Development and assessment of animated infographic: safe medication for children's health

Desenvolvimento e avaliação de infográfico animado: medicação segura em saúde da criança

Desarrollo y evaluación de infográfico animado: medicación segura para la salud de los niños

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Abstract

Objective: To develop and assess an animated infographic as a teaching resource for teaching safe medication in children's health.

Methods: This is a methodological study consisting of the creation of an animated infographic about safe medication in children's health for students in higher education in nursing. The development of this digital educational technology followed four stages: planning, production, implementation and assessment. The criterion for assessment was greater than 90% agreement, analyzed using the Content Validity Index.

Results: The final version has 37 screens, which present the goals of the 3rd Challenge of the World Health Organization, adverse events, risk factors for the target audience and, finally, recommendations on good practices in safe medication administration in children's health. The infographic was assessed by 13 experts and there was an agreement between all items greater than 90%.

Conclusion: The animated infographic was considered a valid educational resource, which could favor the teaching-learning process of nursing students regarding the conduct of good practices in medication administration in children's health.

Resumo

Objetivo: Desenvolver e avaliar um infográfico animado como recurso didático para o ensino de medicação segura em saúde da criança.

Métodos: Trata-se de estudo metodológico composto pela criação de um infográfico animado sobre medicação segura em saúde da criança para estudantes do ensino superior de enfermagem. O desenvolvimento desta tecnologia digital educacional seguiu quatro etapas: planejamento, produção, implementação e avaliação. O critério para avaliação foi concordância superior a 90%, analisada por meio do Índice de Validade de Conteúdo.

Resultados: A versão final do infográfico animado possui 37 telas, as quais apresentam as metas do 3º Desafio da Organização Mundial de Saúde, os eventos adversos, fatores de risco do público-alvo e, por fim, as recomendações sobre boas práticas na administração segura de medicamentos em saúde da criança. O infográfico foi avaliado por 13 especialistas e obteve-se concordância entre todos os itens superior a 90%.

Conclusão: O infográfico animado foi considerado um recurso educacional válido, que poderá favorecer o processo de ensino aprendizagem de estudantes de enfermagem no que tange à conduta de boas práticas na administração de medicação na área da saúde da criança.

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Conflicts of interest: nothing to declare.

Resumen

Objetivo: Desarrollar y evaluar un infográfico animado como recurso didáctico para la enseñanza de medicación segura para la salud de los niños.

Métodos: Se trata de estudio metodológico compuesto por la creación de un infográfico animado sobre medicación segura para la salud del niño para estudiantes de la enseñanza superior en enfermería. El desarrollo de esta tecnología digital educativa siguió cuatro etapas: planificación, producción, implementación y evaluación. El criterio para la evaluación fue la coincidencia superior al 90 %, analizada por medio del Índice de Validez de Contenido.

Resultados: La versión final del infográfico animado cuenta con 37 pantallas que presentan las metas del 3er Desafío de la Organización Mundial de Salud, los eventos adversos, factores de riesgo del público destinatario y, por fin, las recomendaciones sobre buenas prácticas en la administración segura de medicamentos para la salud para los niños. El infográfico fue evaluado por 13 especialistas y se obtuvo la coincidencia entre todos los ítems superior al 90 %.

Conclusión: El infográfico animado fue considerado como un recurso educativo válido, que podrá favorecer el proceso de enseñanza y aprendizaje de estudiantes de enfermería en lo que se refiere a la conducta de buenas prácticas en la administración de medicación en el área de la salud de los niños.

Introduction

Patient safety has been consolidated as a central debate topic in the health care process, especially with regard to the peculiarities of child health care, due to the physical and developmental characteristics of each age group, which condition the highest probability of occurrence of security incidents. In pediatrics, accidents related to medication errors have been growing significantly; according to the numbers, about 8% of adverse events are directed to pediatric patients.[1]

In 2017, the World Health Organization (WHO) launched the Third Global Patient Safety Challenge, with the theme Medication Without Harm, a proposal that is also included in the reference document of the Brazilian National Patient Safety Program (PNSP - *Programa Nacional de Segurança do Paciente*), with the safety protocol on medication prescription, use and administration.[2,3] This third challenge aims to reduce preventable drug-related harm by 50% over the next 5 years and globally.[2]

