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The influence of noise levels on the perception of stress in heart disease patients

Influência do nível de ruídos na percepção do estresse em pacientes cardíacos

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ABSTRACT

Objectives: To identify the main causes of stress in patients staying in a coronary unit and to assess the influence of noise levels on their perception of stress.

Methods: This was a prospective, descriptive and quantitative study conducted between June and November 2009 in the Coronary Unit of the Hospital de Clínicas da Universidade Estadual de Campinas. The Intensive Care Unit Environmental Stressor Scale was used on the first, second and third days of hospitalization to identify stressors. The noise level was measured on the first and second nights using an Instrutherm DEC-460 decibel meter.

Results: Overall, 32 clinical heart disease patients were included. The median Intensive Care Unit Environmental Stressor Scale scores were 67.5, 60.5 and 59.5 for the first, second and third days, respectively. The differences were not statistically significant. The highest noise level (a median of 58.7 dB) was detected on the second night at 9:00 pm; the lowest level (51.5 dB) was measured on the first night at 12:00 am. In a multiple linear regression model, the first-night noise level had a 33% correlation with the second-day stress scale score, and for the second night, the correlation with the third-day stress scale score was 32.8% (p = 0.001).

Conclusion: Patients admitted into a coronary unit have an increased perception of stress. Higher noise levels are also responsible for the perception of stress in these patients.

Keywords: Critical care; Humanization of assistance; Heart diseases; Intensive care units; Sound contamination; Patient satisfaction

INTRODUCTION

Hospital intensive care wards, such as the coronary unit (CU), provide a high complexity of care and have high-technology equipment, which can consequently increase stress and anxiety in patients and their families. Additionally, admission into this ward can make them feel as though they are in an extreme situation.[1,2]

Several studies have shown that the intensive care environment stresses the patient, mainly due to the noise levels above the 35- to 45-dB threshold established by *Associação Brasileira de Normas Técnicas* (Brazilian technical standards association, ABNT). Additionally, many other issues may stress the patients, such as continuous artificial lighting, the constant presence of unfamiliar people and devices, the lack of windows, the loss of time-space references and the lack of privacy.

Continuous monitoring of vital signs and heart activity, invasive procedures, the absence of family and friends and physical restrictions are also stressful. Other factors could also be added, such as unknown smells, impressions of death and a constantly present multidisciplinary team.[1,3-8]

Together, all of these factors may lead to increased anxiety and the perception of pain, reduced sleep and increased heart and respiratory rates. In addition, other changes related to constant stress include blood pressure and intestinal function changes, pupil dilation, and increased muscle tonus. Consequently, the patient may feel angry or annoyed.

Given the pathophysiology of heart disease, these patients may be particularly sensitive to these factors, which may negatively influence their recovery. Therefore, the multidisciplinary team should recognize these stressful factors to be able to develop strategies to improve the care and recovery of these patients.[1,3,4,9-12]

This study aimed to identify the main stressors of CU patients and the influence of noise levels on the perception of stress in these patients.

METHODS

This investigation was approved by the Ethics Committee of the Medical College of the Universidade Estadual de Campinas (UNICAMP) and assigned number 373/2009. After the study details were explained, the patients were required to sign an informed consent form before receiving permission to participate in the study.

This was a prospective, descriptive and quantitative study conducted in the CU of the Hospital de Clínicas da UNICAMP between June and November 2009. We admitted clinical heart disease patients of both genders who were between 18 and 70 years old and had a Glasgow coma scale score of 15. (The Glasgow coma scale was assessed by the investigators.) The patients were not mechanically ventilated and consented to participate. Patients with sensory changes were excluded.

On the day of admission into the CU, a form with the patient's age, gender, weight, height and clinical diagnosis was completed. To identify stressful factors, on the first, second and third mornings in the hospital, the investigators used the Intensive Care Unit Environmental Stressor Scale (ICUESS), as validated by Ballard[13] and translated and culturally adapted by Novaes et al.[14] This scale contains 40 items, which are graded from 1 (not stressful) to 4 (very stressful).

On the first and second nights in the CU, the noise levels were assessed between 7:00 pm and 12:00 am using an Instrutherm DEC-460® decibel meter with the following settings: fast response time, weighted frequency curve A, LA mode and sound pressure measured in decibels. The routine measurements included shift changes, the patients' bathing, vital signs, medical visits, physiotherapy and urgent care (as required). The measurements were conducted by the investigators by placing the decibel meter close to the patient's ear. The mean device measurement value was used for analysis.

