

Gardner-Webb University

Digital Commons @ Gardner-Webb University

Doctor of Nursing Practice Projects

Hunt School of Nursing

Spring 2022

Implementation of Lean Principles During Operating Room Turnovers

Makenzie Marshall

Gardner-Webb University, mmarshall5@gardner-webb.edu

Follow this and additional works at: <https://digitalcommons.gardner-webb.edu/nursing-dnp>



Part of the [Perioperative, Operating Room and Surgical Nursing Commons](#), and the [Quality Improvement Commons](#)

Recommended Citation

Marshall, Makenzie, "Implementation of Lean Principles During Operating Room Turnovers" (2022). *Doctor of Nursing Practice Projects*. 44.

<https://digitalcommons.gardner-webb.edu/nursing-dnp/44>

This Project – Full Written is brought to you for free and open access by the Hunt School of Nursing at Digital Commons @ Gardner-Webb University. It has been accepted for inclusion in Doctor of Nursing Practice Projects by an authorized administrator of Digital Commons @ Gardner-Webb University. For more information, please see [Copyright and Publishing Info](#).

Implementation of Lean Principles during Operating Room Turnovers

by

Makenzie L. Marshall

A project submitted to the faculty of
Gardner-Webb University Hunt School of Nursing
in partial fulfillment of the requirements for the degree of
Doctor of Nursing Practice

Boiling Springs, NC

2022

Submitted by:

Approved by:

Makenzie Marshall

Cindy Miller, Ph.D., RN

Date

Date

Abstract

Background

Many operating rooms across the country face the daunting task of making their turnovers between surgical patients quicker and more efficient. Turnover time is defined as the time it takes to clean an operating room and set up the next sterile field between surgical patients. The time begins when the patient leaves the operating room suite and stops when the next patient enters the same suite. Running an operating room is a complex and costly endeavor, and even small shortfalls can have a snowball effect, leading to delays, wasteful spending, and substandard patient outcomes; therefore, it is imperative to have the turnover process be as efficient as possible. The anticipated overall goal of implementing Lean principles during the operating room turnover process is to improve efficiency and eliminate waste.

Method

The methodology for this quality improvement project consisted of observing the current operating room turnover process and establishing a project team to evaluate the data. The team analyzed the process by utilizing the Lean principles and broke down each step of the turnover process and reconfigured the steps. After the steps were reconfigured into a new process, the improved steps were implemented during the turnovers.

Intervention

The project lead and the project lead team designed and trained their colleagues on the new turnover process. The project lead team members continuously monitored, offered opportunities for improvement, and encouraged staff to use the new process. Prior to implementation, the project lead administered a pre-implementation employee

satisfaction survey to all operating room staff. This survey was compared to a post-implementation employee satisfaction survey to determine how the project affected employee satisfaction. Each month the project leaders met with the administrative team to discuss average monthly turnover times, and incident reports.

Results

The process was implemented and observed for 3 months. During this time the monthly turnover time decreased by 0.5 minutes for 2 of the 3 months observed, zero-incident reports were reported or collected pertaining to the project, but employee satisfaction scores dropped from a pre-implementation average score of 36.7 to a post-implementation average score of 32.3. The surgery center also did not see an increase in expenses of on-boarding new employees due to the implementation of the project. The employee satisfaction scores decreased because of an increase in stress felt by the staff. High-stress levels were caused by an increase in patient volume due to the time of year, pandemic fatigue, and from still adjusting to a new electronic medical record.

Conclusion

With the rising cost of health care, opportunities exist to improve patient safety, minimize delays and waste, increase operating room use, and enhance the perioperative experience for the patient, family, and the perioperative team members. While this project did not meet all its intended objectives, it will still have a lasting impact on the surgery center. With assistance from management to continue encouraging and monitoring the turnover process, the project will be sustained.

Keywords: lean, operating room turnover, efficiency, employee satisfaction, patient safety

Acknowledgements

I would like to express my sincere gratitude and appreciation to all those who gave me the possibility to complete this project. First and foremost, I would like to thank my husband and daughter for their unconditional love and support during this time. Kelly, thank you for being the best husband and showing me grace during the rough days and tough love in the moments when I needed it most. My precious Emileigh, thank you for making our days together interesting and for demanding me to take much-needed breaks from my work for snuggles and playtime. Thank you to my family and friends who have supported me emotionally, mentally, and financially. I knew, in the beginning, it was going to take a village to get me through this and I am so blessed to have each of you in my life to help push me along. A special thank you is due to my project chair Dr. Cindy Miller. I could not have gotten through this project without your guiding wisdom and knowledge. I would also like to acknowledge and thank Susan Deal-Smithey and Nicole Beamon; I would not be the person I am today professionally without your guidance and leadership.

I could not close this acknowledgement without thanking my Savior Jesus Christ for His never-ending mercy, love, and provision during this time. I pray each day that I continue to walk down the path for which He has laid out for me and to be a living example of His love and grace.

