TEXTO & CONTEXTO ENFERMAGEM

TEXT & CONTEXT NURSING TEXTO & CONTEXTO ENFERMERÍA

DEVELOPMENT AND EVALUATION OF MOBILE APPLICATION FOR THE PREVENTION OF MUSCULOSKELETAL RISKS IN NURSING WORK

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ABSTRACT

Objective: to develop a multi-platform mobile application for the prevention of musculoskeletal risk factors related to nursing work in a hospital unit and to evaluate the usability criteria with nurses and computer professionals.

Method: technological production study for the development of a mobile application, following the phases of software engineering: analysis of requirements, design and specification, construction, internal tests, maintenance and external evaluation. The product was evaluated for usability by nurses from public hospital units in the city of Rio de Janeiro (Brazil). The System Usability Scale instrument was used for the evaluation of the nurses and the instrument of heuristics of compliance of digital interfaces was used with the informational technology professionals. The application development period lasted from November 2017 to March 2018 and the usability assessment from March to May 2018.

Results: the evaluation data showed that the application shows agreement and compliance with the principles of usability in the criteria of effectiveness, efficiency and user satisfaction, however, the evaluators suggest that the application's functionalities should be simplified.

Conclusion: the application was designed as a care strategy for the nursing professional, considering the musculoskeletal risks which they are exposed to in their professional activities. The development and evaluation methods were satisfactory and the proposed objectives were achieved.

DESCRIPTORS: Mobile applications. Occupational risks. Cumulative trauma disorders. Ergonomics. Occupational health.

DESENVOLVIMENTO E AVALIAÇÃO DE APLICATIVO MÓVEL NA PREVENÇÃO DE RISCOS OSTEOMUSCULARES NO TRABALHO DE ENFERMAGEM

RESUMO

Objetivo: desenvolver aplicativo móvel multiplataforma na prevenção dos fatores de riscos osteomusculares relacionados ao trabalho de enfermagem em unidade hospitalar e avaliar com enfermeiros e profissionais de informática os critérios de usabilidade.
Método: pesquisa de produção tecnológica para o desenvolvimento de aplicativo móvel, seguindo as fases de engenharia de *software*: análise de requisitos, projeto e especificação, construção, testes internos, manutenção e avaliação externa. O produto foi avaliado quanto à usabilidade por enfermeiros de unidades hospitalares públicas da cidade do Rio de Janeiro (Brasil). Utilizaram-se para a avaliação dos enfermeiros o instrumento *System Usability Scale* e para os profissionais de informática, o instrumento de heurísticas de conformidade de interfaces digitais. O período de desenvolvimento do aplicativo ocorreu de novembro de 2017 a março de 2018 e a avaliação de usabilidade de março a maio de 2018.
Resultados: os dados da avaliação demonstraram que o aplicativo apresenta concordância e conformidade com os princípios de usabilidade nos critérios de efetividade, eficiência e satisfação do usuário, entretanto, os avaliadores sugeriram simplificações das funcionalidades do aplicativo.
Conclusão: o aplicativo foi concebido como estratégia de atenção ao trabalhador de enfermagem, considerando os riscos osteomusculares a que estão expostos em suas atividades profissionais. Os métodos escolhidos para desenvolvimento e avaliação foram satisfatórios para atingir-se os objetivos propostos.

DESCRITORES: Aplicativos móveis. Riscos ocupacionais. Transtornos traumáticos cumulativos. Ergonomia. Saúde do trabalhador.