The patient's pain was managed according to their medical prescriptions. The CU visit time was between 11:00 am and 12:00 pm and between 4:00 pm and 5:00 pm.

Statistical analysis was performed using the Wilcoxon and Friedman tests for dependent variables and the Mann-Whitney test for independent variables. Spearman's test was used to evaluate the correlation between the different measurement tools, and multiple linear regressions were used to determine the stressor scale dependency. A 5% significance level was adopted; the analyses were performed using SPSS 15.0.

RESULTS

This study included 32 patients whose clinical and demographic characteristics are shown in table 1.

No statistically significant association was shown

Table 1 - Patients' clinical and demographic characteristics

Characteristics	Results
Gender	
Male	81.25
Female	18.75
Age	56.5(35 - 68)
BMI	26.82(20.22 - 39.62)
Clinical diagnosis	
Acute coronary syndrome	75.0
Congestive heart failure	9.3
Other*	9.3

BMI - body mass index. *Related to dilated cardiomyopathy, a pulmonary embolism, empyema, bacterial endocarditis, pleural effusion or an abdominal aortic aneurysm. The results are expressed in median (percentile 25-75) or percentages.

for age, gender, body mass index, the clinical diagnosis and the total ICUESS score.

The median ICUESS scores were 67.5, 60.5 and 59.5 for the first, second and third days, respectively. The decreasing perception of stress with time had no statistically significant differences.

Table 2 shows each stressor scale item and the respective median and 25th and 75th percentiles on the first, second and third days of hospitalization. The perception of stress was reduced for all of the

Table 2 - Intensive care unit environmental stressor scale scores by day

	First day	Second day	Third day
1. Being tied by tubes	1 [1-1]	1 [1-1]	1[1-1]
2. Having nose and/or mouth tubes	1[1-1]	1 [1-1]	1 [1-1]
3. A lack of clarification regarding the therapy	1[1-2]	1[1-1]	1[1-2]
4. Feeling pain	3[1-4]	2[1-3]	1[1-4]
5. Not sleeping	2[1-4]	1[1-2]	2[1-4]
6. Being thirsty	1[1-1]	1[1-1]	1[1-1]
7. Hearing devices noises and alarms	1[1-2]	1[1-2]	1[1-1]
8. The team speaks in incomprehensible terms	1[1-1.75]	1[1-1]	1[1-2]
9. Having no privacy	1[1-3]	1[1-2]	1[1-2.75]
10. Having no self-determination	3[1-4]	2[1.25-3.75]	2[1-4]
11. Having extraneous machines nearby	1[1-2]	1[1-1]	1[1-1]
12. Being unable to move his/her hands or arms due to venous access	2[1-4]	2[1-3]	2[1-4]
13. Hearing the heart monitor alarms ringing	1[1-1]	1[1-2]	1[1-1]
14. Being pierced by needles	2[1-3.75]	2[1-3.75]	2[1-3.75]
15. Missing their husband/wife	4[1.25-4]	3[1.25-4]	3[2-4]
16. Not knowing where he/she is	1[1-1]	1[1-1]	1[1-1]
17. Nurses and doctors speak too loudly	1[1-2]	1[1-2]	1[1-1.75]
18. Hearing other patients groan	1[1-3]	1[1-2]	1[1-2]
19. Feeling that the nursing team is more interested in the machines than in you	1[1-1]	1[1-1]	1[1-1]
20. Having the lights constantly on	2[1-4]	2[1-3]	1[1-4]
21. Uncomfortable bed and/or pillow	1[1-2]	1[1-2]	1[1-2.75]
22. Extraneous sounds and noises	1[1-2]	1[1-1.75]	1[1-1.75]
23. Too high or too low of a temperature	1[1-1.75]	1[1-2.75]	1[1-2]
24. Not knowing when things will be done	1[1-3]	1[1-4]	2[1-3]
25. Feeling that the nurse is too hurried	1[1-1]	1[1-1.75]	1[1-1]
26. Seeing family and friends for just a few minutes	2[1-4]	2[1-4]	2[1-4]
27. Being cared for by unknown doctors	1[1-1]	1[1-1]	1[1-1]
28. Expend the time watching the ceiling details	1.5[1-3]	1[1-3]	1[1-2]
29. Hearing the phones ring	1[1-1.75]	1[1-1]	1[1-1]
30. Being constantly examined by doctors and nurses	1[1-1]	1[1-1]	1[1-1]
31. Not knowing what time it is	2[1-3]	1[1-2]	1[1-2.75]
32. Being awakened by the nursing team	1[1-1.75]	1[1-1.75]	1[1-2]
33. Not knowing what day it is	1[1-2]	1[1-1]	1[1-1]
34. Being bothered	1[1-1]	1[1-1]	1[1-1]
35. Unknown smells	1[1-2]	1[1-2.75]	1[1-2.75]
36. The nurse fails to introduce herself by name	1[1-1]	1[1-1]	1[1-1]
37. Measuring blood pressure too many times a day	1[1-1]	1[1-2.75]	1[1-1]
38. Seeing bags of fluids hanging overhead	1[1-1.75]	1[1-1]	1[1-1.75]
39. Having to use oxygen	1.5[1-3.75]	1[1-2]	1[1-2]
40. Having the nursing team constantly working around the bed	1[1-1]	1[1-1]	1[1-1]

