



KEY POINT SUMMARY

OBJECTIVES

1. To review (and compare) guidelines in the UK and the US governing the design of ventilation systems for hospital wards and other multibed rooms
2. To evaluate the effectiveness of various ventilation strategies in removing airborne pathogens by conducting an analytical computational fluid dynamics (CFD) study.

The Ventilation of Multiple-Bed Hospital Wards: Review and Analysis

Beggs, C.B., Kevin, G., Noakes, C.J., Hathway, A., Andrewsleigh, P.
 2008 | *American Journal of Infection Control*
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Key Concepts/Context

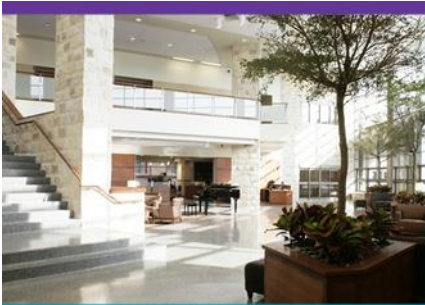
Ventilation is a key concern in hospitals, however this has received less attention in the context of hospital wards, as compared to operating theaters or isolation rooms which have a high risk of infections. In many countries in the world where private rooms are not yet the norm, the issue of ventilation in multi-bed rooms is a critical concern. This paper undertakes a review of guidelines in the UK and the US around this issue.

Methods

UK and US guidelines, in particular the AIA and ASHRAE guidelines for the US, and the HTM guidelines for the UK, were reviewed to identify the standards and metrics that are in place, and how they differ in the two countries. These were summarized in a comparative table for general ward spaces, outlining the recommended pressure relationships, Air Change Rate (AC/h), air temperature and relative humidity. The authors found that neither set of guidelines specified airflow patterns. To address this gap they investigated the effect of airflow direction on bio-aerosol concentration generated within a ward space via a CFD study by simulating 3 different ventilation strategies in an empty 32 cu.m. room, using Fluent 6.2 CFD software.

Findings

- Though it does not cite conclusive research, the paper connects the dots about the possible risk of HAI due to airborne pathogens, and suggests that improved ventilation can minimize this risk, especially for immunocompromised patients.
- Air flow patterns are important considerations, especially to ensure that clinically significant surfaces (like beds) remain free from microbial



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contamination. Piston-type ventilation may offer benefits over conventional dilution systems. On the other hand displacement ventilation may offer the least benefit in terms of removing larger particles from the air. Authors caution that these findings are not conclusive.

- Heat sources within the room can influence both appropriate airflow and thermal comfort.
- Negatively pressurized isolation rooms should be used for patients with infectious diseases (citing other sources).
- There is a knowledge gap between the extent to which airborne pathogens contribute to infection, and good quality data from which to make decisions regarding minimum ventilation rates.

Limitations

The study does not clearly outline objectives and methods. While an excellent resource to understanding the relevance of the current ventilation standards and their relevance to patient safety, the study cannot offer any conclusive new knowledge.

Design Implications

1. Air-flow patterns within ward spaces are important
2. To ensure that clinically sensitive surfaces remain free of microbial contamination it is important to focus on the removal of larger particles (>10 micro m) from the air. To do so piston type ventilation offers some benefits over conventional dilution systems. Displacement ventilation on the other hand is relatively poor at removing large particles.
3. CFD modeling can be a powerful tool to determine airflow patterns and designing ventilation strategies.