Revista Educação, Meio Ambiente e Saúde ISSN: 1983-0173

Realidade virtual como auxílio à enfermagem: avaliação do contéudo do software-protótipo vencture vr

Virtual reality as an aid to nursing: evaluation of the content of the software-prototype vencture vr

La realidad virtual como ayuda a la enfermería: evaluación del contenido del software-prototipo vencture vr

Viviane Reis Fontes da Silva[1], Daniel Aragão Machado[2], Priscila de Castro Handen[2], Taís Verônica Cardoso Vernaglia[2], Cezar Cheng[3], Clenya Rejane Barros de Lima[4], Luiz Carlos Santiago[2]

Resumo

Objetivos: Avaliar o conteúdo de um software-protótipo de realidade virtual com vistas à sua utilização tecnológica no cuidado de enfermagem à criança submetida à cateterização venosa periférica. **Metodologia:** Pesquisa de Avaliação, com método quantitativo, como modelo de operacionalização a Prototipação de acordo com Pressman. Trata-se de um estudo descritivo exploratório de avaliação de conteúdo de uma ferramenta de TI, em forma de software. **Resultados:** Considerando todos os parâmetros tratados - adequação funcional, confiabilidade, usabilidade, eficiência de desempenho, compatibilidade, segurança, manutenabilidade e portabilidade – e seus sucessivos Valores de cada Características (VC) – 100%, 90,47%, 98,70%, 100%, 100%, 100% e 100% - advindos das respostas dos participantes de nossa pesquisa, afirmamos a tese em tela O software-protótipo VENCTURE VR otimiza o cuidado de enfermagem prestado à criança hospitalizada submetida à cateterização venosa periférica. Os resultados demonstraram a qualidade do sistema em cada atributo considerado. **Conclusão:** É possível concluir que na avaliação de conteúdo do VENCTURE VR, quase todas as características com 100% de respostas positivas, tendo apenas duas características com percentuais abaixo, que foi Confiabilidade (90%) e Usabilidade com (99%), o que torna o aplicativo mais uma alternativa tecnológica em prol da assistência de enfermagem.
Descritores: Pediatria, Enfermagem, Prototipação, Atuação do profissional enfermeiro, Realidade virtual.

Abstract

Objectives: To evaluate the content of a virtual reality prototype software with a view to its technological use in nursing care for children undergoing peripheral venous catheterization. **Methodology:** Evaluation Research, with a quantitative method, as operationalization model Prototyping according to Pressman. This is an exploratory descriptive study of content evaluation of an IT tool, in the form of software. **Results:** Considering all the treated parameters - functional adequacy, reliability, usability, performance efficiency, compatibility, security, maintainability and portability - and their successive Values of each Characteristics (CV) - 100%, 90.47%, 98, 70%, 100%, 100%, 100% and 100% - arising from the responses of our research participants, we state the thesis on screen The VENCTURE VR prototype software optimizes the nursing care provided to hospitalized children undergoing peripheral venous catheterization. The results demonstrated the quality of the system in each considered

[1] Enfermeira da Secretaria de Saúde do Rio de Janeiro, Doutoranda do PPGENFBIO-UNIRIO, Rio de Janeiro-RJ. E-mail: vivianereisfontes@gmail.com
[2] Doutores em Enfermagem, Docentes da Escola de Enfermagem Alfredo Pinto, da Universidade Federal do estado do Rio de Janeiro – UNIRIO, Rio de Janeiro-RJ.
[3] Analista de C&T do Instituto Nacional do Câncer – INCA, Rio de Janeiro-RJ.
[4] Professora da Universidade Estadual de Roraima – UEER, Boa Vista – RR.

attribute. **Conclusion**: It is possible to conclude that in the evaluation of the content of VENCTURE VR, almost all the characteristics with 100% of positive answers, having only two characteristics with percentages below, which was Reliability (90%) and Usability with (99%), the which makes the application another technological alternative in favor of nursing care.
Descriptors: Pediatrics, Nursing, Prototyping, Professional nursing practice, Virtual reality.

