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Development of an algorithm for choosing the bath of the coronary disease patient

Desarrollo de un algoritmo para la elección del baño del paciente coronario

Elaboração de algoritmo para a escolha do banho do paciente coronariopata

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Abstract

The aim was to apply the validated criteria and clinical parameters used by nurses in an algorithm to support the choice of bathing for patients with coronary artery disease. This is a methodological study with a quantitative approach to develop an algorithm for decision making regarding the choice of bathing in patients with coronary artery disease. It resulted in 19 validated items and 19 items suggested and used by experts. Of these, after categorization, 21 items were selected, organized in an algorithm format, with dichotomous responses that suggest, at each end of the flow, the type of bath indicated for the patient, due to their clinical conditions at the time of evaluation. In conclusion, an elaborate algorithm guides nurses in choosing the type of bath that will be offered to patients with coronary artery disease, through validated clinical parameters based on findings in the literature. This study needs algorithm validation for its clinical use.

Descriptors: Baths; Cardiovascular Nursing; Coronary Disease; Nursing Care; Critical Care.

Resumén

El objetivo fue aplicar los criterios validados y los parámetros clínicos utilizados por las enfermeras en un algoritmo para apoyar la elección del baño de los pacientes con enfermedad arterial coronaria. Se trata de un estudio metodológico con abordaje cuantitativo para desarrollar un algoritmo de toma de decisiones sobre la elección del baño en pacientes con enfermedad coronaria. Resultó en 19 elementos validados y 19 elementos sugeridos y utilizados por expertos. De estos, luego de la categorización, se seleccionaron 21 ítems, organizados en formato de algoritmo, con respuestas dicotómicas que sugieren, en cada extremo del flujo, el tipo de baño indicado para el paciente, debido a sus condiciones clínicas al momento de la evaluación. En conclusión, un elaborado algoritmo guía a las enfermeras en la elección del tipo de baño que se ofrecerá a los pacientes con enfermedad coronaria, a través de parámetros clínicos validados con base en los hallazgos de la literatura. Este estudio necesita la validación de un algoritmo para su uso clínico.

Descriptores: Baños; Enfermería Cardiovascular; Enfermedad Coronaria; Atención de Enfermería; Cuidados Críticos.

Resumo

Objetivou-se aplicar os critérios validados e parâmetros clínicos utilizados por enfermeiros em um algoritmo para a apoiar a escolha do banho do paciente coronariopata. Trata-se de um estudo metodológico com abordagem quantitativa para elaboração de um algoritmo para tomada de decisão referente a escolha do banho no paciente coronariopata. Resultou-se em 19 itens validados e 19 itens sugeridos e utilizados pelos especialistas. Destes, após categorização, foram selecionados 21 itens, organizados em formato de algoritmo, com respostas dicotômicas que sugerem, a cada final de fluxo, o tipo do banho indicado ao paciente, devido às suas condições clínicas no momento da avaliação. Por conclusão, algoritmo elaborado norteia o enfermeiro na escolha do tipo do banho que será oferecido ao paciente coronariopata, através de parâmetros clínicos validados baseados nos achados da literatura. Este estudo necessita de validação do algoritmo para sua utilização clínica.

Descritores: Banhos; Enfermagem Cardiovascular; Doença das Coronárias; Assistência de Enfermagem; Cuidados Críticos.

Introduction

Cardiovascular diseases (CAD) have been responsible for the main cause of death in Brazil and for 30% of deaths in the world each year. They account for about 8% of the total cost of healthcare in our country, a figure that has been increasing year after year in parallel with the aging of the population[1].

In this context, CAD can culminate in an acute event, leading the individual to a medical diagnosis of acute coronary syndrome (ACS) and, sometimes, hospitalization in a unit for critically ill patients called Coronary Unit (UC). Care for critically ill patients in UC is guided by clinical protocols, guidelines, and technical procedures in order to contribute to the clinical stabilization and recovery of the individual with ACS, minimizing the risk of complications and preventing damage. Among the technical procedures involving this assistance, bathing stands out, which can be classified as in-bed or sprinkler[2,3].

