

Prevention of facial injuries caused by personal protective equipment during the COVID-19 pandemic

Prevenção de lesões faciais causadas pelos equipamentos de proteção individual durante a pandemia da COVID-19

Prevención de lesiones faciales causadas por equipos de protección individual durante la pandemia de Covid-19

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ABSTRACT

Objective: Develop and validate a leaflet to guide health professionals in preventive measures related to injuries caused by the use of personal protective equipment during the COVID-19 pandemic. **Methods:** For the construction of the brochure, an integrative review was carried out in the main databases. The evaluation of the leaflet was made by 59 health professionals (nurses, physiotherapists, and doctors), using the Delphi technique. **Results:** In the first evaluation cycle, the items in the brochure were considered by the judges to be "inadequate" to "adequate"; the Content Validity Index was 0.80-1.0. After the adjustments suggested by the judges were implemented, the leaflet was sent back to the second evaluation cycle, in which all items were considered "adequate", resulting in a Content Validity Index of 1.0.

Conclusion: The developed brochure has content validity and can assist health professionals in preventing injuries caused by the use of personal protective equipment the developed brochure has content validity and can assist health professionals in preventing injuries caused by the use of personal protective equipment.

Descriptors: COVID-19; Pressure Ulcer; Equipment and Supplies; Personal Protective Equipment; Pandemics.

RESUMO

Objetivo: Desenvolver e validar um folheto para orientar os profissionais da saúde nas medidas preventivas relacionadas às lesões causadas pelo uso dos equipamentos de proteção individual durante a pandemia da COVID-19. **Métodos:** Para a construção do folheto, realizou-se revisão integrativa nas principais bases de dados. A avaliação do folheto foi feita por 59 profissionais da saúde (enfermeiros, fisioterapeutas e médicos), utilizando-se a técnica Delphi.

Resultados: No primeiro ciclo de avaliação, os itens do folheto foram considerados pelos juízes de "inadequados" a "adequados"; o Índice de Validade de Conteúdo foi de 0,80-1,0. Após implementados os ajustes sugeridos pelos juízes, o folheto foi reenviado para o segundo ciclo de avaliação, no qual todos os itens foram julgados "adequados", resultando em um Índice de Validez de Contenido de 1,0. **Conclusão:** O folheto desenvolvido apresenta validade de conteúdo e pode auxiliar profissionais de saúde na prevenção das lesões causadas pelo uso dos equipamentos de proteção individual.

Descriptores: COVID-19; Lesão por Pressão; Equipamentos e Provisões; Equipamento de Proteção Individual; Pandemias.

RESUMEN

Objetivo: Desarrollar y validar folleto para orientar a profesionales de salud en medidas preventivas relacionadas a lesiones causadas por uso de equipo de protección individual durante la pandemia de COVID-19. **Métodos:** Realizó revisión integrativa en las principales bases de datos para la construcción del folleto. Su evaluación fue hecha por 59 profesionales de salud (enfermeros, fisioterapeutas y médicos), utilizando la técnica Delphi. **Resultados:** En el primer ciclo de evaluación, los ítems del folleto fueron considerados por jueces de "inadecuados" a "adecuados"; el Índice de Validez de Contenido fue de 0,80-1,0. Tras implementados los ajustes sugeridos por los jueces, el folleto fue reenviado al segundo ciclo de evaluación, en lo cual todos los ítems fueron juzgados "adecuados", resultando en un Índice de Validez de Contenido de 1,0. **Conclusión:** El folleto desarrollado presenta validez de contenido y puede auxiliar profesionales de salud en la prevención a lesiones causadas por uso de equipos de protección individual.

Descriptores: COVID-19; Lesión por Presión; Equipos y Provisiones; Equipo de Protección Individual; Pandemias.

INTRODUCTION

The COVID-19 pandemic quickly spread to all continents in early 2020. The disease caused by a new coronavirus, SARS-CoV-2, has put the world on alert and quarantined and brought about the need to rethink old issues (whether individual or collective) to protect the health of workers on the front lines⁽¹⁻²⁾.

The place of service plays a considerable role in the spread of the virus, so analyzing how they are organized is crucial to preventing disease. Understanding how different occupational groups are exposed to infections and contracting injuries caused by the inappropriate use of personal protective equipment (PPE) can be of great value to public health agencies in the responses and risk management for COVID-19 and subsequent outbreaks of others. infectious diseases⁽³⁾.

