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MULTIPROFESSIONAL EDUCATIONAL ACTION REDUCES STRESS AND ANXIETY IN SURGICAL CARDIAC PATIENTS: RANDOMIZED CONTROLLED STUDY

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ABSTRACT

Objective: to evaluate the association between an educational action on stress and anxiety levels in patients undergoing heart surgery. **Methodology:** randomized clinical trial with 32 patients with scheduled elective cardiac surgery divided into two groups: Control Group (CG, n = 16) which received the pre-operative information according to hospital routine; and Intervention Group (IG, n = 16) which participated in an educational action carried out by the multidisciplinary team and associated with the routine of the hospital. Stress was assessed by the Perceived Stress scale and by salivary cortisol. We use the Hamilton Anxiety scale to measure anxiety. **Results:** regarding stress assessed by the Perceived Stress scale, a significant difference between the IG and CG was seen in the pre- and post-operative moments. In the measurement of salivary cortisol concentration, the mean in the IG was 2.88 ± 1.94 in the pre-operative phase, increasing to 7.25 ± 6.49 in the post-operative. The mean anxiety in the IG was 12.19 ± 8.10 in the pre-operative phase and 36.13 ± 13.24 in the CG, with a significant difference between groups (p = 0.000), which remained in the post-operative moment. **Conclusion:** the educational action conducted by the multidisciplinary team proved to be effective to reduce stress and anxiety levels in patients undergoing cardiac surgery.

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INTRODUCTION

Cardiovascular diseases (CVDs) account for 30% of all deaths in the world (WHO, 2014) and among their forms of treatment, cardiac surgery stands out (Malta *et al*., 2014; Cani *et al*., 2016; Docherty and Walsh, 2018). This type of surgery reverses the symptoms of patients with specific CVDs, increasing survival and quality of life (Medeiros *et al*., 2017).

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Dessotte *et al*. (2016) point out that cardiac surgery is still the intervention of choice in many cases of coronary artery disease, despite advances in clinical treatment and the advent of minimally invasive approach. Surgical procedures have also presented innovations, with reduced morbidity and mortality, although some factors still impact on prognosis, including stress and anxiety (Rodrigues *et al*., 2016). Cardiac surgery is considered a stress factor related to physical and psychological discomforts (Costa *et al*., 2016; Kazitani *et al*., 2018). Stressors, in turn, vary in intensity, quantity and quality (Silva *et al*., 2018). Santos *et al*. (2015) highlight some educational strategies that may ease the stress of cardiac surgical patients.

Besides stress, anxiety is directly related to cardiac surgery. Authors evaluate the role of pre-surgical preparation in reducing the anxiety of cardiopathic patients by enhancing the clinical evolution. Studies have also shown the need to create a protocol for educational interventions for this population in the pre-operative period (Gomes and Bezerra, 2017; Grasel *et al*., 2009; Umann *et al*., 2011; Assis *et al*., 2014; Kazitani *et al*., 2018). Cardiac surgery requires actions by the health team, with use of verbal communication techniques, an atmosphere of trust through the creation of bond with the patients, aiming at guaranteeing quality care and rapid recovery and early discharge that can achieve positive results, such as lower levels of stress and anxiety of patients in this process (Silva and Zakir, 2011; Silva and Teles, 2015; Coppetti *et al*., 2015; Knihs *et al*., 2017). However, there are no recent studies evaluating the impact of educational actions on the stress and anxiety of cardiac surgical patients. This reality highlights the importance of this study. Thus, considering the importance of educational actions in the health area, this study aimed to evaluate the association between a multiprofessional educational action with stress and anxiety levels in patients submitted to cardiac surgery.

MATERIALS AND METHODS

Study design: This is a randomized, analytical clinical trial described according to the 2010 version of the CONSORT statement (Schulz *et al*., 2011) and developed in the period from January to June 2018, in a level IV hospital of the macro-regional health pole of the Northwest region of the State of Rio Grande do Sul/Brazil. All patients were informed about the purpose and procedures of the study and signed a consent form prior to participation. The protocol was designed according to the Guidelines and Norms Regulating Research Involving Human Beings, according to Resolution nº 466/12 of the National Health Council (NHC); the study was approved by the Local Research Ethics Committee (CAAE: 79602417.2.0000.5350) and registered in the Brazilian Registry of Clinical Trials (RBR-69hdz2).

