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# It's an Open and Shut Case: Airflow and Ventilation in the Operating Room

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## PURPOSE:

Functionality and effectiveness of the ventilation system and airflow in the Operating Room (OR) is crucial in providing the purest air for the surgical patient in the OR suite. Understanding this aspect of patient safety assists the Perioperative care team in decreasing the bacterial air contamination and potentially reduces the risk for surgical site infections.

## PICO:

Will educating OR staff, contracted staff and outside vendors on airflow, ventilation and the effects of door openings lead to a decrease of unnecessary OR door openings between the time sterile supplies are opened and when the patient leaves the OR?

## EVIDENCE:

Multiple studies have been completed which examined air samples taken before and after OR door openings during various surgical procedures.

- Smith et. al (2013) determined that any door openings can increase bacterial air contamination by 70%.
- Andersson, Bergh, Karlsson, Eriksson and Nilsson (2012) showed a strong positive correlation between door openings and colony forming units.



## METHODOLOGY:

### Pre-intervention:

Digital door counters were purchased and installed in designated operating rooms to track the amount of door openings throughout a surgical case. The counters were mounted on the main door and the ancillary door of each OR. The time was recorded when:

- sterile supplies were opened
- incision made
- incision closure
- patient left room

Digital door counter readings were recorded when:

- sterile supplies were opened
- patient left room

The type of procedure, number of staff present in the room and the staff role was also recorded. A standard data collection tool was developed and used for this research.

Data was collected in designated ORs for the duration of 15 cases. One staff member per specialty was selected for consistency of data collection for each of the following specialties:

- General surgery
- Total Joint surgery
- Cardio-thoracic surgery
- Spine surgery

### Intervention:

An audio paced educational module on the airflow and ventilation systems in the OR was created. The module included information discussing:

- the presence of positive pressure in the OR suite.
- the presence of negative pressure in the OR hallway.
- diagrams of air movement and pressure changes when a door is opened.
- the difference between conventional and laminar air flow ventilation systems along with diagrams of air movement.
- evidence from completed studies that support keeping door opening to a minimum.
- what constitutes as necessary, quasi-necessary and unnecessary door openings and examples of actions staff members can utilize to aid in decreasing door openings.

Educational module was distributed via Network e-learning system to the OR, radiology, perfusion, anesthesia, and neuro-monitoring staff. Module also shared with the Supply Management Department to be loaded on the Network's vendor education website for vendor completion.

### Post-intervention:

Data was collected in the same manner as initial data collection approximately 60 days post administration of educational module.

### References:

1. Smith, E.B., Raphael, I.J., Maltentfort, M.G., Honsawek, S., Dolan, K., & Younkins, E.A. (2013). The effect of laminar air flow and door openings on operating room contamination. 28, 1482-1485.
2. Andersson, A.E., Bergh, I., Karlsson, J., Eriksson, B. I., & Nilsson, K. (2012). Traffic flow in the operating room: An explorative and descriptive study on air quality during orthopedic trauma implant surgery. *American Journal of Infection Control*. 40, 750-755.



## RESULTS:

- Minimal decrease in the average number of door openings during General surgery was noted after the airflow and ventilation education provided

### Learnings

- Education on airflow and ventilation had a minimal impact on the amount of door openings in the OR
- Education combined with process changes would lead to culture shift within the OR to decrease the amount of door openings
- Other teaching modes, such as face to face education, could have been utilized for better retention of information



## LIMITATIONS:

- Resistance received from other disciplines/departments to assign educational module
- Difficulty assigning educational module to non-employed vendors
- Bias due to the use of familiar staff as designated research partners
- Additional data through observation could have been obtained if non-staff member research partners were utilized

## IMPLICATIONS:

- This study can easily be replicated by other institutions due to the simplistic design and affordable equipment used.
- Staff knowledge of the amount of door openings can assist in creation of performance improvement process changes.
- Airflow and ventilation education will be shared with all network campuses and new operating room staff members.

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