The spray bath is a self-care routinely performed by all human beings who have the physical and physiological capacity to perform it, where the procedure takes place in a shower and the bath is performed with the individual standing or even sitting in an appropriate place. a stool or toilet chair. Critically ill patients, usually sedated or comatose and under invasive ventilatory support, are totally dependent on the care provided by the healthcare team. Regarding the body hygiene of this patient, it is emphasized that the nursing team performs it through the technical procedure of bed bath, due to the impossibility of self-care[4].

It should be noted that the promotion of physical activity should be implemented as early as possible through Cardiovascular Rehabilitation, even in the intra-hospital space and under the supervision of a multidisciplinary team. When considering that the patient, after an event related to ACS, can be encouraged to return to physical activities, such as the spray bath, for example, one must consider their clinical response as the basis for indicating this self-care. That said, considering all the benefits related to cardiovascular function and quality of life, in addition to the possible reduction of the negative effects of prolonged rest, the indication for a spray bath still in the CU can be done safely, based on parameters as the double-product[5,6].

Despite its benefits, bathing in critically ill patients and under invasive ventilatory support is considered a highly complex procedure. Bathing is generally associated with good health care, however, there are risks associated with the mobilization necessary for its execution and this needs to be identified. Mobilization in bed influences respiratory mechanics and the ventilation/perfusion relationship, which may cause respiratory imbalance4, for example. A certain study on the hemodynamic response of patients to the change in position did not show a statistically relevant difference ($p > 0.05$), suggesting safety in mobilization. It is considered, therefore, that the mobilization of patients hospitalized in the ICU needs to be carried out always considering their oxy-hemodynamic monitoring and the appropriate time for the indication of bathing, whether spraying or in bed, based on scientific, technical and clinical, in order to minimize the associated risks[7].

Observing the aforementioned aspects, the context of Systematization of Nursing Care (SAE) and the need for Cardiovascular Rehabilitation, there is a need for critical decision-making on the part of nurses regarding the type of bath for patients with coronary artery disease in the CU. Based on the clinical parameters to guide this critical assessment, as well as the multidisciplinary discussion about the prescription of this important intervention, an algorithm is proposed to support the professionals of the nursing team.

Algorithms are actions guided by decision-making that follow until a definitive goal is reached. Commonly used in the health area, its classic use is exemplified in the approach to cardiac arrest. Visually tend to guide the user through its interdependent and easy-to-use steps. Instruments that can be used in clinical practice tend to benefit patients, considering not only physiological, but also psychological-spiritual aspects, in addition to standardizing actions, bringing more quality to care, and contributing to epidemiological indicators[8,9].

The bathing of critically ill patients was approached using an algorithm in a study that focused on the steps interrelated to bed baths, demonstrating the technical procedure in question to ensure its systematization. However, it is considered that decision-making regarding the type of bath to be prescribed to patients admitted to the CU with a focus on their rehabilitation remains little objective.[10].

Considering this context, it is questioned about the criteria that could compose an algorithm for decision making regarding the type of bath. Thus, this study aimed to apply the validated criteria and clinical parameters used by nurses in an algorithm to support the choice of bathing for patients with coronary artery disease.

Methodology

This is a methodological study, with a quantitative approach, for the development of an algorithm that can help nurses' decision making regarding the choice of bathing in patients with coronary artery disease[11].

To support the development of the algorithm, a literature review was carried out addressing issues related to cardiac rehabilitation and bathing, and later, an instrument based on COSMIN (Consensus Based Standards for the Selection of Health Measurement Instruments) was developed). This initiative to establish consensus-based standards for the selection of health measuring instruments aims to improve the selection of health measuring instruments[12-15]. Study participants were specialist nurses who worked in care/management in intensive cardiology ICU (clinical, coronary, or surgical). The reference scenario for the study was compatible with an intensive cardiology ICU, however data collection took place through a virtual environment. The selection criteria were nurses considered specialists, based on the following criteria: minimum experience of 2 (two) years in an intensive cardiology ICU (clinical, coronary, or surgical) or specialization in intensive care/cardiology, under a graduate degree in lato sensu. Nurses who, even with the criteria described above, were away from their work activity in the related area for more than 2 (two) years were excluded.

