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# Construction of educational technology for infection control in health services

**Construcción de tecnología educativa para el control de infecciones en servicios de salud****Construção de tecnologia educativa para o controle de infecção em serviços de saúde****ABSTRACT**

**Objective:** To describe the process of developing an educational technology for patients and health professionals with the purpose of preventing infection in health services. **Methodology:** Methodological study developed in 2019 in two stages: selection of content and construction of educational technology. **Results:** The technology called "Preventing at all times" has a dimension of 10.5 x 14.8 cm, has 7 front and back pages, containing: cover, information panel, and the organization of the content, starting on page 3, was organized through ludic activities, being: maze game, game of seven errors, memory game, word search, game of 5 moments, crosswords, direct figure and information of the correct sequence for hand hygiene. **Final Considerations:** The product of this technology is expected to awaken knowledge about hygiene, thus, leading to good adherence to services so that better quality of care is sought.

**DESCRIPTORS:** Hand Hygiene; Educational Technology; Infection in Health Services.

**RESUMEN**

**Objetivo:** Describir el proceso de desarrollo de una tecnología educativa para pacientes y profesionales de la salud con el propósito de prevenir infecciones en los servicios de salud. **Metodología:** Estudio metodológico desarrollado en 2019 en dos etapas: selección de contenidos y construcción de tecnología educativa. **Resultados:** La tecnología denominada "Prevenir en todo momento" tiene una dimensión de 10,5 x 14,8 cm, consta de 7 portadas y contraportadas, que contienen: portada, panel informativo y organización del contenido, a partir de la página 3, se organizó a través de actividades lúdicas, siendo: juego de laberinto, juego de siete errores, juego de memoria, búsqueda de palabras, juego de 5 momentos, crucigramas, figura directa e información de la secuencia correcta para la higiene de manos. **Consideraciones Finales:** Se espera que el producto de esta tecnología despierte conocimientos sobre higiene, conduciendo así a una buena adherencia a los servicios para que se busque una mejor calidad de atención.

**DESCRIPTORES:** Higienización de Manos; Tecnología Educativa; Infección en los Servicios de Salud.

**RESUMO**

**Objetivo:** Descrever o processo de desenvolvimento de uma tecnologia educativa destinada a pacientes e profissionais de saúde com a finalidade de prevenção de infecção em serviços de saúde. **Metodologia:** Estudo metodológico desenvolvido em 2019 em duas etapas: seleção do conteúdo e construção da tecnologia educativa. **Resultados:** A tecnologia denominada "Prevenindo a todo tempo" tem na sua dimensão 10,5 x 14,8 cm, possui 7 páginas frente e verso, contendo: capa, painel informativo, sendo que a organização do conteúdo, a partir da página 3, foi organizado por meio de atividades lúdicas, sendo: jogo de labirinto, jogo dos sete erros, jogo da memória, caça palavras, jogo dos 5 momentos, cruzadinhas, figura direta e informações da sequência correta para higienização das mãos. **Considerações Finais:** O produto desta tecnologia espera-se despertar o conhecimento sobre a higienização, sendo assim, acarretar uma boa adesão nos serviços para que se busque uma melhor qualidade da assistência prestada.

**DESCRIPTORES:** Higienização das Mãos; Tecnologia Educativa; Infecção em Serviços em Saúde.

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## INTRODUCTION

Health education is a tool widely used by nurses, especially when changes related to habits are aimed at reducing the risks of various infections acquired in health services. Among the most used measures for health promotion and education, we can mention the printed materials widely used to improve the patient's knowledge and self-responsibility towards their health. Studies recommend the use of printed materials to reinforce verbal guidelines, it is known that these materials help in the possible doubts of the patient, contributing with safe and timeless information in the absence of a health professional<sup>(1-5)</sup>.

The nurse acts as a health education agent by developing educational materials that can assist you in the process of teaching and learning patients. Such educational resources allow interactions between the nurse, the patient and their family, and the object to be understood. It should be noted, then, that printed materials require clear educational objectives to be achieved by the target audience. In this sense, the participatory multiprofessional approach in the construction of these is necessary for the development of quality printed materials that allow to identify the needs of the target audience, corre-

ponding, at the same time, to the need for health services<sup>(3-5)</sup>.