Table of Contents

Problem Recognition	9
Literature Review.....	11
Needs Assessment.....	13
Target Population/Community.....	13
Sponsors and Stakeholders	14
Organizational Assessment.....	15
SWOT analysis	16
Available Resources.....	17
Desired and Expected Outcomes	18
Team Selection.....	18
Cost/Benefit Analysis	19
Scope of the Project	22
Goals and Mission Statement.....	23
Goals of Project.....	23
Mission Statement.....	24
Theoretical Underpinning	25
Work Planning	29
Timeline	29
Evaluation Planning.....	30
Implementation	33
Threats and Barriers	33
Monitoring of Implementation.....	35

Project Closure.....	35
Interpretation of Data	37
Qualitative Data	37
Quantitative Data	44
Process Improvement Data	49
References.....	54

List of Tables

Table 1: Breakdown of Average Case Cost and Calculated Cost Savings from Turnover Efficiency	20
Table 2: Cost of Implementation and Supporting Calculations.....	21
Table 3: Breakdown of Anticipated Monthly Savings vs. Cost the First Year Post Implementation	21

List of Figures

Figure 1: Link between Lippitt’s Theory and Project’s Outcome Measures.....28

Figure 2: Work Breakdown Structure Depicting Milestone Events and Required Major
Activities.....30

Figure 3: Initial Lean Turnover Process Flowchart38

Figure 4: Final Lean Turnover Process Flowchart40

Figure 5: Average Turnover Time vs. Anticipated Goals.....45

Figure 6: Comparison of Pre-implementation Survey Scores to Post-implementation
Survey Scores.....46

Figure 7: Comparison of Average Scores from Pre and Post Implementation Surveys....47

Figure 8: Relationship Between Case Volume and Turnover Time48

Figure 9: Monthly Cumulative Overtime Hours for 202150

Problem Recognition

The operating room is a fast-paced, high-stress environment with multiple critical, moving pieces. Each piece relies on the next to make the entire picture sound.

Perioperative team communication is just one of the many important pieces of operational efficiency in the perioperative setting. Team communication can affect employee satisfaction, patient safety, and patient and family satisfaction. The JAMA Network studied six waste domains in the United States healthcare system including care delivery, care coordination, overtreatment or low-value care, pricing failure, fraud and abuse, and administrative complexity, and estimated the total annual cost of healthcare waste in the United States was between \$760 billion to \$935 billion (Shrank, 2019). With the rising cost of health care, opportunities exist to improve patient safety, minimize delays and waste, increase operating room use, and enhance the perioperative experience for the patient, family, and the perioperative team members.

The facility where the project was conducted is an outpatient surgery center solely dedicated to orthopedic surgeries. A variety of orthopedic surgeries are performed at the facility ranging from minor hand procedures to total joint arthroplasties. The facility is one of three outpatient surgery centers in a large metropolitan area performing outpatient total joints. It is a physician-owned facility, and the focus is heavily on providing superior care at a more affordable price to its patients. The inability to dig deep into the pockets of a large healthcare organization for daily operation costs creates tension on the purse strings of the facility; therefore, the staff and administrative team work diligently to find ways to improve operational efficiencies and eliminate excess waste all while still providing high-quality care. With the rise in national healthcare costs, it is imperative for

these types of private facilities to identify process improvement strategies and quickly act to eliminate any operational interruptions and produce a prime, streamlined workflow.

Running an operating room is a complex and costly endeavor, and even small shortfalls can have a snowball effect, leading to delays, wasteful spending, and substandard patient outcomes (Stern, 2015). Many operating rooms across the country all face the daunting task of decreasing turnover times between surgical procedures, and this facility is no exception. The surgery center's goal for operating room turnovers is 20 minutes or less; however, their current average is 22.34 minutes. With an average net revenue of \$1487 per surgery, lasting an average of 100 minutes equals potential earnings of \$14.87 per minute. Decreasing the average turnover time will allow for more surgical cases to be added to the schedule, therefore increasing the facility's revenue.

Saving time in the operating room not only saves money but also increases patient safety and satisfaction. Safety in the operating room is the highest priority of all the team members and with a push to move quicker, errors can occur. Surgery requires an incredibly choreographed dance and if all parties involved hit their marks at the right time, patient safety will not be compromised; in fact, patient safety will improve by eliminating wasted time. Patient and family member satisfaction scores will also improve because surgeries will not be delayed or canceled.

The United States healthcare system is an ever-evolving, high-demand, and costly industry. It is imperative for administrative teams to improve operational efficiencies and eliminate excess waste in their facilities to keep costs affordable to patients. By decreasing the time it takes to turnover an operating room, patient safety, and patient and family satisfaction will improve.

Literature Review

The Lean philosophy has become increasingly popular in the healthcare industry because of its widely accepted management approach to improving quality and efficiency while controlling cost. More and more facilities are applying Lean principles to minimize waste with ongoing process improvement. All members of an organization strive to identify areas of waste and eliminate anything that does not add value for patients, thus contributing to patient satisfaction and improved care. With buy-in from all team members, “lean thinking” becomes part of an organization’s culture (NEJM Catalyst, 2018).

