



KEY POINT SUMMARY

OBJECTIVES

To examine three different operating room ventilation systems (LAF, TMA, and T_cAF) with respect to energy consumption levels, air cleanliness, and general comfort within the OR from the perspective of surgeons.

Temperature-controlled airflow ventilation in operating rooms compared with laminar airflow and turbulent mixed airflow

M. Alsvéd, A. Civilis, P. Ekolind, A. Tammelin, A. Erichsen Andersson, J. Jakobsson, T. Svensson, M. Ramstorp, S. Sadrizadeh, P-A. Larsson, M. Bohgard, T. Santl-Temkiv, J. Loöndahl 2017 | *Journal of Hospital Infection*. Volume 98, Issue 2, Pages 181-190

Key Concepts/Context

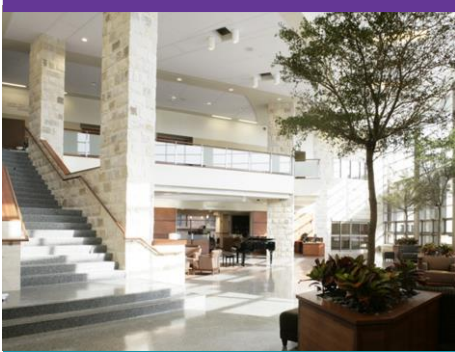
Maintaining a low concentration of bacteria within operating room (OR) air is a widely accepted solution to preventing surgical site infections (SSI). As bacteria become more resistant to antibiotics, researchers and designers are working to improve OR ventilation systems in order to decrease SSI. The usual types of ventilation systems employed to mitigate SSI in ORs are laminar airflow (LAF) and turbulent mixed airflow (TMA) systems. However, there is a lack of available research to help designers make informed decisions about which systems to use in specific contexts. A new ventilation system, temperature-controlled airflow (T_cAF), also needs further analysis.

Methods

Researchers measured energy consumption levels, air cleanliness, and staff comfort levels within three different acute care hospital ORs between January 2015 and February 2016. The three ORs included in the study used different ventilation systems: LAF, TMA, or T_cAF, but were otherwise near-identical to each other by design. Fifteen identical surgical procedures performed by surgeons wearing similar clothing material were observed in each OR, for a total of 45 operations examined in the study.

Findings

In general, air with less than 10 colony-forming units per cubic meter (cfu/m³) is recommended for minimizing SSI during implant or infection-prone surgery. Researchers found that the LAF and T_cAF systems consistently provided air below the recommended limit during the entire length of OR surgeries. Cfu concentrations



The Center for Health Design:
Moving Healthcare Forward

The Center for Health Design advances best practices and empowers healthcare leaders with quality research that demonstrates the value of design to improve health outcomes, patient experience of care, and provider/staff satisfaction and performance.

Learn more at
www.healthdesign.org

under the TMA system were higher than the recommended limit, making their usage during infection-sensitive surgeries questionable. The LAF and T_cAF systems were also able to direct clean airflow more efficiently, providing cleaner air while consuming less energy and reducing the risk of hypothermia in patients. The T_cAF system ranked the highest with regard to environmental comfort among staff.

Limitations

The authors note that many different designs exist for LAF and TMA systems, and only specific versions were examined in this study. The fact that this study involved three identical ORs with no variability between surgical procedures or staff routines and resources could also be viewed as a limitation. No follow-ups on SSI occurrences after these surgeries were conducted. Cfu is a standard yet limited measure of airborne microbial loads; other bacterial colonies may have gone unrecognized in this study.

Design Implications

This study provides evidence supporting the use of laminar airflow ventilation systems and temperature-controlled airflow systems due to their lower levels of energy consumption and airborne bacteria propagation. Temperature-controlled airflow systems, which are the newest design examined in the study, are also the highest-rated in terms of workplace comfort among surgeons. Designers are advised to carefully consider staff routines and resources as well as OR designs themselves before deciding on an ideal ventilation system.

The Knowledge Repository is a collaborative effort with our partners



Additional key point summaries provided by

