The Effect of an Interdisciplinary QI Project to Reduce OR Foot Traffic 2.8

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Continuing Education Contact Hours

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The Effect of an Interdisciplinary QI Project to Reduce OR Foot Traffic 2.8 CE www.aorn.org/CE

CATHARINE J. ROVALDI, MS, MBA, BSN, RN, CNOR; PAUL J. KING, MD

ABSTRACT
We instituted a multidisciplinary educational and operational quality improvement initiative to assess the effect of process interventions on reducing OR door openings and, by extension, surgical site infections. From 2009 to 2012, we conducted an initial trial to gather information and identify reasons for door openings followed by a three-phase investigation that evaluated a total of 102 orthopedic hip and knee procedures in which we counted door openings from the time of incision to the closing of the capsule. We analyzed the effectiveness of door opening deterrents (eg, a pull shade, magnetic yellow caution tape across the door frame) and changes in traffic processes (eg, clear-covered implant carts). The interventions and process changes showed a 50% reduction in door openings compared to the baseline. AORN J 101 (June 2015) 667-678. © AORN, Inc, 2015. http://dx.doi.org/10.1016/j.aorn.2015.03.011

Key words: surgical site infection, SSI, foot traffic, door openings, door closings, traffic deterrents.
Annually, surgical site infections (SSIs) affect 2% to 5% of the approximately 500,000 patients undergoing inpatient surgery.1-3 Surgical site infections are costly (ie, $3,000 to $29,000 per SSI depending on the procedure and pathogen).3 These costs account for up to $10 billion of inpatient health care expenditures annually.1,3 Each year between 6,000 and 20,000 SSIs occur in patients who receive hip and knee replacements.4 Given the projected substantial increase of hip and knee replacements in the aging population, the number of SSIs will increase, along with the substantial economic burden of this surgical complication.5

Major SSI pathogen sources include patient factors, such as pre-existing medical conditions and type of resident skin bacteria, and factors connected with the surgical team, such as poor hand and scrub hygiene, inadequate instrument and equipment sterilization, breaks in sterile technique, and contamination from the OR environment.1,6,7 In addition to these sources of infection, the human body sheds skin and hair particles that could transmit microorganisms to the surgical site.8 Operating room ventilation system air flow into and out of the surgical suite also serves to dilute airborne microorganisms.9,10 However, foot traffic into and out of the OR can lead to airflow disruptions and airborne contamination.11-14

FOOT TRAFFIC AND THE OR ENVIRONMENT

Controlling the OR environment to maintain proper air flow is a worldwide issue.6 Current AORN guidelines recommend that access to an OR should be kept to a minimum during procedures.15 However, these guidelines do not include specific recommendations for OR staff with regard to foot traffic, which must be determined by the practice setting. In recent years, financial and inventory control measures have promoted a decrease in the availability of the amount of supplies stored in individual ORs and in the OR overall. An increased use of vendors to supply high-dollar inventory resources such as implants and instrumentation also has occurred. As a result, OR foot traffic has increased. RN circulators often must leave the room to obtain resources and vendors must move in and out of the OR with the required implants and instrumentation. The issue of increased foot traffic is widespread enough that The Joint Commission, as part of its SSI Change Project, is promoting a reduction in OR traffic as an effective practice to reduce SSIs.3

The quality measures from the Surgical Care Improvement Project (SCIP) are intended to reduce surgical complications and infections.16,17 These measures concentrate on preventing patient factors that contribute to SSIs and encouraging health care personnel to follow certain preventative care processes that can reduce infections.16 Few quality indicators focus on the operational aspects related to the surgical team, instrumentation, equipment, supplies, and the physical environment of the OR. The knowledge gap in operational aspects indicates a need for future research.