Participants

The population consisted of patients scheduled for elective cardiac surgery, randomized according to simple random sampling.

Inclusion criteria were: patient awaiting elective cardiac surgery; undergoing cardiac surgery for the first time; aged 18 years or more; lucid; able to verbally communicate; in clinical conditions to participate in the study and under medical follow-up at the cardiac surgery unit of the hospital studied.

Exclusion criteria were: patient undergoing other emergency cardiac surgeries; patient who did not complete all stages of the study; patient with neurological sequelae or any psychiatric disorder; patient unable to respond to the questionnaires applied in the research.

Sample size and randomization

Sample calculation was performed in the Lee-Laboratory of Epidemiology and Statistics software (http://www.lee.dante.br/pesquisa.html) with data from a previous study that used the value of 1.18 as the mean difference of salivary cortisol between the control group and intervention group and a difference between standard deviations of 1.2 (Mello, 2007). The study adopted the significance level of 0.05 and test power of 80%, obtaining a sample of 16 patients in each group. All participants who did all the interventions proposed in the research were considered for pre-operative and post-operative evaluation. The allocation method was intentional and, in order to create intervention groups, and considering that an average of three surgeries were performed per week, we opted to include the patients of the Control Group (CG) in one week and the patients of the Intervention Group (IG) in the subsequent week (weekly randomization) until equalizing the groups. Simple randomization was chosen to decide whether the first group would be CG or IG to start the data collection. In the subsequent weeks, the group was alternated until obtaining the necessary sample described above. The establishment of random allocation, recruitment of participants and their assignment into interventions was done by the research proponents. Patients enrolled in the study were randomized into two groups: CG –patients who received pre-operative information according to the hospital routine; IG– patients who received pre-operative information from the hospital routine associated with the educational action by the "Health education for cardiac/surgical patients". The intervention applied to the IG was developed with patients whose surgical procedure was scheduled for the following week, with approximately two hours duration, in which an expository/dialogued lecture was conducted with professionals from the multidisciplinary team of Cardiac Surgery (physicians, nurses, physical therapists, pharmacists), linked to the sites involved in the research. The topics covered were: surgical procedure and pre- and post-operative care within each area of knowledge of each member of the multidisciplinary team. The activity was completed with a visit to the Cardiology Clinic, a place destined for hospitalization of cardiac surgical patients.

Outcomes

The primary outcome of this study was stress and anxiety levels in pre-operative and post-operative cardiac surgical patients.

Clinical evaluation of the sample

Participants were submitted to pre- and post-operative evaluation. The first evaluation was performed at least twelve hours before the heart surgery and the post-operative evaluation was performed 48 hours after the end of the surgery. The instrument used for data collection was a structured socio-demographic/clinical-surgical questionnaire prepared specifically for this research, containing questions about personal, social, economic, demographic characteristics and associated comorbidities and applied on the first day of hospitalization. This instrument was complemented by information obtained from medical records on variables prior to the cardiac surgery, individual characteristics and perioperative data during the period of hospitalization. On the first and third day of hospitalization, the Hamilton (1959) Anxiety scale; the Perceived Stress scale Cohen *et al*. (1983) were applied and salivary cortisol was collected. The Hamilton Anxiety Scale was used to evaluate the generalized Anxiety - (somatic and psychic) HAM. The scale has 14 items and generates a result between 0 to 56 points. A result from zero to 17 indicates normal anxiety; from 18 to 24, mild anxiety; from 25 to 29, moderate anxiety; and 30 or more indicates severe

anxiety (Dallarmi *et al*., 2015; Hamilton, 1959). The Perceived Stress Scale proposed by Cohen *et al*. (1983) was used to measure the level of stress. This scale measures how much a situation is or is not stressful for the individual, based on his perception. This scale contains 14 questions that address the individuals' feelings and thoughts, evaluated in the last month, with options ranging from zero to four (0 = never, 1 = almost never, 2 = sometimes, 3 = almost always 4 = always) and the scores can range from zero to 56 (Luft *et al*., 2007). Another parameter used to quantitatively measure the level of stress was the analysis of salivary cortisol concentration, collected in the interval from 7:00 p.m. to 8:00 p.m. The reference values considered for normality are<7.0 nmol/L between 16:00 and 20:00 hours (Rocha *et al*., 2013).