Statistical data show that one in ten patients are harmed while receiving healthcare, with forty-three million patient safety incidents occurring each year, and that medication errors are spent around US$ 42 billion annually, with failures occurring at various medication process stages.[2]

In children's health, the main medication errors are those related to the calculation of inadequate medication, which is specific for each child, dose amount, which varies a lot when it is related to the age of an adult, not checking correct and changing patient names, among others.[1]

Patient safety culture is also one of the crucial factors in ensuring pediatric patient safety. WHO describes that patient safety culture addresses five essential attributes that must be considered in their care practice during the implementation of solid safety management systems: a culture in which all healthcare workers take responsibility for their own safety, that of co-workers, patients and visitors; a culture that prioritizes safety over financial and operational objectives; a culture that encourages and rewards the identification, communication and resolution of safety issues; a culture that establishes organizational learning from accidents that have occurred and a culture that provides appropriate structures, responsibilities and resources to maintain efficient safety systems.[2]

In the creation of strategies that minimize and prevent the occurrence of adverse events related to medication errors in pediatrics, technology has stood out as a strong ally for achieving the objective and promoting a culture of patient safety. The implementation of an electronic medical prescription system, clinical dosage decision support systems and electronic alerts have proven to be important tools for error prevention.[4]

Among the educational technologies, animated infographics can be highlighted. This communication resource uses visual elements combined with reduced and objective verbal texts, to convey information in an attractive way and with a high explanatory potential.[5] Infographics allow to make different contents more accessible, allow the use of aesthetic components that easily capture users' attention, insertion of illustrations, audio, text and photography with movement, videos and simultaneous animations, aiming to motivate learning with less effort cognitive.[6]

Infographics are, therefore, a powerful teaching-learning strategy, considering that most students

in current academic training are part of Generation Z, also called digital natives, with a preference for multimodal communications.[7]

In order to contribute to WHO's Third Global Patient Safety Challenge, with the theme Medication Without Harm, and considering the potential of using infographics in the educational process, the approach to pediatric patient safety in medication administration was dazzled.

In order to collaborate in health education activities to promote a culture of patient safety with children, family members and caregivers, the objective of this study was to develop and assess an animated infographic as a didactic resource for teaching safe medication in children's health.

Methods

This is a methodological research on the development of an educational product to enhance the teaching-learning process of higher education nursing students, which aimed to develop and assess an animated infographic on safe medication for children's health. The stages of construction and assessment of the Digital Educational Technology (DET) infographic were conducted from February 2019 to July 2020, carried out by a team composed of undergraduate and graduate students, responsible researcher and multimedia team.

The development process of this educational technology had as theoretical reference the Instructional Design, which aims to systematize teaching, through the planning and development of methods in order to generate learning.[8] In the study, the concept of the Brazilian National Policy for Comprehensive Health Care for Children (PNAISC - *Política Nacional de Atenção Integral à Saúde da Crianças*), which considers the term children as a person aged 0 (zero) to 9 (nine) years, that is, from 0 (zero) to 120 (one hundred and twenty) months.

For the methodological development, the project was outlined from the recommendations:[9,10] 1) planning, 2) production, 3) implementation, 4) assessment. The present study aimed to present the development of the first two stages, as shown in Figure 1.

In the context of developing the infographic, the aforementioned stages and production subprocesses were followed, covering a period of six months for the development of the Planning phase and 11 months for the Production phase. The sample size for content assessment by experts was defined using a formula for finite population $n=Za2.P(1-P)/e^2$. A 95% confidence interval (Za) was established,
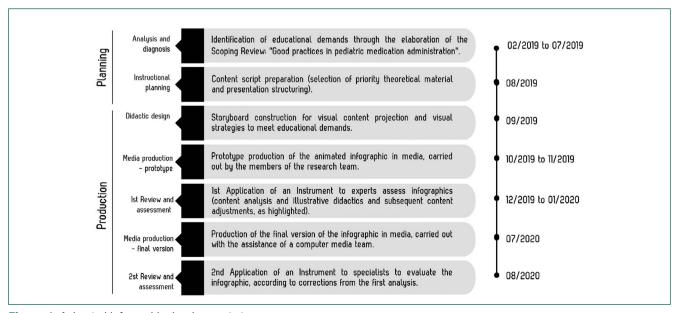

Figure 1. Animated infographic development stages

in which P (proportion of experts on item adequacy) was set at 90% and "e" (expected difference) was 20%. Thus, the initial sample calculated by the methodological framework was a minimum number of 9 specialists;[11] however, according to availability, 13 specialists participated in the assessment.