The presence of appropriate resources in the OR suite can reduce foot traffic; however, issues with instrumentation, supply and equipment availability, and the overscheduling of procedure resources are common in many OR suites. Counting the number of door openings during procedures is a simple quality measure that can provide a feedback loop for operational issues, serves as a measure of the OR team’s efficiency, and provides strategies to address SSI prevention.4

RELATIONSHIP BETWEEN OR FOOT TRAFFIC AND SSIs

Foot traffic in and out of the OR can lead to airflow disruptions and airborne contamination that may increase the risk of SSIs and can cause distractions that can lead to errors.11-14 Research has shown a positive correlation between OR door openings and elevated airborne bacterial counts.12,13 The duration of orthopedic procedures, for example, correlates with increased foot traffic and SSIs, emphasizing the importance of efficiency in the OR.18,19 Lynch et al18 reported a large percentage of door openings per hour across all specialties, but especially in cardiac surgery (48 door openings per hour), neurosurgery (42 door openings per hour), and orthopedic spinal fusions (50 door openings per hour) and total joint procedures (40 door openings per hour). Considering that it can take 20 seconds for a door to close, door openings could account for 15 to 20 minutes of every surgical hour.

Operating room ventilation systems create an environment that reduces airborne contaminate, but these systems cannot work effectively if the doors are opened frequently.9,10 High airborne particle concentrations may be generated if the air flow in the OR suite is turbulent rather than unidirectional.10 Door openings are one cause of air turbulence.10 Excessive foot traffic could be defined as the number of door openings needed to cause air flow turbulence that minimizes the effectiveness of the OR suite ventilation system.9,10
Studies examining the association between foot traffic and SSIs are mostly observational; researchers used the number of door openings in each study to assess the number of door openings during a certain period. However, counting door openings may introduce bias because staff behaviors may change in the presence of a surveyor and data interpretation may differ from one observer to another.  

Several studies have identified two time frames for increased foot traffic to occur during procedures: preincision and post-incision.  

A review of the literature found a limited number of studies that focused on foot traffic during orthopedic joint procedures. Lynch et al found that during orthopedic total joint surgery, there was an average of 40 door openings per hour, or 0.66 door openings per minute. A study by Panahi et al. found the mean rate of door openings to be 0.65 openings per minute for primary orthopedic procedures, while the mean rate of door openings increased to 0.84 openings per minute for revisions.

### Statement of Goal

Promoting good practice and examining foot traffic is an important topic. It is believed that OR staff members have ownership and control over many aspects of this issue. The goal of the project was to measure the number of door openings and then institute operational changes (eg, pull shades, use of magnetic caution tapes, clear-covered implant carts) and assess the success in minimizing or eliminating the causes of door openings and, by extension, the risk of infection. To do this, the opening of inner sterile core doors was monitored.

### Project Setting

Anne Arundel Medical Center, Annapolis, Maryland, is a 380-bed regional hospital with 20 ORs. Personnel perform more than 7,000 surgical procedures annually, 1,700 of which are joint procedures. The hospital is nationally recognized for its joint replacement center and is the state’s leading orthopedic center.

The facility’s OR Quality Unit Committee (QUC) consists of a senior nursing administrator, nursing director, nursing manager, staff nurses, and surgical technicians. The committee’s function is to identify nursing practice issues and resources needed at the bedside level of care and recommend and implement solutions. This committee reports to the surgical service line quality committee and the hospital-wide quality committee. These committees include hospital administrators, surgeons, anesthesia professionals, physicians, and nursing administrators.

From 2009 to 2012, members of the QUC initiated a multidisciplinary educational and operational quality improvement (QI) initiative to assess the effect of several operational changes to reduce room traffic as measured by door openings. Similar to other quality foot traffic projects, this project illustrated how cooperation among all team members can improve practice changes. The committees also received monthly SSI reports from members of the infection control department. These reports are aggregate statistics on knee/hip procedures. Because the statistics are general in nature, SSIs (using the different phases’ time frames) were used as reference to detect a change or trend in infection rates.

### Description of the Problem

The QUC made multiple attempts to reduce OR traffic, such as taping various handwritten signs across the inner OR door opening to alert personnel not to enter unless necessary (Figure 1). These efforts were inconsistently implemented and the practice was never formalized. Because the effect of this informal practice on door openings was somewhat successful, the QUC began to investigate current practices and found no formal procedure or policy for deterring foot traffic into and out of ORs. Signs to deter foot traffic had become ineffective. Magnetic signs stating “Do Not Enter” or “Implants in Use” were never removed from the doors; therefore, the signs’ effect on foot traffic and door openings were minimal (Figure 2). Members of the QUC observed an increase in foot traffic and the nurses confirmed their observation and provided their insights. For example, staff nurses felt they were leaving their rooms more frequently for various reasons and stated that the QUC was not counting door openings. To address this operational issue, the QUC members decided to conduct a trial.