Resumen

Objetivos: Evaluar el contenido de un prototipo de software de realidad virtual con miras a su uso tecnológico en la atención de enfermería a niños sometidos a cateterismo venoso periférico. **Metodología:** Investigación de Evaluación, con método cuantitativo, como modelo de operacionalización. Prototipado según Pressman. Se trata de un estudio descriptivo exploratorio de evaluación de contenido de una herramienta informática, en forma de software. **Resultados:** Considerando todos los parámetros tratados - adecuación funcional, confiabilidad, usabilidad, eficiencia de desempeño, compatibilidad, seguridad, mantenibilidad y portabilidad - y sus sucesivos Valores de cada Característica (CV) - 100%, 90.47%, 98, 70 %, 100%, 100%, 100% y 100% - a partir de las respuestas de los participantes de nuestra investigación, expresamos la tesis en pantalla El software prototipo VENCTURE VR optimiza la atención de enfermería brindada a niños hospitalizados sometidos a cateterismo venoso periférico. Los resultados demostraron la calidad del sistema en cada atributo considerado. **Conclusión:** se puede concluir que en la evaluación del contenido de VENCTURE VR, casi todas las características con 100% de respuestas positivas, teniendo solo dos características con porcentajes por debajo, que fue Confiabilidad (90%) y Usabilidad con (99%). %), lo que convierte a la aplicación en otra alternativa tecnológica a favor del cuidado de enfermería.
Descriptores: Pediatría, Enfermería, Prototipado, Práctica Profesional de Enfermería, Realidad Virtual.

INTRODUCTION

Undoubtedly, with the Industrial Revolution, there have clearly been technological advances that directly affect the economy of countries, as well as their social transformations. However, in the 20th century, we experienced the technological revolution based on knowledge from microelectronics, advances in microbiology, genetic engineering and information technology. Currently, the 21st century is being marked as the information age, whose new paradigm - information technology - is having repercussions on the most diverse aspects of daily life, particularly health care (PINHO, 2011).

In the health sector, Information and Communication Technologies (ICT) stand out through the World Wide Web. For the World Health Organization (WHO), technological advances and their impacts contribute to its growing adoption (WHO, 2011).

The use of ICT in health, also known as e-health, is a tool for improving the flow of information, by electronic means, to support the provision of services, communication and management of health systems (WHO, 2011). The term e-health refers to any and all information related to digital health, including all products, systems and services.

Four strategies were determined by the Pan American Health Organization (PAHO, 2011) in the construction of an Action Plan for *e-health* (2012-2017): support public policies for the use and implementation of information and communication technology in health; improve

public health through the use of tools and methodologies based on innovative information and communication technologies; promote and facilitate horizontal cooperation between countries for the development of a digital agenda; ensure training, digital literacy and improved access to information in order to use ICTs as key elements for the quality of care, health promotion and disease prevention. For developing countries, in particular, the International Telecommunication Union (ITU) has published a Guide to implementing *e-health with the* aim of accelerating the uptake of these technologies in the health sector in these countries.

In the case of Brazil, the e-SUS for Primary Care stands out as a reference to the electronic Unified Health System (SUS). This is a strategy of the Ministry of Health, whose purpose is to develop, restructure and guarantee the integration of information systems, in order to allow an individualized record of the health situation (through the national card), integration between the various scenarios of the health care network and interoperability between systems (BRASIL, 2014).

A milestone in the evolution of pediatric units was the inclusion of the companion with the child during the hospitalization process. The Statute of the Child and Adolescent (Law no. 8069 of 1990) regulates this situation in the country as a whole, as article 12 states that hospitals must provide conditions for the full-time stay of a parent or guardian in cases where a child or adolescent is hospitalized.

