SYNOPSIS

KEY POINT SUMMARY

Secondary exposure risks to patients in an airborne isolation room: Implications for anteroom design

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OBJECTIVES

To assess the role of the anteroom when particles representing pathogens are released outside of an isolation room so that, ultimately, the likelihood of secondary infection in this scenario may be evaluated.

DESIGN IMPLICATIONS

Using positive pressurization in anterooms can break the directional pathways of flowing airborne bacteria considerably. More generally, designers should carefully consider how the spaces adjacent to patient isolation rooms could affect airflow into the isolation room, and how potential airflow out of the isolation room might affect these spaces.

Key Concepts/Context

Previous research has shown that negatively pressurized Airborne Infectious Isolation Rooms (AIIRs) can protect hospitals from fatal airborne pathogens such as tuberculosis. But this use of negative pressurization can simultaneously increase the chances of isolated patients contracting secondary infections, or healthcare-acquired infections (HAIs), caused by air blowing in from adjacent spaces. Research is needed to better assess the actual likelihood of secondary infections occurring in these scenarios so that steps can be taken to mitigate these risks.

Methods

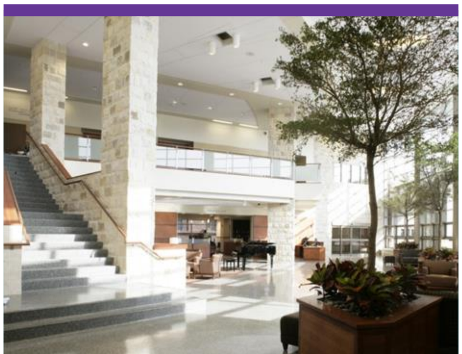
The authors analyzed the aerodynamic behavior of aerosols in various spaces within an actual hospital, including an infectious isolation room, a general patient room, and a nursing station within a patient ward. To study the effect of secondary airborne infection, the aerosols used were about 84.7% of the density of water and were dispersed at a rate of 60 milligrams per 1 L/s of air. Background concentrations were gathered 15 minutes before the test, and were continually gathered every 30 seconds during the test for a total of 30 minutes. A similar routine was used for studying aerosol injection and sampling in the isolation room and nursing station, except that background testing lasted 15 minutes while the aerosol intervention lasted 60 minutes.

Findings

Results supported the idea that airborne bacteria could be suspended and mobilized by currents of directional airflow between healthcare spaces and adjacent patient isolation rooms. Findings also supported the notion that the migration and transport of aerosols depend upon the injection point. In effect, the pathway created by the directional flow toward the isolation room from the adjacent corridor allowed for airborne particles to migrate inside the isolation room and gather around the bed. Generally, it was found that positive pressurization within the anteroom can substantially decrease the chances of harmful particles congregating within a patient isolation room.

Limitations

This study was conducted within only a single hospital, thus the results may not be representative of the different designs within other hospitals, be they subtle or significant in nature. The movement of human bodies or other objects between these spaces was not accounted for in this study.



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