### Initial Trial

The QUC team conducted a three-week observational trial across all specialties to identify the reasons for foot traffic in our OR. Committee members collected data during 33 procedures. The QUC team developed a form that listed reasons for door openings, and the circulator and scrub personnel
would track the activity by tic marks. Completed forms were turned in at the main OR desk.

During this initial trial, the team discovered how difficult it was for the RN circulator to count door openings and determine the reason for them. Even with the assistance of scrub personnel, there were a number of “unknown” entries on the data collection forms. The major barrier to asking either the RN circulator or the scrub person to monitor door openings was the difficulty performing their assigned roles simultaneously. Using this information, the committee planned to investigate devices that would minimize the observational counting process for the RN circulator and eliminate it for scrub personnel.

MATERIALS AND METHODS

The search for devices that would minimize the observational counting process for the circulator resulted in the use of wireless motion sensor door counters. The counter units have two parts—a sensor box and a counter indicator that displayed a number. The team labeled these parts with identical numbers so that the appropriate sensor was used with its associated counter indicator. The device fit our parameters of ease of use, portability, and ability to be reset. The counters also had the capability to chime, if desired, and the team felt that the counter’s chime might act as a deterrent for foot traffic. The door counters also were able to sense and count movement automatically, which would relieve the circulator of the need to count door openings. During the trial run, the chime proved to be more of an annoyance or distraction than a deterrent. The QUC team members reported the issue to the surgical service line committee, and, as a result, the committee recommended using the door counters without the chime.

The committee members created a form to collect data from the counter units. The data collection form included the date and type of procedure (ie, hip or knee), physician name, and the number of door openings, in addition to the time frame in which they occurred. On the data collection sheet, surgeons were identified by a letter (eg, A, B, C) so that those who performed the analyses were masked as to the surgeon, and no patient identifiers or information were collected. The QUC submitted this investigation to the Anne Arundel Medical Center institutional review board, which approved it under exempt status.

The committee conducted a three-phase investigation of the number of door openings during the postincision time frame of orthopedic knee and hip procedures. Each phase of the investigation lasted four weeks. During each phase of the investigation, the same physicians performed surgery according to their block schedule in the six OR suites. Suite assignments were maintained according to physician preference. Block scheduling enabled the team to use a convenience sampling technique and select procedures at random. The procedures
were all elective procedures, and committee members used the same counter units for all three phases.

INVESTIGATION PHASE: BASELINE

The first phase of the investigation was to collect baseline data. The QUC conducted this phase during the day shift; however, the night shift surgical technician placed the sensors and tested them by observing actual door openings and noting that the counted number indicated was the same. In addition, she ensured that each sensor and counter were labeled with the same number and passed out the data collection forms.

During the day, the RN circulators used motion sensor counters to count the number of door openings during the postincision time frame of procedures. One counter unit was used per room for the scheduled day’s procedures. The RN circulators ensured that the counters were set at zero and activated the units after the time out and before the incision was made. At the time of the closing count, each RN circulator noted the number on the counter indicator and recorded it on the data collection form. Committee members present in the OR randomly monitored the counters for intermittent periods, typically three to five minutes, to ensure accuracy.

The decision to count the door openings as the surgeon opened the patient’s joint capsule addressed the most critical time for infection prevention and integrated the use of the door counter with normal routines. By allowing staff members and the physician to focus on a manageable time frame of 40 to 45 minutes, the use of the counters was less intrusive. This structure allowed the QUC to divide, address, and manage the issues caused by door openings into preincision versus postincision phases. The orthopedic team leaders and/or the QUC team collected the counter units and data collection forms at the end of the day’s scheduled procedures and reviewed the forms for correct procedure type and that the surgeons’ names were coded with their assigned letter.

In this phase, the QUC learned that 40% of the traffic was at the postincision phase. The team began discussions about ways to reduce the traffic at this time. Procedural changes to reduce OR traffic that were suggested at this time by OR personnel, surgeons, anesthesia professionals, and vendors included

- using a pull-down shade on the OR door with the word “incision” visible after the shade was drawn halfway,
- placing caution tape with metal clips across the door frame, and
- bringing clear-covered implant carts with anticipated implant sizes into the room during the preincision phase.

