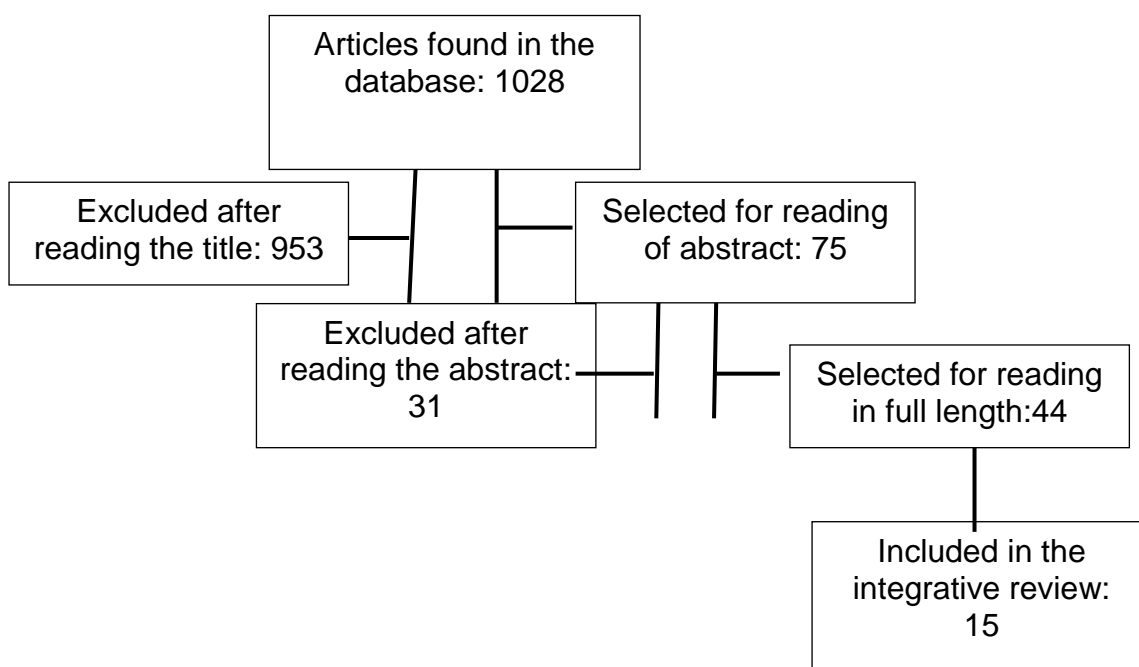
informatics", "medical informatics application", "public health informatics", and " informatics in nursing ". These same descriptors were used to search in the international databases in the English language. The Boolean operator *and* was used for the combination of descriptors (Table 1).

Table 1 - Systematization of the electronic search in PubMed, LILACS and CINAHL databases

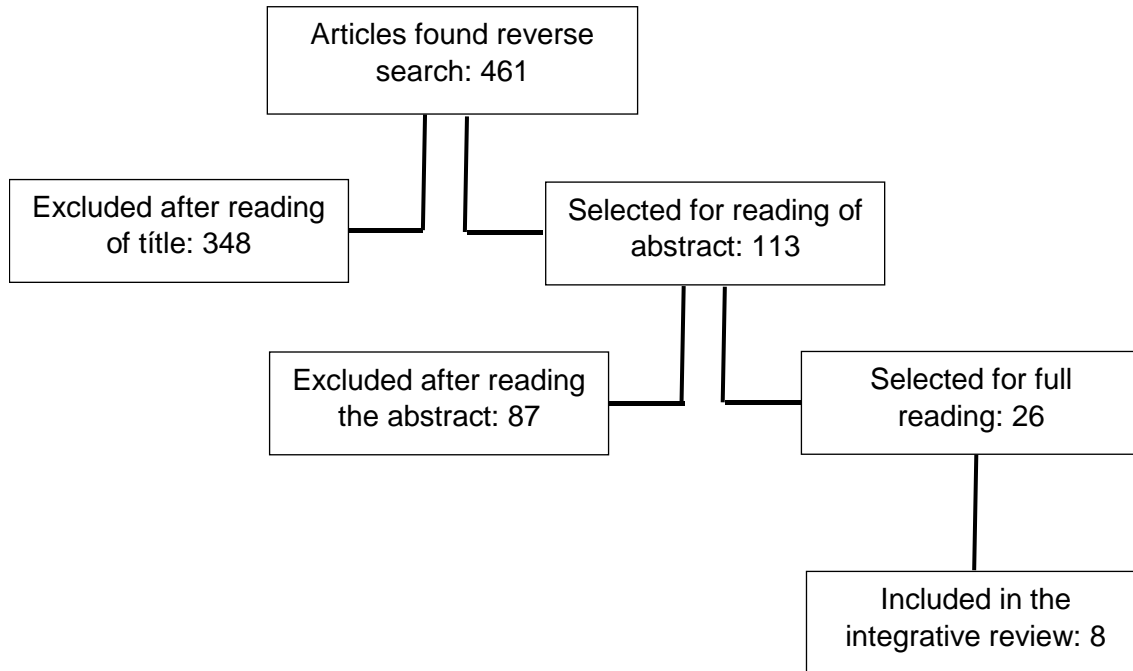| Descriptors		Pubmed	Lilacs	Cinahl
"nursing"*and* "nursing process"	*and* "hospital information systems"	119	1	4
	and "medical informatics"	370	6	1
	and "medical informatics application"	318	1	1
	and "public health informatics"	17	0	0
	and "informatics in nursing"	161	13	16
Total		985	21	22