Sampling was non-probabilistic. After obtaining a letter of consent, granted by the Manager of the Society of Cardiology of Rio de Janeiro (SOCERJ), the nurses participating in the Nursing Journey were approached personally during the event, which took place in April 2018 in the city of Rio de January, and invited to participate in the study. In view of their interest, a link to the data collection instrument was sent to these nurses, via email, allowing them to be forwarded to other professionals they knew who met the inclusion criteria.

The instrument in its first part referred to the characteristics of the research participants, such as gender, age, length of professional experience and degrees. To identify the clinical parameters used by nurses participating in the research, the following open question was followed: which parameters do you use in decision making regarding the type of bath for patients with coronary artery disease in the coronary care unit?

Subsequently, the criteria structured in statements were presented, 22 in total, each item being evaluated by psychometric response using the Likert Scale, considering the variation between: number 1 as I totally disagree and number 5 as I totally agree. Finally, the participant was invited to give their suggestions. All data collection was carried out in 2018[16].

Data were stored in a spreadsheet in Microsoft Excel® software and demonstrated by descriptive statistics, using mean, median and the calculation of Cronbach's Alpha Coefficient for the validation of the criteria, which measures the internal consistency of each criterion and is considered as indicative of internal consistency in the face of values greater than 0.7 and the closer to 1, the greater the reliability of the instrument[17,18].

For the analysis of responses, items 1 and 2 were considered as non-agreement and responses 4 and 5 as agreement. As item 3 allows the specialist's answer without considering any of the options presented, for the analysis the total of these answers was not considered.

The criteria described in the two open questions were structured and analyzed along with the criteria validated by the nurses participating in the research, with duplication being eliminated. Finally, the criteria were categorized and organized in the form of an algorithm guided by dichotomous answers (yes or no), using the Microsoft PowerPoint® software for structuring and downloading through a pdf document (Portable Document Format).

The study was previously submitted for consideration by the Research Ethics Committee (CEP), under Resolution No. 466, of December 12, 2012, and its complements, and, for this purpose, the study was included in the Brazil platform and approved under opinion 2,759,149 in 2018. The Informed Consent Form was made available via e-mail along with the data collection instrument through a link for the consent of research participants.

Results

The sample consisted of 29 nurses, over a period of 03 months, 26 (89%) were female, aged between 23 and 58 years, with an arithmetic mean of 32 (standard deviation of 9, 27). All nurses were postgraduates and 10 (34%) had more than one type of postgraduate degree, for example, some had postgraduate courses like residency and master's, or lato sensu and stricto sensu postgraduate courses.

Relating to the professional profile of the nurses interviewed, the length of experience in the profession remained between 2 and 34 years, with an average of 7.8 years (standard deviation of 8.4). The length of experience in the ICU ranged between 1 and 25 years, with a mean of 5.7 years (standard deviation of 6.4).

The 22 criteria submitted for validation by experts, totaled 638 analyses, and, among these, the majority (63% out of 401) was classified as agreement.

The criteria that showed agreement above 70% were: very recent acute myocardial infarction within less than 72 h (74%); Unstable angina with less than 72 h of stabilization (76%); Uncontrolled arterial hypertension (72%); Pulmonary embolism and thrombophlebitis in the acute phase (73%); Myocardial infarction, myocardial revascularization surgery, percutaneous transluminal coronary angioplasty, uncomplicated (71%) and ventricular arrhythmias (75%). The criteria that showed agreement below 50% were: uncontrolled diabetes mellitus (39%) and acute systemic infection (48%).