PPE are all devices for individual use designed to protect the physical integrity of the worker; include gloves, eye or face protectors, respiratory protectors, aprons and protection for the lower limbs, hand hygiene cannot be ignored as one of the most important standard precautions to prevent contamination and spread of the virus.

The prolonged or incorrect use of facial masks, respirators and glasses/visors is responsible for the constant friction and pressure forces on facial skin tissues, leading professionals to suffer facial skin lesions (FSL) and dermatitis⁽³⁻⁶⁾.

In this sense, it is important to build educational technology, including brochures, that offer health professionals appropriate information about the techniques for using PPE and the preventive actions and therapeutic conduct of FSL caused by the devices. Thus, when using this technology correctly, the professional prevents injuries, and there is less exposure to infectious agents.

The leaflets consist of a finite sequence of well-defined instructions carried out systematically. They are commonly used in the health field; they are simple, direct and easily accessible instruments that provide a complete view of the clinical process⁽⁷⁻⁸⁾. They are the most efficient, reliable, and economical source of information, complementing the knowledge used in the clinical practice of health professionals.

OBJECTIVE

Develop and validate a leaflet to guide health professionals in preventive measures related to FSLs caused by the inappropriate use of PPE during the COVID-19 pandemic.

METHODS

Ethical aspects

The study complied with Resolution 466/12 and was approved by the Research Ethics Committee of the Faculty of Medical Sciences Dr. José Antônio Garcia Coutinho, University of Vale do Sapucaí.

Design, study location and period

This is a methodological study consisting of the construction of two leaflets on the prevention of facial injuries caused by personal protective equipment during the COVID-19 pandemic.

It was developed with professionals working on the front line to combat COVID-19 at Hospital das Clínicas Samuel Libânia. The

validation process by the judges took place from September to October 2020.

Population; exclusion inclusion criterion

The leaflet was validated in accordance with the Brazilian standard ABNT ISO/IEC 25062: 2014, which recommends a minimum sample of ten participants for each type of professional. In this study, the evaluators were nurses, physiotherapists, and doctors, totaling 59 participants.

The evaluators were selected by means of the snowball convenience sampling: thus, when a subject who met the established inclusion criteria was identified, he was asked to suggest other participants.

The inclusion criteria for the judges were: being graduated in Nursing or Physiotherapy or Medicine; be on the front line of assistance to those affected by COVID-19. Professionals who agreed to participate in the research but did not answer the questionnaire within the established period of eight days were excluded.

Study protocol

The brochure construction process went through the steps described below.

First stage: situational diagnosis

The idea of developing this leaflet was based on observations made in clinical practice, on the front line of fighting the pandemic of COVID-19. It was possible to notice that some professionals have difficulty in using the correct technique when making the PPE garment.

Another aggravating factor is the use of PPE for a long period. The prolonged or incorrect use of facial masks, respirators and glasses/visors results in increased frictional forces, pressure, and constant moisture in facial skin tissues, leaving professionals vulnerable to suffering from FSLs and dermatitis.

Second stage: content survey

For the construction of the leaflets, a content survey was initially carried out through an integrative literature review. The following stages for the development of the research were delimited: identification of the theme and selection of the research question; establishment of criteria for the inclusion and exclusion of studies; definition of the information to be extracted from the selected studies; categorization of studies; evaluation of studies included in the integrative review; interpretation of results; presentation of the review and synthesis of knowledge^(4,9).

The theme was determined: "Facial skin lesions caused by the use of PPE during the COVID-19 pandemic".

The objective was to answer the following guiding questions: What are the PPE used by health professionals who are on the front line to combat COVID-19? What preventive measures are available in the literature to prevent facial skin injuries caused by the use of PPE during the COVID-19 pandemic?

For the construction of the appropriate question for the resolution of the researched clinical question, the PICO⁽¹⁰⁾ strategy was used, with "P" corresponding to the population (health

professional); "I", intervention (PPE dressing and peeling technique, preventive measures for facial skin lesions); "C", comparison (not applicable); and "O", outcome (leaflet).

For the construction of the leaflets, an integrative literature review was carried out in the Health Sciences databases, including the Online Medical Literature Search and Analysis System (MEDLINE), Scientific Electronic Library Online (SciELO) and Latin Literature. American and Caribbean Health Sciences (LILACS) published between 2015 and 2020⁽⁷⁻⁸⁾.