The inclusion criteria consisted of full articles available free of charge on the internet that addressed the application of the nursing process with softwares, published in Portuguese, English or Spanish until September 09, 2016. The exclusion criteria were works in other formats such as theses and dissertations and articles that did not answer the research question. The search was carried out without time limitation.

The titles and abstracts of the articles were read. After verifying the pertinence to the theme, the search was made and the articles were read in full length. Figure 1 describes the path taken in identifying and selecting the articles that composed the study sample.

Figure 1 - Flowchart of the selection process of literature in the PubMed, LILACS and CINAHL databases.

During the reading of the 44 selected articles in full length we noted the citation of works that had not been contemplated in the initial search. Thus we adopted the use of "reverse search" in the references, aiming to seize as much as possible the "state of the art" of the studied theme (figure 2).

Figure 2 - Flowchart of the selection process of literature in reverse search.

All the study selection stages were peer reviewed, and the final sample consisted of 23 articles. To characterize the selected studies, an adapted data collection instrument was used gathering information such as title, periodical, authors, country where the study was conducted, language, year of publication, descriptors used, objectives, source, type of study, design, sample, interventions performed, duration of the study, data analysis, results, conclusions, recommendations and limitations[11]. The data were analyzed according to the contents presented by the articles, using descriptive statistics. The selected articles were evaluated for the level of evidence[12]. Regarding the ethical aspects of the study, the authorship of all articles studied was respected.

RESULTS

The sample of this review consisted of 23 studies published between 1992 and 2013, of which 15 (65.2%) were located in the database search and eight (34.8%) in the reverse search. Of the total, two (8.7%) were published in the last five years. Seventeen (73.9%) articles were published between 2000 and 2011, and four (17.4%) were published in the 1990s.

Among the articles that constituted the sample, 12 (52.2%) were published in Portuguese and 11 (47.8%) in English. Most publications (11-47.8%) originated in Brazil, followed by six (26%) from the United States, two (8.6%) from Korea, one (4.4%) from Germany, one (4.4%) from Portugal, one (4.4%) from Taiwan and one (4.4%) from Greece.

Among the 23 articles, nine (39.1%) were descriptive, eight (34.7%) were methodological studies, three (13%) were reports of experience, one (4.4%) was about convergent care, one (4.4%) was a randomized clinical trial, and one (4.4%) was a quasi-experimental study. Regarding the level of evidence, one article (4.4%) presented level of evidence II, one (4.4%) had level of evidence III, nine (39.1%) had level of evidence VI and 12 (55.1%) had a design not classified by the pyramid of evidence, and it was not possible to classify them. Table 2 lists the articles that describe the development of softwares, presenting the authors/year of publication, objective, design, level of evidence and results of the studies.

Table 2 - Result of the search for articles on development of softwares published between 1992 and 2013.

