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CONSTRUCTION AND VALIDATION OF ALGORITHM FOR TREATMENT OF PRESSURE INJURY

CONSTRUÇÃO E VALIDAÇÃO DE ALGORITMO PARA TRATAMENTO DA LESÃO POR PRESSÃO

CONSTRUCCIÓN Y VALIDACIÓN DE ALGORITMO PARA TRATAMIENTO DE LA LESIÓN POR PRESIÓN

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ABSTRACT

Objective: to construct an algorithm for the treatment of pressure injury. ***Method***: this is a quantitative, prospective, descriptive and analytical study for the elaboration of the algorithm; a wide review of the literature was carried out. Thirty-eight specialist nurses participated in the validation of the algorithm. ***Results***: Thirty-five (92.1%) participants favored the ability of the algorithm to support the treatment of pressure injury. All the questions presented in the algorithm of treatment of pressure injury contributed favorably to the internal consistency of the instrument (Cronbach's alpha = 0.880). The great percentage of 80% was obtained by the classification according to the staging of the lesion. Each question pointed to the instrument as a tool capable of assisting the professional in making decisions regarding the choice of therapy proposed. ***Conclusion***: the algorithm in the validated version showed reliability for the treatment of pressure injury. ***Descriptors*:** Pressure Ulcer; Disease Prevention; Algorithms; Protocols; Risk Assessment.

RESUMO

Objetivo*:** construir algoritmo para tratamento da lesão por pressão. ***Método*:** estudo quantitativo, prospectivo, descritivo, analítico para a elaboração do algoritmo; realizou-se ampla revisão da literatura. Trinta e oito enfermeiros especialistas participaram na validação do algoritmo. ***Resultados: trinta e cinco (92,1%) dos participantes opinaram favoravelmente quanto à capacidade do algoritmo em apoiar no tratamento da lesão por pressão. Todas as questões apresentadas no algoritmo de tratamento da lesão de pressão contribuíram favoravelmente para a consistência interna do instrumento (Alfa de Cronbach = 0,880). O percentual de ótimo de 80% foi obtido pelo quesito Classificação de acordo com o estadiamento da lesão. Cada questão apontou o instrumento como ferramenta capaz de auxiliar o profissional na tomada de decisão quanto à escolha da terapêutica proposta. ***Conclusão*:** o algoritmo na versão validada mostrou confiabilidade para tratamento da lesão de pressão. ***Descritores*:** Úlcera por Pressão; Prevenção de Doenças; Algoritmos; Protocolos; Medição de Risco.

RESUMEN

Objetivo*:** construir algoritmo para el tratamiento de la lesión por presión. ***Método*:** estudio cuantitativo, prospectivo, descriptivo, analítico para la elaboración del algoritmo; se realizó uma amplia revisión de la literatura. Trienta y ocho enfermeros especialistas participaron en la validación del algoritmo. ***Resultados: trienta y cinco (92,1%) de los participantes opinaron favorablemente sobre la capacidad del algoritmo en apoyar en el tratamiento de la lesión por presión. Todo el asunto presentado en el algoritmo de tratamiento da lesión de presión contribuyeron favorablemente para la consistencia interna del instrumento (Alfa de Cronbach = 0,880). El percentaje de óptimo de 80% fue obtiendo por la Clasificación de acuerdo con la etapa de la lesión. Cada asunto aponto el instrumento como herramienta capaz de auxiliar al profesional en la tomada de decisión sobre la elección de la terapia propuesta. ***Conclusión*:** el algoritmo en la versión validada mostró confiabilidad para tratamiento de la lesión de presión. ***Descriptores*:** Úlceras por Presión; Prevención de Enfermedades; Algoritmos; Protocolos; Medición de Riesgo.