A review of a study involving three different healthcare facilities was conducted to see how the implementation of Lean principles could help improve their current situations. By introducing the Lean mentality into their daily operations, the three facilities saw a decrease in turnover times, improvement in on-time surgery starts, an increase in patient satisfaction scores, a decrease in the patient’s total cost for their procedure, a decrease in medication reconciliation errors, increase in internal communication and teamwork, and an overall increase in department capacity (Toussaint & Berry, 2013).

There are five Lean principles that make up the recipe to improve workplace efficiencies. These principles include defining value, mapping value stream, creating flow, establishing pull, and pursuing perfection. Defining value involves identifying what the patient wants from, or finds value in, the facility. Identifying and mapping the value stream includes identifying the activities or steps that contribute to value. The steps are broken down into categories of value-adding or wasteful steps to identify which steps

need improvement. After removing the waste from the value stream, creating flow is to ensure that the remaining steps run smoothly without interruption or delays. After creating flow, a pull-based system is established to allow for a just-in-time delivery method to eliminate unnecessary inventory and wasteful spending. Lastly, the final principle is pursuing perfection which makes Lean thinking part of an organization's culture through continuous process improvement (Do, 2017).

Considering a major threat to the success of implementing Lean principles during operating room turnovers is staff acceptance, a study regarding the effects of change on organizational culture was reviewed. The study was conducted in the operating rooms of a Moreno Valley, California hospital called Riverside County Regional Medical Center. The department struggled with relatively long, nonproductive turnover times between surgical cases. The organization's leadership recognized the problem and empowered influential staff members to develop a more efficient turnover process that also paid careful attention to the department's culture. The hospital houses 10 operating rooms, which were all involved in the study, with an average turnover time of 45 minutes. The accumulation of nonproductive turnover time produced significant overtime costs to the institution and a great deal of staff frustration due to the frequent need for after-hour work coverage (Ninan et al., 2017). The facility had attempted multiple tries to change its process, all of which failed. The operating room leadership team acknowledged change can be challenging for an organization, particularly one that has been operating in a stable environment for a significant period of time.

The initial step the team took was a review and collaborative analysis of the causal factors in the prior failed initiatives. The team identified the process of how

changes were implemented as the common denominator in each failed attempt. The area of the biggest impact on assisting in improving the turnover time was parallel processing, especially with interviewing patients prior to surgery. The team also established a communication tool that tracked and analyzed all reasons for delays to the operating room from the pre-operative area. To help with staff buy-in and acclimation to change, the implementation process was introduced in phases on a smaller scale which helped the entire operating room team adjust to the necessary changes. The leadership team also requested feedback from all operating room staff throughout the entire process. The staff members were praised for their hard work and response to change. The overall result from implementing change while still recognizing and respecting the department's culture was a decrease in turnover time to an average of 22.7 minutes. This report highlights the significance of investing in the initial buy-in of key team members, the value of a phased implementation, and the importance of frequent feedback with positive reinforcement (Ninan et al., 2017).

Needs Assessment

Target Population/Community

The benefits of implementing Lean principles during the turnover process could include improving turnover times, patient safety, perioperative team satisfaction, and the surgery center profits when compared to continuing the current turnover practice. The population affected by the current turnover problem is the perioperative team, surgery patients, and the financial shareholders of the surgery center. Each population has the potential to reap the benefits of implementing Lean principles into the surgery center's operating room turnovers.

Sponsors and Stakeholders

Sponsors and stakeholders have a vested interest in the outcome and benefit the most from the outcome. The quality control registered nurse (QCRN) has a continuous investment in the training of staff and the safety of patients, and will benefit from the standardization practices of the Lean principles. The medical director and surgery center shareholders are considered stakeholders in the project because they have a financial investment in the center and will financially benefit from improved turnover times. Perioperative team members such as registered nurses, sterile processing technicians (SPT), anesthesia staff, and certified surgical technologists (CST) are considered major stakeholders because they play major roles in the actual turnover process which determines the success of the project. These key players also reap the benefits of Lean principles by improving their time management skills and efficiency which can decrease the need for after-hours coverage and improve work-life balance. Surgery patients and patient family members are also considered stakeholders because they benefit the most from the surgery center implementing a standardized turnover process. Implementing Lean principles during the turnover process can decrease turnover times and allow for the surgery schedule to flow on time or early, thus potentially allowing the patient and family members to return home within a respectable amount of time. This standardization also improves the quality of care provided to the surgical patients by eliminating wasteful, unproductive time and allowing the perioperative team more time to interact with the patient.

Organizational Assessment

The surgery center takes pride in providing excellent quality care at an affordable price. The center values quality, service, community, and teamwork. It is a superlative organization of professionals committed to improving the lives they serve by providing exceptional patient care, compassion, and personalized service. Through innovation, continued education, and their research institution, they are dedicated to helping patients achieve their best health. They consider their team approaches their greatest asset and the foundation for success. Each team member shares a common passion for making lives better.

