IMPROVING TURNOVER TIMES IN ROBOTICS CASES IN THE OPERATING ROOM

By

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Acknowledgments

A special thank you to my daughters, Ella and Penelope. You love me and inspire me to persevere; this doctorate is for us.

Abstract

Turnover rates are one of the top concerns of leadership in the perioperative setting. A successful quality improvement project can ensure that the perioperative area runs smoothly and is financially stable. Improved turnover rates can lead to cost containment, patient and surgeon satisfaction, and increased patient safety. The faster the turnover from one surgical case to the next in each operating room, the more beneficial to the patient and the operating room. A large organization in the Pacific Northwest reported 30 to 45-minute turnover times in the robotics specialty operating rooms. A change in workflow led to an improvement in turnover times in the robotics specialty. Turnover times improved to under 25 minutes in eight cases and under 30 minutes for an additional eight cases out of the 37 cases reviewed. Streamlining the workflow process and having staff remain accountable for maintaining quality improvement processes will continue to improve turnover times.

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Chapter I: Introduction

Turnover time (TOT) is the time it takes for one surgical case in the operating room to end and the following case in the same operating room to start (Association of periOperative Registered Nurses Foundation, 2016). TOTs are one of the biggest challenges for operating room (OR) managers and are a top complaint from surgeons across the country (Lee et al., 2019). This quality improvement project focused on improving TOT in robotics cases in the operating room by improving the workflow process.

Statement of Problem

In the Pacific Northwest, a large organization noted TOTs of 30 to 45 minutes in the robotics specialty area resulting in lost productivity, increased costs, decreased patient outcomes, and surgeon dissatisfaction (D. Berry, personal communication, June 2, 2022).

Purpose of the Project

The project's goal was to improve TOTs to 25 minutes or less. Robotic surgery benefits include shorter hospital stays and improved patient outcomes; however, the focus of the surgical team often shifts from the patient to the complex equipment. If the surgical team can standardize the robotics turnover process, staff, patient, and surgeon satisfaction will improve (Cohen et al., 2022).

Background/Problem of Interest Supported by the Literature

A TOT of 30 minutes or less is considered the most efficient measure in the operating room (Cohen et al., 2022). The achievement of a TOT benchmark of 30 minutes or less in an operating room reflects a commitment to process improvement. (Fixler & Wright, 2013). Improved efficiency leads to improved TOTs in the operating

room. The improved efficiency in the operating room improves patient safety, decreases operating room costs, and improves surgeon satisfaction (Divatia & Ranganathan, 2015). Reiter et al. (2016) used several tools to focus on quality improvement, with the Lean method being the most successful. The center improved TOT by 15-20 minutes in less than a year, meeting desired outcomes (Reiter et al., 2016).

Significance of the Project

The quality improvement project reduced TOTs in robotics and improved finances related to decreased TOTs. This improvement will promote team satisfaction with improved workflow. Using robotics in surgery adds complexity to surgery. While robotics surgery improves patient outcomes, it increases operating room costs due to more staffing needs, specialized training of staff and surgeons, and longer turnover times. Robotics cases take longer than other specialty areas in the operating room, increasing turnover time and the costs associated with these surgeries (Cohen et al., 2022).

Impact of the Project

Robotic specialty OR nurses collaborate with licensed professionals and staff to provide patient-centered care in the pre-operative, intra-operative, and post-operative areas. The operating room nurse supervises the surgical team to ensure that each patient receives quality care. Workflow changes can only be successful with buy-in from the OR nurse. The project manager created a pilot turnover team to improve TOTs. An improved workflow improved the turnover process and increased the opportunity to schedule more surgical cases.

Chapter II: Literature and Theory Review

Turnover rates are one of the top concerns of leadership in the perioperative setting. A successful quality improvement project allows the perioperative area to function smoothly, remain financially stable, and improve patient, staff, and surgeon satisfaction.

Literature Review

A search for journal articles on quality improvement projects that decreased TOT in the perioperative setting was completed using the Cumulative Index to Nursing and Allied Health and EBSCOhost databases. Studies were reviewed to determine if reducing TOTs improved efficiency, patient outcomes, and staff and surgeon satisfaction in the operating room. Studies supported the need for workflow changes to decrease TOTs.

