SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

The authors conducted a literature review and noise survey at Johns Hopkins Hospital in Baltimore, Maryland. Their results compare noise standards and trends with case study-based equivalent sound pressure levels as a function of location, frequency, and time of day.

Noise Levels in Johns Hopkins Hospital

Busch-Vishniac, I. J., West, J. E., Bamhill, C., Hunter, T., Orellana, D., Chivukula, R.
2005 | Journal of the Acoustical Society of America
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Key Concepts/Context

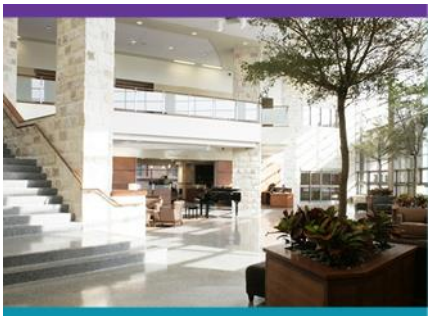
Patients, visitors, and staff often complain about the amount of noise in hospital settings. However, in addition to being annoying and disrupting sleep, some research suggests that high sound levels negatively affect the speed of wound healing and the number of medications, as well as contributing to staff stress and burnout. Most research in this area has focused on overall noise levels rather than spectral quality, tonality, and time variance, which limits the discussion around noise in terms of human physiological and psychological response.

Methods

The researchers started with a literature review to determine typical hospital noise levels and trends as well as identify established guidelines and standards. Next, they measured sound pressure level in the hospital at five locations: the pediatric intensive care unit, Children's Center, adult medical/surgical unit, and two locations in the oncology center over the course of 1 year. They measured equivalent sound pressure levels for 1 minute at various locations on each unit (e.g., patient rooms, hallways, and nurses stations) and obtained octave-band sound pressure levels at the same time. The researchers then collected 24-hour hour measurements at a minimum of three places per unit—a patient room, a nurse station, and an examination room or empty patient room. In every case, the researchers asked patients, staff, and visitors to continue with their normal activity. The investigators used a Larson-Davis System 824 near the center of the room at a height of roughly 4.5 ft and downloaded the measurements to a computer for analysis.

Findings

The literature review revealed that the World Health Organization (WHO) was the most frequently cited and included guidelines for hospitals that recommend a maximum sound pressure level of no more than 40 dB(A) (re 20 μPa) at night measured on the fast setting. Further, the researchers noted that WHO suggests



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that patient rooms have an equivalent sound pressure level of no more than 35 dB(A) during the day and 30 dB(A) at night. The authors also note that the American National Standards Institute Inc. recommends a maximum RC(N) (neutral spectrum room criterion) value ranging from 25 to 40 depending on the room type, and a maximum balanced noise criterion value ranging from 25 to 40. Finally, the authors reported that the Environmental Protection Agency makes its recommendations in terms of the Ldn (day-night sound pressure level), which should not exceed 45 dB(A). The researchers found that none of the locations in the study complied with current WHO guidelines. Further, their review of objective data showed that held true in hospitals worldwide as data gathered at various facilities over the last 45 years indicate a trend of increasing noise levels during daytime and nighttime hours. These high sound pressure levels interfere with sleep, potentially affect speech intelligibility unless voices are raised, and create a general annoying din.

Limitations

Although the authors speculate that noise problems exist at most modern hospitals based on their literature review and the outcomes of the Johns Hopkins Hospital case study, a case study sample inherently limits generalizability. The study did not investigate or correlate medical errors with noise problems.

Design Implications

The authors speculate that noise in hospitals could become important if it permits one facility in an area to gain a competitive advantage by advertising a better patient environment than other hospitals. Technology may enhance the noise level by replacing audible alarms with personal, hands-free call units that broadcast only to the individual desired to be reached. The general noise level must be reduced for transcriptionists who must speak at >15 dB above the surrounding noise level to use speech recognition software without erroneous errors. This may be benefitted by incorporating sound-absorbing panels for ceilings and walls that meet hospital flammability and smoke production standards. Low-frequency noise is commonly attributed to heating, ventilating, and air conditioning (HVAC) units; these should be carefully selected and installed to reduce sound transmission. In addition to HVAC and technology, the selection of quiet hospital instruments or service objects (such as the meal tray carts) should be selected based on their ability to perform well while producing less noise.