



## KEY POINT SUMMARY

### OBJECTIVES

To measure and assess bacterial contamination levels within an OR environment as a function of laminar airflow, door openings, and other potential variables.

## Door openings in the operating room are associated with increased environmental contamination

*Perez, P., Holloway, J., Ehrenfeld, L., Cohen, S., Cunningham, L., Miley, G. B., Hollenbeck, B. L. 2018 / American Journal of Infection Control, Volume 46 Issue 8, Pages 954-956*

### Key Concepts/Context

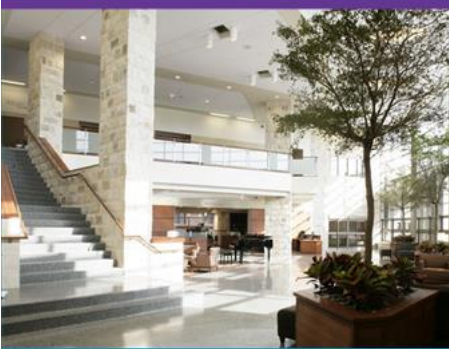
Surgical site infections (SSIs) can pose several risks for patients and institutions, including increased lengths of stay, higher costs, and higher morbidity rates following surgery. Laminar airflow (LAF) is used in many surgical operating rooms (ORs) to decrease the amount of bacterial colony-forming units (CFUs) that might infect patients undergoing surgery. However, there are many variables that might disrupt the efficacy of LAF, such as the bodily movements of surgical personnel or the opening and closing of nearby doors. Further research is needed to better understand the level to which these variables contribute to SSI rates in ORs.

### Methods

This study took place in a single OR over a six-week period, during which 48 general and orthopedic surgical procedures were performed as normal. Researchers measured the average amounts of CFUs both outside and inside the LAF area by placing bacterial settle plates near exit doors and on instrument tables. Researchers also kept note of all patient health backgrounds, lengths of surgical procedures, times of day, number of staff present, room temperature, and humidity. The number of times doors were opened was counted manually throughout the duration of the study.

### Findings

Outside of LAF range, door openings and longer surgery durations were associated with higher CFU counts. Inside of LAF range, higher numbers of staff members occupying the OR was associated with higher CFU counts. The number



### 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](http://www.healthdesign.org)

of door openings per surgical procedure was positively correlated with longer surgical durations, indicating that longer surgeries usually require additional door openings and can subsequently lead to higher CFU presence.

### Limitations

The authors note that during the course of the study, one of the instrument tables would be moved out of LAF range so that the OR could accommodate more staff members, which more than likely influenced CFU average during final analysis. The authors also note that the Hawthorne effect could have affected results, since these procedures were not blinded to OR staff. This study was conducted in one facility, and the floor plans of each OR within the facility were not factored into the study design.

### Design Implications

Laminar airflow systems are helpful for reducing the amount of colony-forming bacteria in and around surgical procedure areas; however, there are other steps that could be taken to further reduce risks of infection. Since this study suggests that higher numbers of staff within operating rooms lead to increased door openings, which subsequently lead to higher levels of bacteria, designers might consider how to allocate space in and around operating room standing areas and doorways to help mitigate the effects of these variables.

#### The Knowledge Repository is a collaborative effort with our partners

Academy of  
Architecture for Health  
an AIA Knowledge Community

AAHF  
ACADEMY OF ARCHITECTURE FOR HEALTH  
FOUNDATION

ASHE  
Optimizing health care facilities

Design for Aging  
an AIA Knowledge Community

The American  
Institute  
of Architects

The American  
Institute  
of Architects

FGI

#### Additional key point summaries provided by:

NIHD | Nursing Institute for  
Healthcare Design  
LEADERSHIP • EDUCATION • ADVOCACY

RESEARCH-DESIGN  
connections