Original Article

TEXTO & CONTEXTO ENFERMAGEM
TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

MOBILE APP FOR NURSING PROCESS IN A NEONATAL INTENSIVE CARE UNIT

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ABSTRACT

Purpose: to develop and validate a nursing process application in a neonatal intensive care unit.
Method: a methodological study, conducted in a university hospital in southeastern Brazil from January 2017 to February 2018, divided into four stages: definition of requirements and elaboration of the conceptual model; generation of implementation and prototyping alternatives; testing and implementation. The app was developed based on Wanda Horta's Basic Human Needs and International Classification for Nursing Practice and following the User Centered Design method and the standards of the Brazilian Association of Software Engineering Technical Standards for IOS and Android platforms. The product was evaluated and validated by nurses for functional suitability, reliability, usability, performance efficiency, compatibility and safety.
Results: the CuidarTech Neo *Processo de Enfermagem* app has screens that integrate the elements for history, diagnosis and nursing interventions. According to the judges' evaluation, it has functional adequacy, reliability, usability, performance efficiency, compatibility and safety.
Conclusion: the app designed and validated by nurses is a computerized instrument that contains the stages of the nursing process: history, diagnoses and interventions, organized by Basic Human Needs and following the taxonomy of the International Classification for Nursing Practices. It relates information of newborns admitted to Neonatal Intensive Care Units and the nursing process, being able to provide quality, effectiveness, safety and personal satisfaction to the nurse's care.

DESCRIPTORS: Nursing process. Neonatal intensive care. Nursing informatics. Biomedical technology. Software. Newborn. Nursing.

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APLICATIVO MÓVEL PARA O PROCESSO DE ENFERMAGEM EM UMA UNIDADE DE TERAPIA INTENSIVA NEONATAL

RESUMO

Objetivo: desenvolver e validar um aplicativo para o processo de enfermagem em unidade de terapia intensiva neonatal.
Método: estudo metodológico, realizado em um hospital universitário do Sudeste brasileiro, entre janeiro de 2017 e fevereiro de 2018 dividido em quatro etapas: definição de requisitos e elaboração do modelo conceitual; geração das alternativas de implementação e prototipagem; testes e implementação. O aplicativo foi desenvolvido baseando-se nas Necessidades Humanas Básicas de Wanda Horta, na Classificação Internacional para a Prática de Enfermagem e seguindo o método do Design Centrado no Usuário e as normas da Associação Brasileira de Normas Técnicas para Engenharia de *Software* para plataformas IOS e Android. O produto foi avaliado e validado por enfermeiros quanto adequação funcional, confiabilidade, usabilidade, eficiência de desempenho, compatibilidade e segurança.
Resultados: o aplicativo CuidarTech Neo Processo de Enfermagem possui telas que integram os elementos para histórico, diagnóstico e intervenções de enfermagem. Conforme avaliação dos juízes enfermeiros, possui adequação funcional, confiabilidade, usabilidade, eficiência de desempenho, compatibilidade e segurança.
Conclusão: o aplicativo elaborado e validado por enfermeiros é um instrumento informatizado que contém as etapas do processo de enfermagem: histórico, diagnósticos e intervenções, organizados pelas Necessidades Humanas Básicas e seguindo a taxonomia da Classificação Internacional para as Práticas de Enfermagem. Ele relaciona informações do recém-nascido internado em Unidades de Terapia Intensiva Neonatal e o processo de enfermagem, sendo capaz de proporcionar qualidade, efetividade, segurança e satisfação pessoal à assistência do enfermeiro.

DESCRITORES: Processo de enfermagem. Terapia intensiva neonatal. Informática em enfermagem. Tecnologia biomédica. Software. Recém-nascido. Enfermagem.