1- Not stressful; 2- Mildly stressful; 3- Stressful; 4 - Very stressful. The results are expressed in median (percentile 25-75) or percentages.

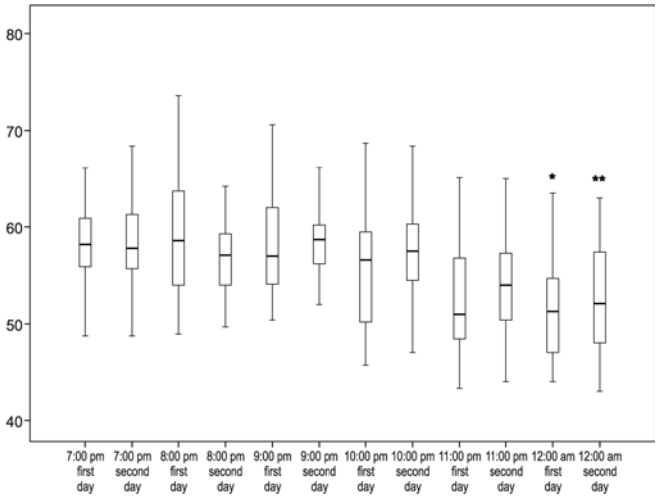
items, and inconsistencies were detected for some of the factors that were categorized as stressful on the first, second or third hospitalization days.

On the first day in the CU, the three main stressful factors were missing their partner, a sense of no personal control, and pain. On the second day, missing their partner remained the most stressful factor, which was followed by seeing family/friends for just a couple of minutes and again a sense of no personal control. On the second day, the third factor remained one of the top three stressful factors but had a lower median score.

On the third day, the most important factor in the preceding days remained missing their partner, which was followed by not sleeping (which was not one of the top three stressful factors on the first two days) and again a sense of no personal control. However, no statistical significance was found for any of these stressor scale items on the three days of hospitalization.

The median noise level was the highest at 9:00 pm on the second night in the CU (58.7 dB), and the lowest value (51.5 dB) was measured at 12:00 am on the first night in the CU. The other values are described in Figure 1; the difference between these two days was statistically significant ($p < 0.05$).

In the multiple linear regression, the first-night noise level had a 33% correlation (adjusted R^2) with the ICUESS total score on the second day ($p = 0.001$). The second-night noise level had a 32.8% correlation with the third-day ICUESS score ($p=0.001$).



*p<0.001 for the first-day dependent variables. **p<0.001 for the second-day dependent variables.

Figure 1 - Noise profiles on the first and second days between 7:00 pm and 12:00 am.

DISCUSSION

Stress is a straining situation that may have both physiological and psychological causes and affects all patient dimensions. The response to stress depends on the intensity of the stressing agent and its duration and extent. In an intensive care unit (ICU), stress is mostly related to psychological issues, such as anxiety, depression, dependence and cognitive changes, which impact the patient's quality of life both during and after the hospital stay.[10]

In this study, the patients considered the psychological stressors 'missing their partner' and 'seeingfamily/friends for a couple of minutes' to be the most stressful. This corroborates the literature. In a 2007 study[10] that included 30 patients staying in a general adult ICU, these factors were the fourth- and fifth-most stressful factors, with mean scores of 2.20 and 2.60, respectively.