INVESTIGATION PHASE 2: INTERVENTIONS

During phase 2, the team placed pull shades on the OR door windows to signal personnel not involved in the procedure that the surgeon had opened the patient’s joint capsule. The pull shade had the word “Incision” placed on its outside surface so that it would be seen from the inner sterile core area. The RN circulator was instructed to pull the shade halfway down the door’s window when the surgeon made the incision. The person assigned to the inner core located between ORs was instructed to place a caution tape across the door frame using magnetic clips. Finally, when needed, personnel brought clear-covered implant carts into the room that contained the anticipated implant sizes. The committee based the new process on input from OR personnel, surgeons, anesthesia professionals, and vendors provided during phase 1. Similar to the phase 1 protocol, the committee tracked the number of door openings, date and type of procedure, surgeon, and time frames using the same investigation instruments and counter units.

INVESTIGATION PHASE 3: SIX-MONTH FOLLOW-UP

We conducted a third unannounced four-week investigation in phase 3. The team tracked the form and data collection similar to the first two phases of the investigation using the same instruments and door counting units, using the same protocol as phases 1 and 2. In addition to the deterrents used in phase 2, verbal reinforcement and reminders were given to the staff by the OR team leaders, core person, and surgeons. An important aspect of this phase included the comparison between the first week, when the monitoring was unannounced and relatively unnoticed, and the final week, when word of mouth had spread awareness about the counter units’ presence, the effect of which the team wanted to determine. The team tracked monthly SSI reports and noted trends.

RESULTS

During the QI project, across all specialties, QUC members found that the five top reasons for unnecessary traffic in an OR were

- supply procurement,
- vendor foot traffic,
- warm solution and blanket acquisition,
- staff breaks, and
- communication.
Figure 3 indicates the reasons for door openings collected from this first project phase. Although identification of the reasons for door openings was the primary focus of the project, the team observed different reasons for door openings during the preincision and postincision time frame. During the preincision period, causes of door openings included supply procurement, sterility of trays, equipment requirements, and patient comfort items. Although many of the reasons overlap both periods, the main causes of door openings during the postincision period were communication, vendor foot traffic, and personnel reliefs.

Based on these data, the QUC team re-evaluated and edited physician preference cards, reviewed and adjusted the quantity of supplies available in the inner core, and addressed restocking issues. On recommendation from the QUC, hospital administrators purchased individualized room warmers to minimize foot traffic to retrieve warm blankets and fluids. Further, administrators sent a letter to the medical supply representatives citing the importance of reducing foot traffic. However, QUC members noted very little visible change in foot traffic. After these interventions, identified vendor foot traffic, communication, and staff breaks and reliefs as the primary reasons for failing to reduce foot traffic. They observed these issues mainly during the postincision phase of surgical procedures, and the behaviors were related to practice and behavior issues (eg, charge nurse checking on progress of procedure, untimely scrub person reliefs, vendors needing additional implant sizes or having to go into or out of the room for communication reason). To address specific behaviors, committee members narrowed the project to observing the orthopedics service line, hoping this strategy would improve the chances to effect change because of the support of the orthopedic surgeons, the orthopedic caseload, and the costly and devastating effects of SSIs on patients.

The data from the first phase of the three-phase investigation during 34 knee and hip procedures performed by six orthopedic surgeons using their routine practices indicated that an average of 26 door openings occurred per surgeon after he or she made the incision and before the closure of the capsule. Table 1 shows a comparison of the number of door openings in all phases (ie, baseline, postintervention, at six-month follow-up); Figure 4 illustrates the findings per surgeon in phase 1. The second phase of the investigation results show that the average number of openings dropped from 26 to 13. Figure 5 shows a comparison of the findings per surgeon after interventions to the baseline phase 1.

The aim of an unannounced phase 3 investigation six months after the phase 2 investigation was to see how much of a reduction in door openings had been maintained. Figure 6 depicts the occurrence of foot traffic in the third phase (ie, at six-month follow-up) per surgeon. Only five surgeons were able to participate in phase 2 and phase 3. Compared to phase 1, all surgeons maintained a reduction of door openings. However, compared to phase 2, the results were mixed. Two surgeons further reduced their door opening numbers, while three surgeons increased their numbers. The average number of door openings in phase 3 was 16 per procedure. The mean number of absolute door openings and door openings per minute was less in both phases 2 and 3 when compared to phase 1 ($P < .001$). There was no statistically significant difference between phase 2 and 3 or between surgeons in any phase. Table 2 compares number of door openings, while Table 3 compares the number of door openings per minute; Figures 7 and 8 are line graphs indicating the number of door openings and door openings per minute between phases 1, 2, and 3.