APLICACIÓN MÓVIL PARA EL PROCESO DE ENFERMERÍA EN UNA UNIDAD NEONATAL DE CUIDADOS INTENSIVOS

RESUMEN

Objetivo: desarrollar y validar una aplicación sobre el proceso de enfermería en una unidad neonatal de cuidados intensivos.
Método: estudio metodológico, realizado en un hospital universitario del sudeste de Brasil entre enero de 2017 y febrero de 2018, dividido en cuatro etapas: definición de los requisitos y elaboración del modelo conceptual; generación de las alternativas de implementación y diseño de prototipos; pruebas e implementación. La aplicación se desarrolló sobre la base de las Necesidades Humanas Básicas de Wanda Horta y de la Clasificación Internacional para la Práctica de Enfermería, y siguiendo el método del Diseño centrado en el usuario y de las normas de la Asociación Brasileña de Normas Técnicas para Ingeniería de *Software* para plataformas IOS y Android. Los enfermeros evaluaron y validaron el producto según la aptitud funcional, la confiabilidad, la facilidad de uso, la eficiencia de su rendimiento, la compatibilidad y la seguridad.
Resultados: la aplicación CuidarTech Neo *Processo de Enfermagem* posee pantallas que integran los elementos correspondientes al historial, al diagnóstico y a las intervenciones de enfermería. Conforme la evaluación de los enfermeros que actuaron como jueces, la aplicación presentó aptitud funcional, confiabilidad, facilidad de uso, eficiencia de rendimiento, compatibilidad y seguridad.
Conclusión: la aplicación elaborada y validada por enfermeros es un instrumento informatizado que contiene las etapas del proceso de enfermería, a saber: historial, diagnósticos e intervenciones, organizados según las Necesidades Humanas Básicas y siguiendo la taxonomía de la Clasificación Internacional para las Prácticas de Enfermería. Relaciona informaciones del recién nacido internado en Unidades Neonatales de Cuidados Intensivos con el proceso de enfermería, siendo así capaz de proporcionar calidad, efectividad, seguridad y satisfacción personal a la asistencia del enfermero.

DESCRIPTORES: Proceso de enfermería. Cuidados intensivos neonatales. Informática en enfermería. Tecnología biomédica. Software. Recién nacido. Enfermería.

INTRODUCTION

The nursing process is a nurse's work tool that assists in the systematization of care. Nursing assistance is a theoretical-practical activity attributed by nurses that permeates technical-scientific and interrelational skills.[1] Care in the neonatal intensive care unit (NICU) should be error free, fast, accurate and safe. For this to be possible, nurses need to develop strategies that meet qualified and efficient care.

However, nurses still face difficulties in the operationalization of the nursing process in their daily practice such as, for example, the absence of the nursing diagnosis stage; non-systematic use of a classification and incomplete registration of care.[2–4] Thus, strategies such as computerization, which combine speed, fluidity and assertiveness in the execution and registration of the process can help in its improvement.[5]

Applications are increasingly being used as health allies in order to improve the care provided to system users.[6] The nursing process can benefit from the use of applications, as they can assist the nurse in the evaluation and decision making regarding the care of this area.[7]

The use of computerized technologies in nursing can minimize the time spent with patient information records; eliminate the repetition of erroneous data and information; improve communication of information; improve access to information; provide the information nurses need to make better decision-making regarding patient care.[8]

Given the presented aspects, the objective of this study was to develop and validate a nursing process application in a neonatal intensive care unit.

METHOD

This is a methodological study that was developed in four steps, following the User Centered Design method according to ABNT ISO/TR 16982:2014:[9] 1) definition of requirements and elaboration of the application concept map; 2) generation of implementation and prototyping alternatives; 3) tests; 4) implementation.

In the first stage, the technical-scientific content of the application was selected, which consisted of the instruments of history, diagnosis and nursing interventions for newborns admitted to the NICU based on Horta's Theory of Basic Human Needs (*Necessidades Humanas Básicas*, NHB)[10] and the International Classification for Nursing Practice,[11] elaborated in partnership with the nursing staff of a university hospital in southeastern Brazil. Such material forms the basis for textual production of the screens and elaboration of the application's conceptual map.

The second stage was carried out in partnership with the Project Ontology Laboratory and Observatory (*Laboratório e Observatório de Ontologias Projetuais*, LOOP) team and the Nursing Technologies Laboratory – CuidarTech, both from the Federal University of Espírito Santo (*Universidade Federal do Espírito Santo*, UFES), due to the specificity of technological knowledge required in the creation of a mobile app. Implementation and prototyping alternatives were generated using Apache Cordova software based on AABNT ISO/TR 16982:2014[9] for application functionality, organized in iterative design cycles, with a view to adopting free and open technologies whenever possible.