Improving Quality of Care by Decreasing TOTs

When efficiency in robotics cases is improved, TOTs are decreased. The ability to decrease TOT allows the operating room to schedule additional robotics cases during daytime hours, which would have otherwise been delayed. When the operating room can add more surgeries daily, the patients do not have to wait as long for their necessary surgeries. The ability to schedule more daytime surgeries because of decreased TOTs allows recovery from surgery during daytime hours instead of late at night. Studies by Cerfolio et al. (2019) and Tagge et al. (2017) found that acute care centers rely on income from surgical procedures and that the operating room is the most lucrative area of hospitals. These studies also supported increased staff and patient satisfaction related to decreased TOTs. The studies showed that patients and staff had less stress when procedures could be performed during regular daytime hours.

Operating room efficiency versus quality of care is frequently discussed in the current healthcare environment. The high revenue-generating operating room is pressured by leadership to adopt practices that will increase surgical cases, such as Lean and Six Sigma. It is questionable that patient care can be reduced to a production-line model rather than patient-centered care. A literature gap was found related to Lean processes and whether a decrease in patient outcomes is shown with these models of care (Chernov et al., 2018).

Cohen et al. (2022) reported that robotics surgery improves patient outcomes through shorter hospital stays. Still, robotics surgery has changed the surgical team's focus away from the patient because of the complex equipment used in robotics. The data by Cohen et al. (2022) supported that turnover times in robotics cases take longer than other specialty areas, at over 70 minutes, increasing costs associated with these surgeries. Similar results in robotics surgeries were found in a study by Souders et al. (2017), where improvement in TOT was seen when a consistent workflow was implemented. Sounders et al. (2017) also found that having the same staff members in robotics cases leads to improved TOT. Similar outcomes were found in this quality improvement project when workflow changes were implemented.

Improved Staff Satisfaction

A study by Pappada et al. (2022) argued that longer TOTs can affect staff morale negatively and that long wait times for patients can increase stress and anxiety in patients and their families. This supports the practice's quality improvement project implications to increase staff and patient satisfaction.

Improved TOT is a measurement that the operating room meets performance

standards, such as improved staff satisfaction. TOTs of less than 30 minutes are the gold standard of OR productivity (Fixler & Wright, 2013) and staff satisfaction. Documenting when one surgical case ends, and the next surgical case begins in the robotics specialty is the best way to measure TOTs. (Fixler & Wright, 2013).

Importance of Surgeon and Anesthesia Provider Timeliness

The tardiness of surgeons and anesthesia providers adds to an increase in TOTs. There are reasons for tardiness, such as trauma and patients' physiological changes, that cannot be controlled. Some areas can be controlled and are worth assessing for improvement. A quality improvement project performed by Perez et al. (2022) showed a small percentage of success in decreasing TOTs related to surgeons being on time for surgery, and those unknown patient responses could not be adjusted to assist in improved TOTs. Surgeon timeliness would have a definite effect on decreasing turnover time and must be a focus of any quality improvement project attempting to reduce TOT.

Kumar and Malhotra (2017) indicated that it is essential for surgeons to be on time to improve TOTs. Surgeon tardiness was the highest percentage reason for increasing TOT (Kumar & Malhotra, 2017). A similar study by Athanasiadis et al. (2020) supported the need for anesthesia providers to be on time between surgical cases. In their study, the highest percentages of delays to TOT were related to the anesthesia provider, not the surgeon.

A study by Sarpong et al. (2022) supported the recommendation for on-time anesthesia providers to decrease TOT. This study reported that consistent anesthesia providers in one operating room and reduced changeover of different providers improved TOT. This factor was not assessed in this quality improvement project but is noted as a

possible area for improvement.

Consistent Staffing and Meal Breaks for Operating Room Staff

Consistency in staffing in robotics cases allows staff to become experts in the specialty area and improves communication between staff and surgeons as a professional relationship is established. Consistent surgical teams in robotics specialties are used in many operating rooms. A study by Zhong et al. (2022) showed that fixed surgical teams could show improvement. Fixed surgical teams may be assessed for the project facility in the future, but it was not in practice due to staffing issues.