The Health Sciences Controlled Descriptors (DeCS) were used: COVID-19; Individual protection equipment; Wounds and injuries; and the corresponding terms in Portuguese, English and Spanish.

The search strategy for each language was determined by combining the selected descriptors with the Boolean operator "AND", according to the examples: COVID-19 AND Personal protective equipment; e COVID-19 AND Personal protective equipment AND Wounds and injuries.

For the selection of publications to be included in the review, the following criteria were adopted: only primary studies that have a direct connection with the theme; be available in full. Exclusion criteria: theses, dissertations, monographs, technical reports, and articles that, after reading the abstract, do not fit in with the proposed study object; and duplicates.

To classify the level of evidence of the selected studies, categories from the Agency for Healthcare Research and Quality⁽¹¹⁾ were used, which cover six levels: Level 1 - Evidence resulting from the meta-analysis of multiple controlled and randomized clinical trials; Level 2 - Evidence obtained in individual studies with experimental design; Level 3 - Evidence from quasi-experimental studies; Level 4 - Evidence from descriptive studies (non-experimental) or qualitative approach; Level 5 - Evidence of case or experience reports; Level 6 - Evidence based on expert opinions. Based on this survey, an information leaflet was prepared, which comprises a sequence described in three parts.

In the first part, the consequences of the incorrect and prolonged use of PPE are described. In the second part, the anatomical regions that are at greatest risk for the professional to develop facial injuries caused by the incorrect use of PPE are indicated. The third part covers the therapeutic procedures that the professional must have with the skin before and after the use of PPE; materials that promote interface between PPE and the professional's skin; and preventive measures.

Third stage: formulation/assembly of the leaflet

The illustrations and preliminary content were developed and submitted to the editing and diagramming process, following criteria related to content, structure/organization, language, layout and design, cultural sensitivity, and suitability to the target audience.

The images were selected from the internet and then converted into a drawing and worked in the Corel Draw® program, version 17; and the photos were authorized by the professionals, originating the first version of the information leaflet submitted for validation, which was prepared from June to August 2020. The second version was developed between the months of September and October 2020.

For the validation of the leaflet, the following documents were prepared and sent in an invitation letter to the research participants (65 professionals): initial personal presentation and clarifications on the research topic, opinion of the Institutional Research Ethics Committee, explanations about the importance of the professional evaluator for the study, step by step of the steps for the effective participation of the judges and the communication of the period of eight days to complete the questionnaire for each round of the evaluation and send the answers. Fifty-nine professionals agreed to participate in the study and returned the completed questionnaire within the requested deadline.

The judges evaluated the following aspects of the brochure: thematic content, sequence, ease of learning, vocabulary, language, graphic presentation, places of risk for the professional who developed the injuries caused by the inappropriate use of PPE, skin care before and after the use of PPE, materials that promote an interface between PPE and the patient's skin, avoiding shear, pressure and friction; skin cleaning and hydration procedures, therapeutic approach to treat skin lesions caused by PPE.

The Likert scale was used in the evaluation questions of the leaflets and had the following answer options: "adequate", "partially adequate" and "inadequate". When the judges' responses were "partially inadequate" and "inadequate", suggestions were made to improve the issue.

For the validation of the leaflets, the Delphi technique was used, which has the characteristic of obtaining opinions from judges with specific knowledge in a given area through questionnaires, in which the contents of the instruments are analyzed and judged by the judges in search of a consensus between them. Generally, two or three assessment cycles are required, and there may be more⁽¹²⁾.

Analysis of results and statistics

Absolute and relative frequency was used to present the evaluation of the leaflet content by the judges according to the Delphi technique.

The validation of the content of the leaflet was verified by applying the calculations of the Content Validity Index (CVI), to measure the degree of agreement between the judges in relation to the content of the leaflet. The CVI value for the validation of a questionnaire was calculated as the sum of the number of "adequate" responses divided by the total number of responses. When six or more judges participate in the validation of the instrument, the CVI value must be greater than or equal to 0.80 of agreement between them⁽⁴⁾.

This research was approved by the Research Ethics Committee of the Faculty of Medical Sciences Dr. José Antônio Garcia Coutinho, University of Vale do Sapucaí.

RESULTS

12,535 articles were identified by searching Health Sciences databases; of these, 4,523 were excluded because they were duplicated in the databases. Thus, 8,012 articles were selected for reading the title and 163 for reading the abstract, which resulted in a sample of 112 articles for reading the full text. Among these,

86 were excluded, which led to a total of 26 articles selected for the construction of the leaflets.