National and international health authorities recommend patient safety as a priority issue in the provision of services. It is known that it is the responsibility of the nurse and his team to aid the person, the family and the community, free of damages resulting from malpractice, negligence or imprudence. In Brazil, this trend is regulated through the National Patient Safety Program, whose objective is to implement safe care measures in different areas of health care. Among these measures, we can mention hand hygiene, considered the main professional conduct of infection prevention in health services<sup>(6-8)</sup>.

Studies show that hands are the main means of interconnection between nursing professionals and the patient. Thus, the practice of hand hygiene significantly reduces the transmission of microorganisms and, consequently, the incidence of preventable infections, reducing morbidity and mortality in health services. However, the literature points out that the lack of adherence to the hand hygiene procedure is still a gap to be solved<sup>(9,10)</sup>. In view of this reality, the present research proposed the development of an educational technology for infection control in health services.

## METHODOLOGY

This is a methodological study consisting of two stages: 1) Selection of content and 2) Construction of educational technology. The educational booklet called "Preventing at all times" was developed according to the following requirements: content and language, organization, layout, illustration, forms of motivation and learning. In this way, the preparation of the information booklet translated into providing patients and companions with knowledge related to hand hygiene and the prevention of infections in health services.

In the process of building the information booklet, a bibliographic survey was carried out using guidelines from the Ministry of Health, among which are: the manuals of the National Health Surveillance Agency (ANVISA), the patient safety guides and some forms of good practices assistance in the prevention of infection related to health services.

Thus, considering the specificity of the technology developed, the design work, the diagramming of the images, the layout, the cultural sensitivity, suitability to the target population and the colors and size of the information booklet, the work of a graphic design professional was counted on. The images were captured and later adapted in the Adobe Illustrator® program.

The version of the booklet called "Preventing at all times" is 10.5 x 14.8 cm in size, has 7 front and back pages, containing: cover, information panel, and the organization of the content, starting on page 3, was organized through ludic activities, being: maze game, game of seven errors, memory game, word search, game of 5 moments, crosswords, direct figure and information of the correct sequence for hand hygiene.

Right after the textual revisions, seeking to classify the degree of ease in reading the texts presented, the ILF (Flesch's Legibility Index) was cal-

culated, which assesses the degree of legibility of the texts on a percentage scale from zero to one hundred according to following formula:  $206,835 - (1,015 \times \text{ASL}) - (84,6 \times \text{ASW})$ , where ASL means average sentence length - the number of words divided by the number of sentences, while ASW means average number of syllables per word - the number of words syllables divided by the number of words. It is worth mentioning that because this is a technology that will be validated in the future in terms of content and appearance, the present study was submitted to the Research Ethics

Committee of the Catholic University Center of Vitória (UCV) obtaining approval under number CAAE 19271019.0.0000.5068.

## RESULTS AND DISCUSSION

Based on the approached method, the content was initially selected which served as a basis for the construction of the proposed technology, considering as sources scientific articles, Ministry of Health manuals and Books, among others described below:

For the construction of the information booklet, the author's expe-

Chart 1. Selection of content for the development of technology. Vitória, ES, Brazil, 2019