Statistical Analysis: Data were analyzed using the SPSS software version 21.0. Absolute and relative frequencies, means and standard deviations were calculated. The Kolmogorov Smirnov normality test was applied to evaluate whether the data were parametric or non-parametric. Qualitative variables were analyzed by the Pearson Chi-square test and quantitative variables by the Student's t-test for independent samples.

RESULTS

Of the thirty-two patients eligible for pre-operative evaluation, three CG patients died after surgery, who were replaced with the inclusion of three new patients who completed all the stages of the study. There were, therefore, 16 patients in the intervention group and 16 in the control group (Figure 1. Flowchart of the study). The participants had a minimum age of 33 years and a maximum of 79, and 24 (75%) were elderly, aged 60 or over. The majority of the patients were male (56.3%); married or common-law married (60%); with children (93.8%); had completed elementary school (94.3%); and 53.1% had a family income up to 2 minimum wages. The comorbidities that affected the participants were: Systemic Arterial Hypertension (SAH) 25 (78.1%), followed by dyslipidemia 11 (34.4%). It was verified that 78.1% had already undergone previous cardiac catheterization. Regarding lifestyle, it was identified that 18 (56.3%) were sedentary and 11 (34.4%) reported ingesting excess salt. Further data are shown in Table 1. The anxiety level evaluated by the Hamilton scale showed that the mean in the pre-operative period of the intervention group was 12.19 ± 8.10 and in the control group, 36.13 ± 13.24, with a significant difference between groups (p = 0.000), which was also verified post-operatively (Table 2). There was a statistical association in the classification of anxiety, both in the pre- and post-operative periods; the IG presented a higher frequency of patients classified with normal anxiety and the CG, with severe anxiety. In Table 3 we find information related to stress, evaluated by the Perceived Stress scale. A significant difference between the IG and CG was observed, both in the post- and pre-operative moment. Post-operative stress was 13.13 ± 5.14 in the IG and 38.50 ± 6.24 in the CG. The evaluation of the questions of the instrument showed that only in the question "Do you think you cannot handle all the things you have to go through?"There was no significant difference between IG and CG. As for the level of stress according to salivary cortisol concentration, data showed a mean of 2.88 ± 1.94 in the IG in the pre-operative assessment, increasing to 7.25 ± 6.49 in the post-operative assessment, considering values <7 nmol/L as a reference for normality.

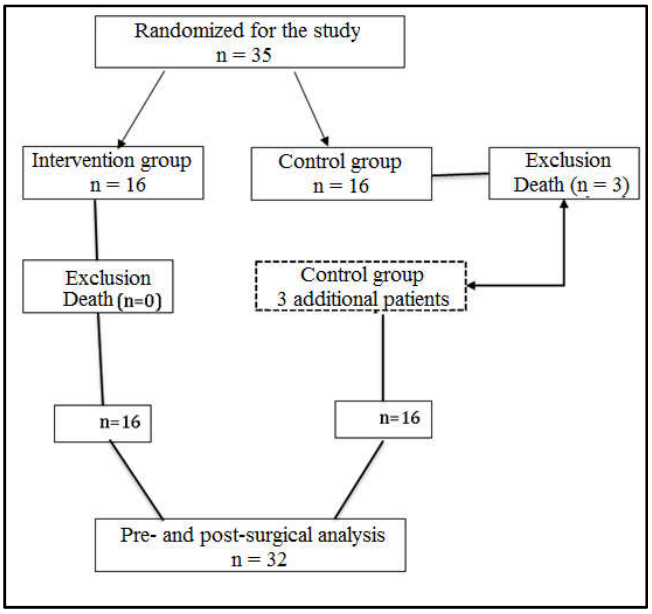

Figure 1. Flowchart of the study

Table 1. Clinical characteristics, comorbidities and lifestyle of patients submitted to cardiac surgery in a level IV hospital of the macro-regional health pole of the Northwest region of the State of Rio Grande do Sul, Brazil. n = 32, 2018