DESARROLLO Y EVALUACIÓN DE UNA APLICACIÓN MÓVIL EN LA PREVENCIÓN DE RIESGOS OSTEOMUSCULARES EN EL TRABAJO DE ENFERMERÍA

RESUMEN

Objetivo: desarrollar una aplicación móvil multiplataforma en la prevención de los factores de riesgos osteomusculares relacionados al trabajo de enfermería en unidades hospitalarias y evaluar con enfermeros y profesionales de la informática los criterios de usabilidad.
Método: estudio de producción tecnológica para el desarrollo de una aplicación móvil, siguiendo las etapas de ingeniería de un software: análisis de los requisitos, proyecto y especificación, construcción, tests internos, mantenimiento y evaluación externa. El producto se evaluó según su usabilidad por enfermeros de las unidades hospitalarias públicas de la ciudad de Rio de Janeiro (Brasil). Para que los enfermeros pudieran evaluarla, se utilizó el instrumento System Usability Scale, mientras que los profesionales en informática utilizaron el instrumento de heurísticas de conformidad de interfaces digitales. El período de desarrollo de la aplicación se llevó a cabo de noviembre de 2017 a marzo de 2018, y la evaluación de usabilidad de marzo a mayo de 2018.
Resultados: los datos de la evaluación demostraron que la aplicación presenta concordancia y conformidad con los principios de usabilidad en los criterios de efectividad, eficiencia y satisfacción del usuario. No obstante, los evaluadores sugirieron simplificar las funcionalidades de la aplicación.
Conclusión: la aplicación se concibió como una estrategia de atención para el trabajador de enfermería, considerando los riesgos osteomusculares a los que están expuestos en sus actividades profesionales. Los métodos elegidos para desarrollar y evaluar fueron satisfactorios para alcanzar los objetivos propuestos.

DESCRIPTORES: Aplicaciones móviles. Riesgos ocupacionales. Trastornos traumáticos acumulativos. Ergonomía. Salud laboral.

INTRODUCTION

With the recognition and applicability of digital information and communication technologies in the various areas of knowledge, it is necessary to rethink the possibilities and demands in this complex global space for health actions. In this scenario of computerized processes and media convergences, where there is an emphasis on interactivity and collaborative production work, eHealth emerges, which refers to the use of digital technologies in health, encompassing products, systems and actions necessary for the entire supply chain of services and public policies for its implementation. Considering the importance of the theme, the World Health Organization created the Global Observatory for eHealth, an initiative that establishes objectives and goals in this area to promote, disseminate and generate knowledge that contribute significantly to health and that provides references and relevant information to support governments and political decision-makers for its use in the coming years.[1]

With the spread of the wireless internet via mobile devices, especially cell phones, eHealth has evolved into a new field, mHealth (mobile health),[2] which, due to its mobility, portability, functionality and connectivity, has become a technology that brings together a growing variety of health, operational, managerial and decision support applications, in conversation networks for prevention, promotion, disease control, surveillance, and monitoring.[3–5] The potential of mobile digital technologies applied to health care, both from the point of view of citizens and from the point of view of institutions, is critically important as it broadens the design of the care environment, a mobile space of interactions interconnecting contexts, subjects and knowledge, where care and education walk together gaining prominence and relevance.

In this context, combining the categories of work, worker and health, studies carried out in several countries, show a prevalence of work-related musculoskeletal disorders among nursing professionals[6–9] such as injuries to muscles, tendon, nerves, joints and ligament and have a complex multifactorial origin. Its etiology includes, besides ergonomic stressors, psychosocial and organizational risk factors, leading to different degrees of functional incapacity, reduced productivity and increased rates of absenteeism.[10] According to the Welfare Department in Brazil, upper back pain was the main reason sick leave among workers in 2017, with a report of 83,736 cases of welfare granted in this period by the National Social Security Institute (INSS). In the last ten years, it has been the top disease which has received the most welfare aid.[11]

In the provision of care, the nursing team, in its activities such as patient management, excessive work pace, repetitiveness, inadequate postures and environmental and organizational work conditions are exposed to high biomechanical and psychophysiological demands. Workers, even with painful joint symptoms, lower back pain, disc herniations, tendonitis and tiredness, continue to work using anti-inflammatory drugs as palliative agents and delay the search for effective treatment, resulting in the evolution to chronic conditions.[12] Work-related musculoskeletal disorders generate socioeconomic impacts, taking into account the expenses due to treatments, indemnification processes and diminishing the quality of life of the individual, interfering or disabling the performance of daily activities, becoming an important public health problem, which prompts the need for attention to these workers and their working conditions.