The third step was the evaluation and validation of the application. The LOOP team for developing an application with the full usability standard during design applied the following heuristics: 1) system visibility; 2) correspondence between the system and the real world; 3) control and freedom of the user; 4) consistency and standardization; 5) recognition instead of memorization; 6) flexibility and efficiency of use; 7) aesthetic and minimalist design; 8) error prevention; 9) helps users to recognize, diagnose and recover from errors; 10) help and documentation; 11) little man / device interaction; 12) physical interaction and ergonomics and 13) readability and *layout*.[12]

Subsequently, the application was evaluated and validated according to the Brazilian standard ABNT ISO/IEC 25062: 2011 (International Organization for Standardization / International Electrotechnical Commission)[13] which recommends a minimum sampling of eight participants at the testing stage. All nurses in the sector were invited to participate in the research through individual approach and invitation letter delivery. Eleven nurses with at least two years of experience in the care of newborns admitted to the NICU participated. The exclusion criterion would be absence of participation in the first stage of this study. No nurses were excluded. The evaluations took place in a university hospital in southeastern Brazil, from January to February 2018.

For the tests, the nurses received a fictitious case study of a newborn admitted to a NICU to simulate the execution of the nursing process. In possession of this case, the evaluator consulted the application CuidarTech Neo *Processo de Enfermagem* to perform the history, diagnosis and nursing intervention. Next, the nurse answered a questionnaire, based on another study that evaluated *software* for application of the nursing process.[6] This instrument evaluates functional suitability, reliability, usability, performance efficiency, compatibility and security characteristics of mobile applications.

The questionnaire subdivides each characteristic into a number of sub-characteristics and, to operationalize them, formulates key questions, which must be answered as “Agreement”, “Disagreement” or “Not applicable”. If the assessment is “Disagreement”, the judge must justify the reason. “Not applicable” answers have been discarded as they are not applicable or have not been evaluated.

In judging the results, we used the scale proposed in another study indicating the expected values for each characteristic and sub-characteristic. Such a scale states that responses with positive values above 70% are adequate while below 70% inappropriate. The expected value of 70% of positive responses was considered adequate as suggested by ISO / IEC 14598-6. [14]

In the fourth step, Implementation, after testing results and corrections, the app will be registered with the UFES Institute for Technological Innovation and a release version will be published in the Google Play Store, available for free. Subsequently, the intention is to develop an implementation/ application study which will evaluate the efficiency of the product developed.

The research was conducted according to ethical standards.

RESULTS

Elaboration of the CuidarTech Neo application

The transformation of instruments for the nursing process into an application is complex, requiring creativity and mastery of instrument variables. Developing digital versions of protocols, forms, and guides is challenging, both because of the properties of the chosen digital device (screen size, keyboard, processing performance) and the differences in data use in the new format.

The CuidarTech Neo *Processo de Enfermagem* app is a technology that provides nurses with a computerized instrument containing nursing history, diagnoses and interventions organized by the NHB and following the taxonomy of the International Classification for Nursing Practices. The application, from filling in the history and physical examination, crosses the altered clinical indicators, suggesting the possible diagnoses. And for each diagnosis, it presents a list of possible interventions. Thus, the application supports decision making in choosing the most appropriate diagnoses and interventions for the newborn.

In this sense, the complexity of nursing theories coupled with nursing taxonomies was internalized by the interface of a mobile application to generate possibilities to perform nursing care to the newborn with assertiveness, speed and safety.

Also, the nursing processes performed are stored in a database that can be retrieved for sequential evaluations. Another feature of the app is to send all material formatted by e-mail to be printed and attached to medical records if necessary.

The icon representing the application was constructed to represent the neonatal patient. The kangaroo represents the kangaroo method, which has made assistance to the mother and premature newborn binomial more humanized and scientifically based.[15] In addition, the cross-shaped "C" is the logo of the CuidarTech brand in nursing technologies. The violet color of the app is the reference color of prematurity.