In another 2005 study[11] that included 104 liver transplant patients and 103 elective abdominal surgery patients, these factors were the fourth- and fifth-most stressful factors (with average scores of 2.46 and 2.34) in the first group and the fifth-most stressful factor (with average scores of 2.18 and 2.33) in the second group.[11] A 2006 study [12] analyzed 43 heart disease patients staying in the CU, and both of these factors were mentioned as the third main cause of stress in heart disease patients, with an average score of 2.44. These factors may be reduced by implementing simple changes to CU access (i.e., appropriate visit times that would provide a more comfortable environment and thus reduce the patient's perception of stress).[10,11]

The restrictions posed by tubes, venous and arterial access and bed rest added to pain sensitivity and were responsible for an increased perception of stress because these patients were dependent on the CU professionals for simple tasks, such as changing position, hygiene and feeding. Together, these factors cause increased stress, psychological instability and discomfort. An appropriate nursing team evaluation regarding how to help and stimulate these patients to participate in simple tasks, such as oral hygiene, may reduce this sense of discomfort and lead the patients to recover their sense of self-determination.[2-4,10]

The mention of pain as one of the top stressors is related to the severity of these patients' disease and the need for monitoring invasive procedures. Therefore, the experiences that cause physical or psychological discomfort frequently overcome other inconveniences

in critical care wards. The multidisciplinary team has a critical role in pain control and should be aware of the patient's symptoms to provide appropriate analgesia and minimize pain-related stress.[2,3,11,12]

In this study, being 'tied by nose or mouth tubes' was not reported as stressful, as is frequently reported in the literature,[2-4,10,15] because these patients were staying in a CU and not in an ICU. Thus, none of the participants in this study had tracheal, nasogastric or nasoenteral tubes.

Environmental factors were also responsible for an increased perception of stress. The noise level was one of the main stressors.[6,8,9,16]

The noise level between 7:00 pm and 12:00 am that was found in this study was above ABNT recommendations;[7] this may increase the perception of stress and prolong the patients' stay and recovery. Several literature reports have mentioned high noise levels in hospitals. A 2003 study[6] analyzed general adult ICU noise levels and found 65.2 dB between 6:00 pm and 12:00 am. Another 2005 study[16] involving healthy subjects, measured noise levels in an environment simulating ICU noise and found an average of 57.9 dB.[6,7,16]

Additionally, a 2008 study[8] involving heart surgery patients measured ICU noise levels and found a mean of 64 dB, a minimum of 49 dB and a maximum of 89 dB. These findings show that the hospital environment has noise levels that are above the recommended thresholds and therefore contribute to patient stress.[6,8,16]

However, no literature reports that related noise levels to the patient's perception of stress were found. In this study, the noise level could not fully explain the ICUESS score, and the patients did not mention the noise level as a top stressor.

Some limitations, such as the lack of a distinction between higher- and lower-frequency sounds and the lack of noise measurement during the ICUESS scoring time, should be considered. It is fundamental that healthcare professionals discuss the top stressors that are mentioned by patients to improve the quality of the services provided. Certain measures, such as multidisciplinary team education on the importance of lowering their voices during conversations in the CU, should be implemented.

CONCLUSION

Patients staying in a CU have an increased perception of stress, which is mostly related to psychological factors, such as a sense of restriction. Environmental factors, such as high noise levels, are also responsible for the perception of stress, which decreases within the first days after admission.

RESUMO

Objetivo: Identificar os principais fatores geradores de estresse em pacientes internados em unidade coronariana e a influência do nível de ruídos na percepção de estresse dos mesmos.

Métodos: Estudo prospectivo, descritivo e quantitativo, realizado de junho a novembro de 2009 na Unidade Coronariana do Hospital de Clínicas da Unicamp. Para identificar os fatores estressantes foi utilizada a Escala de Estressores em Unidade de Terapia Intensiva (Intensive Care Unit Environmental Stressor Scale - ICUESS) no primeiro, segundo e terceiro dias de internação. Na primeira e segunda noite de internação, foi mensurado o nível de ruído pelo decibelímetro marca Instrutherm - modelo DEC-460.

Resultados: Participaram do estudo 32 pacientes cardiopatas clínicos. A mediana para a Escala de Estressores em Unidade de Terapia Intensiva foi de 67,5, 60,5 e 59,5, no primeiro, segundo e terceiro dias respectivamente, não apresentando diferença estatisticamente significante entre os valores. O maior valor de nível de ruídos foi às 21 horas, da segunda noite com mediana de 58,7dB, e o menor, de 51,5dB à zero hora da primeira noite. Quando feita a regressão linear múltipla, o nível de ruídos da primeira noite teve correlação de 33% com a Escala de Estressores do segundo dia, e o nível de ruídos da segunda noite teve correlação de 32,8% com a Escala de Estressores do terceiro dia, com p=0,001.

Conclusão: Pacientes internados em Unidade Coronariana apresentam maior percepção de estresse. O elevado nível de ruídos também é responsável pela percepção do estresse dos pacientes.

Descritores: Cuidados críticos; Humanização da assistência; Cardiopatias; Unidades de terapia intensiva; Poluição sonora; Satisfação do paciente

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