A leaflet was prepared to guide health professionals in preventing injuries during the COVID-19 pandemic, as shown in Figures 1 and 2.

The items in the brochure went through the first evaluation cycle, with the possibility of answers: "adequate", "partially inadequate" and "inadequate". The material was revised based on the suggestions

made by the judges and submitted to a second evaluation cycle, with the items being assessed as "adequate", as shown in Table 1.

In Table 2, below, we can see that there was no total agreement between the judges in the first assessment, with the Content Validity Index ranging between 0.88 and 1.0; however, in the second assessment, the judges agreed on all items, and the Content Validity Index was 1.0.

DISCUSSION

The leaflets are useful printed materials to convey health-related information, making it possible to use them as an instrument that promotes health and facilitates the educational process as well as improving the knowledge and attitudes of the health professional's clinical practice⁽⁹⁾.

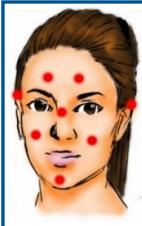
The leaflet built in this study was developed after an integrative literature review. Using the Delphi technique, it was validated by health professionals who are at the forefront of treatment for patients affected by COVID-19. After the first evaluation cycle of the initial version of the leaflet, the judges' responses and suggestions regarding each question marked as "partially inadequate" or "inadequate" were analyzed.

These suggestions ranged from details, how to exchange terms for a better understanding of the text, to important considerations about preventive measures and types of devices that promote the interface between PPE and the professional's skin. The suggestions considered relevant were accepted, which contributed to the absence of negative responses in the second evaluation cycle, increasing the reliability of the final instrument, as observed in other studies⁽¹⁰⁻¹¹⁾.

LEAFLET TO GUIDE HEALTH PROFESSIONALS TO PREVENT FACIAL INJURY DURING THE COVID-19 PANDEMIC



With COVID-19, health professionals need to use personal protective equipment, the inappropriate use of which results in facial injuries. Thus, the prolonged and continuous use of facial masks, gloves, goggles, and face shield is responsible for constant friction and pressure forces on the tissues, causing skin lesions.



Risk sites for facial injuries caused by the use of personal protective equipment.

Types of facial injuries caused using a mask, glasses and face shield.

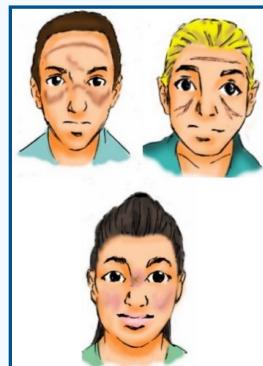


Figure 1 – Leaflet to guide health professionals in the prevention of facial injuries caused by personal protective equipment (Page 1), Pouso Alegre, Minas Gerais, Brazil, 2020

1. Skin care before and after using personal protective equipment

Use of creams and barrier protectors slow down sweating and reduce friction on the skin due to its fatty nature (hyperoxygenated fatty acids).

2. Use of materials that promote an interface between personal protective equipment and the skin in regions of pressure, friction and shear

The material must: be thin and non-traumatic during removal, absorb moisture, be adaptable to the contour of the face structures, guarantee the correct sealing of the mask. Avoid excessive force in the attachment locations.



How to place the devices to avoid shearing, pressure and friction between the skin and the mask or glasses.

3. Skin protection when using personal protective equipment

After daily hygiene, apply moisturizing cream or skin protector on the face, especially in the regions: ears, forehead, nose and malar area.

Avoid using creams based on acrylate and / or dimethicone polymer.

Moisturizing creams should be used one hour before using personal protective equipment.

4. Skin cleansing and hydration

Facial cleansing should be performed with physiological saline or soap and water.

Dry the face well and then apply moisturizer on the skin (moisturizing cream, hyperoxygenated fatty acids).

5. Pressure relief

During each shift, in a maximum interval of four hours, the professional must relieve the pressure of personal protective equipment on the skin of the face where they are fixed.

If the skin protection material or personal protective equipment is wet or damaged, it must be changed immediately.

6. Presence of skin lesions

Facial cleansing should be performed with physiological saline or soap and water.

Dry the face well and then apply a device (silicone foam, transparent polyurethane and hydrocolloid).