CONTEÚDO SELECIONADO	FONTE:
Segurança do paciente Higienização das mãos.	Agência Nacional de Vigilância Sanitária (Ministério da Saúde). Acesso em: 05 de nov. de 2019. Disponível em: < <a href="http://www.anvisa.gov.br/servicosaude/manuais/paciente_hig_maos.pdf">http://www.anvisa.gov.br/servicosaude/manuais/paciente_hig_maos.pdf</a> >
Resolução da diretoria colegiada –RDC Nº 50	Agência Nacional de Vigilância Sanitária (Ministério da Saúde). Acesso em: 05 de nov. de 2019. Disponível em: < <a href="http://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2002/res0050_21_02_2002.html">http://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2002/res0050_21_02_2002.html</a> >
Resolução de diretoria colegiada - RDC Nº 36	Agência Nacional de Vigilância Sanitária (Ministério da Saúde). Acesso em: 05 de nov. de 2019. Disponível em: < <a href="http://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2013/rdc0036_25_07_2013.html">http://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2013/rdc0036_25_07_2013.html</a> >
Protocolo para a prática de higiene das mãos em serviços de saúde.	Agência Nacional de Vigilância Sanitária (Ministério da Saúde). Acesso em: 05 de nov. de 2019. Disponível em: < <a href="file:///C:/Users/Familia/Downloads/protoc_higieneDasMaos.pdf">file:///C:/Users/Familia/Downloads/protoc_higieneDasMaos.pdf</a> >.
Guia para a Implementação da Estratégia Multimodal da OMS para a Melhoria da Higiene das Mãos	Agência Nacional de Vigilância Sanitária (Ministério da Saúde). Acesso em: 01 de nov. de 2019. Disponível em: < <a href="http://www.anvisa.gov.br/servicosaude/controlo/higienizacao_oms/guiae_implement.pdf">http://www.anvisa.gov.br/servicosaude/controlo/higienizacao_oms/guiae_implement.pdf</a> >.
Assistência Segura: Uma Reflexão Teórica Aplicada à Prática. Série Segurança do Paciente e Qualidade em Serviços de Saúde	Agência Nacional de Vigilância Sanitária (Ministério da Saúde). Acesso em: 01 de nov. de 2019. Disponível em: < <a href="http://portal.anvisa.gov.br/documents/33852/3507912/Caderno+1+-+Assistencia+Segura+-+Uma+Reflexao+Teorica+Aplicada+a+Pratica/97881798-cea0-4974-9d9b-077528ea1573">http://portal.anvisa.gov.br/documents/33852/3507912/Caderno+1+-+Assistencia+Segura+-+Uma+Reflexao+Teorica+Aplicada+a+Pratica/97881798-cea0-4974-9d9b-077528ea1573</a> >.
Higienização das mãos como prática do cuidar: reflexão acerca da responsabilidade profissional	Belela-Anacleto ASC, Peterlini MAS, Pedreira MLG.. Rev Bras Enferm [Internet]. 2017;70(2):442-5. DOI: <a href="http://dx.doi.org/10.1590/0034-7167-2016-0189">http://dx.doi.org/10.1590/0034-7167-2016-0189</a> . Acesso em: 01 de nov. de 2019. Disponível em: < <a href="http://www.scielo.br/pdf/reben/v70n2/pt_0034-7167-reben-70-02-0442.pdf">http://www.scielo.br/pdf/reben/v70n2/pt_0034-7167-reben-70-02-0442.pdf</a> >.
World Health Organization	WHO. Hand Hygiene: Why, How and When. Summary Brochure on Hand Hygiene. World Alliance for Patient Safety, 2006. p. 1-4. Acesso em: 01 nov. 2019. Disponível em: < <a href="https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf;jsessionid=232884196B5CD9A317CBE262D9972EE4?sequenc e=1">https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf;jsessionid=232884196B5CD9A317CBE262D9972EE4?sequenc e=1</a> >.
Estratégia lúdica para a melhoria de práticas de higienização das mãos entre os profissionais de saúde.	Rev enferm UFPE on-line., Recife, 11(10):3971-9, out., 2017. Acesso em: 01 de nov. de 2019. Disponível em: < <a href="file:///C:/Users/Familia/Downloads/25207-69766-1PB%20(1).pdf">file:///C:/Users/Familia/Downloads/25207-69766-1PB%20(1).pdf</a> >.

rience acquired during the academic internship carried out at the Hospital Infection Control Service (SCIH) of a Private General Hospital located in the Municipality of Cariacica / ES was used. It was observed that patients remained idle for a long period while waiting for surgical procedures, scheduling appointments or even for prolonged hospitalization. In this perspective, it was thought to develop a playful informative booklet that could serve as a mediating instrument of knowledge for changing attitudes towards the hand hygiene habit.