For the selection of experts for this study, the Fehring expert classification system was considered.[12] The following were included: Nurses with practical or academic experience in the area of children's health and/or educational technology, as long as they reach a minimum score of five points, according to score: PhD degree (four points); master's degree (three points); publication in an indexed journal on the topic of interest to the study (two points); specialization in the topic of interest to the study (two points); clinical practice in the area of interest of at least 2 years (two points); participation in a scientific event in the last two years on the topic of interest to the study (one point). The exclusion criterion was not reaching the minimum score according to Fehring and incomplete filling out of the collection instrument.

For recruiting content specialists, convenience sampling was used. An invitation was issued among the contacts of nurses in children's health, within the research group, with an eligible profile to integrate the sample of this stage, according to the analysis of resumes After accepting to participate, the evaluators received by email (via Google Forms®) the animated infographic, the Informed Consent Form (ICF), for reading and signing, and an assessment instrument for the animated infographic adapted from Teixeira (2011),[10] with 17 items to assess the purpose, structure and presentation and relevance of the teaching resource, as presented in Annex 1.

The assessment instrument,[10] of a Likert-type scale, has four options for selection 1, 2, 3, and 4. Item 1 indicates totally adequate (TA), item 2 adequate (A), 3 partially adequate (PA) and 4 indicates inadequate (I). The instrument also has an open questionnaire for evaluators' comments, observations and suggestions.[10]

For content assessment, a level of agreement greater than 90% was established.[11] A Content Validity Index (CVI) was applied in order to calculate experts' agreement on the items assessed. For analysis, CVI = Number of AT + A/total number of participants was considered, in which a CVI greater than 0.9 was adopted for assessment.[13] In all, two stages of assessment were carried out by experts: the first with the infographic prototype and the second with the final production.

The prototype assessment is justified as essential in the development of educational technologies, since, through its assessment, it is possible to correct flaws and verify whether the solution to be developed is viable. Prototyping can be defined as visualizing an outline of an idea and performing tests on the functions of the technological solution being developed.[14] Thus, a round of prototype version assessment with experts and a second round of assessment of the final production were necessary.

It should be noted that there are several types of prototypes, from low-fidelity, such as the paper version, which presents the content and images of the content to be used, as well as the high-fidelity prototype version, which can be the digital version, which allows using the graphical interface, animation features and user interface similar to the final version. In this study, in turn, we chose to use the high-fidelity digital prototype version, as it resembles the final version.[14]

The infographic developed and assessed can be used in the teaching-learning process of undergraduate nursing students from the third to the last semester of the course, who are in teaching and practical activities on the process of medication administration in children's health. For the form of use, it will be up to the teachers to insert it in their lesson and course planning, and it can be used as a media resource in Virtual Learning Environments (VLE) or in the classroom. The tool can still be used in several contexts that contemplate the use of innovative teaching methodologies, such as inverted classroom, simulation activities, among others.

In all stages, the ethical precepts established by Resolution 466/2012 of the Brazilian National Health Council (*Conselho Nacional de Saúde*) were followed so that the study was appreciated and approved by the Institutional Review Board, through Opinion 3,795,387 and CAAE (*Certificado de*

Apresentação para Apreciação Ética - Certificate of Presentation for Ethical Consideration) 16807619.0.0000.5393.

Results

For greater understanding, the results will be described respecting the chronological order of development of the DET, divided into sections: a) Development, b) Assessment.