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INTRODUCTION

Pressure injuries are considered a serious and worldwide problem, responsible for significant morbidity and mortality rates. Several studies report that in the national scenario, the incidence of pressure injury varied from 13.13% to 62.5% and the prevalence between 9.2% and 37.41%.[1-4] In the international scenario, prevalence ranging from 5% to 15% and the incidence of 1.9% to 7%.[5-7] Also, these lesions cause considerable impact to the patient, causing pain, functional disability, changes in self-esteem, self-image, quality of life, leisure and removal from social life.[8-9]

The cost invested in the prevention and treatment of pressure injury is a challenge for professionals and for health institutions since the economic issue is fundamental for the decision-making process in the choice of therapeutic behavior. Several authors report that the cost for the treatment of pressure injury can vary between R$ 16.41 and R$ 360.15 per day, depending on the type of coverage, category, and extent of pressure injury. However, the cost related to prevention varies from R$ 15.80 to R$ 68,00.[1,10-12]

The selection of different coverages for the treatment of pressure lesions requires professionals to have technical and scientific knowledge related to the physiology, anatomy, efficacy/effectiveness and cost-effectiveness of the innovative coverages in the market. It is also important that the professional development of educational tools, for example, protocols, manuals, booklets, brochures, and algorithms.

Algorithms have been developed so health professionals can make clinical decisions on prevention and treatment. They should be validated and their construction should be done through practice based on scientific evidence, clinical guidelines, and randomized clinical trials.[13-14] Algorithms are graphical maps, used to better visualize the components and processes of a problem.15-19

An algorithm was constructed to direct and support the decision of the professional involved in the ideal conduct in the treatment of pressure injury to contribute to the management and standardization of nursing care to the patient with pressure injury.

OBJECTIVES

- To build an algorithm for treatment of pressure injury.
- To validate the algorithm for treatment of pressure injury.

METHOD

This is a quantitative, prospective, descriptive and analytical study approved by the Research Ethics Committee of the Medical Sciences School Dr. José Antônio Garcia Coutinho, University of Vale do Sapucaí, under the Opinion Constituted number 1,417,426. The study was carried out at the Samuel Libânio Clinical Hospital with the participation of postgraduate nurses in Stomatherapy and Dermatology, registered at the Brazilian Society of Stomatherapy (SOBEST) and the Brazilian Association of Nursing in Dermatology (SOBENDE). A research was also carried out on the Lattes platform of the National Council for Scientific and Technological Development (CNPq) for the subjects "pressure ulcer", "algorithms", "protocols", "injuries and lesions", "wound healing" and "technology".

For the selection of participants of the study, 200 professionals with experience in evaluation and treatment of patients with pressure injury were contacted by e-mail, 38 of whom answered the questionnaire in the pre-established time and were included in the study.

The inclusion criteria were to be a certificate holder of the undergraduate course in Nursing and have experience of at least 12 months in assessing and caring for patients at risk to develop pressure injury. The non-inclusion criterion was nurses with a time of assistance experience to the individual with a pressure injury of fewer than 12 months.

For the construction of the algorithm, a literature review was carried out in the Health Sciences databases, including Cochrane Libraries, Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Science Literature (LILACS), National Library of (CINAHL), in addition to consulting bibliographies, books and theses of the area of the last 10 years, using as descriptors: “pressure ulcer”, “Algorithms”, “protocols”, “injuries and lesions”, “wound healing”, and “technology”.

After extensive bibliographical research in national and international indexed journals, as well as the reading of the abstracts, articles describing the evaluation of the pressure injury, the cleaning, the lesion stage, the type of tissue and the dressings used in the treatment of pressure injury, were selected.

Only primary studies that had a direct link with the theme available as full inclusion

criteria and without the proposed temporal delimitation were used to select the publications to be included in the review since the intention was to compile all the studies that established criteria. Chapters of books, theses, dissertations, monographs, technical reports, reference works and articles that, after reading the abstract, did not converge with the proposed study object, besides the publications that were repeated in the databases and in the virtual library were excluded. These procedures helped to obtain data for the construction of the algorithm.

From the survey, the algorithm of treatment of the pressure injury was elaborated in four stages: evaluation of the injury by pressure; cleaning of the pressure lesion; classification of pressure injury; and therapeutic agent proposal.

First stage: the objective was to evaluate the pressure injury by its characteristics: margin, tissue type present in the lesion bed, type, amount and color of the exudate, as well as the presence of clinical signs of infection.

Second stage: cleaning of the lesion according to the type of tissue in the lesional bed, with the distribution of the vitalized and devitalized tissues. Both recommended dressings were made by means of the warm 0.9% physiological solution, with a 20 ml syringe and a 40x12 needle; however, in the presence of devitalized tissue, the possibility of debridement is possible.