The Lean process emphasizes minimizing waste in every process, procedure, and task through an ongoing system of improvements (NEJM Catalyst, 2018). With these improvements, the overall expected outcome is for the company to become more efficient, at a more profitable rate, and still provide the same, if not better, high-quality care. The surgery center's goal is parallel with the Lean mentality in providing patients with a more affordable surgery than other surrounding facilities while still exceeding expectations in care. In order for incorporating the Lean principles into their turnover process to be successful, the organization must develop staff acceptance. It is the responsibility of the project lead, who is also a member of the team, to educate and encourage other team members.

The mission of the project, implementing Lean principles into the center's operating room turnovers, was to decrease turnover times, improve perioperative team satisfaction, and surgery center profits, while also continuing to provide, if not improve, quality patient care. Ambulatory surgery centers are known for being more efficient

which leads to greater productivity and lower costs. This has a significant effect on all relevant healthcare stakeholders. Patients can pay less for their care, physicians can share in greater profits, and staff members benefit from a more efficient workload. The healthcare industry, which is in dire need of cost control, has a significant financial opportunity to decrease spending without sacrificing the quality of care by following Lean principles.

SWOT Analysis

By conducting a SWOT analysis on implementing Lean principles during the operating room turnover process, strengths, weaknesses, opportunities, and threats are identified. The project's strengths are time management skills, waste minimization, time value for patients, and the principles that can be introduced incrementally during the implementation process. These attributes will allow the center to meet the project's goals of improving turnover times and becoming more efficient. Weaknesses include minimal staff acceptance, pre-determined negative attitudes towards process changes, or possible passive-aggressive sabotage. The Lean process also leaves no room for errors such as equipment failures. It is our human nature to dislike change and adopting the Lean principles requires change among employees to bring about a more efficient process to ensure that quality care is held at the forefront. If the employees reject the new methods, inconsistencies in delivery will occur. Another weakness of the project is the surgery center functions with minimal staff. One of the largest overhead costs that any organization contends with is payroll. The facility manages its payroll very lean with the minimal staff possible and therefore the center runs without extra custodial help. External factors that could have a positive impact on the project's success are strong leadership

staff who are previously trained in Lean principles and the surgery center being a physician-owned, small, single-specialty facility. Having a strong, supportive management team with skills to encourage the new process change can be helpful in avoiding disgruntled employees. Being a single-specialty facility allows for repetitive surgeries, and the small size eliminates extra space harboring unnecessary equipment and supplies. The small size also allows for less time traveling from one area of care to another. Threats that can have a negative impact on the success of the project are employee dissatisfaction, equipment or labor errors, and delivery inconsistency. With proper planning and training for the perioperative team members, the project should withstand dissatisfaction and inconsistencies. Employees should be educated on the positive gains they will experience because of the Lean process change prior to implementation.

Available Resources

The financial aspects, including travel costs, for the project, were kept to a minimum and absorbed by the surgery center and project lead. To make the process change successful very little financial support was needed; however, time for planning and coordination between the project lead, project committee members, and the perioperative staff was required. The personnel involved in planning and implementation of the project made up of a team consisting of the project lead, at least one project committee member, a lead certified registered nurse anesthetist (CRNA), one operating room registered nurse, one pre-operative/post-operative registered nurse, one CST, and the lead SPT. Because this process requires a team approach and all parties involved must have acceptance, all surgery center staff were informed about the project and educated

prior to implementation. Office supplies were made available. Statistical analysis support was provided by the surgery center's QCRN who also served as a project committee member. There were no consultation costs accrued while planning and implementing the project since the project lead had training in Lean principles.

Desired and Expected Outcomes

The desired outcomes of the project were to decrease the operating room's turnover time without jeopardizing patient safety which will then improve perioperative team satisfaction and increase the surgery center's profits. It was hoped that the implementation of Lean principles would produce a positive change in the turnover process even if the expected outcomes were not reached. With minimal changes by the operating room staff, the turnover times were projected to improve. Decreasing the operating room turnover times may prevent further after-hours coverage by staff and decrease the center's payroll costs. Standardization of non-direct patient care tasks decreases the time spent on performing these duties, therefore allowing more time available to provide direct, personalized care to the patient. By doing so, should then improve patient safety and satisfaction. Creating a standardized flow and improving teamwork skills during the turnover process allow teammate roles to be clearly outlined. This provides staff satisfaction knowing all responsibilities are validated and divided equally.

Team Selection

The lead project team consisted of the project leader, at least one project committee member, the lead CRNA, one operating room registered nurse, one pre-operative/post-operative registered nurse, one CST, and the lead SPT. Interprofessional

collaboration brings a different perspective to the project so others can appreciate, learn, and respect each significant role. Considering the Lean initiative focuses on teamwork, guest staff members were invited to join the lead team meetings to add a different viewpoint on how the process was evolving or regressing.

