



KEY POINT SUMMARY

OBJECTIVES

The purpose of the study was to record the noise level at the pediatric intensive care unit in a major US hospital and examine how noise may cause staff stress and annoyance.

DESIGN IMPLICATIONS

Acoustic design of healthcare facilities especially intensive care units should consider the needs of both staff and patients. Noise reduction may be achieved through identification and elimination of noise sources, sound absorption, and sound blocking.

Noise, Stress, and Annoyance in a Pediatric Intensive Care Unit

Morrison, W.E., Haas, E.C., Shaffner, D.H., Garrett, E.S., Fackler, J.C.
2003 / Critical Care Medicine
Volume 31, Issue 1, Pages 113-119

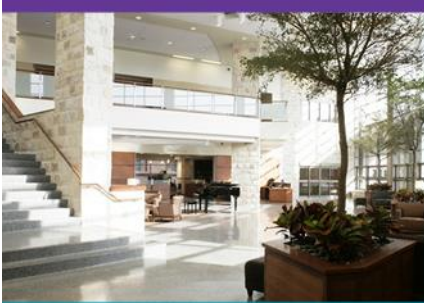
Key Concepts/Context

Stress is a state of mental or bodily tension caused by the imbalance between environment demands and an individual's ability to cope with the environmental demands. Stress may be reflected in physiological, psychological, and behavioral reactions to external stimuli such as high heart rate and blood pressure, sleeplessness, and social withdraw. Healthcare workers typically experienced high levels of stress because of workplace and personal factors such as workload, noise, and so on. High workplace stress may result in physical disorders and diseases, burnout, impaired work efficiency, and an intention to quit the job among health workers.

Noise in hospitals often exceeds the recommended levels. Research identified noise as an important stressor in healthcare settings that caused annoyance, depression or psychosis, sleep abnormality, and delays in recovery in patients. However, relative smaller number of studies was conducted to examine the effects of noise on staff.

Methods

This correlational study involved three data collection steps on 11 registered nurses. The first part was conducted in a quiet room for collecting baseline data including demographics, physiological indicators of stress (salivary amylase, heart rate, blood pressure), and self-reported stress and annoyance level. The second part was a 3-hour period during which nurses were performing normal patient care activities in the ICU. During the 3-hour period, a sound meter was used to continuously record sound level. The weighted sound pressure level, minimum and maximum sound levels, and peak sound level were calculated for each half-hour interval. Each nurse's heart rate, episodes of ectopy (disturbance of the cardiac rhythm), and time in tachycardia (heart rate exceeding the normal range) were



The Center for Health Design: Moving Healthcare Forward

The Center for Health Design advances best practices and empowers healthcare leaders with quality research providing the value of design in improving patient and performance outcomes in healthcare facility planning, design, and construction, optimizing the healthcare experience and contributing to superior patient, staff, and performance outcomes.

Learn more at
www.healthdesign.org

continuously monitored by a Holter meter (a portable device for continuously monitoring various electrical activity of the cardiovascular system). Every half hour, salivary amylase (a physiological indicator of stress) was measured by using field test kits and the level of stress and annoyance were rated by the nurse their on a scale of 0-100. In the third step, nurses returned to the quiet room and completed a questionnaire regarding their perception of noise in the unit. In multiple regression analysis, data about heart rate, salivary amylase, and ratings on stress and annoyance were entered as dependent variables; weighted average sound pressure level was entered as independent variable; nursing experience, shift worked (day vs. night), caffeine intake, patient room size, and patient risk of mortality were entered as confounding variables.

Findings

The weighted average sound pressure level (for half-hour intervals) was significantly higher during daytime (61.2 dBA) than night (58.8 dBA). Higher patient census was associated with higher average sound level. The weighted average sound level was positively correlated with heart rate, percent of time in tachycardia, and self-rated stress and annoyance. With an increase of 10 dBA in average sound level, average heart rate increased by 6 beats per minute, and time in tachycardia increased by 20%. Level of salivary amylase was not correlated to noise level. More nursing experience was related to lower heart rate and less time in tachycardia. More caffeine intake was related to higher heart rate, more time in tachycardia, and higher level of salivary amylase and lower self-rated stress and annoyance levels. Night shift was associated with higher heart rate but lower stress ratings.

Limitations

There were several limitations of this study:

- The sample size was relatively small for a regression analysis including many variables even though the analysis still showed significant results, suggesting very strong association between noise and stress.
- The noise and stress might have been caused by other factors. For example, patient emergency might increase noise level and at the same time cause higher heart rate in nurses. Therefore, the study did not indicate a direct and causal relationship between noise and stress.
- The results (especially the subjective ratings) might have been biased because nurses might know the purpose of the study and nurses who were more affected by noise level might be more willing to voluntarily participate.
- Sound level was used as a surrogate measure of noise level because noise only referred to “unwanted” sounds and not all sounds might be perceived as noise.
- The study did not measure the effects of higher sound level on long term effects such as turnover intention.