In the main screen (Figure 1), the upper right-hand menu of the application displays a tab that, when pressed, shows the "*Processos de enfermagem*" ("Nursing Processes") buttons – displays previous nursing processes stored in the application; "*Novo processo*" ("New process") – starts a new nursing process; "*Como utilizar*" ("How to use") - demonstrates a tutorial for using the application; "*Sobre o* CuidarTech Neo" ("About CuidarTech Neo") – lists the application's development team; "*Banco de dados*" ("Database") – displays the data stored by the application, figure 2.

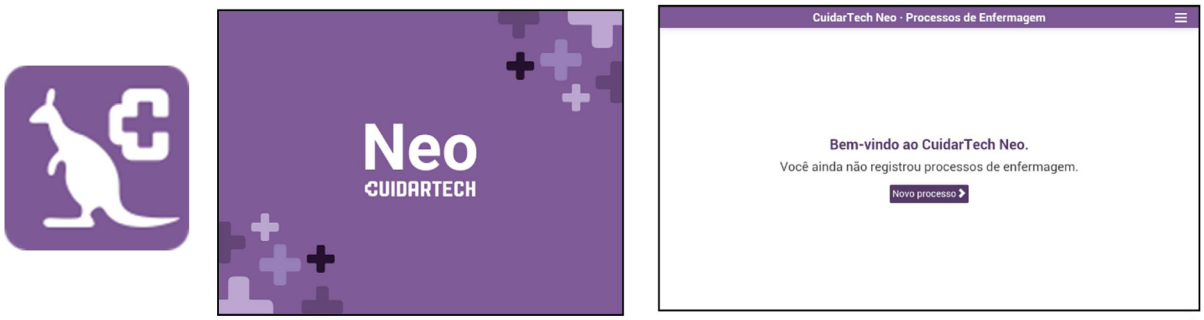

Figure 1 – CuidarTech Neo App Launcher Icon and Screens

Figure 2 – CuidarTech Neo Application Menu Tab

After accessing "Novo processo", the "*Identificação do bebê*" ("Baby Identification") (Figure 3) screen is triggered and thus patient identification data can be added. After filling in the identification data, pressing the button at the bottom of the "*Iniciar processo*" ("Start Process") screen displays the NHBs for the Nursing History execution.

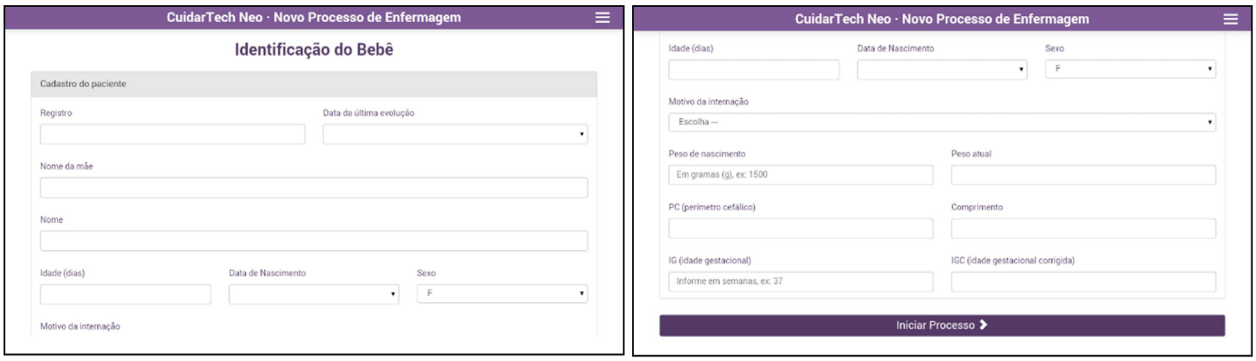

Figure 3 – Beginning and ending of the Baby Identification screen of the CuidarTech Neo application.

The screen shows the NHBs (Figure 4) for selection and filling. By clicking on each NHB, the nurse must record the data. It is noteworthy that no data is mandatory, ensuring that the dynamism of nursing care is respected.

Figure 4 – *Histórico de Enfermagem* (Nursing History) screen and detail of the need for oxygenation of the CuidarTech Neo application

When accessing, for example, the second NHB, "*Oxigenação*" ("Oxygenation"), there are fields for including open data, fields like checkbox – represented by small squares before the data (multiple answer) and fields *radio button* – represented by circles before the data (single dichotomous answer). At this time the nurse can select data by clicking on the items.