Cost/Benefit Analysis

The surgery center completes an average of 9.5 cases per day utilizing three operating rooms. The average turnover time for the year 2020 was 23.5 minutes. To determine the savings per day the surgery center budgets its expenses based on 12.6 cases per day. For the purposes of this cost/benefit analysis, time savings from turnover reduction was based on four cases per room (12 cases total per day). The desired reduction of turnover time is 3.5 minutes which would reduce room turnover to 20 minutes total. This reduction of turnover time amounts to a 14-minute (4 x 3.5) reduction of the operational day. The variable cost per case for the surgery center is \$2,787 which is assumed to be the labor cost for each case. This extrapolates to \$26,477 ($\$2,787 \times 9.5$) of labor costs per day. With a typical workday being 14.5 hours (0500-1930), a 14-minute reduction to the workday is a 1.61% ($14 \text{ min} / 60 \text{ min/hr} / 14.5 \text{ hrs/day}$) reduction or \$426 per day ($\$2,787 \times 9.5 \times 1.61\%$). Assuming 50 weeks (250 days) of operation which accounts for holidays and other non-operational periods, this is a yearly savings of \$106,500 ($\426×250). This data is summarized and organized in Table 1 listed below.

Table 1*Breakdown of Average Case Cost and Calculated Cost Savings from Turnover Efficiency*

Cost and Efficiency Variables	Values
Average Cost per Case	\$2,787
Current Turnover Time (minutes)	23.5
Desired Turnover Time (minutes)	20
Total Operating hours/day	14.5
Total Savings per day (minutes)	14
Percentage	0.01609195
Cost per day	\$26,477
Savings per day	\$426
Savings per year	\$106,500

The cost to capture these yearly savings involves several components. Some are one-time expenditures while others are recurring costs. These costs are shown below in Table 2. The single largest one-time expense is the cost of 4 hours of training for all staff which is assumed to be \$13,238 ($\$26,477/2$). This cost will be spread out over a 4-week period. The largest recurring cost is the cost of monitoring and analyzing the progress. This would be conducted by an existing employee, the Quality Control registered nurse, who already tracks the metrics used in this analysis. The cost shown here is an approximate amount based on 5 hours spent each week assembling data and performing root cause analyses to direct efforts. While the cost of this staff member is already captured in the labor expenses for the surgery center, this additional time spent will detract from other tasks which will need to be accounted for. Other one-time expenses include the cost associated with providing the training which has two parts: the direct cost

to pay the trainers, project manager, and the costs for the trainers to prep the material; and the second recurring cost is continuing education training on a quarterly basis to keep staff up to date on progress. All of these costs total \$37,257 for a 12-month period.

Table 2

Cost of Implementation and Supporting Calculations

Expenditures	Cost	Recurring?	Calculation
Employee Training (Labor Cost)	\$13,238		26477/2
Recurring Monitoring	\$12,500	Yes	2.5 hrs/wk *\$100/hr * 50
Project lead Costs	\$2,400		12hrs* 2ppl*\$100/hr
Pre-Training Prep	\$2,000		20 hrs * \$100
Training Materials	\$500		
Refresher Training	\$6,619	Yes	
Total	\$37,257		

After the 4-week training period, it is estimated that it will take staff 5 months to capture the complete time savings desired for the turnover time. Table 3 represents how much savings could be anticipated in the first 12-month period.

Table 3

Breakdown of Anticipated Monthly Savings vs. Cost the First Year Post Implementation

Month	Savings	Cost	Calculation
Month 1	\$0	-\$19,180	13,238+2,400+2,000+500+(12,500/12)
Month 2	\$1,775	-\$1,042	12,500/12
Month 3	\$3,550	-\$2,696	12,500/12+6,619/4
Month 4	\$5,326	-\$1,042	12,500/12
Month 5	\$7,101	-\$1,042	12,500/12

Month	Savings	Cost	Calculation
Month 6	\$8,876	-\$2,696	12,500/12+6,619/4
Month 7	\$8,876	-\$1,042	12,500/12
Month 8	\$8,876	-\$1,042	12,500/12
Month 9	\$8,876	-\$2,696	12,500/12+6,619/4
Month 10	\$8,876	-\$1,042	12,500/12
Month 11	\$8,876	-\$1,042	12,500/12
Month 12	\$8,876	-\$2,696	12,500/12+6,619/4
Sub Totals	\$79,886	-\$37,257	
Total Savings	\$42,629		79,886-37,257

Scope of the Project

Defining the scope of the project allows the project leader as well as the project's leadership team to make informed decisions throughout the progression of the project. The anticipated overall goal of implementing Lean principles during the operating room turnover process was to improve efficiency and eliminate waste. This process will improve perioperative team satisfaction by delegating turnover responsibilities equally among team members and potentially decrease overtime and time away from family. Patient safety was held at the forefront of the project; therefore, no patient's safety or satisfaction was jeopardized during the process. The project did not interfere with interpersonal relationships between administration and staff members. The most significant potential barrier to the project was staff member dissatisfaction which can lead to delivery inconsistencies. To prevent this barrier from occurring all surgery center staff were educated prior to implementation and continuous communication ensued throughout the process. All staff ideas and concerns were heard and supported. Having a strong leadership team can help to persuade the change from one technique to another. Another

barrier to the project was minimal staffing. Having an extra hand in the turnover process could help delegate all necessary cleaning tasks further and add value to the process.