Third stage: classification of the lesions by the classification proposed by the National Pressure Ulcer Advisory Panel (NPUAP), according to the level of tissue involvement.[20]

Fourth stage: the last step was aimed at providing professionals with therapeutic behaviors according to each phase of the lesion.

For its validation, the algorithm was submitted to the evaluation of 38 nurses with experience in evaluating, preventing and treating individuals with pressure injury. The research participants were contacted by e-mail and invited to participate in the study by an invitation letter containing the objectives and methodology of the study, and an access link was sent to the evaluation form of the instrument, built through Google Docs.google.com) together with the Informed Consent Form. The professional who agreed to participate in the research accessed the link in the text of the e-mail, filling out the questionnaire called "Questionnaire for elaborating an algorithm for treatment of pressure injury", sending it to us. The questionnaire was available in the system for seven days after sending the e-mail.

The questionnaire sent to the research participants for the evaluation of the algorithm for the treatment of pressure injury was composed of two parts. The first one was aimed at characterizing the participants of the study, with questions related to age, gender, professional qualification, professional experience, time of experience in teaching and care, and region of professional performance. The second part referred to the evaluation of the algorithm of treatment of the injury by pressure. This was evaluated by the participants of the study, according to their suitability in relation to the graphical presentation, readability, instructional sequence of the algorithm, vocabulary, updating of the theme and if feasible. Specific evaluation items were added to the algorithm for the treatment of pressure injury in relation to the cleaning of the lesion, classification of pressure ulcer in its staging and the therapeutic proposal. The judges analyzed the content, presentation, clarity, and understanding of the instrument.

The response alternatives for the evaluation of the algorithm were: great (10 to 8 points), good (7 to 6 points), regular (5 to 4 points), bad (3 to 0 points). The instrument was considered "applicable" for a percentage of 70% or more, greater than 0.70 of positive responses (Great and Good).

In the case of inadequacies in the evaluated items of the algorithm, the research participants were encouraged to present suggestions and justifications so the items could be redone, modified and improved.

The obtained data were tabulated electronically using the Microsoft® EXCEL® 97 software and analyzed quantitatively. The program used for statistical analysis was the Statistical Package for Social Sciences (SPSS) version 2. The Cronbach's Alpha Coefficient, the Chi-square test of independence and the non-parametric Friedman test were used in the study. The level of significance was set at 5% ($P < 0.05$).

RESULTS

The algorithm was built through the researched literature, validated from the appreciation by professionals with expertise in evaluating and treating people with pressure injury (Figure 1).