Author/Year Publication	Objective/design	Level of evidence	Results
Cho, Park, 2003	To describe three phases of the conception and evaluation of a system of electronic nursing registration based on terminologies. Descriptive study.	VI	The analysis of the records of nursing crossed with the ICNP was accomplished, and narrative standards were found with the later development of an electronic nursing registration system.
Schrader, Marx, Balint, 1995	To develop a referral system to collect nursing classifications and standards and make it available. Descriptive study.	VI	Selecting a specific record is facilitated by a hierarchical browser. The browser uses the data representing the taxonomies of the different classifications.
Campbel, Stoupa, Warren, 1991	To design a program for the collection of nursing history, problem tracking and documentation to organize the use of hospitalization time during the clinical check-in of the patient. Quase-experimental study.	III	The interaction driver assists the nurse with time spent with tracking problems, allows data recording and nursing interventions. Nursing problems are placed on problem lists within the computerized registry.
Malucelli, Otemaier, Bonnet, Cubas, Garcia, 2010	To describe the methodological steps and results of the development of the referred information system. Descriptive study.	VI	Development of the system with rapid access to information, diagnoses, interventions and nursing outcomes, reports and relevant statistics to obtain epidemiological information.

Santos, 2009	To develop an information system with application in the assistance and management of the nursing service in the Medical Clinic of the University Hospital Lauro Wanderley. Descriptive study.	VI	In the care area, the nurse can visualize the patient's history, elaborate the plan of care and follow their clinical evolution. The management area follows the hospital indicators, the patient classification system, among others.
Dal Sasso et al, 2012	To perform the articulation of data and information of the Computerized Nursing Process according to ICNP® version 1.0. Methodological study.	-	The first and second steps addressed ISO 18.104 and ICNP® version 1.0. The third stage was the presentation of the current structure of the computerized NP. The 4th and 5th stages addressed the use of Nursing data, by the clients in the scenarios of the Intensive Care Units.
Veríssimo, Marin, 2013	To develop a prototype of documentation system in nursing in the puerperium. Methodological study.	-	Nursing diagnoses and planning are formulated based on ICNP® version 1.0. The system offers the functions of description, generate evolution and reports.
Keenan, Yakel, 2005	It reports a pilot care plan for possible integration into an electronic health record. Methodological study.	-	During four months, 12 nurses assessed the navigability of the software, using NANDA diagnostics, NOC outcomes, and NIC interventions.
Sperandio, Évora, 2005	To develop a software for data collection and nursing prescription. Methodological study.	-	The NP according to Wanda Horta and interventions described by Carpenito. The activities took place in three specific stages: planning, analysis and definition of requirements and revision.
Peres et al, 2009	To develop an electronic system for nursing documentation for clinical and surgical patients. Methodological study.	-	*PROCEnf-USP* allows the user to make clinical decisions, supporting the diagnostic judgments, expected results and nursing interventions.
Pinto, 2011	To develop and implement a clinical nursing record system	-	Creation of eight modules: periodic nursing consultation based on ICNP, patient

	at a day care center for the elderly. Methodological study.		reference, general data, therapy, evolution, care plan, general medical consultation schedule and statistics.
Kuchler, Alvarez, Haertel, 2006	To show the work developed at the Santa Catarina Hospital - Blumenau. Descriptive study.	VI	The NCS (Nursing Care Systematization) module is composed of: daily assessment, diagnosis, collaborative problems, interventions and comments. Based on Dorothea Orem's Theory of Self-Care, the NANDA taxonomy and Carpenito. Three of the eight hospital units use the program.
Hao et al, 2006	To integrate the NANDA, NIC, and ICNP taxonomy and coding into a relational database for the exchange of different electronic registration patterns. Descriptive study.	VI	In the pilot structure, it includes nursing evaluation, nursing diagnosis, nursing plan and nursing record. The system will be built based on the pilot structure next year.

Table 3 lists the articles that describe the use of softwares, presenting the authors/year of publication, objective, design, level of evidence and results of the studies.

Table 3 - Result of the search for articles on use of softwares published between 1992 and 2013.