Development

In the context of the infographic development, in the Planning – analysis and diagnosis stage (Figure 1), it was pertinent to select scientific evidence on the subject for mapping knowledge related to pediatric patient safety and medication errors common in the population. For this, we chose to use the Scoping Review method, in order to identify good practices in pediatric medication administration.

On the Instructional planning stage (Figure 1), a script was prepared detailing the thematic approaches selected as priorities for the teaching resource, according to the results obtained in the literature review *Boas práticas da administração de medicamentos pediátricas: scoping review.*

With the script established, the Production - didactic design stage (Figure 1) began. Using the storyboard technique, a script was created for visual projection on screens of the proposals brought by the research team. For the production of screens and illustration of layout and images, Articulate Story 360˚ was used. The selection of images and illustrations used in the animated infographic sketch occurred according to its respective communicative function. The use of abstract images instead of realistic ones occurred, as abstraction eliminates unnecessary details and focuses the viewer's attention on passing on central information.

This prototype was changed five times throughout the production process, as new ideas emerged and new screens were added. For the sketch construction, a total of 32 storyboard screens were produced in Articulate Storyline 360˚.

With the prototype construction, the Media production stage began, developed in an experimental phase by a research team. For the animated infographic development, the free version of Articulate Storyline 360˚ was used for making and animating the screen, as the software allows for the creation of layout, editing and diagramming, images and use of media elements. The narrative script's audio recording was performed using the Voice Recorder application - BACHA Soft, available free of charge on Google Play Store˚, and the white soundtrack used was "Mr Sunny Face", by Wayne Jones, exported from public profile on YouTube Audio Library (Figure 2).

After construction, the animated infographic was subjected to content review and assessment (Figure 2) by thirteen experts with expertise in the study area, in order to assess the quality of the product developed and ensure the achievement of the proposed educational objectives and goals, besides pointing out aspects to be improved.

After the first assessment of the animated infographic, it was submitted to a media reproduction by a company specialized in computer animations. The technologies used for develop-

Figure 2. High-fidelity digital prototype version of the animated infographic on good medication administration practices

ment were: Adobe Illustrator for making the illustrations, Adobe Premiere for editing and After Effects for treatment of images and animation of the media (Figure 3). The white track was kept and exported from a public profile on YouTube Audio Library.

The observations made by the evaluators and suggestions for improvement were related to the reformulation of sentences in the narration, diction in narrative locution and graphic quality of layouts, in order to make content visibly more attractive to the public and facilitate the understanding of the theoretical content.

With experts' suggestions for improvements and the technological improvement of the animated infographic, it was submitted to a second assessment to verify the reach of consensus among experts. The final version of the animated infographic has 6 minutes and 26 seconds, which is the time required for transfer of information.

The final version of the animated infographic has 37 screens, which present the goals of the 3rd Challenge of the World Health Organization, adverse events, risk factors for the target audience and, finally, recommendations on good practices in safe medication administration in children's health.

Assessment

Regarding the sociodemographic characterization, it is observed that the specialists were between 23 and 43 years old, mostly female, with 76.9% (10) to 23.1% (3). All evaluators had training in nursing, with 2 to 14 years of training in the area. With regard to the degree, 69.2% (9) had a master's degree, 53.8% (7) a specialization and 15.4% (2) had a doctorate. Regarding the score attributed to the Fehring criteria, the study experts scored between 5 to 12 points.

The instrument above has 17 items; thus, the sum of all evaluative items, considering the number of experts, is 221 items (100%). The results of this assessment were: 65.5% for totally adequate (TA), 29.9% for adequate (A), 4.9% for partially adequate (PA) and no result for inadequate (I), which indicates a agreement of 95.4%, considering the sum of positive assessment of Totally adequate and Adequate. The CVI among experts for the first assessment was 0.95. The CVI was obtained with the sum of the scores TA = 144+ A = 66 (210), divided by the total of items = 221. The results found, 94.5% of agreement and CVI of 0.95, are above the established values of 90% and CVI of 0.90. Thus, the present resource was already validated in its first assessment. Table 2 presents the data from the second assessment of the final version.