Variables	IG[a]	CG[b]	TOTAL
	n (%)	n (%)	
Comorbidities			
Systemic Arterial Hypertension	12(75)	13(81.3)	25(78.1)
Diabetes Mellitus	4(25)	4(25)	8(25)
CHF[c]	2(12.5)	3(18.8)	5(15.6)
COPD[d]	1(6.3)	0(0.0)	1(3.1)
Dyslipidemia	5(31.3)	6(37.5)	11(34.4)
Clinical Characteristics			
AMI[e]	4(25)	3(18.8)	7(21.9)
Cardiac catheterization	14(87.5)	11(68.8)	25(78.1)
Previous Surgeries	11(68.8)	11(57.9)	22(62.9)
Family history of HD[f]	12(75)	13(81.3)	25(78.1)
Lifestyle			
Smoking	1(6.3)	3(18.8)	4(12.5)
Drinks alcoholic beverages	4(25)	2(12.5)	6(18.8)
Sedentary lifestyle	8(50)	10(62.5)	18(56.3)

Legend: [a]IG = Intervention Group; [b]CG = Control Group; [c]CHF = Congestive Heart Failure; [d]COPD = Chronic Obstructive Bronchopulmonary Disease; and [e]AMI = Acute Myocardial Infarction;[f]HD = Heart Disease.

Table 2. Anxiety scale evaluated in the pre- and post-operative period of patients undergoing cardiac surgery at a level IV hospital in the macro-regional health pole of the Northwest region of the State of Rio Grande do Sul, Brazil. n = 32, 2018

	IG[a] (Mean ± SD[c])	CG[b] (Mean ± SD)	p
Pre-operative anxiety	12.19 ± 8.10	36.13 ± 13.24	<0.001*¥
Post-operative anxiety	10.00 ± 7.84	36.81 ± 8.78	<0.001*¥
Pre-operative classification	n (%)	n (%)	
Normal - (0-17)	12 (75)	2 (12.5)	<0.001*§
Mild (18-24)	2 (12.5)	1 (6.25)	
Moderate (25-29)	2 (12.5)	1 (6.25)	
Severe (Greater 30)	0 (0.0)	12 (75.0)	
Post-operative classification			
Normal - (0-17)	14 (87.5)	0 (0.0)	<0.001*§
Mild (18-24)	1 (6.3)	1 (6.3)	
Moderate (25-29)	0 (0.0)	3 (18.8)	
Severe (Greater 30)	1 (6.3)	12 (75)	

Legend: [a]IG = Intervention Group; [b]CG = Control Group; [c]SD = Standard Deviation; pre-operative [d]n = 32, [e]n post-operative = 32; * = Significant p <0.05; ¥ = Student's t-test for independent samples; § = Chi-square test.

Table 3. Perceived stress scale evaluated in the pre- and post-operative period of patients submitted to cardiac surgery at a level IV hospital in the macro-regional health pole of the Northwest region of the State of Rio Grande do Sul, Brazil. n = 32, 2018

	IG[a] (Mean ± SD[c])	CG[b] (Mean ± SD)	p[¥]
PRE-OP[d] Stress	15.56 ± 7.24	37.93 ± 7.92	≤0,000*
POST-OP[e]Stress	13.13 ± 5.14	38.50 ± 6.24	0,000*

Legend: [a]IG = Intervention Group; [b]CG = Control Group; [c]SD= Standard Deviation; [d]n pre-operative = 32, [e]n post-operative = 32; * = Significant <,05; ¥ = Student's t-test for independent samples.

Table 4. Salivary cortisol evaluated in the pre- and post-operative period of patients submitted to cardiac surgery at a level IV hospital in the macro-regional health pole of the Northwest region of the State of Rio Grande do Sul, Brazil. n = 32, 2018

	(Mean ± SD[a])	p
PRE-OPERATIVE CORTISOL		
Intervention Group	2,88 ± 1,94	≤0,001
Control Group	8,18 ± 5,15	
POST-OPERATIVE CORTISOL		
Intervention Group	7.25 ± 6.49	0.08
Control Group	12.06 ± 12.00	

Legend: [a]SD = Standard Deviation; * = Significant < 0.05.

In the CG, the pre- and post-operative mean remained high, according to the statistical association shown in Table 4. An analysis including the evaluation data of the patients who died was conducted and the results showed that there was no difference in the statistical significance of the results.