Goals and Mission Statement

Goals of Project

One of the main goals of this project was to improve employee satisfaction at the surgery center. To make this improvement, Lean principles were introduced as a process improvement strategy during operating room turnovers. By implementing these strategies, it was hoped that the operating room nurses will be granted more time to spend on direct patient care, the CST will have more time dedicated to sterile field setup, and the SPT will receive dirty instruments in a timely manner, therefore allowing them more time for proper instrument inspection and sterilization. These tasks are critical to each individual responsible for completing them; therefore, allowing for the appropriate time to complete them provides the employee with satisfaction. Employees who feel rushed to complete critical duties or believe others think their job requirements are insignificant develop a sense of dissatisfaction with their job and workplace. Another major job dissatisfier is an increase in overtime which creates a decrease in personal time. Streamlining the turnover process and decreasing the amount of time required to efficiently complete all necessary turnover tasks helps prevent delays in the operating room schedule, allowing employees to finish their day in a timely manner.

Another goal for this project was to decrease operating room turnover times without sacrificing patient safety or satisfaction. Patient safety is held at the center of all process improvement projects and with a push to move quicker, errors can occur. The implementation of Lean principles will sustain, if not improve, patient safety by allowing

nurses more time to spend in direct patient care and prevent patient errors, more time for sterile field setup by CSTs to prevent injury and contamination, and improved inspection and sterilization by the sterile processing department to prevent infections. Improved patient and family satisfaction is an added bonus for this implementation. By streamlining the turnover process and eliminating wasted time, the operating room schedule will run without delays or potential cancellations, thus preventing the patient and family members from spending unnecessary time at the surgery center and more time at home recovering.

The third goal for this project was to increase the surgery center's profits. This will be evaluated over time. By eliminating wasteful time throughout the day, the operating room schedule should finish on time without delays, thus preventing the need to pay employees overtime. Also, by improving employee satisfaction the overwhelming expenses related to staff turnover and the onboarding of new employees will decrease. As explained in the project's cost/benefit analysis, the reduction in turnover time equates to a minimum savings of 14 minutes per day which will not allow for an additional surgical procedure to be added on, however, will provide the staff with the necessary time to complete other required duties such as cleaning and preparing for the next day's assignment.

Mission Statement

The overall mission of this project was to develop a culture that enables a managed system to provide high-quality, cost-effective care to all surgery patients by eliminating waste and creating a standardized method of practice. The initiative was intended to improve the efficiency of the center's turnover process with the expectation

of causing an increase in employee satisfaction, improved patient safety, and an increase in the surgery center's profits. The skills learned during this process will provide the perioperative team with the necessary building blocks for other process improvements throughout the surgery center.

Theoretical Underpinning

Lippitt's seven-step change theory was used to guide the progression of implementing Lean principles during operating room turnovers. The theory concentrates on the role of the leader affiliated with the change process (White, 2019). The transformation of tasks, processes, methods, structures, and/or relationships, otherwise known as change, is necessary for organizational survival and success (White, 2019). The translation of new knowledge into practice must be planned for and managed based on how the change affects the people and culture of the organization. This planning and management process ultimately determines whether the change will be a success or a failure (White, 2019). Lean principles are parallel with this concept because it encourages the practice of continuous improvement, and is based on the fundamental idea of respect for the culture and people.

Step 1 of the change theory requires diagnosing the problem, identifying who will be affected by the change, and determining the essential management personnel who will be responsible for solving the problem, collecting data, and ensuring to others the change will be a success (Spear, 2016). This step is critical in the initial planning phase of the project. It correlates with the needs assessment phase of the project by reviewing the literature and identifying supported outcomes of similar projects and determining the target population, sponsors, and stakeholders. This step also identifies the lead project

team members who will be the recruiters of change for the facility. Incorporate Lean principles as a process improvement strategy requires many changes. The main change is eliminating waste from the process to create a more efficient workflow. By using Step 1 of Lippitt's change theory, the problem becomes more apparent, the employees most affected by the change are identified to help further improvements, and management is given a distinct role in ensuring a positive outcome from the process changes.

Steps 2 and 3 of Lippitt's change theory identify the motivation and capability for change and the available financial and human resources necessary to do so. This includes the change agent's commitment to change, stamina, and power (Spear, 2016). The project's needs assessment also identifies the resources available at the surgery center to make the project successful. The motivation of the perioperative team, as well as the management team, is critical for determining the success of the project. Without a positive outlook on change, the process of removing excess waste will fail and the outcome will not be as efficient as desired. This assessment step is revisited and evaluated throughout the implementation phase of the project to allow management and the project team lead opportunities to influence unmotivated employees.