Author/Year Publication	Objective/design	Level of evidence	Results
Siders, Peterson, 1992	To identify and save nursing data in the database for clinical analysis. Descriptive study.	VI	Using the system, the nurse can produce a summary of an uncomplicated patient in 10 to 15 minutes and of a complex patient in 20 to 30 minutes. The function is used in 80% of all demands.
Saba, Feeg, 2005	To develop and evaluate the effectiveness of electronic graphics simulation using a bedside computer. Experience Report.	-	Assessments of care plans by students using the data-based system were significantly higher than those of students using the text-based system.
Dykes et al, 2007	To evaluate the feasibility of using wireless devices for data collection and	II	Overall satisfaction was significantly higher with electronic devices (mean rating: PDA-33.19, tablet PC-33.08,

	patient assessment information. Randomized clinical trial.		paper-32.74, p <.008).
Prophet, 1993	To develop and implement the diagnosis form INFORMMA (Information Network for Online Recovery and Medical Management). Experience Report.	-	The patient record form contains all the data relating to the history of problems, nursing diagnoses, and the status of the outcome of the patient.
Aquino, Lunardi Filho, 2004	Collectively building of a methodological instrument for the operationalization of the nursing process proposed. Convergent care study.	-	The goal reached was the care of all the patients who entered the unit, through the use of computerized nursing prescription (CNP), easily entering into the routine of the unit
Crossetti, Rodegheri, Ávila, Dias, 2003	To present the development of the prescription system of nursing interventions with a focus on diagnoses. Experience report.	-	The computerized system made possible the execution of computerized prescriptions based on the nursing diagnosis for all patients admitted to the Clinical Hospital, Porto Alegre, RS.
Cho, Park, 2006	To assess the integrity and expressiveness of the domain of the ICNP nursing data dictionary (NDD) through its application in a company electronic medical record (EMR) system at a tertiary hospital in Korea. Methodological study.	-	The nursing units involved were: medical, surgical, maternity, psychiatry, pediatrics, rehabilitation, anesthesia and dentistry. The average number of uses per sentence was 35.2. User interface issues were associated with nurses not having enough time to find expressions
Caritá, Nini, Melo, 2010	To develop a system to aid decision-making on nursing diagnoses in trauma victims in advanced pre-hospital mobile care considering NANDA and NIC taxonomies. Methodological study.	-	The qualitative evaluation of the students and the teacher made it possible to identify that the system was considered good by the evaluators, that is, it can be used, with very little limitation, however friendly and appropriate to meet the proposed objective.

Liaskos, Mantas, 2004	Developing a nursing documentation system based on the ICNP and evaluate its usability. Methodological study.	-	For the most part, the nurses expressed a positive attitude towards the tool developed. They found it innovative and interesting, useful and simple to use.
Oliveira, Barros, Oliveira, 2010	Definition of a software prototype to assist the nurses' tasks during the NCS, allowing their usability. Descriptive study.	VI	Several usability problems were identified, and corrected, making the prototype more consistent and more intuitive for the user. The result of the usability test was quite satisfactory. All measurements reached the target level average.

DISCUSSION

In the 1950s, with the heyday of nursing theories, the insertion of computers in the hospital area happened in parallel, and since then, nursing and computer science has become an area of knowledge. Currently, to implement the concepts of theories in clinical practice, nurses have sought to associate NP with the use of softwares[13,14].

Brazil stands out in the productions, more specifically, from the beginning of the XXI century onwards, considering the wide dissemination, growth and commitment of the Brazilian nursing to the success of the applicability of the NP[8]. The evaluation of the works found in this review made it possible to distinguish between two categories: studies describing the development of softwares and those that approach their use.

Development of the software

From the total of selected studies, 13 addressed the stages that involve the development of systems. Among the selected articles, only two mention the use of a theoretical reference as support for the system, precisely the Wanda Horta's Basic Human Needs Theory and Dorothea Orem's Self-Care Theory[15,16]. The Federal Nursing Council (FNC) Resolution 358 of 2009 established that the NP should be based on a theoretical support that guides all stages. 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[17].

A descriptive study[17] that analyzed the production of knowledge about nursing theories published in local journals between 1998 and 2007 found that out of a total of 3,757 abstracts, only 171 (4.6%) used nursing theories. It was observed that the scientific production using nursing theories has been growing since 2002, but the results found in the present review show that there is still a lack of studies on the development of softwares based on theoretical references.

Among the systems described in this study, eight contemplated all five stages of the NP[16,18,19,20,21,22,23,24]. In five studies, it was identified that the NP was used in a fragmented way, that is, not all stages were used, and the most absent stage was nursing evaluation[4,5,25,26,27]. Although the NP is divided into stages, these do not occur in isolation and linearly; rather, they are interrelated, interdependent, and recurrent.

Thus, incomplete softwares compromise the performance of NP in a full and effective way[2,28].

