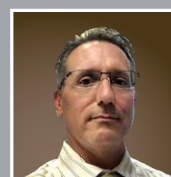


STRATEGIES FOR IMPROVING EFFICIENCY AND INFECTION CONTROL DURING OPERATING ROOM TURNOVER

LEARNING OBJECTIVES

1. Identify current challenges facing surgical departments
2. Review definitions for turnover time (TOT)
3. Establish methods for best practices for operating room (O.R.) turnover
4. Examine opportunities resulting from a comprehensive O.R. turnover program
5. Evaluate long-term effectiveness with surveys and programs



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CURRENT CHALLENGES FACING SURGICAL DEPARTMENTS

Several challenges are faced in healthcare today. An examination of the specifics of surgical departments in the hospital and/or surgical centers shall elucidate the many issues and opportunities to improve efficiency and operating room turnover. We shall identify a few current issues and process challenges facing this department in this review. One issue of note is the complexity and process challenges from turnover time (TOT), which is, simply put, the time it takes to ready the room for the next case. The increased cost associated with these delays negatively impacts the healthcare system itself. Moreover, these delays can also impact patient care and satisfaction. This is a critical time for ensuring patient safety and preventing infection.

To accomplish such a goal, the implementation of leadership strategies becomes paramount for improving efficiency and infection control. There is a required emphasis on well-managed surgery departments that can assist with providing safe and effective care to a patient. Part of the emphasis starts with managing TOTs using a process improvement methodology. Part of this transformation consists of training, establishing, and applying standard operating procedures (SOPs), data collection, improving variation with technology and equipment, and maintaining optimal control through the use of high-quality disposable products such as turnover kits.

By implementing process improvement strategies, operating room turnover can be made more efficient, and infection control can be improved. What is more, such strategical innovation can lead to better patient outcomes and a safer operating room environment while simultaneously optimizing performance and reducing associated costs.

In a 2019 publication by Lee et al., improving O.R. efficiency can benefit the health system by improving patient outcomes and costs.¹

Operating room (O.R.) turnover time (TOT) is a complex issue with a significant impact on hospitals, staff, and patients. A 2011 study by Cima et al. found that maximizing O.R. efficiency is essential to maintaining an economically viable institution.²

There are many factors that can contribute to long O.R. TOTs, including:

- Inadequate staffing: Not having enough staff, such as anesthesia providers, nurses, or environmental services staff, can lead to delays in cleaning and preparing the O.R. for the next patient.
- Supply and equipment issues: Not having the necessary supplies or equipment, such as bed linens or mops, can also lead to delays.
- Random unplanned events: Unexpected events, such as a missing or broken transfer device, can also delay O.R. TOT.
- Patient acuity: Patients with more complex medical needs may require more time to prepare for surgery, which can also lead to delays.
- Inconsistent practices: If staff members do not follow the same procedures for cleaning and preparing the O.R., this can also lead to delays.

The creation of O.R. TOT affects the health system and the individuals by whom it is comprised, such as surgeons, staff members, and patients, in numerous ways. For surgeons, the time lost transitioning from one case to the next is considered non-productive and is often the cause of surgeon dissatisfaction and complaints. For hospital administrators, O.R. TOT is a non-productive period since the time lost prepping the O.R. is most often neither reimbursed nor allocated on a shared cost basis. This O.R. downtime negatively affects return on investment (ROI), overall productivity, and reimbursement. Inefficient and lengthy room turnover times can result in thousands of dollars in lost revenue. The cost per O.R. minute ranges from US\$29 to US\$80.³ In an era of decreasing reimbursement and heavy schedules this leads to increased pressure to improve TOT efficiency by hospital administrators, especially O.R. managers and staff. No bigger impact can be felt than that which is experienced by the patient. Not only may the patient be exhibiting acute pain or serious morbidity, but the time spent waiting for their surgery is often stressful.