Figure 9 illustrates a reduction of door openings for all surgeons. The reduction in foot traffic per surgeon ranged from 32% to 75% from phase 1. The phase 1 through 3 comparison data also illustrate a reduction in foot traffic ranging from 16% to 56%.

Personnel in the infection control department receive surgical patient infection data from the orthopedic surgeons’
Table 1. Comparison of Door Openings Before and After Interventions to Reduce Foot Traffic

| Case | Surgeon A | | | Surgeon B | | | Surgeon C | | | Surgeon D | | | Surgeon E | | | Surgeon F | | |
|------|-----------|---|---|-----------|---|---|-----------|---|---|-----------|---|---|-----------|---|---|-----------|
|      | Baseline | Postintervention | 6-Month Follow-up | Baseline | Postintervention | 6-Month Follow-up | Baseline | Postintervention | 6-Month Follow-up | Baseline | Postintervention | 6-Month Follow-up | Baseline | Postintervention | 6-Month Follow-up |
|      | Phase 1  | Phase 2  | Phase 3  | Phase 1  | Phase 2  | Phase 3  | Phase 1  | Phase 2  | Phase 3  | Phase 1  | Phase 2  | Phase 3  | Phase 1  | Phase 2  | Phase 3  |
| 1    | 18       | 6       | 18      | 32       | 6       | 21      | 36<sup>b</sup> | 9       | 28      | 24       | 12      | 24      | 31<sup>b</sup> | 15<sup>b</sup> | 26<sup>b</sup> |
| 2    | 24<sup>b</sup> | 17    | 15<sup>b</sup> | 10       | 13      | 24       | 12      | 24      | 31<sup>b</sup> | 15<sup>b</sup> |
| 3    | 16       | 25<sup>b</sup> | 11      | 8        | 32       | 25<sup>b</sup> | 26<sup>b</sup> |
| 4    | 20       | 14      | 25      |          |          |          |          |          |          |          |          |          |          |          |          |
| 5    | 17       | 18      | 6       |          |          |          |          |          |          |          |          |          |          |          |          |
| 6    | 21       | 11      | 9       |          |          |          |          |          |          |          |          |          |          |          |          |
| 7    | 31       | 15      | 7       |          |          |          |          |          |          |          |          |          |          |          |          |
| 8    | 31       | 8       | 3       |          |          |          |          |          |          |          |          |          |          |          |          |
| 9    |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| 10   |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Avg  | 22       | 14      | 12      | 32       | 8       | 14      | 31       | 15      | 26      |          |          |          |          |          |          |

<sup>a</sup> Averages (Avg) are rounded to nearest whole number.

<sup>b</sup> Hip surgery.
offices and track them for a year: this was included in a previous section. The orthopedic infection rate is low (ie, less than one SSI per 100 patients). Using the monthly tracking data, the QUC team did not see any changes in orthopedic SSI rates.

**DISCUSSION**

Implementing process changes achieved a reduction in door openings. During phase 1, the average of 26 door openings per orthopedic surgery decreased to 13 (50%). This 50% reduction in door openings was not maintained after six months, and it increased to 16 door openings (ie, a 38% reduction) compared to the baseline in phase 1.

Committee members presented the phase 1 investigation results at various meetings to physicians, administrators, and OR staff. This allowed all disciplines the opportunity to provide immediate feedback. The QUC team held a raffle to solicit suggestions to reduce foot traffic and to promote both discussion and creativity. Every suggestion was rewarded with a raffle ticket; the more suggestions, the better the chances to win. At the next staff meeting, they presented a summary of all the suggestions and awarded gift certificates. Two $50 and one $25 gift certificates were given to two RNs and one surgical technician who submitted the winning suggestions to reduce foot traffic by the use of pull shades on the sterile core windows, the use of magnetic yellow caution tape across the door frame (Figure 10), and clear-covered implant carts.