The most widely used taxonomy in the creation of the systems presented in the articles was the International Classification for Nursing Practice (ICNP), which was used in four studies[4,20,25,26], followed by the NANDA International (NANDA-I), the Classification of Nursing Interventions (NIC) and the Classification of Nursing Outcomes (NOC), used in two studies[18,21]. One study addressed the NANDA-I, the NIC, and the ICNP[23]. In four works, no reference to the use of nursing classifications was found in the information systems[19,22,24,27].

Classifications are a recent movement in nursing and have been inserted in the stages of the NP, generating uniform language, greater safety, efficiency and cost-benefit of nursing practice for the populations, reflecting the representation of nursing knowledge in the computational systems[6].

We believe that the largest number of studies found in this study on the development of softwares using it is due to the fact that this is a terminology that brings together, in a single structure, the diagnostics, interventions and results that can be computerized[29] facilitating their use. Furthermore, the International Council of Nurses (ICN) recommends its use in the care practice and its incorporation into softwares. This enables nurses to organize and develop logical thinking in the process of assisting clients, allowing them to establish a concrete relationship between clinical evaluations, diagnoses, interventions and nursing outcomes through computerized tools[6,30].

Other taxonomies used are the NANDA-I classification systems, used to improve the reliability, validity, and usability of nursing documentation. Especially if used in well-designed computerized documentation systems, they allow the consistent use of nursing assistance data to evaluate nursing care and inform decisions of clinical, managerial and political nature[21].

Eight studies[4,13,15,16,19,29,21,26] of the sample contemplated the assistance dimension through the nursing consultation with the application of the five stages of the nursing process. Only two studies described the use of the system for the purpose of care and management at the same time[22,26]. Regarding management, the studies covered the use for hospital indicators, patient classification system, nursing personnel sizing, frequency control, absenteeism rate, monthly service schedule, incidence rate of certain pathologies and accounting of the care provided.

Nurses spend a lot of time on bureaucratic activities, while the volume of information about the patient grows in the medical records. In this context, nursing informatics becomes relevant to the care and management of the work process, seeking the elaboration of systems able to both minimize the time spent on bureaucratic activities and maximize the time spent on care[22].

The papers highlight the potential of the experience of building the software[21,24], the opportunity for the articulation of researchers from different areas[21], as well as the effective participation of nurses demonstrating that the use of informatics applied to nursing demonstrates the versatility of skills that professionals are nowadays required to have[19,26]. The studies reported the motivation to systematize nursing care, with a longer time dedicated to care[16,22] due to the reduction of time spent filling out

documents and forms, reflecting the reduction of bureaucracy that hinders close and lasting contact of nurses with patients[15,22].

Only two articles addressed the limitations in the construction of the system. In a study about the development of a prototype of nursing documentation in the puerperium, it was pointed out that the proposed system did not have a standardized data collection at the bedside, nor was it characterized as a decision support system[20]. Another study carried out in Germany identified the delay to integrate nursing information systems into routine work due to lack of experience with the system and lack of knowledge of nurses in the preparation of individual care plans[24].

The daily record of care and management activities for the system to be used in its fullness was a recommendation found in one of the studies of the sample of this study[22]. Another study[19] emphasized the need for the systems to be updated and tested in professional practice. The authors[4] suggest extending the software developed for the use in intensive care units to the other scenarios of the professional practice. In this study, it is highlighted that the amplification of the use of the developed instrument can promote integration with different hospital information systems, thus allowing the construction of quality indicators for patient safety with subsequent development of studies to measure the main outcomes of nursing interventions.

Use of the software

This category consisted of 10 articles of the total sample. Studies[31,32] comparing the use of manual versus computerized nursing prescriptions found that overall satisfaction was significantly higher with electronic devices. In addition to eliminating manual documentation, computer-generated forms make it possible to execute computerized prescriptions based on nursing diagnosis, improving the review and recovery of associated clinical notes[33,34].

According to a study developed by Liaskos and Mantas (2004), nurses, for the most part, express a positive attitude towards the use of softwares for the application of the NP, considering them innovative, interesting, useful and simple to use. Researchers[35] found that by using the automated function, the nurse can produce a synthesis of the conditions of a patient who needs minimal care in 10 to 15 minutes, and for critical patients, in 20 to 30 minutes. For the authors Oliveira, Barros and Oliveira (2010) the ideal time to carry out systematization, in the opinion of these nurses, is between 10 to 30 minutes.