Several studies have shown the importance and benefits of the presence of a companion, preferably the mother with the child. International literature has shown the benefits of the presence of a companion, especially a mother with a hospitalized child. Studies in psychoanalytic psychology have shown emotional and behavioral disorders when children are separated from their mothers, whether in hospital or in schools, characterizing deprivation, called Analytic Depression (partial affective deprivation, lasting up to five months) and Hospitalism (total affective deprivation, lasting more than five months) (REZENDE, 2013).

Thinking about the issue of comfort in pediatrics, and the experience of this specialty, it can be said that the most painful procedure performed on children by the nursing team, among all the procedures during their hospital stay, is peripheral venipuncture, since the child does not preserve the access very carefully: They want to run around, play, or simply don't want to have this "nuisance" in their body and pull it out; in addition to the conditions of: dehydration/ malnutrition, childhood obesity, which make it difficult to get a good access and thus don't last for long, consequently resulting in the child being subjected to peripheral venous catheterization more often.

The technique for venipuncture requires antisepsis, precision, skill, attention, calm and concentration on the part of the professional, regardless of unfavorable environmental circumstances, the outcome that is expected is the successful puncture with the least possible

exposure of the child and their mother/carer to discomfort, whether in the laboratory routine or at times when the infusion of fluids and medications is necessary.

The aim of this study was to evaluate the content of a virtual reality software prototype with a view to its technological use in nursing care for children undergoing peripheral venous catheterization.

METHODOLOGY

In order to achieve the proposed objective, we used Evaluation Research (POLIT & BECK, 2011), with a quantitative method (MINAYO, 1993), as an operationalization model, Prototyping according to Pressman (2011) and was developed from January 2016 to August 2017.

According to Polit & Beck (2011), evaluation research from a nursing perspective is about developing useful information about a program, practice or procedure, allowing the researcher to decide whether to fully adopt, modify for adoption or abandon the program, which is a new intervention. An instrument is created to intervene in practice where its data will be used more and more each day to guide decision-making and actions in the real world.

Minayo (1993) states that the quantitative approach to research aims to elucidate observable data, indicators and trends.

TYPE OF STUDY

This is an exploratory descriptive study evaluating the content of an IT tool in the form of software. To this end, the study was carried out as part of the Doctorate Course in Nursing and Biosciences, of the Postgraduate Program in Nursing and Biosciences - PPGENFBIO, based at the Alfredo Pinto Nursing School, of the Federal University of the State of Rio de Janeiro - UNIRIO, located in the State of Rio de Janeiro.

The methodology used in this research is based on the software life cycle proposed by Pressman and Maxim (2016), originally proposed by Barry Boehm (1988), which was developed in two stages:

Stage 1 - development of the software based on a prototype developed during the professional master's course of the Postgraduate Program in Health and Technologies in the Hospital Space, which ended in 2019, so this first stage has already been completed.

Stage 2 - during the doctoral course at the Postgraduate Program in Nursing and Biosciences - PPGENFBIO, the content of the VENCTURE VR software was evaluated. In this stage, the Group of evaluators who took part in this evaluation are nurses - master's and doctoral students from PPGENF and PPGENFBIO with experience in pediatrics and peripheral venous catheterization.

The reason for choosing these participants was due to the restrictions imposed by the Covid-19 pandemic, making it impossible for the researcher to access hospital environments, especially to carry out research of this nature and methodological approach. Therefore, the evaluation of the app did not involve hospitalized children and/or their companions; however, the stage was conducted based on the ISO/IEC 25010 (2011) standard.

Regarding evaluation research from a nursing perspective, Polit & Beck (2001) point out that it involves developing useful information about a program, practice or procedure, allowing the researcher to decide whether to adopt it fully, modify it for adoption or abandon the program, which is a new intervention. Minayo (1993) corroborates this by pointing out that the quantitative method aims to elucidate observable data, indicators and trends.