After completing the relevant Patient History and screen scroll data, the "*Necessidade anterior*" ("Previous Need"), "*Gerar diagnóstico*" ("Generate Diagnosis"), and "*Próxima necessidade"* ("Next Need") buttons appear at the bottom of the screen. Pressing the "*Gerar diagnóstico*" button displays the "*Diagnóstico de enfermagem*" (Nursing Diagnostics) screen.

The data selected in the "*Histórico de enfermagem*" ("Nursing History"), here exemplified by NHB of Oxygenation, crossed with the "*Identificação do bebê*" ("Baby Identification") data, promotes the generation of "nursing diagnoses" when the "*Gerar diagnóstico*" ("Generate Diagnosis") button is pressed. The generation of the diagnosis respects a line of thought of relationships between clinical and diagnostic indicators and depends on marking and filling in the data fields.

The "*Diagnóstico*" ("Diagnosis") screen (Figure 5) contains: on purple background, the diagnosis number, title - with multi-select option type checkbox, diagnostic definition, and, on gray background, selected diagnostic-related indicators in the history.

Figure 5 – Diagnósticos de enfermagem (Nursing diagnosis) screen and integration between nursing Diagnosis and nursing care interventions in the CuidarTech Neo app

When the nurse uses clinical judgment and selects the desired diagnosis by pressing the *checkbox* button, the "*Intervenções de enfermagem*" ("Nursing Interventions") related to that diagnosis are displayed.

After judging all the suggested diagnoses, scrolling the "*Diagnósticos de enfermagem*" ("Nursing Diagnosis") screen displays the "*Voltar às Necessidades*" ("Back to Needs") buttons – which returns you to the Nursing History home screen; "Enviar por e-mail" ("Emailing") – which creates a summary of "*Identificação do bebê*" ("Baby Identification") data, displays the Diagnosis selected by the nurse and their text-based interventions that allow emailing; and "*Salvar diagnóstico*" ("Save Diagnosis") – which stores the data completed and selected by the nurse for later use and database formation.

In the case of the CuidarTech Neo application, the clinical indicators raised in the nursing history were fundamental to elaborate the algorithms that generate the diagnoses and, consequently, their relations with the nursing interventions. This process in itself is innovative and can help other nursing professionals to develop digital versions of their work tools, reinforcing the need for integration between interdisciplinary teams.

CuidarTech Neo application validation

Nurses evaluated the application according to characteristics of functional suitability, reliability, usability, performance efficiency, compatibility and security of mobile applications, according to the answers in tables 1,2, and 3.

Table 1 – Distribution of responses regarding the functional adequacy and reliability of the CuidarTech Neo Application among nurses. Vitória, ES, 2018. (n=11)

Characteristic	Agreement		Disagreement		Does not apply		Total	
	n	%	n	%	n	%	n	%
Functional suitability								
Functional integrity								
The app meets the application of the nursing process	11	100.0	0	0.0	0	0.0	11	100.0
The app has all the necessary functions to perform the nursing process	9	81.8	2	18.2	0	0.0	11	100.0
Functional correction								
The app allows application of the nursing process correctly	11	100.0	0	0.0	0	0.0	11	100.0

Table 1 – Cont.

Characteristic	Agreement		Disagreement		Does not apply		Total	
	n	%	n	%	n	%	n	%
The app is accurate in performing the nursing process functions	11	100.0	0	0.0	0	0.0	11	100.0
Functional fitness								
The app facilitates the execution of the nursing process	11	100.0	0	0.0	0	0.0	11	100.0
Reliability								
Maturity								
The app fails frequently	8	72.7	0	0.0	3	27.3	11	100.0
Fault tolerance								
When failures occur the app continues to function as expected	8	72.7	0	0.0	3	27.3	11	100.0
Recoverability								
The app is able to recover data affected by crashes	6	54.5	0	0.0	5	45.5	11	100.0
Availability								
The app is accessible for use when needed	11	100.0	0	0.0	0	0.0	11	100.0

Table 2 – Distribution of responses related to the usability of the CuidarTech Neo Application by nurses. Vitória, ES, 2018. (n=11)