When submitting the development of the system to the Usability Test, the authors[36,37] found a quite satisfactory result; all items received indices 4 or 5, meaning a good or very good evaluation. As a result of the qualitative evaluation, it is possible to identify that the system was considered good by the evaluators, that is, it can be used with a small limitation, yet friendly and adequate to meet the proposed objective.

For Oliveira, Barros and Oliveira (2010) the development of the software allowed the validation of the interface by the users themselves during the construction of the system. Another advantage is the personalization, that is, the product is suitable for the operation of the institution. The use of Software Engineering and Usability techniques allowed the construction of a functional software with good quality of use, especially when the user is involved during the development process.

With the use, there was improvement in the reception of patients, making it possible to individualize the care to the patient[31,34], with reduced time for elaboration of nursing diagnoses, unification of language of the practice in nursing, becoming a differential in the attendance and being able to interfere positively in the rates of morbidity and mortality[37,38].

The authors[32,33,35] stated that access to evaluative content is reliable and valid in devices that are integrated into workflows with the implementation of automated nursing summary, and facilitates the filling of a nursing assessment database with the potential to support evidence-based practice and nursing research.

As a limitation, Dykes et al (2007) highlights the difficulty of finding published reports of randomized trials conducted to assess the efficacy of the use of portable devices by nurses for documentation of patient assessment in inpatient units.

As recommendations, the studies[31,38] stressed the need to create a tutorial to guide the use of the tool and that this must be further tested in other clinical settings. A careful evaluation before the insertion of the systems in the health service routine and/or for use as an educational tool[37,38,39] was also suggested. In addition, they emphasize that additional studies are necessary to evaluate the effectiveness of hand devices in relation to other outcomes and for use in different clinical settings and specifically for use by nurses who perform the patient evaluation at the medical center. The analysis of the selected works in the sample that describe the development and use of softwares showed their application in different scenarios. It was observed that only 11 papers[4,16,19,20,21,22,32,34,37,39,40] described the scenario where the software is used. Three studies[16,21,34] mentioned the use of the software throughout the hospital. One study[19] described the use of systems in basic health units. The system was used in Intensive Care Units in two studies[4,39], in hospitalization units in two studies[22,32], and one study addressed the use of the system in eight sectors, namely, the medical clinic, surgical clinic, maternity, psychiatry, pediatrics, rehabilitation, anesthesia and dentistry[40]. One study addressed the use in the maternity ward[20]. Finally, one study addressed the use of the system in traumatized victims, to be used in pre-hospital care[37]. The use of softwares applying the NP in secondary levels of health care was not observed.

The construction and use of softwares has direct implications in nursing. Besides the assistance dimension, the use of systems aids the management of care. The incorporation of information technology in nursing practice is a facilitator that must be stimulated based on scientific knowledge and training so that this technology become accessible to professionals and patients who need it.

CONCLUSION

The NCS is a methodology to guide the nursing care, being operationalized through the NP, grounding the evidence-based practice and consolidating nursing as a science.

In the present study, researches on the nursing process applied to softwares were identified, showing an increasing production of works from 2000 onwards, with emphasis on Brazilian productions. Among the selected papers, there were two categories of analysis: development and use of softwares.

In the category 'development of softwares', the importance of the theoretical basis of the NP, as well as the use of taxonomies for the use of a standardized language, was highlighted. Among the studies, eight described the five stages of the NP, two integrated the assistance and management dimension, noting that the use of both facilitates the reduction of bureaucracy and allows more time to be dedicated to the patients.

Regarding the use of the systems, it was verified that the electronic prescription of nursing has greater usability when compared to the manual process; and it is important to emphasize the clinical application of the systems for improvement.

There is a lack of studies on the development of systems based on nursing theories that address the nursing care and management dimensions and measure the impact of the computerized nursing process. In this sense, further research focusing on these issues is recommended with the objective to expand the use of softwares with the NP. The development of the present study highlights that the computerized nursing process generates positive effects on nursing care and has implications for practice as the use of software increases the satisfaction of professionals, reflecting in a greater time spent with direct care to patients. Thus, it is necessary to encourage the development of systems based on nursing theories, using standardized languages, expanding their use to other scenarios, and contemplating the three levels of care.