RESULTS

To characterize the evaluators, variables related to their area of expertise, length of experience and area of professional experience were collected.

As for the area in which the evaluators work, 5 (62.5%) work only in care, 3 (37.5%) work in care and teaching at the same time, 0 (0%) work only in teaching and 0 (0%) in none of the professional options.

As for length of experience, the evaluators are professionals with considerable experience, 7 (87.5%) with more than 84 months working in nursing, either in care or teaching or both. Only 1 (12.5%) chose not to answer.

As for the professional experience of nurses in pediatrics, up to 1 year 1 (12.5%); 2 years 2 (25%); 3 years 3 (37.5%); 12 years 1 (12.5%) and 21 years 1 (12.5%) preferred not to answer. This shows us that practically all the participants in the survey have extensive experience in pediatric nursing.

The Functional Adequacy characteristic was evaluated considering the sub-characteristics: Functional Integrity, Functional Correctness and Functional Aptitude. It was found that the functional adequacy characteristic scored almost 100% in all its sub-characteristics, with only functional aptitude scoring 1 not applicable.

The Reliability characteristic was evaluated taking into account the Maturity, Fault Tolerance, Recoverability and Availability sub-characteristics. We can see that in the sub-characteristics on failures, 4 (50%) said that Vencture VR does not fail frequently, 1 (12.5%) disagreed and 1 (12.5%) preferred not to answer. And more than 60% say that when it does fail, the software continues to work as expected. Half of the evaluators 4(50%) agree with the recoverability of data affected by failures. In the availability sub-characteristic, 6(75%) say that the software is accessible for use when needed, only 1 disagrees and another prefers not

to answer. The Usability characteristic was evaluated considering the sub-characteristics Recognition of Adequacy, Apprehensibility, Operability and Attractiveness.

In the evaluation of the usability characteristic, the vast majority of the sub-characteristics were evaluated positively with values equal to or above 75%, with only the possibility of data input and output by the user being lower, 3 (37.5%) each and whether the software informs the user of invalid data input, 3 (3.75%).

The Performance Efficiency characteristic was evaluated considering the Time, Resources and Capacity sub-characteristics, with the performance efficiency evaluation, we can verify that the "time and resources" sub-characteristics were very well evaluated with 7 (87.5%); evaluators in agreement on the software execution time, the software resources are adequate and the software execution time is adequate for the time in which the nurse punctures, with only the software response time with 6 (75%) evaluations in agreement.

The "capacity" sub-characteristic has the following analyses in agreement: multi-user processing 3 (37.5%); operation with networks 3 (37.5%); good navigation 6 (75%) and software is fast and doesn't crash during execution 6 (75%).

The Compatibility characteristic was evaluated considering the Interoperability sub-characteristic. In this characteristic, almost all of the 7 evaluators (87.5%) were in favor of the Vencture VR software allowing direct interaction with the user.

In the evaluation of "security", with regard to the "confidentiality" sub-characteristic, half of the evaluators 4 (50%) agreed with the identity test, with 3 (37.5) saying that it does not apply and 1 (12.5%) preferring not to answer.

The Maintainability characteristic was evaluated considering the Modifiability, Testability, Modularity and Reusability sub-characteristics. This characteristic had 50% agreement in each sub-characteristic ("testability", "modularity" and "reusability"), with only "modifiability" having 3 (37.5%) agreements. The rest believed it didn't apply or preferred not to answer, i.e. we didn't have any sub-features in disagreement.

The Portability characteristic was evaluated by eight IT experts, considering the sub-characteristics Adaptability, Ability to be Installed and Ability to Replace. This was the last characteristic to be evaluated, where 100% said it was easy to adapt to other environments and 7 (87.5%) agreed that it was easy to install in other environments, only 1 preferred not to answer, i.e. we didn't have any sub-characteristics in disagreement either.