UNDERSTANDING TURNOVER TIME (TOT)

The term “turnover time” (TOT) has been used to describe different aspects of the turnover process. Thus, it is important to note that there is no single “correct” definition of TOT. The definition that is most appropriate for a particular facility will depend on the specific factors that are important to that facility. For example, a facility that is focused on reducing delays may use a definition that includes the time it takes to clean up any spills or messes. A facility that is focused on efficiency may use a definition that excludes gaps and delays.

- Mathias (2000) defines TOT as the time needed to set up and clean up for the same procedure, excluding gaps and delays. This definition focuses on the time it takes to prepare the O.R. for the next patient, without taking into account any unexpected events that may delay the process.⁴
- Mowbray (2003) explains that TOT is the sum of the set-up time and room clean-up time plus delayed time for the same case. This definition includes the time it takes to clean up any spills or messes that occurred during the previous case, as well as any delays that may have occurred.⁵

- Adams (2004) positions turnover time as the overall turnaround time from when a surgeon leaves the O.R. after completing a case to when the surgeon arrives in the O.R. for the following case. This definition takes into account the entire process of turnover, from the time the surgeon leaves the O.R. until the time they are ready to start the next case.⁶

Most facilities use the definition of TOT proposed by the Association of Anesthesia Clinical Directors (AACD) which is “wheels out to wheels in.” This definition measures the time it takes from the moment the patient is wheeled out of the O.R. until the moment the next patient is wheeled in.^{7,8}

Completing the turnover process can require members from the Environmental Services (EVS) team to work with others on the surgical team participating in duties, ranging from gathering supplies and equipment to assembling those items or cleaning the room. Ultimately, the definition of TOT that is used should be the one that best reflects the goals of the facility.

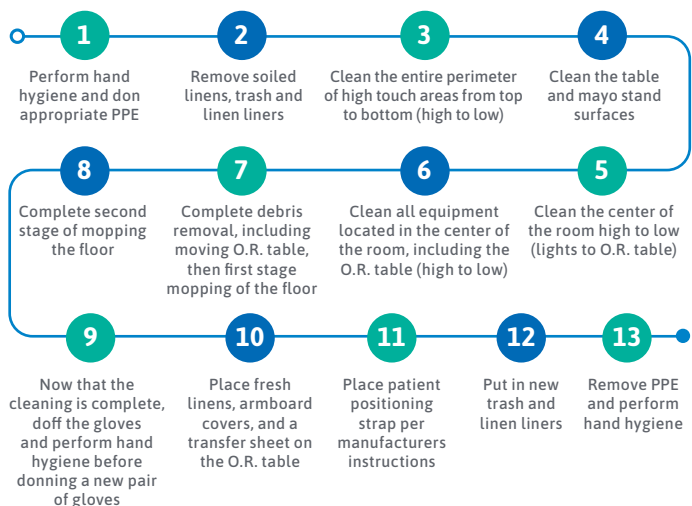
O.R. TURNOVER METHODS OF BEST PRACTICE

Clearly, well-defined roles and responsibilities must be in place for cleaning all environmental surfaces and equipment to ensure optimal effectiveness. The use of Standard Operating Procedures (SOPs) and checklists are but a couple of methods by which to achieve this. Routine observational surveys are helpful to examine current practices and identify gaps and potential opportunities for process improvement. This can also assist in identifying TOT deficiencies which can negatively impact surgeons, staff, patients, and overall productivity. Establishing a baseline and thereafter repeating the assessment periodically will help monitor the long-term sustainability of practice improvements. Using recommendations from your local perioperative nursing body, such as the guidelines for environmental cleaning offered by the U.S. peak body Association for periOperative Registered Nursing (AORN), can assist in identifying opportunities for best practices to improve overall room turnover.⁹ AORN recommends the use of a standardized cleaning checklist, ensuring O.R. hygiene procedures are standardized and applied universally.

The O.R. environment encompasses multiple surface types and equipment, all of which require cleaning and disinfection. Teamwork and designated roles guarantee there is accountability for each of these areas. A U.S. multi-society expert opinion document recommended in 2015 the use of a checklist to make sure all surfaces are cleaned and disinfected as part of a bundled approach for an effective cleaning program.¹⁰

An O.R. turnover process chart is shown below, and it is a useful tool that O.R. teams can adopt to outline the proper order of cleaning and disinfection tasks. In this procedure, clear roles should be defined for each staff member participating in the cleaning process to ensure optimal efficiency and cleaning so that nothing is overlooked.