DISCUSSION

This study was a randomized controlled clinical trial aimed at investigating stress and anxiety levels in patients before and after undergoing cardiac surgery following an educational intervention by the multiprofessional health care team through a group. The proposal to evaluate differentiated care in the period prior to admission for cardiac surgery when compared to the existing standard management resulted in significantly lower levels of stress and anxiety in the GI patients in the pre-operative phase. Lower salivary cortisol levels in the IG in comparison with the CG were observed at the pre-operative moment in this study. This demonstrates that the educational action performed prior to cardiac surgery interfered with the patients' stress level. The action implemented through a group, with a multidisciplinary health care team, allowed to guide the patients regarding all the processes to be performed in the period of hospitalization. Informing the patients about the surgical procedure, hospitalization time, possible complications, physical therapy rehabilitation, and nursing, nutritional, pharmaceutical, psychological, medical care as well as other care measures involved in their treatment made the patients more participatory in the care process, because they interacted with the team before the beginning of hospitalization. Furthermore, patients have the opportunity to clarify their doubts and soften their main afflictions. Salivary cortisol has been used as a quantitative, non-invasive measure of stress assessment in different populations (Betti *et al*., 2017; Huda *et al*., 2018; Bastin *et al*., 2018). It is a method of choice in research because it measures the amount of the non-bound and biologically active hormone (Kothgassner *et al*., 2016). However, the literature lacks information on quantitative stress analysis using salivary cortisol in cardiac surgical patients, because such analysis is not yet part of hospital routines and is used only for research purposes. A study in this population was described by Bergmann *et al*. (2001),reinforcing the results of this research in relation to stress reduction, anxiety and improved well-being, reducing salivary cortisol levels of patients in the perioperative period. At the post-operative phase, both groups had high salivary cortisol levels when compared to pre-operative values, and there was no significant difference between groups. However, the IG maintained lower levels of salivary cortisol in relation to the CG. These results also demonstrate the effectiveness of the educational action. The worsening of parameters evaluated in the pre- and post-operative period may be justified by the fact that the majority of clinical variables in patients submitted to cardiac surgery, among which stress, is related to the surgical procedure and complications such as endotracheal intubation, hospitalization in intensive care unit, fear of death and change of self-image. It is noteworthy that two IG patients presented post-operative clinical complications and, consequently, higher levels of cortisol, impacting on the mean and standard deviation of the group, which may have influenced the lack of statistical significance. The review by Paiva *et al*. (2017) reaffirms the importance of educational actions of multidisciplinary teams in pre-operative moments. The Perceived Stress scale used in the present study was applied by Esplendori *et al*. (2018) and the results indicated that there was a relationship between perceived stress /coping strategies and stressors. These authors emphasize the pre-operative period as a stressful moment when there are feelings of fear of post-surgical complications, restrictions, immobility, pain and sleep problems. They also state that pre-operative educational actions such as those used in the present study, can reduce stress levels.

When assessing the open questions that make up this instrument, we observed a difference between groups in questions that address sadness, inability, fear, confidence and irritation, but no significant difference was found specifically in the question that addresses activity overload, which may be related to the predominance of retired people among the interviewees or people without normal work activities due to the disease. In addition to reduced stress levels, different educational strategies to cardiac surgical patients have proved to be efficient in the reduction of the anxiety (Guo *et al*., 2012; Hoseini *et al*., 2013; Almeida *et al*., 2013; Gonçalves *et al*., 2016; Heilmann *et al*., 2016; Malek *et al*., 2018), depression (Furze *et al*., 2009; Hoseini *et al*., 2013), physical functioning (Furze *et al*., 2009), sleep (Malek *et al*., 2018) and self-management (Veronovici *et al*., 2014; Roohafza *et al*., 2015). The present study also confirmed findings in the literature on the reduction of anxiety levels as evaluated by the Hamilton scale. The results that were observed in the pre-operative moment were maintained after surgery, when compared to the patients who did not receive the educational action. It is noteworthy that IG patients presented anxiety at a normal level, that is, scores below 17. On the other hand, the CG had anxiety levels classified as severe and this behavior, of both groups, remained after surgery. Reduced anxiety resulting from the educational action is important because it is estimated that from 20% to 50% of patients experience clinically significant anxiety on the days before cardiac surgery (Heilmann *et al*., 2016). Anxiety is related to the change in daily life and uncertainties regarding hospitalization and post-operative events (Guo, 2015). Anxiety reduction strategies, when implemented in the pre-operative phase, may have