After selecting the content, the booklet was prepared by a professional web design and followed a portable size of 10.5x14.8 cm equivalent to the A6 format. This size is sufficient to provide a good reading and interpretation of the games, and can be stored in a bag, so that the user has the possibility to use it later. The colors used and the type of illustration were designed to make the material more playful, less formal and more "fun". This is a strategy that helps to conserve the user's attention in the graphic material. The typographies used were Cooper Black for 11pt size titles and Trebuchet MS 10pt size and 12pt line spacing. For the body of the text, it was decided to use Cooper Black in the titles, as it has rounded and striking features, since the titles are the focus of attention in the text; the body of the text, on the other hand, consists of a more readable typography and of a size that would allow a good reading. The colors chosen for the backgrounds are cool and derived from colors of a hospital environment, the colors in the illustrations are warmer and more colorful and contrast with the background.

The cover was created with an illustration of a hand being analyzed by a magnifying glass, which identifies the presence of microorganisms and the question: Have you cleaned

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your hands today? Full of questions. A study<sup>(11)</sup> found that hands are the main risk factor for the transmission of microorganisms, so that the importance of hand hygiene is assured and recognizes, in his study, that this practice is not done most of the time. Thus, the same author developed a playful technology for the involvement and theoretical and practical aspects about hand hygiene, thus contributing to the improvement of patient safety. Infections caused by multidrug-resistant bacteria are becoming quite common, which has been causing the entities a great deal of concern, because with the resistance to antimicrobials, the bacteria are only getting stronger<sup>(6)</sup>.

The industrialization and modernization process brought technological advances and, with that, the valorization of science; for the health area, the introduction of information technology and the emergence of modern and sophisticated devices that enabled benefits and speed in the fight against diseases. Daily technological innovations occur in an increasing and accelerated way, making available to professionals and users different types of technology, be they educational, managerial or assistance<sup>(12)</sup>.

The visual design causes the user to question whether hand hygiene has been done properly, the colors and the type of illustration help the material to have a certain lightness in addressing such a serious subject and instigates the reading of the material (figures 1, 2, 3, 4, 5 and 6).

The hand hygiene process stands out as one of the most important measures to control infection related to health care. And it is one of the most low-cost forms, with good efficacy due to practicality and good benefits for health care-related infections<sup>(13)</sup>.

Hygiene is one of the proven low-cost measures for the primary prevention of infections, in addition to promoting a good stay of the patient

in the hospital environment, thus not causing possible infections, leading to the prolongation of the individual in the hospital<sup>(14)</sup>.

The theme served as a basis for the illustrations of bacteria and microorganisms identified in a magnifying glass so that it was clear that in one hand there are bacteria. The lack of hand hygiene is part of the reality of the Brazilian population. It is said that outbreaks have already occurred due to the non-hygiene of the hands of health workers, so that several microorganisms were identified. There are several antiseptics and soaps that can be used for hand hygiene during the