O.R. Environmental Cleaning Process







Another newer tool to assist with environmental hygiene assessment is the use of Adenosine Triphosphate (ATP) bioluminescence assay testing. ATP testing is a quick and easy method that utilizes a swab to sample and test a variety of surfaces. The test is based on Relative Light Units (RLUs) and provides an objective numerical result showing the amount of ATP or contaminant remaining on the surface. The higher the RLU, the greater the amount of contamination present. By using the data collected, the O.R. can be measured for the effectiveness of the cleaning process it underwent. The data can also be used as a follow-up for monitoring implemented practice changes. It is a powerful tool that can train personnel on the importance of effective cleaning practices and protocol adherence.

ATP testing combined with routine observational surveys provides an effective quality check for overall room turnover and helps improve standardization and efficiency for the turnover team. Using the same tools to reassess and routinely monitor practices over the long term can assist in identifying overall compliance and future opportunities for review, training, and improvement.

Quality of care is the number one priority for every institution. While turnover speed is important, it must be balanced with excellent quality standards to ensure optimal clinical outcomes. Using the aforementioned tools helps to define and prioritize focus on those standards of practice that are most important to ensure cleanliness to prevent infection. Barriers should be positioned around the procedures in places where practice cannot be modified as part of the efficiency process. Rushing through room turnover, or ‘Trash-and-Dash,’ as it’s sometimes called, places staff and patients at risk.

Studies assessing O.R. environmental cleanliness have indicated suboptimal levels where such activities have occurred. A study by Jefferson et al. (2011) evaluated 71 operating rooms in six acute-care hospitals and found a mean daily cleaning rate of 25% based on the objects monitored.¹² As part of appropriate infection prevention and control measures in the O.R., inanimate surfaces benefit from established cleaning and disinfection practices, as they decrease patient complications such as surgical site infection (SSI). There should be no doubt that the O.R. environment plays a major role in healthcare associated infections (HAIs). These infections cause significant patient morbidity and mortality and place an immense burden of costs on healthcare systems.¹³⁻¹⁴

Infection Control

 <p>Healthcare associated infections (HAIs) occur nearly 2 million times each year in the U.S. alone¹¹</p>	 <p>Surgical Site Infections (SSIs) occurring in surgical procedures account for 20% of all HAIs¹⁴</p>
 <p>Resulting in costs of \$36 to 45 billion annually in the U.S.¹³</p>	 <p>Resulting in annual costs of \$3.5 to 10 billion US Dollars, none of which are reimbursable¹³</p>

BENEFITS RESULTING FROM A COMPREHENSIVE O.R. TURNOVER PROGRAM

To lessen the risk of SSIs, hospitals and staff employ an assortment of preventive measures to assist with nullifying the hazards of contamination posed by the O.R. environment. A 2014 study published in the Journal of Surgical Infections found evidence demonstrating how the inanimate environment of the O.R. can become contaminated with harmful pathogens. These pathogens can then be transferred to the patient by the provider's hands, potentially increasing the likelihood of an SSI.¹⁵ The possibility of transmission of organisms from the surgical environment to patients is a concern due to the many interactions between patients, HCWs' hands, and environmental surfaces throughout each shift. Adopting and working with consistent products, processes, and practices to ensure that each patient is provided with the safest environment possible can assist with SSI prevention.

One important opportunity for improving infection and quality of care while streamlining cleaning procedures is the use of customizable disposable room turnover kits.

Custom, pre-assembled kits include all the items needed to turn over the room quickly and efficiently, including disposable linens, patient safety straps, mop heads, replacement waste bags, and fluid solidifier. These items help reduce turnover time and potentially add thousands of dollars back into the revenue stream over time.