Characteristic	Agreement		Disagreement		Does not apply		Total	
	n	%	n	%	n	%	n	%
Suitability recognition								
Concept and app are easy to understand	11	100.0	0	0.0	0	0.0	11	100.0
Is it easy to perform your duties?	11	100.0	0	0.0	0	0.0	11	100.0
Apprehensibility								
It is easy to learn to use	11	100.0	0	0.0	0	0.0	11	100.0
The app facilitates user input	10	90.9	1	9.1	0	0.0	11	100.0
The app facilitates user data output	10	90.9	0	0.0	1	9.1	11	100.0
Operability								
The app has attributes that make it easy to perform the nursing process	11	100.0	0	0.0	0	0.0	11	100.0
The app provides help clearly	10	90.9	0	0.0	1	9.1	11	100.0
Accessibility								
The app can be used by people with disabilities	9	81.8	1	9.1	1	9.1	11	100.0
Error protection								
The app informs the user of invalid data entry	8	72.7	0	0.0	3	27.3	11	100.0
User interface aesthetics								
Graphic design is user friendly	10	90.9	1	9.1	0	0.0	11	100.0
The color is nice	11	100.0	0	0.0	0	0.0	11	100.0

Table 3 – Distribution of responses regarding the performance efficiency, compatibility and safety of the CuidarTech Neo Application among nurses. Vitória, ES, 2018. (n=11)

Characteristic	Agreement		Disagreement		Does not apply		Total	
	n	%	n	%	n	%	n	%
Performance efficiency								
Time								
The app's response time is adequate	11	100.0	0	0.0	0	0.0	11	100.0
The app's runtime is adequate	11	100.0	0	0.0	0	0.0	11	100.0
Resources								
The resources used by the app are adequate	11	100.0	0	0.0	0	0.0	11	100.0
Capacity								
The app allows good navigation	11	100.0	0	0.0	0	0.0	11	100.0
The app is fast	10	90.9	0	0.0	1	9.1	11	100.0
Compatibility								
Interoperability								
The app allows interaction between modules (identification, history, diagnosis, interventions)	11	100.0	0	0.0	0	0.0	11	100.0
Safety								
Integrity								
The app is capable of preventing deletion or alteration of stored information	8	72.7	0	0.0	3	27.3	11	100.0

In the assessment of "functional adequacy", it was found that in the sub-characteristic "functional integrity", all nurses agreed that the app meets the application of the nursing process. However, two nurses pointed out that the app does not have all the necessary functions to perform the nursing process, as it does not have an open field to describe historical data that are not included in the predefined items.

The absence of an open field to allow some patient data to evolve may make the data collection step difficult (E2).

I missed an open field in each NHB (E3).

In the "functional correction" all judges stated that the app allows application of the process correctly and that is necessary in the execution of functions. And in "functional fitness" everyone agreed that the app facilitates the execution of the process.

When assessing the "reliability", under the "maturity" and "fault tolerance" sub-characteristics, if the app frequently fails and if it continues to fail as expected, three nurses were not able to judge such items, precisely because of the failure. no failures occur during app handling.

In the sub-feature "recoverability", five nurses were unable to judge the statement that the app is capable of recovering data affected by failures, because the app did not fail during the assessment. Only six nurses agreed with this statement, which corresponds to 54.5% of the research subjects. Thus, only this sub-characteristic did not reach the expected positive target of 70%.

Given the sub-feature "availability", everyone agreed that the app is accessible for use when needed.

Regarding the “usability” characteristic, the “adequacy recognition” sub-characteristic obtained positive responses in all evaluations. In the “apprehensibility”, two nurses disagreed that the app facilitates user input, justifying that: t*here should be options to mark “does not apply” for each item in the nursing history, as this is the only way to ensure that the nurse even evaluated the patient. In addition, there should be an open field in each NHB as much patient information needs to be better described* (E2); *maybe there should be some missing data completion system to prevent the history from being blank. I think you need to correct it, otherwise some nurses may not even read the questions* (E7).

For the question whether the app facilitates user data output, there was an answer that does not apply, on the grounds that it was unable to evaluate such statement.