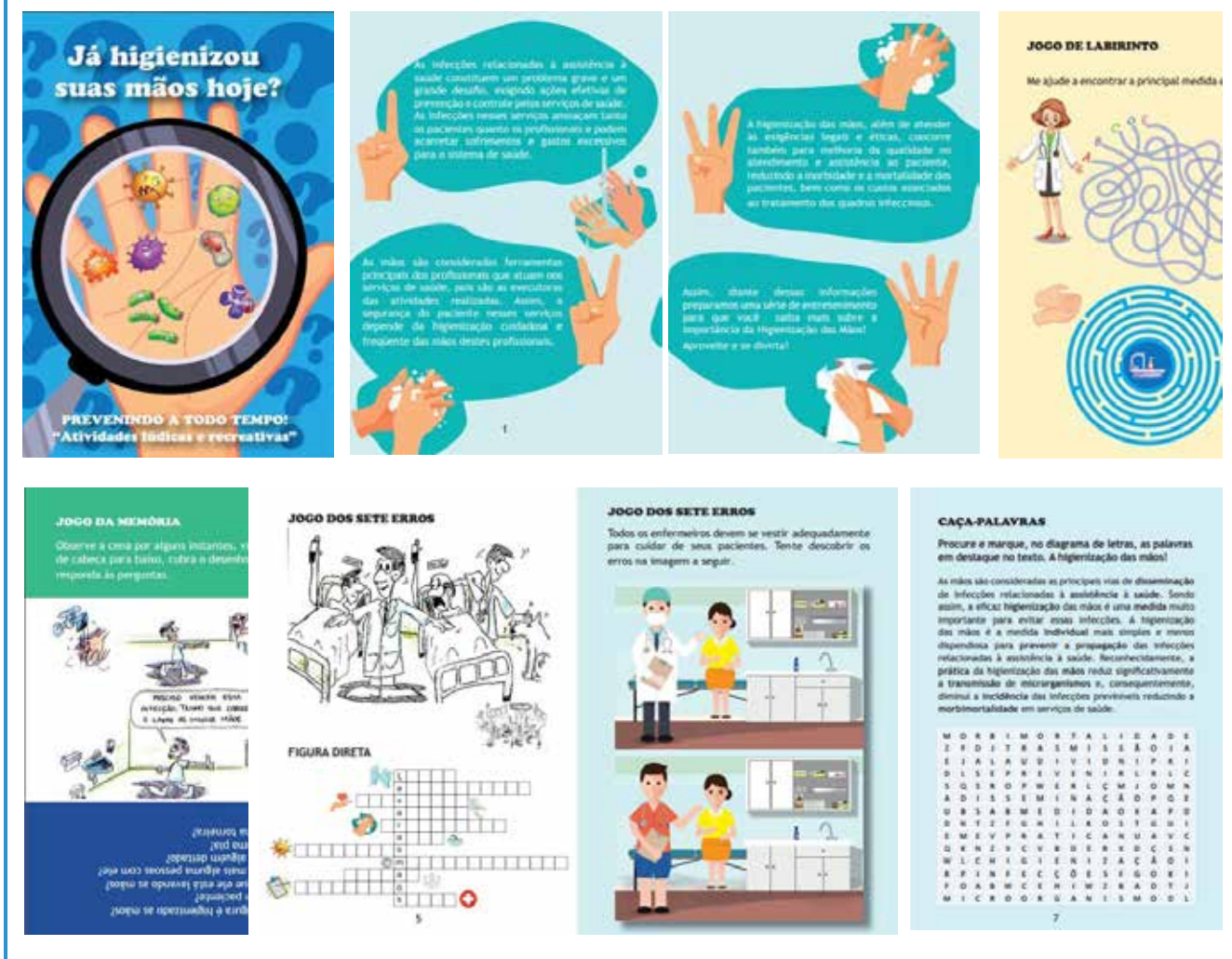
patient care process<sup>(6)</sup>. A study<sup>(13)</sup> found the possibility of transmission of microorganisms by the hands of the health professional, while, with the hygiene measures, the infection rates are reduced after the adoption of the proposed measures, making the professionals achieve efficacy in hand hygiene and a reduction in the microbial load of this individual.

The version of this educational technology contains twelve pages. The cover has as an illustration of a hand being analyzed by a magnifying glass, which identifies the presence of a microorganism causing it to arouse the target audience to curiosity and interest in knowing the booklet. In the

first and second figures, there is information for the target audience: health professionals, patients and companions who are idle, which enables a good understanding of hand hygiene and hospital infection. The importance of people's behavior has been a fundamental issue in the practice of the professionals involved, adherence and recommendations for adherence to the protocols are especially important. It is essential that it involves education, so that there are changes and motivation in the system, causing strategies to be created to increase this hand hygiene adherence<sup>(6)</sup>.

Still in the second figure, it contains a playful educational game through a

Figure 1. Technology "Preventing at all times!". Vitória, ES, Brazil, 2019



maze showing the inputs for hand hygiene, that is, soap and water. Emphasizes the need for hand hygiene and, especially, the availability of inputs necessary for the practice, with easy access, for sinks and taps with automatic activation to have a good adhesion to hand hygiene and other possible<sup>(14)</sup>.