The results of the VENCTURE VR evaluation were compared with the judgment criteria, whose expected value was above 70% of responses indicating agreement with the characteristics evaluated. It can be seen that Functional Adequacy was evaluated in agreement

with the sub-characteristics evaluated by the evaluators, as it had the maximum percentage of 100% positive responses. None of them disagreed with the evaluation criteria.

The Reliability characteristic achieved the necessary quality in the nurses' evaluation, because although 10% of the evaluations were in disagreement, their evaluation in agreement exceeded the percentage of 70% for positive responses. It can be seen that the nurses assessed this characteristic positively, as 99% of the responses were in agreement, i.e. more than 70% of the responses were positive. Only 1% disagreed.

The Performance Efficiency characteristic achieved 100% positive responses in the nurses' evaluation, and therefore 0% disagreement.

The Compatibility characteristic reached 100% positive responses in the nurses' assessment. There was 0% disagreement. On the other hand, Safety was rated positively by all the evaluators, reaching 100%, surpassing the 70% percentage for positive responses.

FINAL CONSIDERATIONS

The development of this research made it possible to evaluate the content of the VENCTURE VR software, where it was possible to analyze the technical quality and functional performance of this application. The results demonstrated the quality of the system in each attribute considered.

The evaluation was carried out by eight (8) nurses with experience in pediatrics, considering that this area has a certain particularity when it comes to performing the peripheral venipuncture technique on children. When analyzing the content of the software, the nurse will take into account the non-cooperation of the child, the need for playfulness, visuals, colors, sounds, game time, virtual reality itself, in other words, important issues in the world of children.

The Quality Model used in the study was the ISO/IEC 25010 standard and the Evaluation Process was the ISO/IEC 25040 standard, published in 2011, and the quality was considered very satisfactory based on the percentage of VC for each characteristic/sub-characteristic evaluated.

VENCTURE VR was evaluated by the nurses according to the following characteristics: Functional Adequacy, Reliability, Usability, Performance Efficiency, Compatibility, Security, Maintainability and Portability.

The Functional Adequacy of VENCTURE VR received 100% positive responses from the pediatric nurses. The Reliability of VENCTURE VR obtained 90% positive responses from the nurses who evaluated it. The Usability of VENCTURE VR obtained 99% positive responses from the evaluators. The Performance Efficiency of VENCTURE VR obtained 100% positive responses from the nurses. The Compatibility of VENCTURE VR received 100% positive responses from

nurses. The Safety of VENCTURE VR received 100% positive responses from the evaluators. The Maintainability of VENCTURE VR received 100% positive responses from the evaluators. The Portability of VENCTURE VR obtained 100% positive responses from the nurses who evaluated it.

Therefore, it is possible to conclude that in the content evaluation of VENCTURE VR, almost all the characteristics had 100% positive responses, with only two characteristics with percentages below, which were Reliability (90%) and Usability with (99%), which makes the application another technological alternative in favor of nursing care.

However, it is worth noting that these results do not exclude the need for a real-world evaluation study, using the app in a care practice setting, perhaps allowing an evaluation to verify the app's effectiveness in pediatric units, with all the adversities that the hospital environment offers, from the skill of the nursing staff to the almost constant presence of companions during the venipuncture procedure. This would be the perfect scenario for assessing usability, among other characteristics and sub-characteristics, since a diverse set of people would be using the app in the most adverse conditions. However, although the study demonstrated the quality of the product's content, it needs to be evaluated from other perspectives, perhaps during a post-doctoral internship.

REFERENCES

_____. ISO/IEC 25010 – **System and Software engineering - System and software Quality Requirements and Evaluation (SQuaRE) - System and software quality models**. Switzerland; 2011.

_____. NBR ISO/IEC 14598-6. **Engenharia de Software - Avaliação do Produto - Parte 6: Documentos de módulos de avaliação.** Rio de Janeiro, 2004.

_____. NBR ISO/IEC 25000. **Engenharia de Software - Requisitos e avaliação da qualidade de produto de software (SQuaRE) - Guia do SQuaRE**. Rio de Janeiro, 2008.