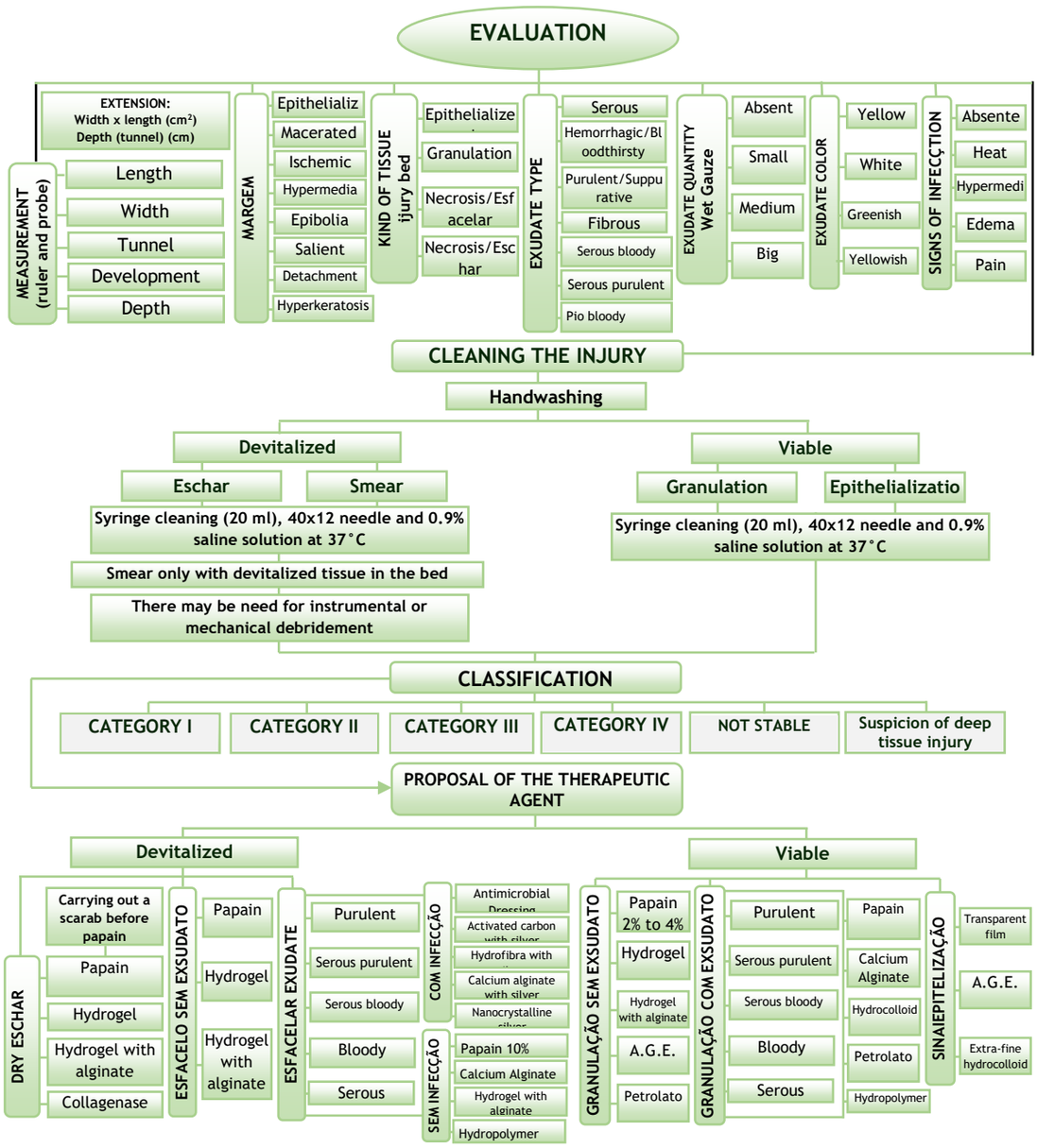

Figure 1. Algorithm for treatment of pressure injury. Pouso Alegre (MG), 2016, Brazil.

With this algorithm, the professional can indicate the type of cleaning, identify the stage of the pressure lesion and the most appropriate therapeutic behavior to promote the healing of the pressure lesion (Figure 1).

Table 1 shows that most (n=31; 81.6%) of the study participants were female, with ages between 25 and 64 years old (mean, 41 years old), with a predominance of age in the 30 to 39 (39.4%) years old. As for the region where they worked, the Southeast ranged from 32 (84.2%) of the survey judges, followed by the Northeast (n=3, 7.9%), South (n=2, 5.3%) and Central West, with only 1 (2.6%) judge. It was observed that 13 (34.2%) judges had training time of 10 to 15 years and 12 (30.8%) had over 20 years of training. The sample was composed of highly qualified professionals with postgraduate studies, of which 18 (47.4%) had a Master's degree, 15 (39.50%) with Specialization in the area and 5 (13.2%) had a Ph.D. Most nurses had experience in teaching and assistance, and 10 (26.3%) and 9 (23.7%) of the participants had teaching time of 1 to 5 years and 6 to 10 years, respectively, while there were 11 to 15 years with 9 (23.7%) participants, and over 20 years, with 10 (26.3%) participants.

Table 1. Characteristics of the research participants. Pouso Alegre (MG), 2016, Brazil.

Characteristics	N	%	% valid	% accumulated
Age group				
25 to 29 years old	3	7.9	8.1	8.1
30 to 39 years old	15	**39.4**	40.5	45.5
40 to 49 years old	12	31.6	32.4	78.4
50 to 64 years old	8	21.1	21.6	100
Total	38	100	100	
P-value	0.671			
Gender				
Female	31	81.6	81.6	81.6
Male	7	18.4	18.4	100
Total	38	100	100	
P-value	0.001*			
Region of professional activity				
Northeast	3	7.9	7.9	7.9
Southeast	32	84.2	84.2	92.1
Midwest	1	2.6	2.6	94.7
South	2	5.3	5.3	100
Total	38	100	100	
P-value	0.001*			
Time of training				
1 to 5 years	2	5.3	5.3	5.3
5 to 10 years	9	23.7	23.7	28.9
10 to 15 years	13	34.2	34.2	63.2
15 to 20 years	2	5.3	5.3	68.4
More than 20 years	12	31.6	31.6	100
Total	38	100	100	
P-value	0.581			
If yes, which one?				
Specialization	15	39.5	39.5	39.5
Master	18	47.4	47.4	86.8
Doctorate degree	5	13.2	13.2	100
Total	38	100	100	
P-value	0.329			
Time of teaching experience				
Less than 1 year	6	15.8	15.8	15.8
1 to 5 years	9	23.7	23.7	39.5
6 to 10 years	10	26.3	26.3	65.8