Seeking a greater consensus among the evaluators, the infographic was submitted to a second assessment. The results found were: 82.4% for totally adequate (TA), 16.7% for adequate, 0.9% for partially adequate (PA) and no value for inadequate (I). The CVI among experts for the second assessment was 0.99. The CVI was obtained with the sum of scores TA = 182 + A = 37 (219), divided by the total of items = 221. The results achieved in the second assessment had 99.1% of agreement among experts and a CVI of 0.99, indicating a significant approximation to the consensus (100%) for assessing the infographic.

Figure 3. Content sequence of the second version of the animated infographic on good practices in medication administration

Table 1. Result of assessment of the first version of the animated infographic by experts

Criteria to be assessed	1st expert assessment - General Impression			
	TA n(%)	A n(%)	PA n(%)	I n(%)
Objectives				
1. Information/content is or is consistent with the daily needs of the technology's target audience	9(69.2)	4(30.8)	-	-
2. Information/content is important for the quality of life and/or the work of the technology's target audience	9(69.2)	4(30.8)	-	-
3. Invites and/or instigates changes in behavior and attitude	6(46.2)	5(38.5)	2(15.4)	-
4. Can circulate in scientific circle of the area	8(61.5)	4(30.8)	1(7.7)	-
5. Meets institutions' objectives that serve/work with the technology's target audience	11(84.6)	2(15.4)	-	-
Structure and presentation				
6. Technology is appropriate for the target audience	7(53.8)	6(46.2)	-	-
7. Messages are presented in a clear and objective manner	7(53.8)	6(46.2)	-	-
8. The information presented is scientifically correct	10(76.9)	3(23.1)	-	-
9. Material is appropriate to the target audience's sociocultural level	9(69.2)	4(30.8)	-	-
10. There is a logical sequence of the proposed content	9(69.2)	4(30.8)	-	-
11. Information is well structured in concordance and spelling	6(46.2)	4(30.8)	3(23)	-
12. Writing style matches the target audience's knowledge level	9(69.2)	3(23.1)	1(7.7)	-
Relevance				
13. The themes portray key aspects that must be reinforced	11(84.6)	2(15.4)	-	-
14. Technology allows for generalization and transfer of learning to different contexts	8(61.5)	4(30.8)	1(7.7)	-
15. Technology proposes the construction of knowledge	10(76.9)	2(15.4)	1(7.7)	-
16. Technology addresses subjects necessary for the target audience's knowledge	8(61.5)	4(30.8)	1(7.7)	-
17. Technology is adequate to be used by any professional with the target audience	7(53.8)	5(38.5)	1(7.7)	-
Total	144(65.5)	66(29.9)	11(4.9)	-

*TA - totally adequate; A - adequate; PA - partially adequate; I - inadequate; % - percentage; n - sample number

Table 2. Result of assessment of the second version of the animated infographic by experts

Criteria to be assessed	2nd expert assessment - General Impression			
	TA n(%)	A n(%)	PA n(%)	I n(%)
Objectives				
1. Information/content is or is consistent with the daily needs of the technology's target audience	11(84.6)	2(15.4)	-	-
2. Information/content is important for the quality of life and/or the work of the technology's target audience	11(84.6)	2(15.4)	-	-
3. Invites and/or instigates changes in behavior and attitude	9(69.2)	4(30.8)	-	-
4. Can circulate in the scientific circle of the area	12(92.3)	1(7.7)	-	-
5. Meets institutions' objectives that serve/work with the technology's target audience	10(76.9)	3(23.1)	-	-
Structure and presentation				
6. Technology is appropriate for the target audience	12(92.3)	-	1(7.7)	-
7. Messages are presented in a clear and objective manner	10(76.9)	3(23.1)	-	-
8. The information presented is scientifically correct	11(84.6)	2(15.4)	-	-
9. Material is appropriate to the target audience's sociocultural level	11(84.6)	2(15.4)	-	-
10. There is a logical sequence of the proposed content	12(92.3)	1(7.7)	-	-
11. Information is well structured in concordance and spelling	12(92.3)	-	1(7.7)	-
12. Writing style matches the target audience's knowledge level	12(92.3)	1(7.7)	-	-
Relevance				
13. The themes portray key aspects that must be reinforced	11(84.6)	2(15.4)	-	-
14. Technology allows for generalization and transfer of learning to different contexts	8(61.5)	5(38.5)	-	-
15. Technology proposes the construction of knowledge	10(76.9)	3(23.1)	-	-
16. Technology addresses subjects necessary for the target audience's knowledge	10(76.9)	3(23.1)	-	-
17. Technology is adequate to be used by any professional with the target audience	10(76.9)	3(23.1)	-	-
Total	182(82.4)	37(16.7)	2(0.9)	-