_____. NBR ISO/IEC 25001. **Engenharia de Software - Requisitos e avaliação da qualidade de produto de software (SQuaRE) - Guia do SQuaRE**. Rio de Janeiro, 2009.

ANDRADE, R.M. **Um roteiro para o ensino de qualidade de arquitetura de software guiado por requisitos não funcionais**. 2015. 279f. Tese (Doutorado em Engenharia de Computação e Sistemas Digitais) – Escola Politécnica da Universidade de São Paulo. Universidade de São Paulo, São Paulo, 2015. Disponível em: <https://dx.doi.org/10.11606/T.3.2016.tde-19072016-121434>. Acesso em: 17 set. 2021.

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR ISO/IEC 9126-1:2003. **Engenharia de software: qualidade de produto: parte 1: modelo de qualidade**. Rio de Janeiro, 2003.

BOEHM, B.W. **A spiral Model for Software Development and Enhancement. Barry Boehm. Computer**. May, 1988. Disponível em: <http://www-scf.usc.edu/~csci201/lectures/Lecture11/boehm1988.pdf >. Acesso em: 17 sep. 2021.

BRASIL. Ministério da Saúde. Conselho Nacional de Saúde. Comissão Nacional de Ética e Pesquisa. Resolução nº 466, de 12 de dezembro de 2012. **Aprova diretrizes e normas**

regulamentadoras de pesquisas envolvendo seres humanos. Diário Oficial da União, Brasília, DF, 13 jun. 2013.

BROY, M. **Software quality: from requirements to architecture**. In: WINKLER, D.; BIFFL, S.; BERGSMANN, J. (Org.). Software Quality. Increasing Value in Software and Systems Development. Lecture Notes in Business Information Processing. v. 133, Berlin: Sprenger, 2013. p. 1-2.

CAIRES, C. **Cozinha Virtual: Uma prova de avaliação neuropsicológica em Realidade Virtual. Tese apresentada para o grau de Mestre em Psicologia no Curso de Mestrado em Psicoterapia, Reabilitação Cognitiva e Ciberterapia**, conferido pela Universidade Lusófona de Humanidades e Tecnologias; 2012.

CANFORA, G., GARCIA, F., PIATTINI, M., RUIZ, F., VISAGGIO, C. A., 2004, "A Family of Experiments to Validate Metrics for Software Process Models", **The Journal of Systems and Software**, v. 77, n. 2, pp. 113-129.

CASTRO, A. V.; REZENDE, M. A Técnica Delphi e seu uso na pesquisa de enfermagem: revisão bibliográfica. **REME - Rev. Min. Enferm.,** v. 13, n. 3, p. 429-34, 2009

Centro Brasileiro para a Infância e Adolescência. **Estatuto da Criança e do Adolescente**. Ministério da Ação Social Brasília; 1990.

Cetic/Nic/CGI; **Painel TIC COVID-19 - Pesquisa online com usuários de internet no Brasil**; 4ª edição; 2022. Disponível em: https://cetic.br/pt/publicacao/painel-tic-covid-19-pesquisa-online-com-usuarios-de-internet-no-brasil-4edicao/

CLEMENTS, P.; KAZMAN, R.; KLEIN, M. Evaluating software architectures. Boston: Addison-Wesley, 2002.

COCKBURN, A. **Slecting a Project's Methodology**. IEEE Software, v.17, n.4, p.64 –71, Jul./Aug. 2000. Disponível em: <https://courses.cs.ut.ee/MTAT.03.243/2015_spring/uploads/Main/cockburn.pdf>. Acesso em: 17 sep 2021.