The environment of transformation created by phase 1 led to the dramatic reduction in door openings seen in phase 2 (ie, 26 openings reduced to 13, or 50%). “Key Champions” (including members of the medical staff) helped engage staff members in the change process by facilitating positive results. Without the support of these champions and without pressure for cooperation from all, the results would not have been as significant. Heightened awareness of the actual number of door openings in addition to the solicitation of suggestions to reduce foot traffic promoted education and engagement in the process. The time the team invested to listen to staff members, organize and carry out the investigation, and then help educate all team members, in addition to updating and posting the actual foot traffic reduction numbers on the surgical services quality board, helped move the project forward.

Policy revisions reinforced and further promoted behavior change. The perioperative department instituted a policy stating that scrub personnel could not be relieved during the

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**Figure 4.** Phase 1 investigation, no interventions.

**Figure 5.** Comparison of phase 1 and phase 2.

**Figure 6.** Results of the foot traffic phase 3 investigation.
joint replacement procedures until the surgeon had implanted
the prosthesis. The charge person paid special attention to
lunch and dinner assignments daily and further promoted
scrub person relief within the new parameters. In addition,
personnel altered procedure scheduling practices. Surgeons
were given use of two OR suites during their block time. This
allowed the surgeon to alternate rooms and enabled each room
team to consolidate their break times so that relief during the
procedures was not necessary and consistency of staff
was achieved.

During the investigation, respondents cited vendor foot traffic
as the second highest reason for door opening. By providing a
portable clear-covered cart located in the OR that could hold
several sizes of implant components, the vendor representatives
were able to avoid exposing the implant boxes to cross-
contamination. The availability of the implants on the cart
helped minimize the number of times vendors left the OR
suite. The cart’s organization made it easy for the RN circu-
lator to step in and access the proper size when the vendor was
unavailable.

The pull shade intervention appeared to deter OR personnel
from entering the OR suite during the specified time. Drawing
the shade only halfway allowed outside personnel the ability to
observe the room’s status. The occasional failure to return the
pull shade to its original position was corrected through verbal
reinforcement from orthopedic team leaders and core persons.
Although the yellow magnetic tape was a good suggestion,
often draping the tape on the door frame was forgotten. It was
difficult to judge its effectiveness.

The limitations of the project are that it was relatively small,
only examined orthopedic cases, did not provide similar OR
environments, and the counter units were visible. As time
passed, awareness of the counter units dulled and their pres-
ence became less conspicuous; however, their presence may
have influenced individual behavior patterns in all three phases.

The QUC team recommended that periodic monitoring of
foot traffic into and out of ORs be continued and suggested
changing the design of the pull shade deterrent. Periodic
monitoring, changing of pull shade design, and reporting of
the results at various meetings may prevent complacency and
remind personnel of the importance of reducing foot traffic.
Periodic education on the effect of foot traffic on SSI rates is of
critical importance. In-services on the ventilation system and
how it is affected by door openings, the number of personnel
in the room, and forced air warming emissions are just a few
topics that should be discussed. Education with periodic
monitoring is one method to maintain and improve current
practices. To monitor various improvements effectively, a
door counter system capable of sensing both the number of
door openings and the actual number of individuals going in
and out would be ideal. The device would need to have the
capability of measuring certain time frames that were either
set manually or by computer.

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<th>Table 2. Phase Comparison of Number of Door Openings</th>
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<td>Phase 2 (intervention) vs Phase 1 (baseline)</td>
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<th>Table 3. Phase Comparison of Number of Door Openings per Minute</th>
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CONCLUSION

Operating room traffic is an important quality measure to reduce SSIs. Foot traffic and door openings not only negatively affect the risk of infection, but tracking patterns of opening doors can also indicate areas of inefficiency in the daily operational system. Daily tracking of door openings can provide immediate feedback to help analyze these inefficiencies. Analyzing the reasons for OR traffic is important to the success of any intervention implemented. Obstacles the QUC team members noticed pertained to updated surgeons’ preference cards, hospital inventory, and restocking processes. However, the primary obstacle to monitoring and reducing foot traffic remains the counting process itself.

The widespread use of electronic medical records (EMRs) may allow for the use of new technologies to better study the OR environment. A large number of surgical procedures would be required to adequately power a study of the relationship between OR traffic, airflow disruption, and increased infection risk. New technologies may allow for wireless communication between EMR systems and devices monitoring the OR environment, such as the door sensors used in this project. The seamless collection of case-specific data in adequate numbers could answer important questions about the effect of the OR environment on patient outcomes.