Faced with this context and the technological transformations and the accelerated productive restructuring under way, investments in occupational health and the safety of nursing professionals are necessary. Thus, considering the need for preventive actions for work-related musculoskeletal disorders and existing gaps in nursing-focused applications in this area, the objective of this study was to develop a multi-platform mobile application for the prevention of musculoskeletal risk factors related to nursing work in a hospital unit and to evaluate the usability criteria with nurses and information technology professionals.

METHOD

A technological production study aimed at the development and evaluation of a multi-platform application on musculoskeletal risks in nursing work in a hospital unit. The technology production process was based on software engineering using the prototyping concept with the following steps: problem recognition, feasibility study, analysis, design, implementation, testing and maintenance. For programming, a framework (object-oriented architecture, object types and interactions among them) was used for the web system and mobile devices in HTML5, Cascading Style Sheets (CSS) and JavaScript languages.

In order to obtain indicators that followed the performance of the system in face of real demands of users, usability evaluations were conducted by nurses and information technology professionals. The purpose was to collect data in the initial version for the use experience and improvement, applying it at the application development stage. The development took place from November 2017 to March 2018 and the usability evaluation took place from March to May 2018. The Informed Consent Term was issued, providing the participants access to the application. The nurse were provided with The System Usability Scale with a guidance manual, and the experts were supplied with the application heuristic analysis tool.

Eight nurses and two information technology professionals participated in the study. The inclusion criteria for nurses were: being a nurse and working in public hospitals in the city of Rio de Janeiro (Brazil), regardless of work department, since ergonomic risks are multifactorial and are likely to occur between the work and worker relationship; minimum of three years as a nurse in the unit; be able to use a smartphone and be available to use it with the application. Inclusion criteria for the IT professional were: to be a specialist in the area of computational interfaces; experience in application evaluation and recommended by researchers from the computer science course of the Federal Fluminense University (Brazil). Exclusion criteria for both were: to have difficulty adapting to the use of the application. The recruitment of the participants was done by invitation, via e-mail, providing guidelines, access to the application and online evaluation forms, as well as a communication channel by means of a group messaging application.

The construction of the informational content was based on Ergonomics, which refers to the interactions of people with technology, organization and the environment, with focus on safety, satisfaction and effectiveness in human activities. Given its breadth and complexity, it dynamically integrates physical, cognitive and organizational ergonomics in its area of activity. Physical ergonomics refers to anatomical, anthropometric, physiological and biomechanical characteristics with physical activity and involves the workstation, postures, reaches, handling and the design of the workstation. Cognitive ergonomics deals with the operative mobilization of the worker's mental capacities at work and how they affect their interactions with other elements of the system. It consists of mental processes, perception, memory, motor response, mental workload, stress, performance, training and performance.[13–14]

Organizational ergonomics deals with the optimization of sociotechnical systems, including their organizational structures, policies and processes, such as communication systems, cooperative work, organizational culture, temporal and spatial structure of activities, supervision, management quality, and training methods for work.[13–14] Another aspect worth mentioning in the application are the main foundations of the Regulatory Norm 17, which regulates ergonomics in the workplace in order to provide maximum comfort, safety and efficient performance to the worker.[15] Presented in the application with the following structure: survey, transport of materials; workstations; workstations furniture; environmental conditions and work organization.