Relieving the registered nurse (RN) and scrub technician simultaneously for breaks and mealtimes decreases the possibility of errors caused by frequent handoffs and increases the consistency of care. Olsen et al. (2018) showed that giving meal and rest breaks to the RN and the scrub technician simultaneously in surgical cases was an improvement in the standardized workflow associated with an improvement in TOT. Results showed that this change allowed for an improvement in TOT that added one surgical case per day to the operating room (Olsen et al. 2018). This study showed a trend in standardized break processes in anesthesia providers and licensed and unlicensed staff to improve TOT (Olsen et al. 2018). The quality improvement project manager received permission to assign the same staff for this project, which was regarded as the pilot turnover team to improve TOT.

Negash et al. (2022) focused on a rural setting with fewer resources that was not comparable to the Pacific Northwest but connected the dissatisfaction and increased stress in staff when there is an increase in TOT. Their study found that increased TOT leads to extended workdays, mandatory overtime, and staff burnout.

A similar pattern to the quality improvement project was noted in a study by Bathish et al. (2021) and Ernst et al. (2021). The authors suggested that consistency of staff in the operating room and similar surgical procedures can decrease TOT. This study indicated that further research should be performed on various specialty areas such as robotics, cardiac, and neurology with lengthy setup and surgical time.

The literature review suggests surgeons and anesthesia providers significantly impact TOT delays when not on time. Standardized workflows and consistent staff in operating rooms decreased TOT and increased morale among staff. Improving TOT leads to improved operating room efficiency and patient outcomes.

Standardized Workflow

Standardized workflow is a process that streamlines the work in the operating room. The operating room is a highly technical specialty that aligns well with standardized workflow. In a retrospective study, Beaulé et al. (2015) demonstrated improvement in TOT was achievable. The researchers showed that efficient use of resources in total joint surgical cases could support robotics surgeries with similar amounts of instrumentation trays and equipment, leading to shorter turnovers. This study supports the premise that a standardized workflow decreases TOT.

Burlingame (2014) discussed TOTs and the perioperative teams' involvement, suggesting that each team member depends on the other to improve TOTs. If a surgeon is late, this affects the operating room nurse. The choice of anesthetic the anesthesiologist uses on a patient can affect how long the patient takes to emerge from anesthesia, delaying the start of the turnover process. TOT can significantly improve if a standardized workflow is agreed upon and the team briefs at the start of each surgical

case. The quality improvement project used standardized roles and responsibilities to improve TOT. When turning over an operating room, there is an improvement in TOT when there is a standardized process. Each zone should be assigned to a team member so that the process is efficient and no one on the team is repeating a task someone else has already completed (Norman & Bidanda, 2014).

Vassell (2016) focused on TOT as a quality improvement project in a large acute care center in the United States. The Lean methodology was used to improve and implement a standardization process. TOT was reduced, and the medical center met outcomes that improved staff participation, cost improvement, and staff role clarity. Lengthy TOTs can increase costs in the OR. This leads to patients' discontent, as well as surgeons and staff. According to Vassell (2016), evaluating improved TOT in the perioperative setting includes assessing surgery start times and turnover time for delays. They recognized the need for standard workflow and improvement in communication, appropriate staffing, the collaboration between licensed staff, and engaged leadership.

The methodology used in this quality improvement project can be adapted to other perioperative locations within the system. Process improvement must be at a system level and supported by all stakeholders to improve long-term results. It must be supported by management through weekly management and data collection. The goal would be to plan and implement a standard workflow to be followed by every staff member (Amati et al., 2022).

Review of Theory

Lewin's change theory was used to develop and implement this quality improvement project in the perioperative setting. Lewin's change theory includes

unfreezing, change, and refreezing stages. The approach requires that newly presented behaviors replace past behaviors (Wojciechowski et al., 2016)

Unfreezing is when people surrender old behavior patterns (Wojciechowski et al., 2016). One must focus on allowing the old behavior to be released. A team approach can decrease the chance of resistance to change because it allows for peer support with change challenges. Success in this stage reduces the pushback from old behaviors and supports positive reinforcement and outcomes of the new behavior.