*TA - totally adequate; A - adequate; PA - partially adequate; I - inadequate; % - percentage; n - sample number

Discussion

The animated infographic developed includes approaches to pediatric and neonatal patient safety in medication administration, in order to collaborate in educational activities for nursing students, in order to promote a culture of safety among professionals, patients, family members and caregivers.

In line with this objective, the results presented in both assessments of the animated infographic showed

100% positive agreement, between totally adequate and adequate with regard to content consistent with the technology target audience's daily needs and important for quality of their life and work.

The first screens of the animated infographic introduce the WHO goals, adverse events and risk factors, with the aim of inviting viewers to understand what aspects the theme and the strategies of good practice presented later are based on.

The results of the assessments corroborate the proposed objective, in which experts point out that the material invites and/or instigates changes in behavior and attitude. It is noteworthy that in the second assessment the level of agreement with this topic was 100%.

The following educational technology screens discuss the Institute for Safe Medication Practices (ISMP) recommendations for medication use in pediatric patients.[15] Among the error prevention strategies are: the adoption of a standardized drug list, online software for drug consultation and calculation measures; establishment of specific guidelines for prescriptions; use of specific devices for pediatric patients; practical training with health professionals regarding the performance of mathematical calculations; permanent education regarding the stages of medicalization process and reinforcement regarding team and patient communication; and engagement in the health-disease process.[15]

The selected safety strategies aim to address the main errors made in the medication process. The lack of data standardization for the identification of pediatric patients and the non-use of safety strategies are common realities in most health services. A study shows that only 10.7% of professionals performed the labeling of medicines following the five right.[16] It also raises the need for measures such as training and promotion of specific protocols for medication administration in institutionalized children.[17] It is reinforced that, regarding the promotion of a culture of safety, the participation of caregivers and engagement in child care are fundamental strategies for patient safety.[18]

According to Martin et al (2019),[19] infographics of medical summaries are the reader's preference when compared to text-only summaries, in addi-

tion to requiring less mental effort to read. Another study[20] introduced infographic use to senior students as a strategy for teaching the evidence analysis process. The feedback from students pointed to the infographic's good acceptance as a method of learning, synthesis and presentation of results. In the statement support, according to the results of this research, 76.9% of experts considered that the technology presented proposes the construction of knowledge in a completely adequate way.

It emphasizes that the perception of satisfaction regarding the interaction of learning media is directly related to the results of learning material acceptance and knowledge retention.[21] That is why the way in which animated infographics are presented has such an impact on its potential as a learning material.

Thus, during the infographic production stage, it was decided to select images and animations with representational, relational, presentational and attractive communicative functions, in order to draw attention to the content presented and improve and complement information retention by exemplifying abstract concepts, rules and procedures.[22]

As for the information versus time relationship, it is essential that the transmission speed is comfortable for viewers, in order to facilitate content assimilation.[23] With regard to this aspect, 76.90% and 23.10% of experts assessed it as totally adequate or adequate, respectively, in relation to the transmission of the content, assessing it as clear and objective.

Audio resource use, such as soundtracks and narrated dialogues, is favorable to the understanding of information as they help in attention.[23] Regarding the assessment of this aspect, in the assessment instrument available there was no question for analysis of this item; however, in the suggestion question, one evaluator pointed out the need for improvements in the narration process, which was modified in the second assessment.

Conclusion

This study allowed us to conclude that the animated infographic was assessed among experts as a power-

ful digital educational resource and that it can bring significant contributions to nursing students' teaching-learning process, with a view to decision-making based on ethics and current scientific knowledge on the subject, in order to arouse learners' interest. It is expected that this educational digital technology can favor nursing students' teaching-learning process regarding the conduct of good practices in medication administration in children's health, contributing to the promotion of a culture of patient safety within pediatric and neonatal units.