Usability of interfaces

The term usability emerged as a ramification of Ergonomics related to computer interfaces, but eventually spread to other applications and is revealed when users use the system to achieve their goals in a given operational context. Usability assessment enables products to be improved so users can easily reach their interaction goals by addressing how the user communicates with the system and how technology responds to user interaction. The evaluation verifies the quality of the interface and uses methods to group requirements, develop and test prototypes, evaluate alternative projects, analyze usability problems and propose solutions and tests with the user.[16–17]

The System Usability Scale instrument was used by the nurses participating in the study for the evaluation of the application and the usability criteria,[17] this instrument was chosen because it had a balance between being scientifically accurate and at the same time not being extremely long for the user or for the researcher. It consists of ten questions with a Likert scale, with scores 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (I fully agree). The value of each odd question (1,3,5,7 and 9), which presents aspects of agreement with the application, subtracts 1 from the user-given score. In paired questions that present user difficulties with the application, subtracts 5 from the given score. After quantifying each question, all are added up and multiplied by 2.5, obtaining the overall value of the System Usability Scale on a scale of 0 to 100. The average is 68 points, if it is below this, there are probably problems with product usability. There is an open question at the end of the instrument for the evaluator's observations and suggestions.

The System Usability Scale questions evaluate the following items for nurses: 1) frequency of system use; 2) system complexity; 3) ease of use; 4) assistance with using the system; 5) integrated system functions; 6) system inconsistency; 7) fast learning; 8) System is complicated to use; 9) security and confidence to use the system; 10) learning other information to use the system. In addition to these issues, the instrument presents an open field for the evaluator to comment on the system.

Nielsen´s heuristics related to usability criteria and the norms that determine them were used by the information technology professionals.[15] The instrument consists of ten heuristics with the description of the problem: 1) visibility of the status of the system; 2) relationship between the system and the real world; 3) user control and freedom; 4) consistency and standards; 5) error prevention; 6) minimization of user memory load; 7) customization and shortcuts; 8) aesthetic and minimalist design; 9) helps users to recognize, diagnose and recover from error; 10) help and documentation. At the end, there is the description of the problem, explaining where it occurs, description and severity.

In the application development, the usability test is a fundamental step in the process, as i generates an interface with quality of use, taking into account the functionalities, performance, abilities and perceptual and cognitive capacities of its users.[16–17]

As a result of the technological production, the application was developed using DORT name, considering the term work-related musculoskeletal disorders. DORT is a hybrid application, using mobile and native web technology, i.e., it can use many internet resources as device features, and has the ability to run a single code for different platforms (Android, iOS, Windows Phone, with fast and comprehensive updating abilities. It also consists of a set of interactive multimedia guidelines, based on the ergonomic risks that nursing professionals are exposed to during their daily activities, identifying and evaluating the potential risks related to the movement and transportation of patients, workstations, postures, environmental and organizational conditions, proposing actions for the adoption of precautionary measures for the predisposing factors in nursing work.

RESULTS

The application consists of 21 screens. The user registers on the first screen of the DORT application (Figure 1). After the login, a screen with icons corresponding to the tabs appears, where it is necessary to click each icon in order to see the content. In the first tab, information for the user appears about the application as well as help documentation, the following tab - DORT, structured with subgroups of tabs as follows: introduction to fundamental concepts and an overview of the subject; nursing and risk factors; major disorders and prevention.
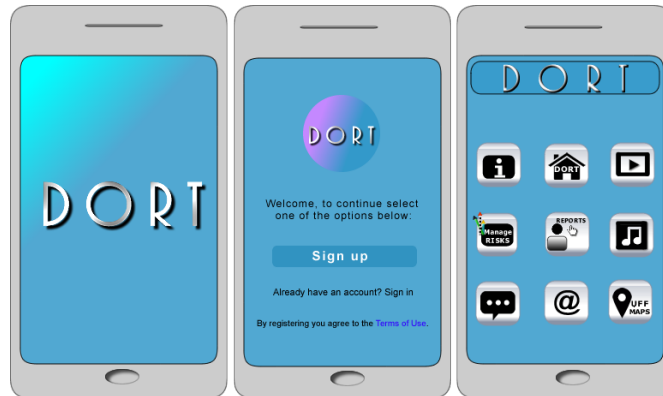