Step 4, choosing progressive change objects such as developing a plan of action and strategies (Spear, 2016), plays a major role in the planning phase of introducing Lean principles into operating room turnovers. One of the five Lean principles is creating flow, which includes developing action plans to help ensure the flow of the necessary steps runs smoothly without interruptions or delays. Strategies such as breaking down steps and leveling out the workload are used to ensure value-adding activities are part of the action plan (Do, 2017).

Explaining the role of the change agent to all involved employees and ensuring expectations are clear is Step 5 of Lippitt's change theory (Spear, 2016). This step is included in the planning phase of the project. All staff members are made aware of the project and the change agent (project lead team) prior to implementing the new process. By establishing these expectations, employees understand what is expected of them and know who their lead representatives are for expressing concerns and receiving clarification on the process.

Step 6, maintaining the change by facilitating feedback, enhancing communication, and coordinating the outcomes of change (Spear, 2016), is continuously assessed throughout the implementation phase of the project. The lead project team met twice prior to implementation and monthly once the project was underway. Employees were provided with constant communication and support from the lead project team and the project leader. The employees were also provided the opportunity to assess the role of the lead project team and their ability to communicate. Suggestions on ways to better communicate provided by the employees were incorporated into the project. Lean principles are centered around the idea of creating an efficient, streamlined workflow; therefore, if a step does not work or is considered unnecessary, the entire process is evaluated, and the step is eliminated. This process cannot be executed without facilitating feedback from the employees producing change.

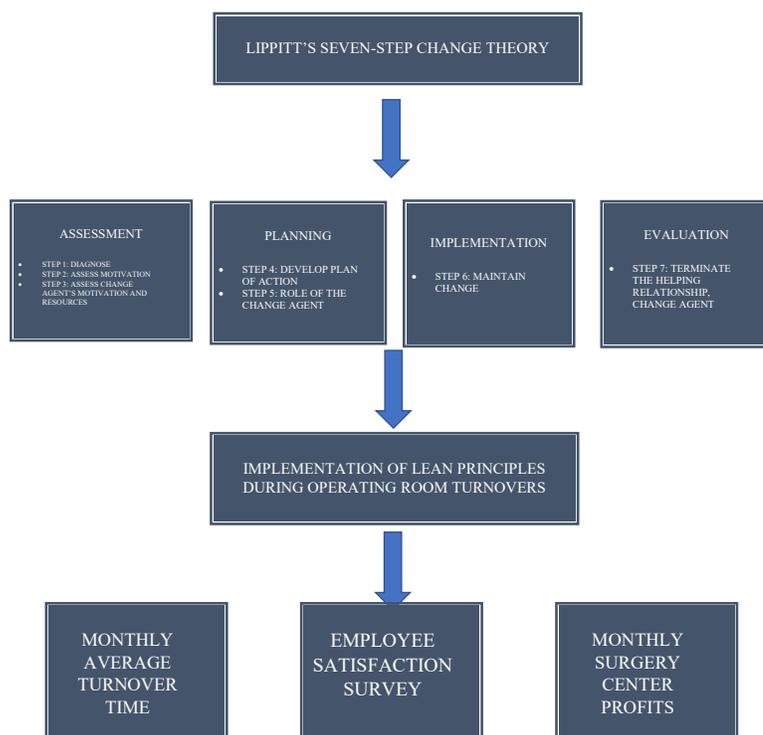
The final step in Lippitt's change theory is Step 7, eliminating the helping relationship of the change agent (Spear, 2016). This step takes some time to achieve because of the constant reassurance and support required by staffing. Implementing Lean principles is an ongoing process of analyzing and eliminating steps until the most

efficient, cost-effective method is established, which can take time. At the end of the implementation period, the project lead, along with the lead project team evaluate the progress of the new operating room turnover process to determine when the change agent can be removed. If the team feels it is not the right time, the change agent continues to support the perioperative team's efforts to create a streamlined process.

Lippitt's theory uses terminology similar to the nursing process of assessment, planning, implementation, and evaluation. This allows the theory to be more useful to nursing management when trying to invoke change into their daily processes because it incorporates a more detailed plan of how to generate change and it is underpinned by the four elements of nursing. Figure 1 demonstrates how the theoretical concepts are linked to the outcome measures.