Qui-square test of independence. *P < 0.05.

Regarding the evaluation of the responses regarding the algorithm of treatment of pressure injury, a maximum value for the "great" concept was verified, with 28 (80%) responses to the item classification according to the staging of the lesion; 25 (67.6%) judges answered "great" to the item "graphic presentation"; and 24 (63.2%) scored as "great" the item "theme update". The items referring to the ease of reading and description of the cleanliness of the lesion were equally distributed in terms of the "good" concept, with 18 (48.6%) participants. Regarding the concept of "good", the highest score was 19 (51.4%) for the item "therapeutic proposal for the treatment of pressure injury". As for the "regular" concept, the highest score was 8 (21.6%) in the responses to the item "readability". Four questions were evaluated as "bad", with 2 (5.4%) referring to the description of the cleanliness of the lesion and the therapeutic proposal for the treatment of the pressure lesion, and 1 (2.6%) judge evaluated as "bad" The graphical presentation and readability (Table 2). The judges' opinion was favorable regarding the ability of the algorithm to support the professional in decision making in the treatment of pressure injury, 35 (92.1%) answered in the affirmative (Table 2).

Table 2. Characterization, content, and capacity of the algorithm for treatment of pressure injury to support decision making according to the participants. Pouso Alegre (MG), 2016, Brazil.

Characteristics and content of the algorithm	Bad		Regular		Good		Great		P-value
	n	%	n	%	n	%	n	%	
Graphic presentation	1	2.7	3	8.1	8	21.6	25	67.6	0.021*
Readability	1	2.7	8	21.6	10	27.0	18	48.6	0.083
Instructional sequence	0	0	3	7.9	12	31.6	23	60.5	0.029*
Vocabulary	0	0	3	8.6	13	37.1	19	54.3	0.019*
Theme update	0	0	3	7.9	11	28.9	24	63.2	0.025*
Description of injury cleaning	2	5.4	6	16.2	11	29.7	18	48.6	0.088
Classification according to the staging of the lesion	0	0	1	2.9	6	17.1	28	80.0	0.001*
Therapeutic proposal	2	5.4	1	2.7	19	51.4	15	40.5	0.017*
Support to the professional in the treatment of the injury	n		%		% valid		% accumulated		P-value
Yes	35		92,1		92.1		92.1		
No	3		7,9		7.9		100		0.001*
Total	38		100		100				

Qui-square test of independence. *P < 0.05.

Table 3 shows all the questions of the algorithm of treatment of pressure injury that contributed positively to the internal consistency of the instrument since Cronbach's alpha coefficient was 0.880 and considered satisfactory.[21]

Table 3. Internal consistency of the algorithm for treatment of pressure injury. Pouso Alegre (MG), 2016, Brazil.

Characteristics and content of the algorithm	Average algorithm if the item is excluded	Variance of the algorithm if the item is excluded	Item-Total Correlation if the item is excluded	Cronbach´s alpha if the item is excluded
Cronbach´s alpha = 0,880				
Graphic presentation	24.06	14.596	0.731	0.856*
Ease of reading	24.32	14.892	0.594	0.873*
Instructional sequence	24.10	15.957	0.623	0.867*
Vocabulary	24.13	16.516	0.513	0.877*
Theme update	24.03	16.299	0.556	0.874*
Description of injury cleaning	24.29	13.880	0.758	0.852*
Classification according to the staging of the lesion	23.81	16.828	0.664	0.868*
Therapeutic proposal	24.32	14.292	0.783	0.849*

Cronbach´s alpha coefficient. *α > 0.7.

Table 4 describes the alteration suggestions presented by the participants who validated the algorithm for the treatment of pressure injury. The suggestions were considered according to a scientific basis.