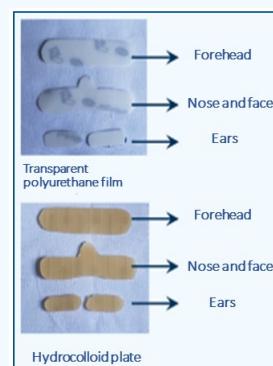


Figure 2 – Leaflet to guide health professionals in the prevention of facial injuries caused by PPE (Page 2), Pouso Alegre, Minas Gerais, Brazil, 2020

Table 1 – Evaluation of the content of the “Leaflet to prevent facial injuries caused by the use of personal protective equipment” by the judges, according to the Delphi technique, Pouso Alegre, Minas Gerais, Brazil, 2020

First evaluation	Inadequate		Partially adequate		Adequate		Total	
	n	%	n	%	n	%	n	%
Is the content suitable for the target audience?	01	01.70	14	23.70	44	74.60	59	100.00
Is the text sequence logical and coherent?	00	00.00	12	20.30	47	79.70	59	100.00
Does the content facilitate learning?	01	01.70	13	22.00	45	76.3	59	100.00
Is the vocabulary accessible?	00	00.00	25	42.40	34	57.60	59	100.00
Is the language easy to assimilate?	00	00.00	28	47.50	31	52.50	59	100.00
Does the content answer questions about the topic?	00	00.00	06	10.20	53	89.80	59	100.00
Graphical presentation	00	00.00	13	22.00	46	78.00	59	100.00
Risk sites for the professional responsible for the development of injuries caused by the inappropriate use of personal protective equipment.	00	00.00	09	15.30	50	84.70	59	100.00
Types of injuries caused by improper use of personal protective equipment	00	00.00	10	16.90	49	83.10	59	100.00
Skin care before and after using personal protective equipment	00	00.00	12	20.30	47	79.70	59	100.00
Materials that promote an interface between personal protective equipment and the patient's skin, avoiding shear, pressure, and friction	00	00.00	09	15.30	50	84.70	59	100.00
Guidelines for cleaning and moisturizing the skin	00	00.00	22	37.30	37	62.70	59	100.00
Therapeutic approach to treat skin lesions caused by personal protective equipment	01	01.70	19	32.20	39	66.10	59	100.00
Second evaluation	Inadequate		Adequate		Totally adequate		Total	
	n	%	n	%	n	%	n	%
Is the content suitable for the target audience?	00	00.00	11	18.60	48	81.40	59	100.00
Is the text sequence logical and coherent?	00	00.00	12	20.30	47	79.70	59	100.00
Does the content facilitate learning?	00	00.00	009	15.30	50	84.70	59	100.00
Is the vocabulary accessible?	00	00.00	25	42.40	34	57.60	59	100.00
Is the language easy to assimilate?	00	00.00	28	47.50	31	52.50	59	100.00
Does the content answer questions about the topic?	00	00.00	06	10.20	53	89.80	59	100.00
Graphical presentation	00	00.00	13	22.00	46	78.00	59	100.00
Risk sites for the professional who develop injuries caused by the inappropriate use of personal protective equipment	00	00.00	09	15.30	50	84.70	59	100.00
Types of injuries caused by improper use of personal protective equipment	00	00.00	10	16.90	49	83.10	59	100.00
Skin care before and after using personal protective equipment	00	00.00	12	20.30	47	79.70	59	100.00
Materials that promote an interface between personal protective equipment and the patient's skin, avoiding shear, pressure, and friction	00	00.00	09	15.30	50	84.70	59	100.00
Guidelines for cleaning and moisturizing the skin	00	00.00	22	37.30	37	62.70	59	100.00
Therapeutic approach to treat skin lesions caused by personal protective equipment	00	00.00	10	16.90	49	83.10	59	100.00

Table 2 – Content Validity Index for the first and second evaluations of the leaflet for the prevention of facial injuries caused by the use of personal protective equipment, Pouso Alegre, Minas Gerais, Brazil, 2020