CYBIS, Walter; BETIOL, Adriana Holtz; Richard, Faust. Ergonomia e Usabilidade: conhecimentos, métodos e aplicações, 2. ed. São Paulo: Novatec Editora, 2010

DA SILVA, B. C.; MACIEL, R. S. P.; RAMALHO, F. Evaluating maintainability of MDA software process models. **Lecture Notes in Computer Sciences**, v. 7983, p. 199- 2013, June 2013. ISSN 03029743.

ENGHOLM, Hélio. **Engenharia de Software na Prática**. São Paulo: Novatec, 2010.

FLEURY, A.C.C.; VARGAS, N.N. **Organização do Trabalho: Uma abordagem interdisciplinar - Sete casos brasileiros para estudo**. São Paulo: Atlas, 1983.

GARCÍA, F., SERRANO, M., CRUZ-LEMOS, J., RUIZ, F., PIATTINI, M., 2007, "Managing Software Process Measurement: A Metamodel-Based Approach", **Information Sciences**, v. 177, n. 12, pp. 2570-2586.

GOMES, Giovana Calcagno; OLIVEIRA, Pâmela Kath de. **Vivências da família no hospital durante a internação da criança**. Rev. Gaúcha Enferm., Porto Alegre, v. 33, n. 4, p. 165-171, Dec. 2012. Disponivel em: <http://dx.doi.org/10.1590/S1983-14472012000400021>. Acesso em: 17 set. 2021.

GREGG, Lynsey; TARRIER, Nicholas. **Virtual reality in mental health. A review of the literature**. Social Psychiatry and Psychiatric Epidemiology. v.42, n.5, p.343-54, 2007. Disponível em: <http://dx.doi.org/10.1007/s00127-007-0173-4>. Acesso em: 17 sep. 2021.

GUERRA, A.C.; COLOMBO, R.M.T. **Qualidade de Produto de Software**, 2009. Disponível em: <http://www.mct.gov.br/index.php/content/view/306537.html>.Acesso em: 17 sep. 2021.

HERSH, W.R.; TOTTEN, A.M.; EDEN, K.B.; DEVINE, B.; GORMAN, P.; KASSAKIAN, S.Z.; WOODS, S. S.; DAEGES, M.; PAPPAS, M.; MCDONAGH, M.S. **Outcomes From Health Information Exchange: Systematic Review and Future Research Needs**. JMIR medical infor-matics, v.3, n.4, p.e39, 2015. Disponível em: <https://dx.doi.org/10.2196%2Fmedinform.5215>. Acesso em: 17 sep. 2021.

KOLCABA, K. **The comfort line**. Disponível em: <http://www.uakron.edu/comfort>. Acesso em: 17 sep. 2021.

KOSCIANSKI, A. *et al*. **Guia para utilização de normas sobre qualidade de produto de software ISO/IEC 9126 e ISO/IEC 14598**. ABNT – Associação brasileira de normas técnicas. SC10 – subcomitê de software. Curitiba, 1999.

LOBIONDO - WOOD, G.; HABER, J. Pesquisa em Enfermagem: métodos, avaliação, crítica e utilização. Rio de Janeiro: Guanabara-Koogan, 2001.

MAGRANI, E. **A internet das coisas** — Rio de Janeiro : FGV Editora,2018.192 p. Disponível em: http://eduardomagrani.com/livro-internet-da-coisas-2018/

MALLOY, K and L., Milling. **The Effectiveness of virtual reality distraction for pain reduction: A sistematic review**. Clinical Psycology, v.30, n.8, p.1011-8. 2010. Disponível em: <https://doi.org/10.1016/j.cpr.2010.07.001>. Acesso em: 17 set. 2021.

MATHUR, A.P. **Foundation of Software Testing**. New York: Person, 2012.

MAYHEW, D. **The usability engineering lifecycle: a practioner's handbook for user interface desing**. San Francisco: Morgan Kaufmann, 1999.

MINAYO, M.C.S.; SANCHES, O. **Quantitativo-Qualitativo: Oposição ou Complementaridade?** Cad. Saúde Pública, Rio de janeiro, 9 (#): 239-262, jul/set. 1993.