Table 4. Summary of the qualitative analysis of the changes suggested by the participants. Pouso Alegre (MG), 2016, Brazil.

Data of the participants			Suggestions
No.	Time of training	Academic level	
5	> 20 years	Doctorate degree	I suggest for debridement papain from 8%. To cut it, I suggest papain from 6%.
7	> 20 years	Master	I question a little the use of water to clean the wound because there is no way to guarantee its proper quality. Collagenase does not work in a dry environment, as the enzyme needs moisture to be activated. In the granulation stage, there is no need to use silver.
10	5-10 years	Master	Review the use of gauze with PHMB. I suggest replacement with antimicrobial dressing with PHMB. Today, we have the market liquid solution, gel with PHMB, besides the gauze.
15	10-15 years	Specialization	Poor evaluation of the wound "Margin"; the terms Keratosis and Invagination have given me some discomfort about terminology! Would keratosis be hyperkeratosis? Is Invagination Epibolia?
16	> 20 years	Master	I missed the scarification before papain administration.
25	10-15 years	Master	It is not possible to measure the amount of exudate, so I suggest putting "SMALL, MEDIUM, BIG QUANTITY". In the classification of the wounds, by the new classification, it is not said more "stage", but "CATEGORY"; in the coverage of the granular tissue without exudation, the concentration could be reduced of papain to 2%.
26	10-15 years	Doctorate degree	Add depth to measurement. As for cleaning the devitalized tissue, the writing is confusing. Ideally, a 20 ml syringe with a 40X12 needle filled with warm saline should be used first. Smear cleaning on devitalized tissue is not always indicated because we usually have more than one tissue in the same lesion. Granulation tissue with infection? If there is an infection, the wound does not improve and remains in the inflammatory phase, therefore I do not know a wounded with granulation tissue and infection simultaneously. Also, if it is already in the granulation stage, there is no need to use silver.
30	5-10 years	Master	Since your focus is PU, you should not put PU Cleanup and PU Assessment?

DISCUSSION

Most (n=31, 81.6%) of the participants in this study were female, with ages between 25 and 64 years old (mean, 41 years) and with predominance (39.4%) between 30 to 39 years old, which meets the characteristics of the profession pointed out by several authors.[22-5]

Regarding the academic degree, all the professionals had postgraduate studies, of which 18 (47.4%) had a Master's degree, 15 (39.5%) with Specialization in the area and 5 (13.2%) with a Ph.D. This demonstrates that health professionals are increasingly concerned about their development and professional development. Today, the labor market demands more and more trained professionals. Performing postgraduate means differential. These results corroborate the findings of several studies.[23-6]

The practice of care for people with wounds is a specialty within the Nursing recognized by the Brazilian Society of Nursing in Dermatology (SOBENDE) and Brazilian Association of Stomatherapy (SOBEST). It is a challenge that requires specific knowledge, skills, and a holistic approach, as well as the search for new knowledge.[23] In this context, nurses are the best qualified professional to lead prevention and treatment programs for pressure injuries, since they spend part of their time with the patient, evaluating skin changes that influence the risk of development and evolution of the lesion, as well as managing care.[23]

In this study, most nurses had experience in teaching and care, with 10 (26.3%) and 9 (23.7%) participants teaching time between 1 and 5 years and 6 to 10 years, respectively (n=9, 23.7%) and over 20 years (n=10, 26.3%). The time of teaching and assistance experience stated by the research participants showed professional experience with teaching-assistance articulation capable of making transformations and improvements in the training and assistance processes possible,[28] confirming the ability of study participants to evaluate the forms used in the evaluation of the algorithm of treatment of the injury by pressure.

As for the region in which the judges of this study carried out their work activities, the Southeast had 32 (84.20%) professionals,

followed by the Northeast (n=3, 7.9%), South (n=2; 3%) and Center-West (n=1, 2.6%). These data coincide with the results of a previous study that aimed to present the process of construction and validation of an instrument to evaluate care to the wounded person for application with Nursing undergraduates.[29] It was evidenced that 56.7% of the research judges worked in the Southeast region, followed by the Northeast with 20% .[29]

Wound treatment requires advanced intervention, focused on a holistic approach, guiding healthcare professionals to the basis of practice in scientific evidence. Technological innovations favor the improvement of care, emphasizing its use in the care of patients with wounds. This knowledge begins during the formal qualification in the undergraduate courses and continues in the post-graduation, constituting a primordial factor for the viability and implementation of care, both for prevention and in the treatment of wounds.[30-3] Thus, it is nurses' responsibility for the elaboration and implementation of protocols, clinical guidelines, and algorithms related to the coverage and products for prevention and treatment of pressure injury in the institution where they work, which should be done by associating knowledge, technology, and innovation to clinical practice based on scientific evidence.