As recommended by the chosen approach, the criteria were discussed regarding its permanence or not, considering its influence on the decision on the choice of the type of bath for the coronary disease patient[17,18]. The value initially found for the α coefficient was approximately 0.9536. After excluding item number 6, referring to "uncontrolled diabetes mellitus" and agreement below 50%, the α coefficient was 0.9522. After removing criterion number 9, referring to "myocardial infarction; myocardial revascularization surgery, percutaneous transluminal coronary angioplasty, uncomplicated" and item above 70%, the value of the α coefficient was 0.9532. After eliminating criterion number 17, referring to "patients over 65 years of age" and the greatest disagreement (31%), it is observed that the α coefficient was approximately 0.9555. And after excluding items 6, 9 and 17 simultaneously, the value of α was approximately 0.9557.

The criteria suggested by the experts for their decision-making regarding the bathing of the patient in the CU in their experience were analyzed, in addition to the validation of the criteria used to develop the algorithm. Insertions of non-invasive and invasive oxy-hemodynamic parameters were suggested; Hemodynamic stability; Fall risk; Medical diagnostic; Comorbidities; Exam Result Evaluation; Mechanical ventilation; Patient's Desire; Human Resources; Atrial arrhythmias; Invasive devices such as an intra-aortic balloon and pulmonary artery catheter; Coronary lesions; Colonization by multiresistant bacteria; Glasgow Coma Scale; Prolonged fasting; Motor conditions; oxygen consumption.

The use of non-invasive oxy-hemodynamic parameters was mentioned 26 times, being exemplified by

heart rate, blood pressure, temperature, respiratory rate, pulse oximetry, dual-product, among others. Among the other items suggested, some were already contemplated in some way in the proposed criteria, such as Medical Diagnosis, Comorbidities and Oxygen Consumption and, therefore, were not considered. The items Exam Result Evaluation; Human Resources; Colonization by multiresistant bacteria and Motor conditions were not considered as factors that should influence decision making regarding the type of bath and, therefore, were discarded. The risk of falling was added to the item's Abnormal hemodynamics with exercise; Orthostatic hypotension; Motor Deficit and Delirium/ Psychomotor Agitation (validated criteria) and Level of consciousness; Glasgow Coma Scale; Prolonged fasting (suggestions), due to its intrinsic relationship of effect and cause. The suggestion regarding permission to the patient about the decision to bathe was valued, as it is understood that their participation in their care plan is fundamental. Finally, in item 1, two validated criteria were allocated, considering that, given the presentation of any of these diagnoses, the decision making would be the same, which facilitated the development of the algorithm (Chart 1).

Chart 1. Criteria used in the elaboration of the Algorithm for Decision Making regarding the Type of Bath of the Coronary Disease Patient. Rio de Janeiro, RJ, Brazil, 2019

N	ITEM	DEFINITION
1	Acute myocardial infarction < 72 h	Damage to the myocardial tissue in specific regions due to ischemia. The lack of blood supply to the heart muscle can cause irreversible damage to the affected part[2].
	Angina < 72 h of stabilization	Chest pain present at rest or on minimal exertion, lasting around 10 to 30 minutes, and accompanied by discomfort, which generally does not improve with rest[2].
2	Arterial hypertension (SBP > 180 mmHg and/or DBP > 110 mmHg)	Hypertensive individuals with high cardiovascular risk (SBP > 180 mmHg and/or DBP > 110 mmHg) who are more predisposed to cardiovascular complications, especially myocardial infarction[19].
3	Severe left main coronary artery lesion	Patients with severe trunk injury are at increased risk of a new ischemic event, especially when they have angina[20].
4	Pulmonary thromboembolism	It occurs when a thrombus, formed in the deep venous system, breaks free and reaches the heart, obstructing the pulmonary artery or its branches[21].
5	Sepsis	Organ dysfunction, characterized by a 2-point increase in the Sequential Organ Failure Assessment (SOFA) score, secondary to the host's dysregulated response to an infection[22].
6	Severe left ventricular dysfunction	Severe left ventricular dysfunction (ejection fraction less than 40%) is an important risk factor for cardiovascular disease [2].
7	Chest pain	Pain in precordial location suggestive of a new ischemic episode or instability of already existing lesions in the myocardium[20].
8	Survivors of cardiac arrest or sudden death	Maintenance of SBP ≥ 90 mmHg, administration of vasoactive drugs, investigation of the causes of arrest, maintenance of MAP ≥ 65 mmHg, central venous access puncture, administration of crystalloids and indwelling urinary catheters are actions aimed at adapting cardiovascular conditions and perfusion of organs and systems, since death from multiple organ failure is associated with persistent low cardiac output in the first 24 hours after cardiopulmonary resuscitation[23].
9	Ventricular Arrhythmias - Non-sustained and Sustained Ventricular Tachycardia, Branch Blocks	A possibility of sudden and fatal ventricular arrhythmias in AMI, it is recommended that all patients are monitored with continuous ECG on hospital admission, which should be maintained during the diagnostic investigation period and suspended between 12 to 24 hours after clinical stabilization[23].