Figure 1 - DORT application icons home screen and screen

The tabs deal with working environment conditions such as comfort, furniture, postures and mechanical load. It discusses work relations, organizational climate and describes the musculoskeletal disorders prevalent in the nursing team, preventive actions and implementation of prevention programs in the workplace. In the tab - Multimedia (Figure 2), there are videos, figures and infographic on ergonomics in nursing work in hospital units, comprising subgroups of tabs that approach workstations, functional postures, material handling, computer work and stress. The management of occupational stress is highlighted as a framework for responses to physical and emotional stimulation, resulting from the demands of the work environment, the skills required to perform it and the conditions of the worker.[13–15,18] Stretching and relaxation suggestions are included in this tab, as well as relaxing songs, simple techniques to be used during work breaks which help to manage stress.
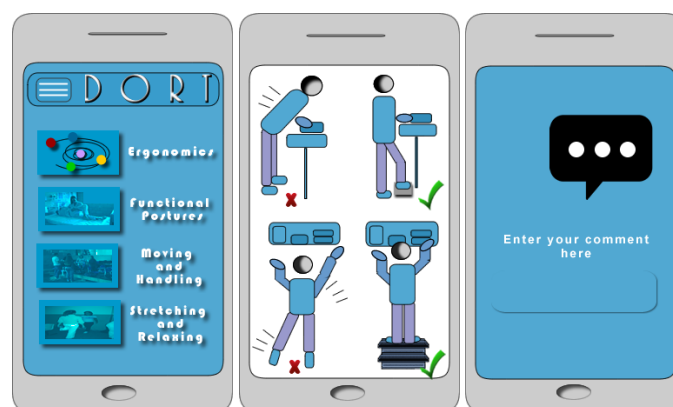

Figure 2 - Multimedia screens of the DORT application

The Risk Management highlights the information regarding the management of musculoskeletal risk factors acquired by the worker under certain working conditions, highlighting permanent education programs, accountability with the involvement of the institution and workers and prompts the user to fill out the forms in the next tab – Field Diary, aimed at recording the worker's own complaints so that the worker identifies the painful and problematic areas from the perspective of ergonomics. Using the available forms, the nursing professional reports the activity and work situation, the identification of the risk factors and then the joint evaluation with the health and safety team of the institution, establishing preventive and corrective actions in the nursing work (Figure 3).
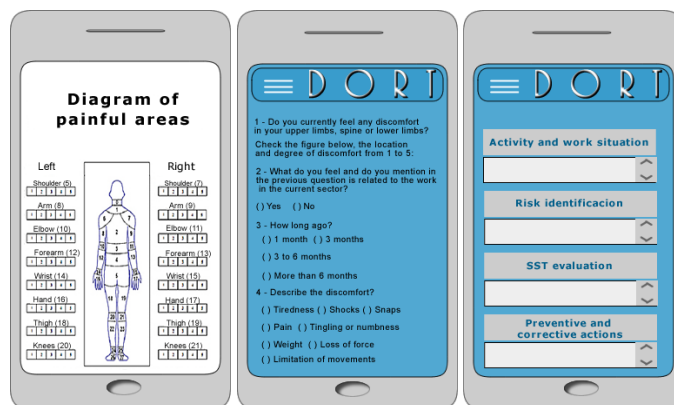

Figure 3 - Multimedia screens of the DORT application

The implementation of programs related to the prevention of work-related musculoskeletal disorders in this process is not restricted to isolated measures, adjusting furniture, postures or equipment. An effective design of the workplace, from an anthropometric perspective, may prove uncomfortable if organizational and psychosocial factors are not considered and the expression of workers should be the main directive. The user interaction icons for comments and suggestions about the application, contact and geolocation tool are also in the application.