Figure 7. Line graph illustrates the number of door openings and their confidence intervals between phases 1, 2, and 3.

Figure 8. Line graph illustrates the number of door openings and door openings per minute between phases 1, 2, and 3.

Figure 9. Comparison of phase 1, phase 2, and phase 3 investigation results.

Figure 10. Pull shade labeled with “Incision” and caution tape applied to the OR door to alert staff not to enter.
KEY TAKEAWAYS FOR CLINICAL PRACTICE

The Effect of an Interdisciplinary QI Project to Reduce OR Foot Traffic

WHY DID WE DO THIS QUALITY IMPROVEMENT (QI) PROJECT?
- This QI project was undertaken to minimize the foot traffic into and out of OR suites during surgical procedures.

WHAT DID WE FIND?
- Our improvement efforts were focused on the following:
  - reducing OR foot traffic related to vendors in the OR, communication, and break and lunch reliefs;
  - increasing awareness;
  - educating personnel;
  - eliciting suggestions/input for reducing foot traffic from all OR team members; and
  - standardizing practice based on project input.
- Key champions helped motivate team member to initiate change.
- Timely reporting and feedback improved staff buy-in.
- During the phase 2 interventions, a 50% reduction in door openings was found, and during the phase 3 six-month follow-up, there was a 38% reduction.

HOW CAN CLINICIANS USE THESE RESULTS?
- **Clinician:** Perioperative team members share in the responsibility of infection prevention. Therefore, maintaining an environment that decreases the risk of infection is significant. Nurses should be prepared to participate in QI activities focused on reducing foot traffic and identify factors that promote traffic.
- **Manager:** Managers should monitor door openings for identifying workflow issues and promote operational efficiency.
- **Educator:** Educators should provide training and in-service programs to all perioperative team members about the OR environment and how it relates to patient infection.


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References


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Continuing Education: The Effect of an Interdisciplinary QI Project to Reduce OR Foot Traffic

2.8 CE www.aorn.org/CE

PURPOSE/GOAL
To provide the learner with knowledge specific to ways in which OR foot traffic can be reduced.

OBJECTIVES
1. Discuss surgical site infections (SSIs).
2. Describe how foot traffic affects the OR environment and the risk for SSIs.
3. Discuss the methods this project evaluated for reducing OR foot traffic.

The Examination and Learner Evaluation are printed here for your convenience. To receive continuing education credit, you must complete the online Examination and Learner Evaluation at http://www.aorn.org/CE.

QUESTIONS
1. Surgical site infections (SSIs) affect ____________ of the approximately 500,000 patients undergoing inpatient surgery annually.
   a. 2% to 5%  b. 3% to 6%
   c. 8% to 10%  d. 10% to 15%

2. Surgical site infections account for up to $10 billion of inpatient health care expenditures annually.
   a. true  b. false

3. Major SSI pathogen sources include
   1. the patient’s pre-existing medical conditions and type of resident skin bacteria.
   2. poor hand and scrub hygiene.
   3. inadequate instrument and equipment sterilization.
   4. breaks in technique.
   5. contamination from OR environment.
   6. airflow into and out of the OR.
      a. 1, 3, and 5  b. 2, 4, and 6
      c. 2, 3, 5, and 6  d. 1, 2, 3, 4, 5, and 6

4. Current AORN guidelines
   1. recommend that OR traffic should be kept to a minimum during procedures.
   2. are very explicit about the means to reduce foot traffic in the OR.
   3. do not include specific recommendations for OR staff behavior with regard to foot traffic, which must be determined by the practice setting.
      a. 1 and 2  b. 1 and 3
      c. 2 and 3  d. 1, 2, and 3

5. Reasons that OR foot traffic has increased in recent years include the following:
   1. There has been an increase in the number of students in the OR.
   2. There is an increased use of vendors to supply high-dollar inventory resources, such as implants and instrumentation.
   3. RN circulators often leave the room to obtain resources.
   4. Vendors move in and out of the OR with needed implants and instrumentation.
5. Financial and inventory control measures have resulted in a decrease in the availability of resources, such as the number of supplies stored in both individual rooms and in the OR overall.

