

# Study finds too much foot traffic in and out of operating rooms

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A "secret shopper" style study by researchers at Johns Hopkins analyzing foot traffic in and out of operating rooms suggests that for the sake of patient safety, OR teams may want to stay put more often.

For the study, published online Nov. 11 in the journal *Orthopedics*, investigators tracked the number and length of door openings during nearly 200 knee and hip arthroplasty surgeries performed at Johns Hopkins Bayview Medical Center over three months. They found enough door openings in nearly one-third of the procedures to potentially defeat the safety effects of so-called positive pressure systems meant to keep germ-contaminated air out of sterile ORs.

Most operating rooms in U. S. hospitals are fitted with systems that keep them at an atmospheric pressure slightly higher than the surrounding corridors. The design allows air to flow out of the OR when doors open, which prevents air potentially contaminated with infection-causing germs from flowing into the OR. However, positive pressure systems can become overwhelmed when doors open too many times in quick succession or stay open too long.

Excessive OR traffic, the researchers say, is believed to be a common occurrence not unique to Johns Hopkins, and previous studies have documented frequent OR door openings during cardiac surgeries performed elsewhere.

"Our findings add to a growing body of evidence of a relatively common

practice that could be a potential safety concern, and raises questions about why doors get opened and how we can prevent or minimize the frequency and duration of behaviors that could compromise OR sterility," says study senior author Stephen Belkoff, Ph.D., M.P.H., an associate professor in the Johns Hopkins University School of Medicine's Department of Orthopaedic Surgery and the director of the International Center for Orthopaedic Advancement.

Because the research team monitored door openings without the knowledge of OR staff, it's impossible to say why they occurred in the first place.

"What we know for sure is that there was a whole lot more traffic in and out of the OR than seems necessary or easily explained," Belkoff says.

There was a single case of [postoperative infection](#) in the 191 surgeries monitored for excessive door openings, Belkoff notes, emphasizing that the cause of that infection was unknown. In addition, he says, infections are quite rare for arthroplasties, both at Johns Hopkins and in general. Indeed, Belkoff says, [infection rates](#) for knee and joint replacement at Johns Hopkins Bayview Medical Center stand at less than 0.33 percent and 0.66 percent, respectively, well below the national averages of 0.89 percent for knee replacement and 1.26 percent for hip replacement.

"Yes, we have low infection rates, and yes, we take great many precautions, but we cannot be complacent, and we must remain vigilant about practices that pose risk—theoretical or otherwise," says co-investigator Simon Mears, M.D., Ph.D. "Excessive door opening is one such practice."

Door openings during surgery, the researchers say, could represent an easily modifiable risk factor.

"Undoubtedly, a handful of door openings during surgery are necessary and unavoidable," Belkoff says. "What we ought to figure out next is what's causing the unnecessary and avoidable ones."

Part of the solution, the researchers say, could be simply planning better to ensure all necessary materials and equipment are pre-stocked before surgery starts so there's no need to shuffle in and out of the room once the procedure begins.

To determine whether excessive door openings were taking place during procedures in his own department, Belkoff, along with colleagues Renee Blanding, M.D., an assistant professor of anesthesiology and critical care medicine at the Johns Hopkins University School of Medicine, and Mears, a former Johns Hopkins orthopaedic surgeon now practicing at Baylor Regional Medical Center in Plano, Texas, studied knee and hip arthroplasty procedures performed March to June 2011 at Johns Hopkins Bayview Medical Center. These procedures, which replace, remodel or realign knee and hip joints, represent some of the most common surgeries in their specialty.

The researchers used sensors inside and outside ORs used for these procedures to measure when a door opened, how long it stayed open, pressure in the OR and pressure in the surrounding corridors. They also tracked how long each procedure took from "cut to close," or the total time in which patients were actively operated on, excluding setup and cleanup time. Then they checked for patients who developed postoperative infections.

Of the 100 knee arthroplasties and 91 hip arthroplasties performed during the study time, doors opened on average every 2.5 minutes. That's a door-open time of 9.6 minutes per average case, which lasted about an hour and a half. And it accounted for about 9 percent of the total cut-to-close time, Belkoff says. In 77 of the 191 cases, doors were open long

enough to compromise the ORs' positive pressure systems, allowing air from surrounding corridors to flow inside.

Beyond potential contamination from airflow, Belkoff and the authors say, excessive foot traffic could suggest distraction among OR staff or simply logistical or personnel management inefficiencies, underscoring the need to find out the reasons behind frequent door opening.

Because the infection rates for these procedures are so low, says Mears, researchers would need to study data from many more such surgeries to determine whether variations in foot traffic could affect patients' postoperative infection rates.

Provided by Johns Hopkins University School of Medicine

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