The change stage is the productive portion of the change theory (Wojciechowski et al., 2016). The team can move forward positively with change and see the results. Behavior changes and there are no longer negative thoughts or feelings regarding the change.

The last stage is refreezing, setting new behaviors that become the standard procedure (Wojciechowski et al., 2016). Refreezing takes time, and to be successful must have the education to support the process.

Alignment of Theory

Lewin's change theory was most helpful during the implementation and education of the pilot turnover team. The team needed to unfreeze the prior workflow of turnover in the robotics cases and reject the old behaviors to decrease turnover times. Educating the pilot turnover team on the new process and walking them through it step by step allowed for the excision of previously learned behaviors. The pilot turnover team understood the need for a change and gave input on the new process, decreasing the stress that comes with a new approach and its acceptance. The unfreezing stage was done in collaboration with the pilot turnover team, so they had a voice in the change process. This process

allowed the pilot turnover team to accept the change on their terms. A clear change plan is used to explain the current problem to staff and allow them to acknowledge that the old process resulted in poor outcomes for patients, staff, and surgeons (Namnabati et al., 2017).

The change stage was implemented for a month using the new workflow conceived by the pilot turnover team, project manager, and leadership. It was accepted and found to be a productive project. The change process was positive and well-supported by the pilot turnover team and leadership.

The refreezing will continue in the robotics specialty for six months to a year. Education, communication, and re-training on the quality improvement project and data presentation will further support refreezing (Wojciechowski et al., 2016). By educating the operating room personnel during morning huddles every week, the refreezing process will become the new standardized workflow process in robotics cases in the operating room.

Chapter III: Method

This quality improvement project focused on improving TOTs in the perioperative area, specifically in robotics cases where more complex technology, equipment, and instrumentation increase the time between surgical cases.

The robotics specialty has the lowest productivity and highest costs associated with increased TOTs. The project manager assessed improvement by collecting data from September 6, 2022, through September 30, 2022.

Design of the Project

After Internal Review Board approval was received from the medical center where the quality improvement project was implemented (Appendix A) and Indiana Wesleyan University (Appendix B), the first step was to meet with the operating room leadership and robotics specialty nurse to discuss the current processes and proposed outcomes. The project manager observed and collected data on TOTs for three days of scheduled surgical procedures. The pre-implementation data collection was to follow the robotics cases' turnover process and make recommendations for workflow improvement. These inefficiencies were discussed and reviewed with leadership and staff in the robotics specialty operating rooms.

A pilot turnover team was formed. Project managers, robotics specialist nurses, operating room managers, surgeons, physician assistants, RNs, scrub technicians, operating room assistants, anesthesiologists, sterile processing personnel, and environmental services helped develop the standardized workflow for robotics operating rooms. The operating room manager and robotics specialty charge nurse approved the revised standardized workflow.

The project manager presented the revised standardized workflow during daily morning huddles to the pilot turnover team. The education on roles and responsibilities for a standard workflow was only assigned to the pilot turnover team in selected robotics cases. Each team member assigned to the pilot turnover team was given a list of expectations with collective responsibilities based on their role in the turnover process (Appendix C). Implementation occurred over one month in one robotics operating room with pilot turnover team participation.

The project manager evaluated the revised standardized workflow with team feedback. The project manager collected data from September 6, 2022, through September 30, 2022, to show whether there was an improvement to under 25 minutes in TOT.

The quality improvement plan to implement a standardized workflow began with establishing standard roles and responsibilities for the robotics team. The pilot turnover team adopted each new role to improve robotics TOT. The standardized workflow changes are addressed in Appendix C.

Data Collection

The project manager, specialty charge nurse, and pilot turnover team performed data collection. A data collection tool (Appendix D) developed by the project manager was used for every robotics surgery in one operating room. The start time of surgery was recorded, designated by the time the patient entered the room, referred to as "wheels in." The end time of each case was recorded when the patient left the operating room, referred to as "wheels out.". The time between "wheels out "to "wheels in" was considered TOT. Data were collected from September 6, 2022, to September 30, 2022, during weekdays

for 37 robotics surgical cases.

