SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

The aim of the study was to evaluate the role of room acoustics on patients with coronary artery disease. The hypothesis was that poor sound absorption would negatively affect patients, as longer reverberation time (poor acoustics) would increase sound propagation and sound levels in the CCU, reduce speech intelligibility and thereby contribute to the generation of work-related noise within the unit

DESIGN IMPLICATIONS

As acoustics may have an impact on healing, rehabilitation, and recovery during acute coronary illness, the use of high-performance ceiling tiles should be considered in cardiac-care units.

Influence of Intensive Coronary Care Acoustics on the Quality of Care and Physiological State of Patients

Hagerman, I., Rasmanis, G., Blomkvist, V. , Ulrich, R. , Eriksen, C. A., Theorell, T.
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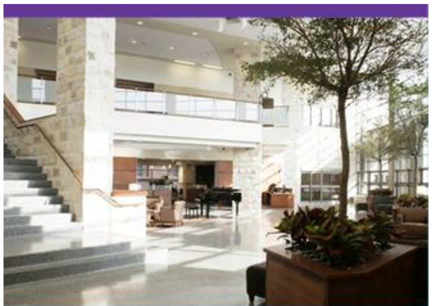
Key Concepts/Context

Unexpected noise has long been recognized to have a negative influence in the rehabilitation of patients. The study was performed in an academic hospital, where patients with acute chest pain were evaluated in the intensive coronary heart unit (CCU). In general, this is considered a stressful situation, and apart from the specific medical condition being evaluated, with an activated sympathetic system, the patients' cardiovascular systems (specific physiological outcomes) may also be affected by built environment conditions that include the acoustical environment.

Methods

A total of 94 patients admitted to the intensive coronary heart unit at a hospital for evaluation of chest pain were included in the study. Patient groups were recruited during two periods of acoustical study. Acoustics were altered during the study period by changing the ceiling tiles throughout the CCU (in the patient rooms and central part of the unit where decision-making and patient-monitoring occur). Each condition was evaluated for four weeks. The sound-reflecting tiles ("poor" acoustics) were 13-mm solid painted plaster board tiles, while "good" acoustics were achieved with sound-absorbing tiles of similar appearance, a 40-mm EcophonR ceiling tile (corresponded to class A Acoustics Sound absorbers for use in buildings). Patients were monitored with regard to systolic and diastolic blood pressure (including pulse amplitude - the difference between the two), heart rate and heart rate variability. Data was collected during regular weekdays and nights, not on weekends. Patients were asked to fill in a questionnaire about the quality of the care (staff attitude, wake-ups due to sounds, intelligibility of the staff's statements, sounds from the corridor and disturbances due to sounds), and a follow-up of rehospitalization and mortality was made at 1 and 3 months, respectively.



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Findings

Noise level measurements showed that there was a drop in sound level of 5–6 dBA in two patient rooms that were measured, while in the main work area, the equivalent sound pressure level only changed by only 1dBA. However, reverberation time was reduced from 0.8 to 0.4s in the main work area and from 0.9 to 0.4s in the patient rooms. Speech intelligibility improved considerably both in the main work area and in the patient rooms, as indicated both by the RASTI method and verbal reports from staff. (This also resulted in notable effects on the perceived psychosocial work environment where staff felt fewer demands and less irritation during the "good" acoustics period.)

While there were no difference in physiological measurements overall in the two acoustic conditions, there were significant differences between good and bad acoustics when subdivided according to the degree of disease. Pulse amplitude was higher in the acute myocardial infarction and unstable angina pectoris groups in the bad acoustical condition, with lower values during the good acoustics period during the night. The incidence of rehospitalization was higher for the bad acoustics group and was statistically significant at the three-month period. Patients treated during the good acoustics period considered the staff attitude to be much better than during the bad acoustics period.

Limitations

The authors identified several potential limitations:

1. While there was a significantly higher frequency for the need of extra intravenous beta-blockers in the group during bad acoustics, medication with betablockers can be considered to be a potentially important confounder. It might explain why there was no difference in heart rate or in heart rate variability between the two groups.
2. Hearing tests were not conducted on patients during the study period. Since the patients represent an urban population in Sweden, they were relatively old and potentially hard of hearing. While acoustics may be less important to older patients, certain hearing are very sensitive to loud sounds, and this group of patients may be even more sensitive to this kind of acoustical study than others.
3. The two patient groups in the study are not randomized, although the study groups did not differ in basal clinical characteristics or subgroups of diagnosis.