REFERENCES

1. Ribeiro JC, Ruoff AB, Baptista CLBM. Informatização da Sistematização da Assistência de Enfermagem: avanços na gestão do cuidado*. J. Health Inform. 2014 jul-set; 6 (3): 75-80.
2. CONSELHO FEDERAL DE ENFERMAGEM. Resolução nº. 358, de 15 de outubro de 2009. Dispõe sobre a Sistematização da Assistência de Enfermagem em ambientes, públicos ou privados, em que ocorre o cuidado profissional de Enfermagem, e dá outras providências. Brasília: COFEN. 2009 [citado em 15 out 2009]. Disponível em: http://www.cofen.gov.br/resoluo-cofen-3582009_4384.html.
3. Barra DCC, Dal Sasso GTM. Tecnologia móvel à beira do leito: processo de enfermagem informatizado em terapia intensiva a partir da CIPE 1.0. Texto Contexto Enferm, Florianópolis. 2010 jan-mar; 19(1): 54-63.
4. Dal Sasso GTM, Barra DCC, Paese F, Almeida SRW, Rios GC, MARINHOS MM, et al. Processo de Enfermagem Informatizado: metodologia para ssociação da Avaliação Clínica, Diagnósticos, Intervenções e Resultados. Rev Esc Enferm USP. 2013; 47 (1): 242-249.
5. Santos SR. Informática em enfermagem: desenvolvimento de software livre com aplicação assistencial e gerencial. Rev Esc Enferm USP. 2010; [citado em 10 out 2016] 44(2): 295-301. Disponível em: www.ee.usp.br/reeusp/
6. Melo EC, Enders BC. Construção de sistemas de informação para o processo de enfermagem: uma revisão integrativa. J. Health Inform. 2013 jan-mar; 5 (1): 23-9.
7. Sousa PAF, Dal Sasso GTM, Barra DCC. Contribuições Dos Registros Eletrônicos Para a Segurança Do Paciente Em Terapia Intensiva: Uma Revisão Integrativa. Texto e Contexto Enferm. Florianópolis. 2012 out-dez; 21 (4): 971-979.
8. Palomares MLE, Marques IR. Contribuições dos Sistemas Computacionais na Implantação da Sistematização Da Assistência De Enfermagem. J. Health Inform. 2010 jul-set; 2 (3): 78-82.

9. Mendes KDS, Silveira RCCP, Galvão CM. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. Texto Contexto Enferm. 2008;17(4):758-64.

10. Santos CMC, Pimenta CAM, Nobre MRC. A estratégia PICO para a construção da pergunta de pesquisa e busca de evidencias. Rev Latino-Am Enferm. 2007; 15(3):508-11.

11. Vasques CI, Rodrigues CC, Reis PED, Carvalho, EC. Nursingcare for hodgkin's lymphomapatientssubjecttochemotherapy: anintegrativereview. Online Braz J Nurs. 2008 [Citado em 28 ago 2016]. 7(1). Disponivel em: ttp://www. objnursing.uff.br//index.php/nursing/article/view/1416

12. Galvão CM. Níveis de evidências [editorial]. Acta Paul Enferm [Internet]. 2006; [citado em 16 out 2016] 19(2). Disponível em: http://www. scielo.br/pdf/ape/v19n2/a01v19n2.pdf

13. Marin HF, Cunha ICKO. Perspectivas atuais da Informática em Enfermagem. Rev Bras Enferm. 2006; 59 (3):354-7.

14. Chianca TCM, Tannure MC. A tecnologia como instrumento facilitador do cuidado integral de Enfermagem. Rev. Enfermagem Revista. 2014 mai-jun; 17 (2).

15. Sperandio DJ, Évora YDM. Planejamento da assistência de enfermagem: proposta de um software-protótipo. Rev Latino-am Enfermagem. 2005 nov-dez; 13 (6): 937-43.

16. Kuchler FF, Alvarez AG, Haertel LA. Elaboração de ferramenta informatizada que viabiliza a prática da sistematização da assistência de enfermagem, 2006.

17. Schaurich D, Crossetti MGO. Produção do conhecimento sobre teorias de enfermagem: análise de periódicos da área, 1998-2007. Esc Anna Nery Rev Enferm. 2010 jan-mar; 14 (1): 182-88.

18. Keenan G, Yakel E. Promoting Safe Nursing Care by Bringing Visibility to the Disciplinary Aspects of Interdisciplinary Care. 2005: 385.