Besides the risk assessment scales, other technologies that contribute to the management of patient care at risk of development and/or pressure injury are the algorithms. They constitute a finite sequence of well-defined instructions that can be carried out systematically.

Algorithms constructed to treat pressure injuries should offer the professional description of techniques, steps, information for the management of assistance with quality and safety for the patient; they should also enable the professional to better visualize, practice and understand the procedure to be performed.

Regarding the answers of the judges who evaluated the algorithm, a maximum value was verified for the great concept of the answers for the classification items according to the staging of the lesion, therapeutic proposal, graphic presentation, readability, institutional sequence, vocabulary and theme update. The items referring to the ease of reading and description of the cleanliness of the lesion were evenly distributed as to the good concept. The answers of the judges related to the validation of the algorithm were positive and the Cronbach´s alpha coefficient of 0.880 had a satisfactory internal consistency.

In health, algorithms are simple, direct and easy-to-access tools, as well as primordial tools for quality management, standing out as an important means of organizing processes. These instruments give a complete view of the care process and support professionals in providing quality care, providing patient safety and professional decision making, especially when they are complex. It is important this instrument be validated by professionals in the area of knowledge of the subject.[17-8]

In the algorithm treatment of pressure injury of this study, when assessing the need to implement care, initially, the lesion is analyzed to define its characteristics, such as margin of injury, type of tissues present in the lesion, such as liquefying necrotic, coagulative necrotic, eschar, granulation and epithelization, presence or absence of exudate, as well as its characteristics and the presence or absence of clinical signs of infection. All items reported initially address the type of injury clearance. In the algorithm, lesion cleaning with a 20 ml syringe and a 40x12 needle filled with 0.9% physiological solution heated at 37°C were recommended in the algorithm. The use of heated and jetted physiological solution leads to mechanical debridement of the lesion, preventing bed temperature decrease and stimulating local vasodilation, accelerating the cicatricial process.[33-5] The use of physiological solution is recommended because it is isotonic and does not interfere in the healing process.[35]

The algorithm of this work associated cleaning with 0.9% physiological solution heated in a jet to the debridement, depending on the type of tissue present in the lesion. Debridement is a frequently used procedure for treating wounds. Guidelines for the treatment of pressure injury indicate debridement for removal of any devitalized tissue, as long as it is consistent with the patient's clinical conditions and goals for the treatment of pressure injury.[36] Therefore, debridement is an essential component for topical therapy be successful and wound management develops its potential. This stage of topical therapy reduces the bacterial load of the wound to prevent infections and facilitate their visualization and evaluation. At the molecular level, debridement interrupts the cycle of the chronic wound. Mechanical debridement consists of the application of mechanical force (smear, friction) directly on the devitalized tissue, using gauze or sponge soaked with appropriate wound cleaning

solution. This smear should be performed in the wound bed in only one direction.[20]

Subsequently, the pressure injury treatment algorithm of this study defined the pressure lesion according to its staging. The classification in categories was proposed by the National Pressure Ulcer Advisory Panel (NPUAP) and European Pressure Ulcer Advisory Panel (EPUAP), based on the depth of the lesion and the type of tissue involved. Recently, the National Pressure Ulcer Advisory Panel redefined the classification of pressure injury during the Consensus Conference.[20] The term pressure ulcer was replaced by pressure injury, and the staging, termed by phase and cardinal and non-Roman numbers as before. It is necessary to evaluate the type of tissue present in the lesion and the amount of exudate present in order to direct the best therapeutic course for the treatment of pressure lesion.[20] Therapeutic agents such as papain in concentrations of 8 to 10%, hydrogel, calcium alginate and collagenase were chosen for the treatment of pressure lesion with presence of devitalized tissue (eschar and sphincter without presence of exudate).[37]