As with other medical devices, the benefits of added antimicrobial properties have seen the introduction of room turnover linen containing antimicrobial, super-absorbent, low-lint, and disposable linens, thus protecting the patient from harmful bacteria and viruses that may be harbored in the cracks and crevices of the O.R. mattress. According to a 2016 cross-sectional study published in the American Journal of Infection Control, hospital mattresses can be contaminated with microorganisms. The most common species of microorganisms discovered included *Acinetobacter baumannii* (69.2%), *Klebsiella pneumoniae* (11.5%), and *Pseudomonas aeruginosa* (11.5%).¹⁶

This data supports how soiled and damaged mattresses can be a source of cross-contamination. From January 2011 to January 2013, the U.S. Food and Drug Administration (FDA) received 485 reports regarding hospital bed mattress covers failing to prevent blood and body fluids from leaking into the mattress and placing patients at risk for infection.¹⁷

These figures reinforce how interactions between surfaces, HCWs, and the overall O.R. environment play an important role in the transmission of microorganisms. Considering the risk, one antimicrobial product on the market offers an extra level of protection and has been tested against more serious microorganisms such as CRE, E.coli, MRSA, and more recently SARS-CoV-2.¹⁸

Healthcare workers need to consider the reusable linen used to make O.R. beds. A 2018 study by Truscott stated that microscopic debris from reusable linens can cause SSIs. Truscott recommends selecting low-linting or lint-free products whenever possible to create a lint-free environment.¹⁹ Another important benefit to consider is that disposable linens can assist in the reduction of moisture-associated skin damage as the disposable covers wick away moisture that can damage skin integrity.²⁰

With the O.R. being one of the most critical and sensitive areas of the hospital's revenue producing departments, the focus on room turnover efficiency is generally a top priority. Hospitals that have utilized a unique combination of disposable products in room turnover kits, along with standardized practices, staff education, and ongoing monitoring have been able to decrease TOT. The overall industry best practice O.R. TOT is below 30 minutes;²¹ however, that can certainly depend on several factors, including the type and intensity of the surgical case, how many staff members are involved in room turnover, and supply and equipment availability.²¹ Disposable kits have demonstrated shorter turnover times when used in combination with an organized process of assigning staff specific tasks in the overall room turnover procedure, which has been shown to have a significant impact on decreasing turnover times while streamlining the entire process. While some facilities choose to stock multiple items separately, many find that single-use kits are ideal for reducing TOT.

EVALUATING LONG-TERM EFFECTIVENESS

HOW TO MEASURE TOT AND LONG-TERM SUCCESS OF PRODUCTS AND PROGRAMS

Hospital managers should continue to dedicate themselves to improving operating room practices. This is critical to ensure control measures are in place to generate long-term success of the selected programs and products for quality patient outcomes. One way to improve O.R. practices is to conduct routine point-prevalence surveys to monitor practices. This helps the surgical team measure areas of success and identify improvement opportunities. The second way to improve and control infection rates is through the utilization of approved products. These products should be commonplace and align with the process improvement strategy to help reduce TOT. Improvements and data collection in the O.R. have been shown to reduce costs for the health system and lead to better patient outcomes.

Operating rooms are considered the financial centers of the hospital system. Improving O.R. efficiency can benefit the health system. This can be accomplished by implementing process improvement strategies, such as those discussed in this review.

In sum, there are several key components that must be in place to maximize O.R. efficiency:

- **Training and education on best practices**
- **Standardized processes with checks and balances**
- **Cleaning checklist for guidance on turnover procedures**
- **Defined roles and responsibilities for all personnel involved in the room turnover process**
- **Consider other single use items that may reduce the risk of contamination (e.g., patient transfer sheets, positioners, etc.) that support patient care**
- **Comply with AORN, AHE, and other related standards for O.R. turnover products per the manufacturer instructions**
- **Measure ongoing compliance and education, and identify gaps with potential for improvement opportunities**



