SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

To perform a psychoacoustic analysis of operating rooms (ORs) and assess the relationships between room size, acoustics, and content with overall sound levels.

Factors affecting acoustics and speech intelligibility in the operating room: Size matters

McNeer, R. R., Bennett, C. L., Horn, D. B., & Dudaryk, R. 2017 | *Anesthesia-Analgesia*. Volume 124, Issue 6, Pages 1978-1985

Key Concepts/Context

Previous studies have shown that noise levels within healthcare environments have been increasing steadily since 1960. Noise is a prominent source of discomfort for both patients and staff, and can also interfere with important interpersonal communications. Conversely, previous studies have also found that decreased sound levels in healthcare environments have been associated with fewer surgical complications.

Methods

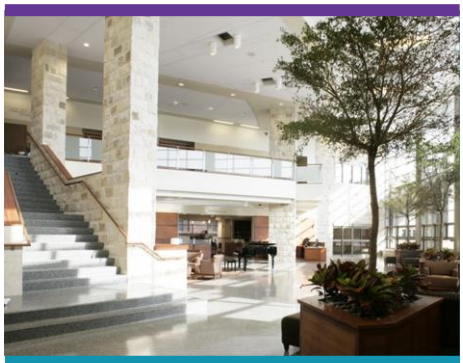
A psychoacoustic analysis was performed in 40 different surgical suites over the course of five days. A series of "sweep tones" of ascending pitch were played from a speaker that was directed toward a room corner. The resulting sounds were recorded from three different locations within the room, each location at least 1.5 meters apart. Five types of sounds were recorded from each location and analyzed using speech intelligibility software.

Findings

After all impulse responses (sounds) were analyzed in relation to the physical designs of their respective ORs, it was found that the contents and size of an OR can act as predictors for a wide range of psychoacoustic indices of speech intelligibility. Larger ORs were correlated with lower speech intelligibility, and ORs with more contents (carts, tables, machines, etc.) featured better speech intelligibility.

Limitations

The authors noted several limitations within this study. The ORs involved in this study were highly heterogeneous in design, and the design factors expected to



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affect acoustics were not factored into part of the statistical analysis. Differences between the surfaces of certain objects within each OR (such as metal tables) may have contributed to differences in the results that were not accounted for in the final analysis. Due to these factors, these results may not be universally applicable to all ORs or healthcare spaces.

Design Implications

This study indicates that noise levels in ORs may be reduced either by using acoustic modifiers, such as sound-absorbent panels, by paying attention to the overall size and contents of the OR, or by using an integrated approach that incorporates all of these factors. The surfaces of objects within ORs should reflect sound as little as possible, and the amount of empty overall space within a given OR could be reduced to further help decrease noise levels.

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