Chapter IV: Results

The project aimed to assess if TOTs could be improved from 40-60 minutes to under 25 minutes in robotics cases. A TOT of less than 30 minutes was expected to increase efficiency in the robotics room, resulting in cost savings and better patient, staff, and surgeon outcomes. TOT data was collected by a tool developed by the project manager. TOTs were collected over four weeks, from 37 cases, in one robotics operating room. Results were discussed and submitted to a statistician at Indiana Wesleyan University for validation. The statistician suggested various ways to present data and agreed that a table would work well to present this data. A t-test was not appropriate, but it would be helpful if the pilot project continued for six months to a year.

Results of Data Collection

There was an improvement in TOTs in the robotics cases to under 25 minutes in eight cases out of the 37 robotics cases or 21.6% of the cases. A more significant improvement would have shown greater success, but this is progress to the pilot turnover team and leadership.

Table 1

Turnover Times in Minutes for Robotics Surgical Cases

TOT Range in Minutes	Number of Robotics Cases
20-24	**8**
25-29	**8**
60-64	**5**
65-69	**8**
70-74	**5**
80-84	**1**
90-94	**1**
115-120	**1**

Discussion

Through the change in workflow in the perioperative area and the robotics team, the project results showed the ability to improve turnover time to the targeted goal of fewer than 25 minutes in 8 out of 37 cases. The reduction in time to less than 25 minutes for 21.6% of robotic cases was less of a change than expected. However, it still represents a significant accomplishment for the pilot turnover team.

This improvement identified the ability to meet the outcomes with continued workflow improvements. As noted in Lewin's change theory, refreezing would be expected to deliver a sustainable and comprehensive reduction in TOTs. It is anticipated the refreezing will continue to occur due to the continued education of robotics staff.

Implications for Practice

Improving turnover times in robotics surgical cases can improve staff, surgeon, and patient satisfaction (Cohen et al., 2022). Surgeons on the pilot turnover team provided verbal feedback, noting the increased efficiency and their satisfaction with the improvement. Staff also verbalized improved satisfaction and decreased stress. Further measurement using a tool of choice to evaluate staff and surgeon satisfaction will be assessed in the future by the organization's stakeholders. The decrease in turnover times allows the team to gain additional time to focus on patient safety preoperatively. The time gained on a surgical day could lead to more surgical cases being scheduled each day and improve patient outcomes by decreasing the wait time for necessary surgeries. Surgical cases are backlogged due to the COVID-19 pandemic. If surgeries are not performed during the daytime surgery schedule, it results in a need for more staffing during evening and night hours. Decreased TOTs allows for more cases with fewer staff demands (Cohen

et al., 2022).

Limitations

Limitations were found during the quality improvement project, but none were as prominent as patient-caused limitations. The pilot turnover team could not control these physiological limitations. Patient issues include late arrivals, digested food, additional laboratory tests, and delayed the next case. Patients' problems affecting TOTs are challenging to anticipate and control.

Another limitation found was the time restriction on project implementation. The project could only be implemented over one month, and a more extended timeframe may have yielded more data and more accurate results.

The ability to decrease TOTs in robotics surgeries was limited due to surgeons' tardiness and anesthesiologists' involvement with previous patient care or surgeries in other specialties. Sterile equipment issues also impacted TOTs and the lack of staff in the operating room. Additional issues assessed during implementation that caused delays in TOTs were room cleaning that took longer due to increased blood and contamination on the floor and equipment. Due to COVID protocol, positive patients needed to be extubated in the operating room and held for 20 minutes before transferring to a negative pressure recovery room. Many causes of increased TOT are human inconsistencies and errors that cannot be controlled.

Recommendations

For improvement in TOT to continue, the standard workflow should involve more staff, not only the pilot turnover team. The quality improvement project involved one robotics room, but the two robotics operating rooms typically run-on weekdays. For

consistency, both operating rooms should implement the new workflow into practice.

Continued staff education in robotics cases needs to occur in daily huddles and during staff education days to review standard workflow in the robotics rooms. Surgeons performing robotics cases need continued reminders on the new workflow processes and commit to timely arrival when possible. Surgeons agreed to work with office staff to ensure surgical consents, history, and physicals are up to date before surgery day. The standard workflow improvement should continue, and education should involve all operating room staff in robotics rooms, not only the pilot turnover team.