REFERENCES

1. Lee DJ, Ding J, Guzzo TJ. Improving Operating Room Efficiency. *Curr Urol Rep.* 2019;20(6):28.
2. Cima RR, Brown MJ, Hebl JR, et al. Use of lean and six sigma methodology to improve operating room efficiency in a high volume tertiary-care academic medical center. *J Am Coll Surg.* 2011;213(1):83-94.
3. Macario, A. What does one minute of operating room time cost? *Journal of Clinical Anesthesia.* 2010;22 (1):233-236.
4. Mathias. Benchmarking OR turnover times. *OR Manager.* 2000;16(6):15-20.
5. Mowbray AG. Time required to set up for and clean up after a case should be attributed to the actual case in measuring turnover time. *Anesth Analg.* 2003;97(2):605.
6. Adams R, Warner P, Hubbard B, Goulding T. Decreasing Turnaround Time Between General Surgery Cases. *JONA: The Journal of Nursing Administration.* 2004;34(3):140-148.
7. Glossary of times used for scheduling and monitoring of diagnostic and therapeutic procedures. *AORN J.* 1997;66(4):601- 606.
8. Boggs SD, Tsai MH, Urman RD; Association of Anesthesia Clinical Directors. The Association of Anesthesia Clinical Directors (AACD) Glossary of Times Used for Scheduling and Monitoring of Diagnostic and Therapeutic Procedures. *J Med Syst.* 2018;42(9):171.
9. Environmental Cleaning. *Environmental Cleaning | AORN eGuidelines+*. <https://aornguidelines.org/guidelines/content?sectionid=173715702&view=book>. Accessed September 5, 2023.
10. The Health Research & Educational Trust of the American Hospital Association, American Society for Health Care Engineering, Association for Professionals in Infection Control and Epidemiology, Society of Hospital Medicine, University of Michigan. *Using the Health Care Physical Environment to Prevent and Control Infection.* Chicago, IL: The American Society for Health Care Engineering of the American Hospital Association; 2015.
11. Preventing Healthcare-associated Infections. Centers for Disease Control and Prevention. Published November 13, 2015. <https://www.cdc.gov/hai/prevent/prevention.html>. Accessed September 5, 2023.
12. Jefferson J, Whelan R, Dick B, Carling P. A novel technique for identifying opportunities to improve environmental hygiene in the operating room. *AORN J.* 2011;93(3):358-364.
13. Addressing Rising Health Care Costs - Consumer Reports. https://advocacy.consumerreports.org/wpcontent/uploads/2014/01/HealthCareCosts_BriefingBooklet-DigitalVersion.pdf. Accessed September 5, 2023.
14. de Lissovoy G, Fraeman K, Hutchins V, Murphy D, Song D, Vaughn BB. Surgical site infection: incidence and impact on hospital utilization and treatment costs. *Am J Infect Control.* 2009;37(5):387-397.
15. Yezli S, Barbut F, Otter JA. Surface Contamination in Operating Rooms: A Risk for Transmission of Pathogens? *Surgical Infections.* 2014;15(6):694-699.
16. Viana Rel H, dos Santos SG, Oliveira AC. Recovery of resistant bacteria from mattresses of patients under contact precautions. *Am J Infect Control.* 2016 Apr 01;44(4):465-9.
17. Center for Devices and Radiological Health. Covers for Hospital Bed Mattresses - Keep Them Safe. U.S. Food and Drug Administration. <https://www.fda.gov/medical-devices/hospital/beds/covers-hospital-bed-mattresses-learn-how-keep-them-safe> Published 2013. Accessed September 5, 2023.
18. Data on File. Ansell Healthcare, Inc. September 5, 2023.
19. Truscott, W. (2018). Impact of Microscopic Foreign Debris on Post Surgical Complications. Impact of Microscopic Foreign Debris on Post-Surgical Complications. <https://www.clnsmedia.com/podcasts/wava-truscott-mighty-microbial-complications-risks-root-causes-part-2/>. Accessed September 5, 2023.
20. Black, G. M. (2011). Moisture-associated skin damage: overview and pathophysiology. *Moisture-associated skin damage: overview and pathophysiology*, 38, 233–241.
21. Action plan, products aid efficient, effective turnover (2016) <https://cdn.hponline.com/inside/2016-02/1602-OR-Turnover.html>. Accessed September 5, 2023.

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