DORT application usability evaluation

In the usability evaluation performed by nurses working in hospital units, the level of agreement in the System Usability Scale instrument in the ten formulated questions obtained the global mean of 90.4 distributed as follows: assess the ease of learning of the application, related to items 3, 4 , 7 and 10 of the System Usability Scale, obtained a mean of 92.5; verify the efficiency of the system, items 5, 6 and 8 obtained a mean of 90.3; identify application inconsistencies, item 6, obtained a means of 91.6; evaluate the ease of memorization, item 2, obtained a mean of 87.1; and verify user satisfaction, items 1,4,9, obtained a mean of 90.8.

Six nurses considered the application suitable for use in continuing education programs, reporting the high rate of musculoskeletal disorders related to work in their institutions, four nurses highlighted difficulties in the item - integrated functions of the system and suggested that the content and functionalities should be simplified. Some of the issues highlighted by the nurses were related to access such as quality of equipment, speed and type of internet connection. Due to the high demand for initial orientations on basic operations, the need for the nurses to have necessary skills related to digital technologies was identified by the study.

In the evaluation performed by the IT professionals, the process begins with the individual inspection of the interface, the results are confronted, discussed and integrated after all evaluation activities are completed. This method is fast and inexpensive, and consists of verifying the interface's

compliance with the given set of heuristics, recording the problems and their location in the interface. It verifies the severity of the identified problems and develops an individual report with the evaluation result and additional comments with suggestions for the application. Some points that need to be improved were identified by the specialists, such as: making an option for older hardware and slower connections available; reduce the number of videos and pictures to minimize the memory load of the device. No catastrophic or serious usability issues were reported by the experts been.

DISCUSSION

Media convergence processes across multiple platforms with mobile characteristics are expanding because of the ability to create interfaces between technology fields through a common digital language. Digital technologies have become increasingly feasible and are undoubtedly reshaping the profile of this century, requiring constant learning and the ability to transform information into knowledge, however it is necessary to ensure regulation of the innovations that arise, not only in relation to the quality of information that is offered to its users, but also at the level of data privacy.[19]

The popularity of handheld devices, such as smartphones, with their portability, functionality and connectivity, have been gaining space and social and professional recognition in a number of areas, joining a variety of applications mainly in the area of health.[20–24] The International Labor Organization (ILO)[2] considers that the use of mHealth, encourages the exchange of knowledge and additional research for promotion at work, as well as the World Health Organization, who also encourages the investment of mobile applications for various purposes in areas such as monitoring, epidemiological surveillance, management, care promotion, prevention, and remote patient care, as it allows the individual to have greater participation in their care.[25]

With increasing usage and different user profiles, it is important to ensure that applications address usability requirements. In computerized system designs, interface is the form of interaction between the human component and the other components, being the communication bridge and the means used by the user for the successful completion of tasks. Thus, usability issues are related to the interface dialog and the designer must have information regarding who the user of the system will be and the context that it will be used. ISO 9241 - International Standard Organization, also adopted by ABNT in Brazil under denomination NBR 9241-11, defines usability as the measure in which a product can be used by users to achieve specific objectives with effectiveness, efficiency and satisfaction in the specific context of use.[26]

Nielsen heuristics

The heuristic evaluation method[16] helps the designer to think about the effectiveness of the user experience in digital interfaces, resulting in easy to understand project interactions which are easy to memorize. The system must continuously inform the user about what it is doing, with 10 seconds being the limit to keep the user's attention focused on the dialog. The terminology must be user-based and not system-oriented. According to the researcher, the other aspects to consider in the project are: to maintain the interface consistency, the same command or action should always have the same effect to facilitate recognition; avoiding error, understanding users' navigation model and avoiding failure; minimize user memory overload and leave visible options to prevent the user from having to memorize previous steps; error messages should have clear language and no codes and that a system should be so easy to use that it does not need help or documentation and if it help is required, it must be accessible.