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Collaborations

Costa JF, Domingues AN and Fonseca LMM contributed to project design, data analysis and interpretation, article writing, relevant critical review of intellectual content and final approval of the version to be published.

References

1. Lima ME, Ribeiro EA. Eventos adversos com medicamentos na pediatria: o papel da organização. Cad Bras Ter Ocup. 2017;25(4):927-33.

2. World Health Organization (WHO). Medication Without Harm. Global Patient Safety Challenge on Medication Safety. Geneva: WHO; 2017 [cited 2020 Nov 18]. Available from: http://apps.who.int/iris/bitstream/handle/10665/255263/WHO-HIS-SDS-2017.6-eng.pdf;jsessionid=A260F522116EA594E45CADDFB7701FBB?sequence=1

3. Brasil. Ministério da Saúde. Portaria n.529, de 1º de abril de 2013. Institui o Programa Nacional de Segurança do Paciente (PNSP). Brasília (DF): Ministério da Saúde; 2013 [citado 2020 Nov 18]. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt0529_01_04_2013.html

4. Volpato BM, Wegner W, Gerhardt LM, Pedro EN, Cruz SS, Bandeira LE. Medication errors in pediatrics and prevention strategies: an integrative review. Cogitare Enferm. 2017;22(1):45132.

5. Bradshaw MJ, Porter, S. Infographics: a new tool for the nursing classroom. Nurse Educator. 2017;42(2):57-9.

6. Dorneles LL, Martins VP, Morelato CS, Góes FS, Fonseca LM, Camargo RA. Creation of an animated infographic on Permanent Health Education. Rev Lat Am Enfermagem. 2020;28:e3311.

7. Chicca J, Shellenbarger T. Connecting with generation z: approaches in nursing education. Teach Learn Nurs. 2018;13(3):1804.

8. Filatro A. Design instrucional na prática. São Paulo: Pearson; 2008.

9. Maciel AM, Rodrigues RL, Filho EC. desenvolvimento de uma ferramenta para a construção e integração de personagens virtuais animados com voz sintética a materiais didáticos para EAD. Rev Bras Inform Educ. 2015;20(1):1-12.

10. Teixeira E, Mota VM. Educação em saúde: Tecnologias educacionais em foco. Vol. 2. São Caetano do Sul (SP): Editora Difusão; 2011.

11. Lopes MV, Silva VM, Araujo TL. Methods for establishing the accuracy of clinical indicators in predicting nursing diagnoses. Int J Nurs Knowl. 2012;23(3):134-9.

12. Fehring JR. The Fehring Model. In: Carrol-Johnson P. Classification of nursing diagnoses: procedigns of the tenth conference of Norh American Nursing Diagnoses Association. Philadelphia: Lippincott; 1994. p. 59.

13. Polit DF, Beck CT. Fundamentos de pesquisa em enfermagem: avaliação de evidências para a prática de enfermagem. 9a ed. Porto Alegre (RS): Artmed; 2019.

14. Stribersky A, Mosera F, Rulkabet W. Structural dynamics and ride comfort of a rail vehicle system. Adv Eng Software. 2002;33(7-10):541-52.

15. Instituto para Práticas Segurança no Uso de Medicamentos (ISMP). Uso Seguro de medicamentos em pacientes pediátricos. Minas Gerais: Boletim ISMP Brasil; 2017 [citado 2020 Nov 18]. Disponível em: https://www.ismp-brasil.org/site/wp-content/uploads/2017/12/BOLETIM-ISMP-BRASIL-PEDIATRIA.pdf

16. Souza S, Rocha PK, Cabral PF, Kusahara DM. Use of safety strategies to identify children for drug administration. Acta Paul Enferm. 2014;27(1):6-11.

17. Chaves CM, Lima FE, Fernandes AF, Matias EO, Araújo PR. Assessment of the preparation and administration of oral medications to institutionalized children. Rev Bras Enferm. 2018;71(3):1388-94.