Papain comes from papaya fruit latex (Carica papaya), commonly used in Brazil since 1983 and can be found in the presentation of pulp, powder, cream-gel associated with urea and/or chlorophyll and spray, these two not found in Brazil. It is a complex mixture of proteolytic enzymes and peroxidases that promote the proteolysis of the devitalized tissue.[37] Besides being used as a debridant, papain has anti-inflammatory action, acting on the contraction and junction of the edges of wounds, and can be used in several phases of healing, with concentrations according to the type of wound tissue. Currently, a concentration of 2% of papain is recommended for granulation tissue; in the presence of necrosis of liquefaction 4 to 6% and in coagulation necrosis 8 to 10%.[38-40]

The applicability and effectiveness of papain at concentrations of 10% and 2% were evaluated in a previous study[41] with the objective of reporting a case study of a patient with a pressure ulcer in the calcaneus region using papain powder at 10% and 2%. Initially, the lesion presented coagulation necrosis, where papain was applied at 10% concentration after scarification. The ulcer showed a decrease in coagulative necrosis through debridement, with an initial area of 0.54 cm^2. The ulcer presented a decrease in coagulation necrosis, with an increase of the granulation tissue in the center and in the bed. It was modified to 2% papain in the granulation and 10% papain was maintained in the sphagnum. After 30 days of treatment, there was a 44% area reduction, with an increase of granulation tissue and edge epithelization. A new procedure was established with only the use of 2% papain. After 50 days of treatment, the wound had an area of 0.06 cm^2 and was in the final stage of healing.

Collagenase is an enzyme preparation obtained from Clostridium hystoliticum filtrates that digest collagen but is not active against keratin, fat or fibrin. It is indicated for chemical debridement, acting effectively in the removal of debris. The ideal wound pH for use is 6 to 8.[24,35]

The hydrogel is a gel consisting of a network of interconnected hydrophilic polymers, composed basically of 20% to 96% water. It maintains the moisture of the lesion, which avoids dehydration of the nerve endings, reducing pain, and promotes tissue autolysis.[35]

In the therapeutic proposal for vitalized tissues, the current study guided the use of therapeutic agents papain 2% to 4%, hydrogel, hydrogel with alginate, essential fatty acids, and petrolatum. Essential fatty acids promote chemotaxis to leukocytes, facilitating the entry of growth factors into the cell, mitosis, and cell proliferation. Essential fatty acids are widely used in Brazil without contraindications and side effects.[42] The hydrogel in granulation tissues provides the ideal medium for tissue repair. Petrolatum is a therapeutic agent that does not adhere to the lesion bed and does not traumatize the removal of the primary dressing, in addition to maintaining bed wetness.[35]

The effectiveness of papain gels at 2% and 4% in the tissue repair of venous ulcers was evaluated in a study with a consecutive sample of 16 patients with 30 venous ulcers, attended at the university hospital outpatient clinic, from April to November 2011, with form for clinical evaluation of the patient and the lesion. Females predominated; age between 51 and 59 years old; obese; with systemic arterial hypertension. As for ulcers, there was an average reduction of 7.9 cm^2 (50% of the size) in 90 days; 20% healed completely in 56.7 days. There was an increase in epithelialization, a significant reduction in sphincter and edema, improvement in depth, type and quantity of exudate ($P < 0.0001$). Papain gels 2% and 4% were effective in the healing of venous ulcers.[39]

Studies have shown that besides essential fatty acids, soy lecithin and vitamins A and E

also contribute to the tissue repair process. Vitamins A and E have antioxidant properties and protect the cell membrane from attack by free radicals. Soy lecithin, besides being a protective agent, it provides maintenance of tissue hydration and aids in the healing process of the skin.[36,39,42-3]

As for epithelial tissue, transparent film, essential fatty acids and superfine hydrocolloid were chosen. Extra-fine hydrocolloid and clear film are used to reduce friction forces and protect neoepithelial areas.

Healing comprises a complex systemic process, which requires the body to activate, produce and inhibit various molecular and cellular components. In an orderly and continuous sequence, they determine the process of tissue repair. It is essential to maintain the moisture of the lesion to optimize the healing of the wound. From this precept, for the treatment of wounds under the condition of the humid environment, many dressings are available, favoring the healing as those used in this algorithm.

CONCLUSION

The algorithm showed reliability for the treatment of pressure injury.

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