Questions	Content Validity Index	
	First evaluation	Second evaluation
Is the content suitable for the target audience?	*0.926	*1.0
Is the text sequence logical and coherent?	**0.88	*1.0
Does the content facilitate learning?	*1.00	*1.0
Is the vocabulary accessible?	*0.92	*1.0
Is the language easy to assimilate?	**0.88	*1.0
Does the content answer questions about the topic?	*0.96	*1.0
Graphical presentation	**0.85	*1.0
Descriptions of places of risk for the professional who develop injuries caused by the inappropriate use of personal protective equipment	*0.96	*1.0
Descriptions of the types of injuries caused by the inappropriate use of personal protective equipment	*0.92	*1.0
Description of skin care before and after using personal protective equipment	*0.96	*1.0
Description of materials that promote interface between PPE and the patient's skin avoiding shear, pressure, and friction	**0.89	*1.0
Guidelines for cleaning and moisturizing the skin	**0.80	*1.0
Therapeutic approach to treat skin lesions caused by personal protective equipment	**0.85	*1.0
Overall Content Validity Index	*0.923	*1.0

Note: *Content Validity Index between 0.91, at 1.0 - excellent/** Content Validity Index between 0.80 to 0.90 - good.

The leaflets are creative, reliable, and useful tools for health education, collaborating directly to improve the teaching-learning process and clinical practice of health professionals, making them provide assistance with the least possible risk, without harm⁽⁴⁻¹³⁾.

When an educational technology is developed with a scientific basis and, during the validation, the judges suggest changes in the content and it is improved, these changes contribute for the professional to improve procedures and interventions based on structured knowledge and information directed to the target audience⁽¹⁴⁻¹⁵⁾.

Among educational technologies, brochures, algorithms, and booklets can be considered an efficient means of communication to promote health. In addition to contributing to the empowerment of the user, they enable the professional to act as a multiplier, presenting the material to other subjects in the community^(4,12-13).

Educational technologies - algorithms, booklets, leaflets, flow-charts - are considered important tools to face several problems in the assistance and management of health services. Studies based on scientific evidence are based on guidelines of a technical, organizational and political nature and focus on the standardization of clinical and preventive approaches^(10,12). The development of new tools requires the incorporation of new technologies that meet the needs of treatment and organizations that provide health care⁽¹⁶⁻¹⁷⁾.

The leaflet to prevent facial injuries caused by the use of PPE offers the health professional the description of techniques, the steps of the preventive measures pertinent to facial injuries caused by the use of PPE; finally, it provides information for the management of assistance with quality and safety for the professional with the minimum possible risk and without damage^(7,18-20). Such a tool has great relevance, since, according to a study, a prevalence of 43% of skin lesions caused by PPE was shown, whose factors responsible were local pressure and friction, intense heat sweating and long time of use⁽²⁰⁻²³⁾.

For PPE to be effective, it is of fundamental importance that health professionals are previously trained on how to put on and remove PPE, and informed about preventive measures for injuries and dermatitis. Studies have shown that the correct use of PPE by health professionals reduces the risk of infection by SARS-CoV-2, prevents injuries, and increases the sense of safety in those working in hospitals⁽¹⁶⁻¹⁷⁾.

The main skin changes identified were: using N95 masks - acne (59.6%), facial itching (51.4%) and rash (35.8%); wearing gloves - 64 (21.4%) out of 299, dry skin (73.4%), itching (56.3%) and skin rash (37.5%). The use of PPE is associated with high rates of adverse reactions on the skin. Hands, cheeks, and nasal bridge were classified as the three most affected areas, reported, respectively, by 237 (84.6%), 211 (75.4%) and 201 (71.8%). An appropriate choice of PPE is recommended^(7,18).

The CVI varied between 0.88 and 0.92 in all questions in the first evaluation cycle; and presented a value of 1.0 in the second cycle, confirming that all aspects covered in the brochure are presented in an understandable way and that there was an agreement among the judges on the relevance of all items. Recent health articles have also used CVI in the validation of instruments⁽¹⁹⁻²³⁾.

Study limitation

As a limitation of this study, the evaluation of the leaflets by the professionals of higher education is pointed out. If the technology is evaluated by nursing technicians and assistants, the results may be different.

Contributions to the field of nursing, health, or public policy

The leaflets developed in this study contribute to innovation in the work of nurses, physicians, and physiotherapists, especially in assisting in clinical decision-making, in dressing, and regarding preventive measures for injuries caused by the inappropriate individual use of protective equipment. This is important because, if the professional does not use this technique correctly, he can become infected with SARS-CoV-2 and transmit it to the patients who are in his care. In addition, it is expected that the tool provides subsidies to keep the professional updated about the theoretical-practical approach to the content.

CONCLUSION

The leaflet developed in this research was validated for appearance and content, demonstrating that it is reliable to be applied by health professionals during the COVID-19 pandemic aimed at preventing injuries caused by the use of PPE.

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