For the criterion of “operability”, the statement that the app has attributes that make it easier to perform the nursing process obtained a positive answer unanimously and one of the nurses considered that it was not possible to evaluate the statement that the app provides help clearly.

In the “accessibility” answers were obtained in disagreement, according to the reports: *the app cannot be used by people with disabilities as it makes no sound* (E1); *depending on the disability, I agree that the app cannot be used* (E7); the sub-feature “error protection” represented by the statement that the app informs the user of invalid data entry was not able to be evaluated by three nurses. One of them justified that: *in filled and marked data no invalid data were entered* (E7).

When we investigated whether the graphic design is user-friendly, under the sub-feature “user interface aesthetics”, everyone agreed that color is nice, however, one nurse was at odds with the size of the fields, explaining: *data visualization is difficult due to small fields* (E2).

In the category “performance efficiency” the sub-characteristic “time” was positively evaluated in all cases, as well as “resources” were considered adequate by all nurses.

As for “capacity”, everyone agreed that the app allows for a good navigation, quickly. However, one nurse considered that in the first assessment of the patient, he prefers to perform the history on the printed instrument, but in the end agreed that after having the data filled the app is faster.

I find it particularly time consuming to use the app rather than to do it by hand, but sometimes when the patient has already been admitted, i.e., not being the patient’s first exam and the information already saved, it is faster (E7).

In the “compatibility” assessment, the “interoperability” subcategory was considered positive by all nurses, as they verified the app’s ability to integrate the modules - identification, history, diagnosis and interventions.

In the Security assessment, integrity was not able to be assessed by three nurses regarding the app to prevent deletion or alteration of stored information.

All features of functional suitability, reliability, usability, performance efficiency, compatibility and security of evaluated mobile apps obtained the minimum expected value of positive suitability of 70%; except for the “reliability” feature, which is the “recoverability” feature, which reached 54.5%.

When he finished filling in the instrument, the nurse gave his opinion about the app, making comments: *I found it very practical, complete, much easier to perform a diagnostic judgment when we have the app than just get it out of our head* (E7); *had a very beautiful layout* [...] *the app does not allow integration with other systems, such as the one used by the hospital, this hinders its use in care practice* (E3); *I loved the app, it’s easy to handle, interesting, it makes me want to examine patients and evolve in the app* (E4).

After the nurses’ evaluation phase, the app was submitted to the suggested corrections.

DISCUSSION

Health information systems group data that can provide knowledge construction, knowledge development, and summarize individual health data to generate health actions and programs. Such technology is considered a tool that supports management, also unfolding in care and care management, focus of nursing.[7,16–17]

A systematic review that evaluated 17 papers on care management information systems showed that only three integrated data to support clinical decisions, which suggests that computerization is still incipient regarding care. It also emphasizes that professionals need to be updated on the subject in order to avoid the use of technologies only for tasks.[7]

Using diverse software in nursing has been growing in recent years. Quality, speed, dynamism and safety are some benefits of its implementation. Software that support the realization of the nursing process may be able to make nursing care appropriate to the Brazilian reality. Mobile apps are tools allied to nurses in the care process.[16]

The use of nursing apps must respect aspects inherent to information technologies and should be able to assist nurses in the technical performance of the nursing process,[17] promoting quality and safety for the patient and staff.[18]

The measure of the quality of one *software* regarding what it proposes to accomplish needs to be evaluated by pre-established criteria, evidencing its success for clinical usability. Standards dictate the technical quality and functional performance of computer technologies.[9.12] Computational tools allow nurses to apply the nursing process correctly,[6] guaranteed by the criterion of functional adequacy, evaluated positively by all nurses.