Computing and mobile internet have facilitated access to information and communication by adding resources that assist users in their activities, especially considering the difficulties specific

to the mobile context. Usability in mobile devices is differentiated from desktop computers because mobile digital media users have different needs and contexts than desktop users, since they access from anywhere, at any time, they need information and interfaces that meet their needs immediately. A mobile application runs on devices whose dimensions and processing are smaller, with device-specific characteristics, limited to the wireless environment, and the context of dynamic use. Its operational logic aims at a pleasant, intuitive, efficient and easy to operate system.

Data from the heuristic assessment performed by the IT professionals demonstrate that the DORT application complies with the principles of usability and does not encounter severe problems in the application. The severity ratings of the usability problem[16–17] consists of: not important - does not affect the operation of the interface, and is not seen as a usability problem; cosmetic - does not need to be fixed, unless you have extra time in the project; simple - slightly affects task execution and can be fixed, low priority; severe - causes confusion and disrupts the execution of the task and must be repaired, high priority; catastrophic - the evaluator can not complete the task because of the problem and must be corrected immediately.

Experts have suggested reducing videos, considering the memory load of devices that in some cases may be reduced and cause crashes. Random Access Memory allows applications to run, and the higher the RAM combined with the internal memory for file, processor and graphics storage, the better the performance. It is important to consider these requirements when acquiring the device, as applications are getting more advanced and running complex multitasking, such as video recording, games with hyper-realistic graphics and the immersion into the world of virtual reality.

Instrument System Usability Scale

Nursing evaluation data in the System Usability Scale instrument demonstrate that the DORT application complies with usability principles in the criteria of effectiveness, efficiency and user satisfaction, obtaining an average of 90.4. The acceptable average of the System Usability Scale is 68 points; if it is below this, serious product usability problems are likely to occur.[14] However, in the nurses' observations, difficulties with certain functions were identified such as the integration with other applications and operational concepts. A relevant point for discussion that arose in the research was that although the nurses were receptive to the application, the difficulties were related to computer knowledge and basic applications. The computerization process is expanding in the health sector, especially in the hospital setting, therefore it is important to pay attention to the existing gaps in this area, both in academic training and in the permanent education in the services.

The 2017 Digital Literacy Impact Study[27] project organized by the New Media Consortium (NMC) investigated the impact of digital literacy and how it influences professional life after graduation as students enter the job market. More than 700 recent graduates from 36 institutions responded to the study that addressed experiences with digital technologies they acquired at colleges and universities, and how their proficiency or lack of proficiency affected their careers, suggesting that access and technological skills with among students, teachers and higher education staff must be expanded.

In the NMC strategies, digital literacy does not only mean understanding how a tool works, but also understanding the responsible and appropriate use of technology - digital citizenship. They define three models of digital literacy: universal, creative and in disciplines.[28] Universal literacy is familiarity with the use of basic digital resources such as image manipulation, application use, cloud content, and the web. Creative literacy adds other technical skills that lead to content production such as video editing, audio creation and editing, animation, understanding computer hardware, programming, digital citizenship, and copyright knowledge. Literacy in disciplines is developed in different types of classes in unique ways and appropriate to each context of learning.

Currently, education on digital information and communication technologies in health services is relevant due to technological innovations in the sector, but fundamentally in academic training, therefore, teacher training that enables the teaching and learning process to be transformed into something dynamic and challenging with the support of the technologies must be provided.[29] Integrated proposals and actions are necessary, or there will be a growing gap between possibilities and unresolved demands in the work process in health, understood here, as a set of knowledge that no longer remain in certain fields, but that dialogue without interruption and require the development of flexibility and adaptability to ongoing technological change.

With the objective of investigating the inclusion of these technologies in health establishments, the *Comitê Gestor da Internet no Brasil*, integrated with the *Centro Regional de Estudos para o Desenvolvimento da Sociedade da Informação* and *Núcleo de Informação e Coordenação do Ponto BR*, interviewed managers, doctors and nurses from establishments located throughout the country. Data collection took place between September 2016 and June 2017 and obtained several indicators and among them found that that computer use and internet access are present in private establishments (100%), but this is not yet a reality among the public establishments.