10	Complications such as cardiogenic shock; congestive heart failure and/or post-procedure ischemia	Cardiogenic shock is a state of generalized tissue hypoperfusion, characterized by SBP usually < 90 mmHg, Cardiac Index < 1.8 L/min/m², and high filling pressures. The use of vasoactive drugs is recommended, with dobutamine being the inotropic of choice, in doses of 5 to 15 mcg/kg/minute alone or associated with dopamine or norepinephrine[24].
11	Stable patient at the expense of vasoactive drugs	Patients using vasoactive amines, such as norepinephrine, dobutamine, dopamine[25].
12	Hemodynamic Stability	Absence of the following signs and symptoms: pain, hypotension, dyspnea, or acute change in the level of consciousness. MAP < 60 mmHg and an SVO2 less than 65%[2].
13	Intravenous Vasodilators (Nitroglycerin and sodium nitroprusside)	Patient using intravenous vasodilators such as: Sodium nitroprusside: continuous infusion 0.5 to 10 µg/kg/min; Nitroglycerin: continuous infusion 5 to 15 mg/h[26].
14	Fall risk	Risk classification by Morse Scale[27].
15	Dual-product controlled	Dual-Product is defined as a product between FC and PAS. An imbalance between myocardial oxygen supply and consumption is considered when the DP exceeds 30,000 bpm.mmHg[28].
16	Mechanical ventilation	Use of invasive ventilatory support with mechanical ventilator support and possible need for sedation[29].
17	Invasive devices (BIA, Swan-Ganz, etc.)	Use of an invasive hemodynamic and/or cardiac mechanical device with possible need for immobilization[30].
18	Atrial arrhythmias (atrial fibrillation and atrial flutter)	Patients with atrial fibrillation have a higher risk of systemic embolization, especially in the first 24 hours, until the fourth day of hospitalization. Anticoagulation with heparin is indicated. Attempts at drug or electrical cardioversion in patients without hemodynamic instability should be performed within the first 48 hours of the onset of the arrhythmia[31].
19	Patient's Wish	The patient's wishes will be considered at the end of the algorithm. The patient may or may not agree with the bath and the choice of bath type.