several benefits since elevated anxiety before surgery correlates with higher rates of depression and post-operative adverse events (Feuchtinger *et al*., 2014). Other strategies different from the one carried out in this study, but also within a method of pre-operative educational action, are described in the literature and show several benefits to patients. In the study by Rosenfeldt *et al*. (2018), an educational action program was applied to sessions of light physical exercises in the outpatient setting, in the two weeks prior to cardiac surgery, leading to stress reduction in patients. In the study by Malek *et al*. (2018), the educational strategy was conducted only by nurses prior to cardiac surgery and showed positive influences on sleep and anxiety, according to the Spielberger State Anxiety Inventory.
The randomized controlled trial of Heilmann *et al*. (2016) in patients of the first elective coronary artery bypass graft surgery was conducted with two groups, the first of which followed the routine information provided in the institution while patients in the intervention group were individualized and received emotional support, one day before surgery, in addition to the standard care above mentioned. The State-Trait Operation Anxiety Inventory (STOA) was used to assess anxiety and pointed out significantly reduced levels in patients in the intervention group compared to control patients prior to the surgery and five days after the surgery, similar to the present findings but using another scale.

Guo *et al*. (2012) used an informative leaflet and verbal counseling by a multidisciplinary team and verified reduction of anxiety measured by the Hospital Anxiety and Depression Scale (HADS). Almeida *et al*. (2013), in a cohort study, compared the level of anxiety by the trait-state anxiety inventory (TSAI) in pre-operative coronary artery bypass graft and cardiac valve replacement patients before and after receiving guidelines in a group, by a multiprofessional team and reporteda significant reduction in anxiety levels. In this way, the literature has shown that non-pharmacological interventions can bring several benefits to patients undergoing cardiac surgery. The literature lacks more scientific studies using the Hamilton Anxiety scale to evaluate this outcome in cardiac surgical patients; the few scientific studies found address the type II diabetic population (Kian *et al*., 2018) and thalamic pain (Lin *et al*., 2018). However, in cardiac surgeries, other scales have been used for such assessments, including the Spielberger State Anxiety Inventory (Malek *et al*., 2018), State-Trait Operation Anxiety (STOA) (Heilmann *et al*., 2016), Hospital Scale of Anxiety and Depression (HSAD) (Guo *et al*., 2012) and Trait-State Anxiety Inventory (TSAI) (Almeida *et al*., 2013). The importance of this study comes from the fact that strategies involving educational actions reduce levels of stress and anxiety in patients undergoing cardiac surgery. As mentioned above, several strategies of this nature have been described in the literature shown beneficial effects for patients (Guo *et al*., 2012; Heilmann *et al*., 2016; Paiva *et al*., 2017; Rosenfeldt *et al*., 2018; Malek *et al*., 2018; Almeida *et al*., 2013). However their results are difficult to compare because they use different methods of intervention and evaluation. Different from other studies, the methodology used in this study emphasizes the importance of the multidisciplinary health team get involved in a group intervention strategy carried out in the week preceding the surgical procedure. Therefore, this methodology, besides effective, is also feasible and can be used in cardiac surgery services. It is still necessary to implement these services routinely, by multidisciplinary teams. On the other hand, this study had limitations in relation to inter-individual variability of patients and use of indirect methods to evaluate the outcomes. Also, other variables that may influence stress and anxiety such as intercurrences, pain, and post-operative complications were not evaluated in the present study because they were considered secondary outcomes and were not part of the objective of this manuscript.

Conclusion

The main objective of this research was to evaluate the association between an educational action with the levels of stress and anxiety in patients submitted to cardiac surgery. The results showed that the educational action carried out by the multidisciplinary health care team, through use of groups, in the week preceding surgery, proved to be effective in reducing stress and anxiety levels in pre-operative cardiac surgery patients. Based on existing evidence, pre-operative educational actions should be incorporated into routine practice to prepare cardiac patients for surgery. There is also a need for more scientific research, since there is a lack of studies addressing this theme. Such shortage may be related to the lack of positive results published fostering the team's decision to perform this routine. It should be said that the data point out the need to implement this strategy in hospital institutions, not only as research, but as a routine, in the search for minimizing the levels of stress and anxiety and bringing benefits such as reduced hospitalization and, consequently, less costs related to care.

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