In the Basic Health Units, which represent the majority of cases of establishments that did not use computers or the Internet, the study identified that 5,779 Basic Health Units did not use computers and 11,107 did not access the Internet in the 12 months prior to the survey. It also highlights that half of the health facilities were present on the Internet via websites or social networks, but only a small proportion offered some kind of service over the internet and that 74% of health facilities had an electronic system to store patient information, only 12% stored the patient's medical record information exclusively in electronic format. The majority (63%) reported partially on paper and 24% only used paper.[30]

With this perspective, it is possible to observe that, although the digital age is permeating the way we work and significantly permeating the forms of interaction in society, its adaptation in the health area is still rudimentary in its respond to the increasingly complex demands of services, actions and provision of care. Thus, the scope offered by digital health technologies still has little or no explored resources, due to its communicational matrix, reproducing the normative and prescriptive pattern, with absolute predominance of authorized voices and practically no horizontal flow. It is not intended to consider these technologies as a saving solution, not outlining a pessimism or messianic optimism related to the idea of social progress of technological base, [29] however, the productions which add quality, interaction and clarity, and at the same time ability to stimulate the user in the search for answers and questions,[31] contribute significantly to the educational process and especially in the confrontation of challenges in the care of populations.

The development and evaluation of the application usability criterion, the scope of this research, made it possible to identify the needs and critical parts that are involved in the use of these technologies. The study also emphasizes the need for permanent education regarding the use of digital technologies in health services and, especially, in academic training, due to the considerable repercussion on familiarity, development of competences and influences in the adoption and diffusion in practice of the future professional.

Regarding the limitations of the study, data such as images and videos require a greater consumption of data and devices, and may cause difficulties in the application. Therefore, in order to make the application responsive, without interfering in its comprehensiveness, it was necessary to simplify the functions, facilitating its access to nursing.

Finally, the results can not be generalized, because the inferences are circumscribed to the object of analysis and the evaluation by the participants. However, it is necessary to problematize in order to advance and invest in this scenario of different and remixed written, oral and hypermedia

languages, bringing opportunities for potential dialogic interfaces to health practices and social support networks. By developing a critical vision for the appropriate and sensible use of technologies, caregiving actions do not paralyze or replace existing ones, but rather broaden them, seeking both to minimize vulnerability to situations that generate health risks and mobilize transformative processes in the contexts involved.

CONCLUSION

The adoption, growth and popularity of computing and mobile internet are driven by its ease of access to data anywhere, anytime, Reflecting on the current technology on health, involves referring to it as a complex phenomenon, overcoming any binarisms and other attempts to simplify and recognize the possibilities that these technologies can bring to actions, be they operational, managerial or decision support actions. In this perspective, the DORT application was developed for the health of the nursing worker, promoting access to information and planning of preventive actions regarding the musculoskeletal risk factors to which they are exposed in the work in hospital units.

The proposed objectives regarding the development methodology and the agreement in the usability criteria, evaluated by nurses and specialists, were achieved. However, the evaluators suggest simplifying the application's functions in accordance with the intended population, thus contributing to the final version of the application, which will initially be made available to the *Hospital Universitário Antônio Pedro*, Federal Fluminense University (Brazil), in order to evaluate its impact in the prevention of the musculoskeletal risk factors in nursing departments in later research.

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NOTES

CONTRIBUTION OF AUTHORITY

Study design: LN range

Data collection: LN range, Tavares CMM.

Data analysis and interpretation: Gama LN, Tavares CMM.

Discussion of the results: Gama LN, Tavares CMM.

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ETHICS COMMITTEE IN RESEARCH Approved by the Research Ethics Committee of *Universidade Federal Fluminense*, opinion number 2,387,001 and Certificate of Presentation for Ethical Appraisal 79098717.6.0000.5243

CONFLICT OF INTEREST

There is no conflict of interest.

HISTORICAL

Received: June 22, 2018

Approved: October 02, 2018

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