19. Malucelli A, Otemaier KR, Bonnet M, Cubas MR, Garcia TR. Sistema de informação para apoio à Sistematização da Assistência de Enfermagem. Rev Bras Enferm, Brasília. 2010 jul-ago; 63 (4): 629-36.

20. Veríssimo RCSS, Marin HFM. Protótipo de sistema de documentação em enfermagem no puerpério. Acta Paul Enferm. 2013; 26 (2):108-15.

21. Peres HHC, Cruz DALM, Lima AFC, Gaidzinski RR, Diley DCF, Trindade MM, Tsukamoto R, et al. Desenvolvimento de Sistema Eletrônico de Documentação Clínica de Enfermagem estruturado em diagnósticos, resultados e intervenções. Rev Esc Enferm USP 2009; 43(Esp 2):1149-55.

22. Santos SR. Informática em Enfermagem: Desenvolvimento de Software Livre Com Aplicação Assistencial e Gerencial. Rev Esc Enferm USP. 2009; 44 (2): 295-301.

23. Hao AT, Hsu CY, Li-Fang H, Jian WS, Wu LB, Kao CC, Lu MS, Chang HK. Apply creative thinking of decision support in electrical nursing record. Stud Health Technol Inform. 2006;124:313-9.

24. Schrader U, Marx R, Balint R. CareBase: a reference base for nursing. Proc Annu Symp Comput Appl Med Care. 1995: 22-6.

25. Cho I, Park H. Development and evaluation of a terminology-based electronic nursing record system. Journal of Biomedical Informatics. 2003 out-dez; 36: 304–312.

26. Pinto N. Concepção, desenvolvimento e aplicação do sistema de registros clínicos de enfermagem "PRINCE". J. Health Inform. 2011 out-dez; 3 (4):146-52.

27. Campbell JR, Stoupa R, Warren JJ. Design and implementation of a rule based system for ambulatory nursing data management. Proc Annu Symp Comput Appl Med Care. 1991: 659-663.

28. Barra DCC, Dal Sasso GTM, Monticelli M. Processo de enfermagem informatizado em unidade de terapia intensiva: uma prática educativa com enfermeiros. Rev. Eletr. Enf. 2009; 11(3):579-89.

29. Garcia TR, Nóbrega MML. A terminologia CIPE® e a participação do Centro CIPE® brasileiroem seu Desenvolvimento e disseminação. RevBrasEnferm. 2013; 6 (esp.): 142-50.

30. 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. 2015 set.-out; 23 (5): 927

31. Saba VK, Feeg V. A Bedside PC Charting System for Nursing Students using Clinical Care Classification (CCC) System. AMIA Annu Symp Proc. 2005: 1101.

32. Dykes PC, Carroll DL, Benoit A, Coakley A, Chang F, Empoliti J, et al. A Randomized Trial of Standardized Nursing Patient Assessment Using Wireless Devices. AMIA Annu Symp Proc. 2007: 206–210.

33. Prophet CM. The patient problem/nursing diagnosis form: a computer-generated chart document. Proc Annu Symp Comput Appl Med Care. 1993:326-30.

34. Crossetti MGO, Rodegheri M, Ávila ML, Dias VLM. O uso do computador como ferramenta para implementação do processo de enfermagem. Rev. Bras. Enferm., Brasília. 2002 nov-dez; 55 (6): 705-708.

35. Siders AM, Peterson M. Increasing patient satisfaction and nursing productivity through implementation of an automated nursing discharge summary. Proc Annu Symp Comput Appl Med Care. 1991:136-40.

36. Oliveira CG, Barros KAL, Oliveira AG. Construção de um protótipo de software para apoio à Sistematização da Assistência de Enfermagem, utilizando a engenharia de software e Usabilidade. J. Health Inform. 2010 jan-mar; 2(1): 1-6.

37. Caritá EC, Nini RA, Melo 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. 2010 out-dez; 2(4): 87-94.

38. Liaskos J, Mantas J. Evaluating an ICNP Web-based nursing documentation system. Stud Health Technol Inform. 2004: 386-390.

39. Aquino DR, Lunardi Filho WD. Construção da prescrição de enfermagem informatizada em uma UTI. Cogitare Enfermagem. 2004; 9 (1): 60-70.

40. Cho I, Park H. Evaluation of the Expressiveness of an ICNP-based Nursing Data Dictionary in a Computerized Nursing Record System. J Am Med Inform Assoc. 2006 jul-ago; 13(4): 456-464.