Some Limits are Good:
Evaluating the Impact of OR Traffic on Airborne Microbial Counts

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Background

- Hospital-acquired surgical site infections (SSI) are costly and occur in the operating room (OR) despite the use of best practices.
- OR **"traffic"** refers to the flow of OR personnel, door movement, & total personnel in the suite. Traffic can affect the airflow system and may be an important modifiable environmental risk factor for SSIs. Published door opening rates average 20-40/hour (range 10-90/hour)
- Researchers (Ogus et al., 2017; Harp 2018) have evaluated the influence of environmental factors on airborne microbial deposits on OR surfaces and established standards for orthopedic surgeries.
- Research on controlling environmental factors to limit SSI has not been reported for colorectal and/or hysterectomy, two procedures with increased risk for SSI, warranting study.

Study Aims:

- To describe current use of SSI prevention strategies and OR traffic patterns (door opening and personnel counts) during elective single-organ colon (COLO) and abdominal hysterectomy (HYST) cases
- To evaluate if traffic has an impact on airborne microbial counts.

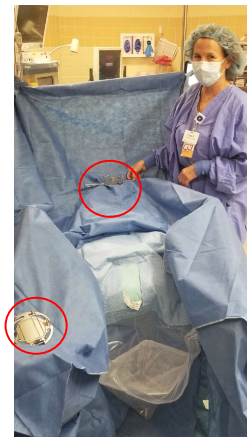
Methods

- Institutional Review Board expedited study (passive sampling, no contact; waived consent)
- Mixed methods, descriptive design
  - Facility assessments (rooms/practices)
  - Non-participant observation with microbial settle plate cultures

Figure 1. Clinical OR Study Team members oversaw microbial sampling and nonparticipant observations.

Methods *(continued)*

- **Settings**: Four hospitals within integrated system:
  COLO: Two large (>600 bed) urban hospitals
  HYST: Two community hospitals (<250 beds)
- **Sample**: Adults scheduled for elective single–organ procedures at study facilities when observer was available; Exclusions: preexisting preoperative wounds (class 3-4) or if wound class was adjusted during case.
- **Procedure: Microbial Deposit (MD) Sampling**
  - Sterile agar settle plates were opened & strategically placed by the scrub technician
  - Plates were set to lab, incubated x 72 hours with colony counts performed.



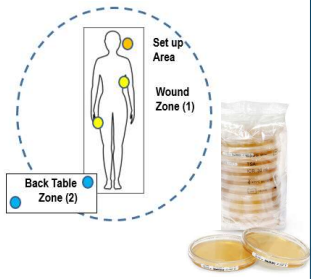
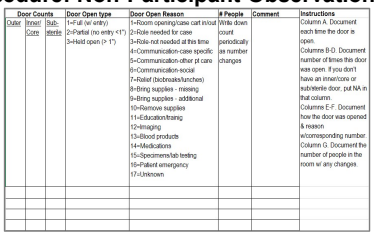


Figure 2. Agar settle plates were placed in set-up area, wound zone(1), & back table zone(2) to measure airborne microbial deposits (MD) during set-up and during case from incision start to close.

- **Procedure: Non-Participant Observations**



Door Counts			Door Open type	Door Open Reason	# People	Comment	Instructions
Outer	Inner/ Core	Sub-sterile	1=Full (w/ entry) 2=Partial (no entry +1*) 3=Held open (> 1*)	1=Room opening/case cart in/out 2=Role needed for case 3=Role not needed at this time 4=Communication-case specific 5=Communication-other pt care 6=Communication-social 7=Relief (bio/breaks/lunches) 8=Bring supplies - missing 9=Bring supplies - additional 10=Remove supplies 11=Education/training 12=Imaging 13=Blood products 14=Medications 15=Specimens/lab testing 16=Patient emergency 17=Unknown	Write down count periodically as number changes		Column A. Document each time the door is open. Columns B-D. Document number of times this door was open. If you don't have an inner/core or sub/sterile door, put NA in that column. Columns E-F. Document how the door was opened & reason w/corresponding number. Column G. Document the number of people in the room w/ any changes.

Figure 3. Data collection sheet describing door opening (time and type, role, reason for entry, and personnel counts

- **Procedure: Environmental Assessment**

Similar room size: Mean=6,023±1,376 cubic ft, Range 4,085–7,650)
Microbial deposit testing under simulated conditions yielded minimal to no growth prior to study.

Results

- All established clinical and environmental SSI prevention standards were in place including preop CHG, antibiotic dosing, glycemic control, normothermia, separate tray for wound closure.
- Cases (N=60): COLO (n=30) & HYST (n=30) involved patients with an average age of 57.2 years (SD= 16, range 26-90), female (80%), white (88%), nonsmokers (92%), non-diabetic (85%), and no prior hospitalization (95%).

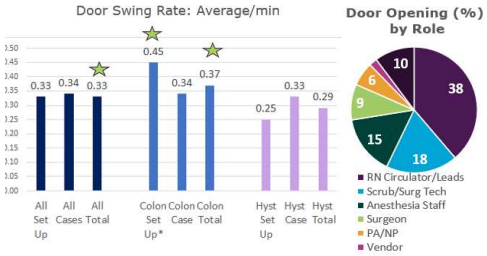


Figure 4. Average DO rate =0.33/min (20/hour.); Median=18/hour) COLO cases lasted significantly longer with more DO for supplies during setup and cases; Doors were opened by nurses (38%), scrub staff (18%), anesthesia (15%) & other (29%).

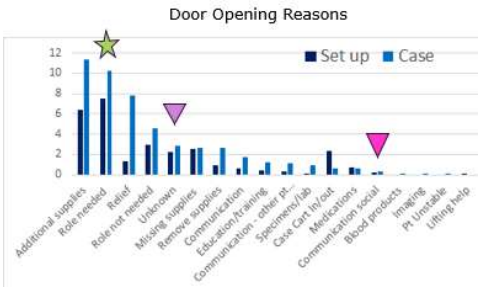


Figure 5 Most door openings were related to supplies, roles needed, and relief. Unknown was low; Social reasons were rare.

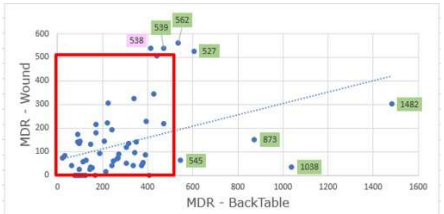
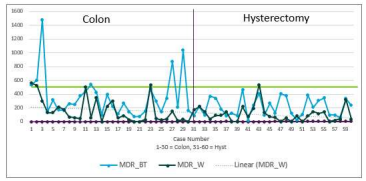


Figure 6. Microbial deposit rates (MDR) in the wound zone were below 510 most of the time (93%) . Benchmark (red box) was derived from calculations reported in orthopedics (Harp, 2018).

Results *(continued)*

Figure 7. MDR rates were lower and less variable in cases with standard set-up & supplies. One SSI was reported with low MDR.



Conclusions / Limitations

- The OR staff at all four sites utilized established environmental and clinical best practices to limit risk for SSI in colon and hysterectomy cases.
- Door openings/hour below published rates with limited non-essential traffic was observed.
- Microbial deposit rates were lower in cases with standardized procedures.
- Limited by convenience sample and potential for observer bias

Implications

- Study provided opportunity to increase OR staff awareness of the effect of traffic on microbial deposits.
- All staff are encouraged to identify ways to reduce variation and unnecessary traffic.
- This nurse-led study contributes to the growing scientific knowledge base for perioperative and infection prevention surgical care.

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Abstract, references, & contact information

Acknowledgements

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