6. Operating room sizes have increased.
   a. 1, 3, and 5    b. 2, 4, and 6
   c. 2, 3, 4, and 5  d. 1, 2, 3, 4, 5, and 6

6. How does foot traffic affect the OR?
   1. Foot traffic into and out of the OR can lead to airflow disruptions.
   2. Airborne contamination from airflow issues may increase the risk of SSIs.
   3. It can cause distractions that can lead to potential errors.
   4. Research has shown a positive correlation between OR door openings and elevated airborne bacterial counts.
      a. 1 and 3    b. 2 and 4
      c. 1, 2, and 4  d. 1, 2, 3, and 4

7. How do OR ventilation systems affect the OR?
   1. Create an environment that reduces airborne contains.
   2. Cannot work effectively if the doors are opened frequently.
   3. Airflow is unidirectional to reduce high airborne particle concentrations.
   4. Airflow turbulence minimizes the effectiveness of the OR suite ventilation system.
   5. Door openings (eg, excessive foot traffic) are one of the causes of air turbulence.
      a. 4 and 5    b. 1, 2, and 3
      c. 1, 2, 3, and 4  d. 1, 2, 3, 4, and 5

8. Efforts that the authors described that had some effect on reducing foot traffic (eg, magnetic signs placed on OR doors stating “Do Not Enter” and/or “Implants in Use”, placing tape attached to various handwritten signs across the inner OR door opening) were effective in reducing foot traffic.
   a. true    b. false

9. Based on a preliminary survey, what interventions did the committee undertake?
   1. Edited preference cards.
   2. Reviewed and adjusted the quantity of supplies available in the inner core.
   3. Purchased individualized room warmers.
   4. Sent a letter to the medical supply representatives citing the importance of reducing foot traffic.
      a. 1 and 3    b. 2 and 4
      c. 1, 2, and 4  d. 1, 2, 3, and 4

10. To determine the actual number of door openings, what did the committee do?
    1. Conducted three four-week investigations on the number of door openings during the postincision phase of orthopedic knee and hip procedures.
    2. Maintained suite assignments according to physician preference.
    3. Monitored only elective procedures.
    4. Used the same counter units for all three surveys.
    5. Used a convenience sampling technique, and procedures were selected at random.
    6. Identified surgeons by name and patient.
       a. 1, 3, and 5    b. 2, 4, and 6
       c. 1, 2, 3, 4, and 5  d. 1, 2, 3, 4, 5, and 6
Continuing Education: The Effect of an Interdisciplinary QI Project to Reduce OR Foot Traffic

2.8 CE www.aorn.org/CE

This evaluation is used to determine the extent to which this continuing education program met your learning needs. The evaluation is printed here for your convenience. To receive continuing education credit, you must complete the online Examination and Learner Evaluation at http://www.aorn.org/CE. Rate the items as described below.

OBJECTIVES
To what extent were the following objectives of this continuing education program achieved?
1. Discuss surgical site infections (SSIs).
   Low 1. 2. 3. 4. 5. High
2. Describe how foot traffic affects the OR environment and the risk for SSIs.
   Low 1. 2. 3. 4. 5. High
3. Discuss the methods this project evaluated for reducing OR foot traffic.
   Low 1. 2. 3. 4. 5. High

CONTENT
4. To what extent did this article increase your knowledge of the subject matter?
   Low 1. 2. 3. 4. 5. High
5. To what extent were your individual objectives met?
   Low 1. 2. 3. 4. 5. High
6. Will you be able to use the information from this article in your work setting?
   1. Yes 2. No
7. Will you change your practice as a result of reading this article? (If yes, answer question #7A. If no, answer question #7B.)

7A. How will you change your practice? (Select all that apply)
   1. I will provide education to my team regarding why change is needed.
   2. I will work with management to change/implement a policy and procedure.
   3. I will plan an informational meeting with physicians to seek their input and acceptance of the need for change.
   4. I will implement change and evaluate the effect of the change at regular intervals until the change is incorporated as best practice.
5. Other: ____________________________

7B. If you will not change your practice as a result of reading this article, why? (Select all that apply)
   1. The content of the article is not relevant to my practice.
   2. I do not have enough time to teach others about the purpose of the needed change.
   3. I do not have management support to make a change.
5. Other: ____________________________

8. Our accrediting body requires that we verify the time you needed to complete the 2.8 continuing education contact hour (168-minute) program: ____________________________