Far beyond the suitability of a certain software according to quality characteristics, comes the ability to interact that it has. The app should be considered as a tool that documents nursing actions, but also supports decision making. The insertion of data in the nursing history with the ability to suggest answers in the nursing diagnosis is a powerful strategy to broaden clinical reasoning.[19]

The integration between the components of the nursing process – history, diagnosis and interventions – is still a challenge for some nurses. Although some studies reinforce the use of the method to apply the process, it is still necessary to teach the integration that exists between its phases.[20] Executing the nursing process implies making clinical decisions about patients' health. Lack of professional training, work overload, slowness and bureaucracy of manual registration are hindering aspects for understanding the interactivity and efficiency of the process.[21]

The mobile app, built in conjunction with nurses, has been evaluated as speeding up the clinical decision-making process, often essential to ensure rapid and assertive care for critically ill patients, such as the NICU. The development of the app together with nurses of a NICU allowed for the integration of content in a way that is relevant to the needs of the patients in question. The relationships established between the Nursing History and Diagnosis modules form a network of clinical thinking that was absorbed by the application interface, with its main clinical links established by the relationship of empirical indicators and the generation of nursing diagnoses. This relationship speeds up and makes the generation of possible nursing diagnoses more assertive, so that nurses can use clinical judgment and finally delineate the nursing diagnoses that the patient has.[22]

Technologies that integrate relevant data from clinical assessment of patients with methodologies for history, diagnosis and nursing interventions are able to strengthen safe and appropriate decision making for the patient.[23]

The association of clinical indicators for the generation of nursing diagnoses and their interventions has been reported in another study as facilitating the development of clinical reasoning of nurses, promoting safe clinical decisions and improving the quality of nursing care.[24]

For the documentation of the nursing process, the computerized record is more accurate, allows a greater understanding of the interrelationship between its stages, providing visibility and advances in nursing care.[25] However, another study compared manual and electronic registration and found no significant differences between them. It is noteworthy that the quality of the scientific method is not determined by the type of record, but by other factors inherent to the professional, work methodology and institutional reality.[5]

As a limitation of the study, there is the need for validation with nurses from other NICU services, in order to broaden the perspectives and the context of use of the app. In addition, application studies are suggested to evaluate the impacts of the use of technology in the daily care practice of nurses.

CONCLUSION

This study developed and validated the CuidarTech Neo Processo de Enfermagem app that provides nurses with a computerized instrument containing nursing history, diagnoses and interventions organized by the NHB and following the taxonomy of the International Classification for Nursing Practices.

The app supports decision making in choosing the most appropriate diagnoses and interventions for the newborn, since, from filling in the history and physical examination, the application crosses the changed clinical indicators suggesting possible diagnoses and a list of interventions for each diagnosis.

The app, according to the judges' evaluation, has functional adequacy, reliability, usability, performance efficiency, compatibility and security.

We highlight the contribution of the design team, considering that this technical knowledge was essential for the production of the app, emphasizing the importance of interdisciplinary production.

The use of the app by nurses increases the ability to perform the nursing process, making it more practical, fast, resolute, assertive, based on scientific knowledge, a nursing theory, a nursing classification, providing uniformity in language and in the attendance record. The importance of this technological innovation as a work tool is highlighted, valuing the role of the nurse and the NHB theory in this context.

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NOTES

ORIGIN OF THE ARTICLE

Extracted from the thesis- Nursing process app in a neonatal intensive care unit, presented to the Graduate Nursing Program of the *Universidade Federal do Espírito Santo*, in 2018.

CONTRIBUTION OF AUTHORSHIP

Conception of this study: Araujo JL, Primo CC.
Data collection: Araujo JL, Primo CC.
Analysis and interpretation of data: Araujo JL, Primo CC.
Discussion of the results: Araujo JL, Sant'Anna HC, Lima EFA, Fioresi M, Nascimento LCN, Primo CC.
Writing and/or critical review of content: Araujo JL, Sant'Anna HC, Lima EFA, Fioresi M, Nascimento LCN, Primo CC.
Review and final approval of the final version: Araujo JL, Primo CC.

ETHICS COMMITTEE IN RESEARCH

Approved by the Research Ethics Committee of the Federal University of Espírito Santo, under opinion No. 1.794.528, Certificado de Apresentação para Apreciação Ética No. 57930016.0.0000.5060.

CONFLICT OF INTERESTS

There is no conflict of interest.

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ERRATUM

Regarding the article “**MOBILE APP FOR NURSING PROCESS IN A NEONATAL INTENSIVE CARE UNIT**”, with DOI number: https://dx.doi.org/10.1590/1980-265x-tce-2018-0210 , published in Texto & Contexto Enfermagem, vol 28 in 2019, e20180210**:**

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