In the third figure, there is a crossroad with several figures involved in biosafety and hospital infection. Then, there is a set of seven errors, figured by a professional playing on different characters (illustrating the lack of hand hygiene between one act and another). Finally, an activity called “direct figure” was proposed. Infections can be prevented, and the microorganisms most associated with transmission are the transient skin microbiota, which can be acquired by colonized or infected people and by leaning against contaminated objects. This infection can be prevented by hand hygiene, by the simple fact of the mechanical act, when it is not performed properly, a transmission of these microorganisms can occur. A study found that the transient microbiota, located on the surface of the skin by means of an external source, can be easily removed through hand hygiene by the mechanical act of friction<sup>(15)</sup>.

In the fourth figure, a set of seven errors was illustrated in which there is a nurse with personal protective equipment. There is also a word search taking knowledge and fixation on hand hygiene. There are researches that reveal the health professional's knowledge of the importance of hand hygiene in the control of transmission of microorganisms and in the moments that should be cleaned, but in practice, there is a deficit, causing a large number of professionals who do not adhere to hand hygiene in the care process<sup>(13)</sup>.

In relation to the fifth figure, she is indicating an educational memory game, representing the five moments of hand hygiene. In the same game, there is a health professional indicating the correct practice of hygiene, during their service. It is stated that all professionals who work in health services, who maintain direct or indirect contact with the patient (professionals who

**As with water and ordinary soap: when there is visible dirt or exposure to body fluids, before and after meals, after going to the bathroom, when starting and ending your work shift.**

work in the feeding or handling of medicines, in handling sterile or contaminated materials), must perform hand hygiene at all your opportunities. Family members, companions and visitors should also be instructed on hygiene before and after contact with patients in health services<sup>(6)</sup>.

The sixth and final figure shows the technique of correct hand hygiene, so that the individual can learn the technique correctly. It is emphasized that the hands of health service professionals can be cleaned by water and common soap, alcoholic solution and degerming antiseptic. And with that, every opportunity has a specification of when to use these products. As with water and ordinary soap: when there is visible dirt or exposure to body fluids, before and after meals, after going to the bathroom, when starting and ending your work shift. The Alcoholic solution: before and after direct contact with the patient, after touching nearby surfaces, before performing invasive procedures, when changing the contaminated site to clean, after the risk of exposure to body fluids. And finally, the antiseptic degerming solution should be used in cases of patient contact precautions, in cases of outbreaks, preoperatively (before any surgical procedure), before any invasive procedure (insertion of central venous catheter, installation dialysis, small sutures<sup>(6)</sup>).

A good cleaning has to follow the steps of the technique (which can be varied depending on the input that she will use for cleaning), and the effectiveness of the technique will depend on the time that the individual will perform, before starting the technique it is necessary to remove the hand objects (with rings and bracelets), as the objects may be colonized by some microorganism. The technique used for hand hygiene can be compromised by the nursing staff, because at the time of care, they do not give due importance to the technique and, thus, skip steps, making these failures when sanitizing have a consequence, such as the spread of micro -organisms from one patient to others, as well as environments and surfaces. Study <sup>(16)</sup> reports a public health

problem, in which the absence of the patient's harm is defined to the patient during the care process, thus encompassing an ineffective care promotion.

## FINAL CONSIDERATIONS

This study described the development of an educational technology called “Pre-

venting at all times”, aimed at patients, companions, and healthcare professionals in health services, to help with hand hygiene and infections related to healthcare. Its content gathers theoretical information, educational games that interconnect for playful learning.

Subsequently, it is intended to develop the validation and implementation of

educational technology. It was considering the technical knowledge to build the technology developed by a professional web design. It is expected that, with the product of this technology, knowledge about hygiene is awakened, thus making it possible to lead to good adherence to services to seek a better quality of care and reduce infections related to healthcare. ■

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