18. Hoffmann LM, Wegner W, Biasibetti C, Peres MA, Gerhardt LM, Breigeiron MK. Patient safety incidents identified by the caregivers of hospitalized children. Rev Bras Enferm. 2019;72(3):707-14.

19. Martin LJ, Turnquist A, Groot B, Huang SY, Kok E, Thoma B, et al. Exploring the role of infographics for summarizing medical literature. Health Professions Educ. 2019;5(1):48-57.

20. Hsiao PY, Laquatra I, Johnson RM, Smolic CE. Using Infographics to teach the evidence analysis process to senior undergraduate students. J Acad Nutr Diet. 2019;119(1):26-30.

21. Lyra KT, Reis RC, Cruz WM, Isotani S. Um framework de classificação de complexidade para infográficos. Rev Bras Inform Educ. 2019;27(1):196-223.

22. Andrade RC, Spinillo CG. Infografia jornalística interativa: Abordagem ergonômica para a avaliação de interação na infografia jornalística. Human Factors Design. 2018;7(14):56-73.

23. Fronza AL, Blüm A, Lima MV. Recomendações sobre design informacional aplicado em motion graphics. Rev Bras Design Inform. 2014;11(1):50-63.

Annex 1. Expert assessment tool

Idade:
Sexo: ( ) F ( ) M
Área de formação:
Tempo de formação:
Cargo na instituição:
Tempo de trabalho:
Titulação: ( ) Especialização ( ) Mestrado ( ) Doutorado ( ) Pós-doutorado
Detalhar área:_____

INSTRUÇÕES

Leia atentamente, o roteiro. Em seguida analise-o marcando com um X em um dos seus números que estão na frente de cada afirmação. Informe sua opinião de acordo com os valores que melhor represente o grau em cada critério abaixo:
Totalmente adequado; 2- Adequado; 3- Parcialmente adequado; 4- Inadequado.

1.OBJETIVOS. Referem-se a propósitos, metas ou afins que se deseja atingir com a utilização da tecnologia.
1.1. As informações/conteúdos são ou estão coerentes com as necessidades cotidianas do público-alvo da tecnologia.

1	2	3	4

1.2. As informações/conteúdos são importantes para a qualidade de vida e/ou o trabalho do público-alvo da tecnologia.

1	2	3	4

1.3. Convida e/ou instiga as mudanças de comportamento e atitude.

1	2	3	4

1.4. Pode circular no meio científico da área.

1	2	3	4

1.5. Atende aos objetivos de instituições que atendem/trabalham com o público-alvo da tecnologia.

1	2	3	4

2. ESTRUTURA E APRESENTAÇÃO. Refere-se à forma de apresentar as orientações. Isso inclui organização geral, estrutura, estratégia de apresentação, coerência e formatação.
2.1. A tecnologia é apropriada para o público-alvo.

1	2	3	4

2.2. As mensagens estão apresentadas de maneira clara e objetiva.

1	2	3	4

2.3. As informações apresentadas estão cientificamente corretas.

1	2	3	4

2.4. O material está apropriado ao nível sociocultural do público-alvo.

1	2	3	4

2.5. Há uma sequência lógica do conteúdo proposto.

1	2	3	4

2.6. As informações estão bem estruturadas em concordância e ortografia.

1	2	3	4

2.7. O estilo da redação corresponde ao nível de conhecimento do público-alvo.

1	2	3	4

3. RELEVÂNCIA. Refere-se às características que avaliam o grau de significado da tecnologia.
3.1. Os temas retratam aspectos-chave que devem ser reforçados.

1	2	3	4

3.2. A tecnologia permite generalização e transferência do aprendizado a diferentes contextos.

1	2	3	4

3.3. A tecnologia propõe a construção de conhecimentos.

1	2	3	4

3.4. A tecnologia aborda os assuntos necessários para o saber do público-alvo.

1	2	3	4

3.5. A tecnologia está adequada para ser usada por qualquer profissional com o público-alvo.

1	2	3	4

Source: Texeira E, Mota VMSS. Educação em saúde: Tecnologias educacionais em foco. 1ªed. São Caetano do Sul, SP: Editora Difusão, v. 2. 2011.