TOTs are essential in every operating room. It is an improvement discussed and focused on daily for quality improvement. The facility staff and leadership showed support and a positive attitude throughout the pilot process, which added to the project's success. As workflow improvement is maintained, it will become a standard of care and improve staff surgeon satisfaction rates and, most importantly, patient outcomes.

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Appendices

Appendix A

IRB Legacy Health

LEGACY HEALTH | LEGACY RESEARCH INSTITUTE

Legacy Research Institute
1225 N.E. Second Ave.
Portland, OR 97232
503.415.2491 phone
503.415.4042 fax

LEGACY HEALTH INSTITUTIONAL REVIEW BOARD

NOTICE OF IRB ACTION

Protocol: *Improving Turn Over Times in the Operating Room*	
Principal Investigator: Ashley Causey, RN	Board Action: EXEMPT QI DETERMINATION
SUBMISSION TYPE: NEW EXEMPT QI STUDY Submitted 6-7-22	Date of Board Action: 6-10-1-22
Sponsor: None	Study Risk Level: Minimal Risk
Site(s): LGS	Jurisdiction: OCR
IRB Tracking Number: 2038	

SUBMITTED DOCUMENTS REVIEWED

- ✓ Legacy DNP Statement of Mutual Agreement:
- ✓ Investigator's CV
- ✓ Study Staff Training Information: CITI
- ✓ Protocol DNP Protocol Development 6-5-22

REVIEW

REVIEW TYPE	IRB ACTION
✓ Initial Review ✓ Exemption Review ✓ QI Review	✓ Exempt from IRB Review determination

ADDITIONAL FINDINGS AND REQUIREMENTS FOR THIS STUDY

- ✓ The study is minimal risk.
- ✓ Legacy site management must be apprised of the study and the Board's action.

APPROVAL IS GRANTED SUBJECT TO THE FOLLOWING

1. Conduct the research in accordance with the protocol, applicable laws and regulations, Legacy policies, and the principles of research ethics as set forth in the Belmont Report.

Appendix B

Indiana Wesleyan University IRB

Institutional Review Board
4201 South Washington Street
Marion, IN 46953

Tel: 765-677-2090
Fax: 765-677-6647

Notice of Exemption

Improving Turn Over Times in the Operating Room
Title of Research Topic

Ashley Causey, Rhonda Oldham
Investigator(s)

1751.22
IRB ID Number

The IWU Institutional Review Board (IRB) has reviewed your proposal and has determined that your proposal is exempt from further review by the IRB because the proposed project does not constitute human subjects research. Federal regulations that establish the authority of the IRB provide a specific definition of human subjects research which defines the scope of IRB authority. Your project falls outside the federal definition of human subjects research and is therefore not subject to IRB review.

Please note that this exemption regards only the oversight of human subjects research by the IRB. The IRB has not reviewed any other aspects of the research project and makes no judgement on the merits of the project or its methodologies. All research executed at IWU must conform to all applicable state and federal laws and regulations and to all applicable IWU policies.

Comments:

Ph.D.
Chair, Institutional Review Board

July 8, 2022
Date

Appendix C

Standardized Roles and Responsibilities

- Delegated a float person (RN or ST) to open robotics instrumentation and supplies during room setup
- Assigned zones for each member when decontaminating between surgical cases
- ORA placed suture and soft goods placed on the surgical case cart
- ORA sort out robotic case-specific implants as open or hold
- Assign the second scrub to organize the trays and instruments
- Assign ORA or float person to remove unnecessary trays and equipment
- Surgeon or PA makes sure consents in Epic are up to date before the morning of surgery
- RN to immediately interview the next patient after dropping off the prior patient, then return to the room for help with room setup
- The anesthesiologist brings the patient to the OR after checking room is ready for surgery to start
- Surgical start and end times are written on the whiteboard in the operating room to reflect the turnover time

Appendix D

Turnover Data Collection Tool

Date	Surgeon/Surgery	Time in	Time Out	Delay Reasons