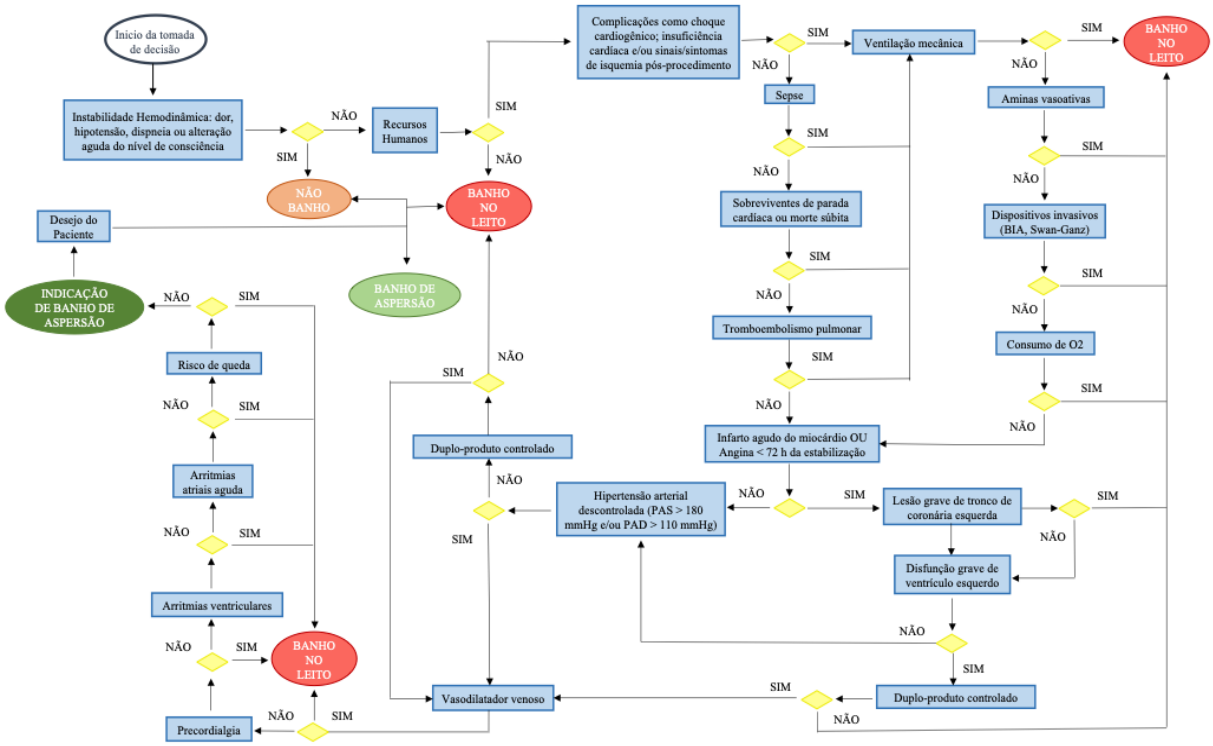
Note: SBP = systolic blood pressure; DBP = diastolic blood pressure; MAP = mean arterial pressure; AMI = acute myocardial infarction; ECG = electrocardiogram; SVO2 = venous oxygen saturation; HR = heart rate; DP = double product.

Based on the items in Table 1, the algorithm for choosing the bath was elaborated with dichotomous answers (yes or no) and based on bibliographic findings that guided its elaboration. It should be noted that the possibility of the patient not being submitted to a bath was considered if this is not a priority. Thus, the following outcomes were considered: bath not recommended at the time (no bath), bed bath and spray bath (Figure 1).

Discussion

Decision making is the choice made between two or more available alternatives, that is, it is the choice of the best alternative, the one that will most benefit the patient and the institution. The alternative that will ensure greater safety in carrying out care. Regarding critically ill patients, the complexity that permeates their care, the need for allocation to the ICU, demanding the inevitable use of various technologies and, above all, requiring trained personnel for quick decision-making and the adoption of immediate behaviors. The adoption of protective measures must be adopted due to the numerous risks and the use of protocols is suggested to enable an evidence-based practice, which tends to bring more quality to care and greater safety for patients. The dynamism involved in the assistance provided in the ICU generates the need for instruments that are easy to understand and implement, which can be obtained through algorithms. Algorithms have been used to identify appropriate management strategies and assist in clinical decision making. In view of the proposal of new algorithms, their validation is essential[32-34].

Figure 1. Algorithm for Decision Making regarding the Patient's Bathing in a Coronary Unit. Rio de Janeiro, RJ, Brazil, 2019



Nurses with an average of 7.8 years of graduation and experience in the ICU with an average of 5.7 participated in this study, and the relevance of this issue for pointing out the clinical issues involved in the topic under consideration is highlighted. The length of work has been pointed out as important, as inexperience can be related to incidents, implying the quality of care provided and the safety of patients and teammates. In addition, the need for professionals specialized in caring for critical patients has fostered the specialization of specialist nurses in the country. The complex situations that involve critical patients, as well as the confrontation of ethical and technical problems, generate in the nurse the development of skills and abilities to deal with this reality[35,36].