NATIONAL CENTER FOR NURSING RESEARCH (NCNR). **Nursing informatics: enhancing patient care. Bethesda (USA)**: U.S. Department of Health and Human Services, 1993.18p. Dsiponivel em: <https://www.nih.gov/about-nih/what-we-do/nih-almanac/national-institute-nursing-research-ninr>. Acesso em: 30 ago. 2021.

NAVARRO, Beatriz R.; SANTOS, Jéssica dos; Baklizky, Maruscia; Wagner, Priscilla K.; ARAÚJO, Luciano V. ADAFARMA: **Aplicativo para Auxílio na Fase de Aderência ao Tratamento. In: XIII Congresso Brasileiro em Informática em Saúde – CBIS 2012**, Universidade de São Paulo (USP), 2012.

OLIVEIRA, Fernanda Maria do Carmo da Silveira Neves de et al. **Noise levels in a pediatric intensive care unit: an observational and correlational study**. Online Brazilian Journal of Nursing, [S.l.], v.12, n.3, p. 431-41, jun 2013. Disponível em: <http://dx.doi.org/10.5935/1676-4285.20134043>. Acesso em: 17 sep. 2021.

OLIVEIRA, T.R.; COSTA, F.M.R. **Desenvolvimento de aplicativo móvel de referência sobre vacinação no Brasil**. J Health Inform, v.4, n.1, p. 23-27, 2012. Disponível em: <http://www.jhi-sbis.saude.ws/ojs-jhi/index.php/jhi-sbis/article/view/161>. Acesso em: 15 ago 2021.

ORGANIZAÇÃO PANAMERICA DE SAÚDE - OPAS. **Strategy and Plan of Action on eHealth: Final Report**. Wasbhington, 2011. Disponível em: <https://iris.paho.org/handle/10665.2/49448>. Acesso em: 17 sep. 2021.

PERES, H.H.C.; KURCGANT, P. **O ser docente de enfermagem frente a informática**. Rev. Latino-Am. Enfermagem, Ribeirão Preto, v.12, n.1, 2004. Disponível em: <http://www.scielo.br/pdf/rlae/v12n1/v12n1a14.pdf>. Acesso em: 30 ago. 2021.

PFLEEGER, S. L. **Software Engineering: Theory and Practice**, v. 39. New Jersey: Prentice Hall, 2001. 792 p.

PINHO, J. A. G de. **Sociedade da informação, capita lismoe sociedade civil: reflexões sobre política, internet e democracia na realidade brasileira**. ERA, São Paulo, v. 51, n. 1, p. 98-106, jan./fev. 2011.

POLIT, D.F.; BECK, C.T. **Fundamentos de Pesquisa em Enfermagem: Avaliação de evidências para a prática da enfermagem**. 7. ed. Porto Alegre: Artmed, 2011.

POWELL, C.. **The delphi technique: Myths and realities**. Journal of Advanced Nursing, v. 41, n. 4, p. 376-382, 2003.

PREECE J, ROGERS Y, SHARP H. **Design de interação: além da interação homen-computador**. Trad. Viviane Possamai. Porto Alegre: Bookman; 2005.

PRESSMAN, R.S. **Engenharia de Software**. McGraw Hill Brasil, 2011.

PRESSMAN, R.S.; MAXIM, B.R. **Engenharia de Software: Uma Abordagem profissional**. 8. ed., Porto Alegre: AMGH, 2016.

RANGEL, A.L. **Avaliação de Software para elaboração automática da escala de trabalho da Enfermagem**. 2010. 109f. Tese (Doutorado em Enfermagem Fundamental) – Escola de Enfermagem de Ribeirão Preto. Universidade de São Paulo, Ribeirão Preto, 2010. Disponível em: <https://dx.doi.org/10.11606/T.22.2010.TDE-09032010-165357>. Acesso em: 17 set. 2021.