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Noise level in intensive care units of a public university hospital in Santa Marta (Colombia)☆

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Public health;
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Abstract
Objective: To evaluate the noise level in adult, pediatric and neonatal intensive care units of a university hospital in the city of Santa Marta (Colombia).
Design: A descriptive, observational, non-interventional study with follow-up over time was carried out.
Materials and methods: Continuous sampling was conducted for 20 days for each unit using a type I sound level meter, filter frequency in A weighting and Fast mode. We recorded the maximum values, the 90th percentile as background noise, and the continuous noise level.
Results: The mean hourly levels in the adult unit varied between 57.40 ± 1.14 and 63.47 ± 2.13 dBA, with a maximum between 71.55 ± 2.32 and 77.22 ± 1.94 dBA, and a background noise between 53.51 ± 1.16 and 60.26 ± 2.10 dBA; in the pediatric unit the mean hourly levels varied between 57.07 ± 3.07 and 65.72 ± 2.46 dBA, with a maximum of 68.69 ± 3.57–79.06 ± 2.34 dBA, and a background noise between 53.33 ± 3.54 and 61.96 ± 2.85 dBA; the neonatal unit in turn presented mean hourly values between 59.54 ± 2.41–65.33 ± 1.77 dBA, with a maximum value between 67.20 ± 2.13 and 77.65 ± 3.74 dBA, and a background noise between 55.02 ± 2.03 and 58.70 ± 1.95 dBA. Analysis of variance revealed a significant difference between the hourly values and between the different units, with the time of day exhibiting a greater influence.
Conclusions: The type of unit affects the noise levels in intensive care units, the pediatric unit showing the highest values and the adult unit the lowest values. However, the parameter exerting the greatest influence upon noise level is the time of day, with higher levels in the morning and evening, and lower levels at night and in the early morning.

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PALABRAS CLAVE
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Nivel de ruido en unidades de cuidado intensivo de un hospital público universitario en Santa Marta (Colombia)

Resumen
Objetivo: Evaluar el nivel de ruido en las unidades de cuidado intensivo adulto, pediátrico y neonatal de un hospital universitario de la ciudad de Santa Marta (Colombia).
Diseño: Estudio descriptivo, observacional no intervencionista y con seguimiento a lo largo del tiempo.
Materiales y métodos: Se realizó un muestreo continuo durante 20 días por cada unidad utilizando un sonómetro tipo I, con filtro de ponderación frecuencial A y temporal Fast. Se registraron los valores máximos, el percentil 90 como ruido de fondo y el nivel continuo de ruido.
Resultados: Los niveles medios horarios variaron entre 57,40 ± 1,14-63,47 ± 2,13 dBA para la unidad de adultos, con un máximo entre 71,55 ± 2,32-77,22 ± 1,94 dBA y un ruido de fondo entre 53,51 ± 1,16-60,26 ± 2,10 dBA; para la unidad pediátrica la media horaria se establece entre 57,07 ± 3,07-65,72 ± 2,46 dBA, con un máximo de 68,69 ± 3,57-79,06 ± 2,34 dBA, y de 53,33 ± 3,54-61,96 ± 2,85 dBA de ruido de fondo; finalmente, la unidad neonatal reporta entre 59,54 ± 2,41-65,33 ± 1,77 dBA la media horaria, los máximos entre 67,20 ± 2,13-77,65 ± 3,74 dBA, y fondo de 55,02 ± 2,03-58,70 ± 1,95 dBA. El ANOVA evidenció una diferencia significativa entre los valores horarios y entre las unidades de cuidado intensivo, mostrando una mayor influencia la hora del día.
Conclusiones: Los niveles de ruido en las unidades de cuidado intensivo se ven afectados por el tipo de unidad; se presentaron los valores más altos en la unidad pediátrica y los más bajos en la de adultos. No obstante, el parámetro que más influye en el nivel es la hora del día, con mayores niveles en la mañana y la tarde, y menores en la noche y la madrugada.

Introduction

In hospitals, intensive care units (ICUs) are regarded as areas exposed to noise produced by medical equipment and human activity. Excessive noise levels can lead to stress and delirium among the patients admitted to such Units,[1–4] as well as to fatigue and stress among the healthcare personnel.[5–7]

The literature shows that approximately 50% of all patients develop important sleep disturbances during their stay in the ICU. In this regard, noise reduces the duration and number of rapid eye movement (REM) periods,[8] with an impact upon the physiological and psychological wellbeing of critical patients in the form of metabolic, endocrine and immune alterations.[3]

In the case of newborn infants admitted to such Units, it has been estimated that continuous and persistent exposure to excessive noise can lead to hearing loss, increased intracranial pressure, stress, arterial hypertension, metabolic instability, sleep disturbances, irritability and loss of appetite, particularly among premature infants.[9–11]

The literature reports mean a noise level in ICUs of 68 decibels A (dBA). As illustrative examples, an Austrian hospital recorded an average of 60–65 dBA, while a University Hospital in Valencia (Spain) recorded a level of 55 dBA. In a Children's Hospital in Cincinnati (USA) the mean noise level was found to be 71.9 dBA, while in the ICU of the Hospital of Manitoba (Canada) the level was 68 dBA.[12,13] In adult ICUs (AICUs), the reported mean equivalent noise level (LA_{eq}) was 52–84 dBA,[14–16] while in pediatric ICUs (PICUs), the literature describes levels in the range of 48–72 dBA.[17–20] Lastly, the noise levels in neonatal ICUs (NICUs) are reported to range between 45 and 90 dBA.[11,21–24]

The present study was carried out to assess the equivalent continuous noise levels in three ICUs of a hospital in the city of Santa Marta (Colombia), and to evaluate the existence of differences or similarities among the analyzed Units –taking into account the repercussions of excessive noise upon critical patients admitted to the ICU.

Material and methods

Study setting

The study was carried out in a university hospital in the city of Santa Marta (Colombia), with three general ICUs (no differentiation being made according to disease type) classified as AICU, PICU and NICU. The AICU cares for adults and young individuals over 15 years of age and has 19 beds with a mean occupation of 10 ± 2 patients and an attending personnel of 7 ± 3 professionals. The PICU in turn cares for patients between 31 days and 14 years of age and has 7 beds with a mean occupation of 3 ± 2 patients and an attending personnel of 5 ± 1 professionals. Lastly, the NICU cares for newborn infants between 0 and 31 days of age and has 14 cribs with a mean occupation of 8 ± 1 patients and an attending personnel of 4 ± 0 professionals.[25]