The criteria suggested by experts, such as the assessment of oxyhemodynamic parameters, for example, corroborate studies found in the literature[37], such as control of the double-product, heart rate and blood pressure levels, as well as monitoring pulse oximetry and central venous saturation as O2 consumption parameter. Monitoring these parameters before, during and after allows for more safe bathing of patients with coronary artery disease, avoiding complications related to hemodynamic instability[38].

Hemodynamic monitoring is a fundamental element of care for critically ill patients, as the search for stability of cardiovascular function ends up guiding interventions. In addition, the need for differential diagnosis makes hemodynamic monitoring, especially invasive in critically ill patients, a fundamental component of its clinical outcome. In ICUs, continuous monitoring allows for early signs of instability, and through these signs the development of strategies that do not expose these patients, such as not bathing in patients who show signs of instability, awaiting their clinical compensation for implementation[39].

The results proved the validity of the criteria that made up the algorithm, however, the validation of its content must be performed[40].

Regarding the validation of the proposed criteria, the literature shows that the minimum acceptable value for Cronbach's alpha is 0.70 and the maximum is 0.90. If there are values lower than the minimally determined, the internal consistency of the scale is reduced and, in case of values above the maximum value, it can be considered that there are several elements that are measuring exactly the same construct[17,18]. In this case, the instrument must be adjusted, trying to identify what is in common that may be influencing the alpha value, until values between 0.80 and 0.90 are reached. It should be noted that the alpha value is influenced by the number of items that make up the instrument and at high values there is an increase in variance, which may overestimate the internal consistency[17,18].

Reliability by item correlation can be measured by eliminating some items from the questionnaire and if this causes an increase in alpha, it can be said that this item is not highly correlated with the other items in the instrument. However, if there is a decrease in alpha, it can be assumed that the removed item is highly correlated with the others present in the instrument. Thus, Cronbach's alpha suggests the instrument's reliability, considering the influence of the items that comprise it. Despite the alpha in the present study being 0.9557, the experts added items, which contributed to the criteria that could compose the algorithm. However, it is understood that this contribution filled the framework for the development of the algorithm that needs further validation[18, 41].

The present proposed algorithm was also structured in a mobile application format, called Bath Choice, which was elaborated by a collaborator through the Android Studio® development interface with the Java® language. The application has a user-friendly layout, and each item has dichotomous alternatives (Yes and No) for the user's choice. At the end, the outcome will appear, which can support the nurse's decision regarding the type of bath (bath not recommended, bed bath or spray bath). There are a total of 19 items and their filling time is approximately 3 minutes. The software allows the registration of new users using the password that will be made available and is for the exclusive use of nurses, as it is understood that the decision about bathing comprises an intervention to be applied based on clinical assessment and not routinely. To use the algorithm through the mobile application, it is recommended that the manager purchase a tablet for each unit which will be applied. The application was not available for download in stores, as it lacks clinical validation, to ensure patient safety, identifying possible risks and avoiding unnecessary exposure.

The valuing of the patient's desire is highlighted, even with the algorithm showing evidence of clinical stabilization and indication for the spray bath, including not bathing. It is considered that nursing care, whenever possible, should be planned together with the patient to ensure that their real need is met, which may go beyond clinical criteria.

Limitations include not fully validating the content of the algorithm, as well as verifying the security of the algorithm in view of its applicability in care practice, both in its printed form and through the mobile application.

Conclusion

The prescription of bathing as a care and activity of the nursing team is exclusive to the nurse, therefore, it is highlighted that the developed algorithm can guide them in choosing the type of bath that will be offered to the coronary disease patient, through validated criteria. However, it is emphasized that this algorithm requires content and clinical validation for its use in care practice.

The essence of intensive care nursing is based on the decision-making process dynamically and quickly, based on the understanding of the physiological and psychological conditions of the patient under their care, with an emphasis on safe care. Algorithms can streamline the decision-making process, considering that all the variables involved in the context in which it is being analyzed will be judged, thus enabling the minimization of incident risks and bringing more safety to the care of patients with coronary artery disease.

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