Figure 1

Link between Lippitt's Theory and Project's Outcome Measures



Work Planning

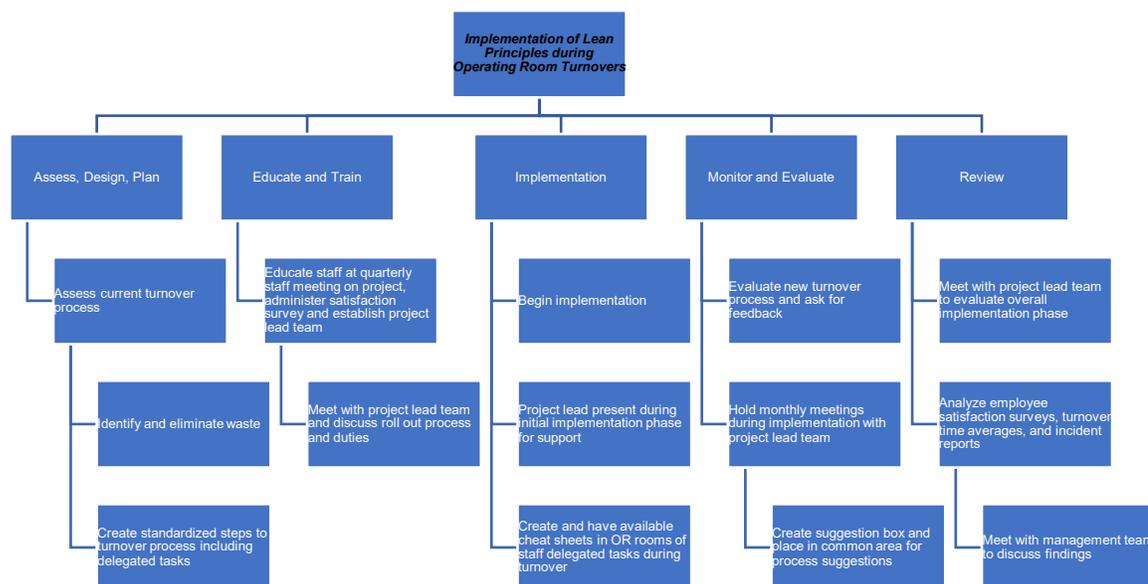
The project was introduced in the fall of 2021. All surgery center staff were informed, educated, and trained prior to implementation. They were given the opportunity to provide input on how the process should be executed. By providing the staff with the necessary information ahead of time and allowing them to have a direct effect on the actual process, the goal of complete staff buy-in will have a greater chance of success. The initial activities involved observing current practices, identifying ways to make improvements, and educating and training staff members. These steps are vital to occur prior to the initiation of other activities. After these initial steps were complete the middle phase, or implementation phase, could occur. Evaluation and monitoring of the project occurred during and after the implementation phase. The final evaluation and data collected were reviewed and presented to the management team at the surgery center at the end of December 2021.

Timeline

The Work Breakdown Structure (WBS) shown in Figure 2 depicts the project's milestone events and all major activities which were required for the project to be executed in a timely manner. This allowed for major steps to be broken down into smaller tasks so they could be easily monitored and completed (Zaccagnini & Pechacek, 2021). The WBS allowed for all the work required for the project to be identified so the project could be accomplished efficiently.

Figure 2

Work Breakdown Structure Depicting Milestone Events and Required Major Activities



Evaluation Planning

Value analysis, or value engineering, is a quality improvement method that uses a systematic team approach that analyzes ways to improve value in a product, facility, system, or service (SkyMark, 2020). It focuses on a very structured analysis of materials, processes, and designs by multifunctional teams to seek cost-effective alternatives (Zaccagnini & Pechacek, 2021). Value analysis is the quality improvement method used to evaluate each outcome objective for the project because this structured methodology laid the foundational groundwork for the Lean and six sigma techniques for quality improvement in health care (Zaccagnini & Pechacek, 2021). The method's process involves forming a team to study, dissect, organize, and structure the new product, or in

reference to the project the new turnover procedure. The process also looks at all the roadblocks that may occur preventing achieving the overall goals of the project. The core principle of Lean is to cut out unnecessary and wasteful steps in the creation of a product or delivery of service so that only steps that directly add value are taken (AHRQ, 2020). Similar to value engineering, Lean also uses a team approach to analyze a system or service to improve the value of the final product which will be provided to the customer. A core team was established prior to implementation to help dissect and analyze the turnover process. The team also evaluates the progression of the project. The core team members are the backbone of the project and hold imperative responsibilities in determining the success of the project.

Outcome objective one, the surgery center's perioperative team job satisfaction score will increase by a minimum of two points, was evaluated by an anonymous survey provided to the staff. The survey consists of 10 questions handed out prior to the implementation phase of the project and then again afterward. Employees were encouraged to answer truthfully and anonymously. The employee's satisfaction is evaluated by using this survey and the scores derived from it. Employee satisfaction is a key component in the success of the implementation process. To help ensure the meeting of this objective, employees were educated prior to the implementation phase and given the opportunity to provide input, ask questions, and express concerns.

Outcome objective two, monthly average operating room turnover times will decrease by at least 3.5 minutes to meet the goal of 20 minutes without jeopardizing patient safety, was monitored by reviewing and comparing the collected monthly data. Turnover times were collected daily, and averages were evaluated each month. Many

nonmodifiable factors play a role in the success of this objective such as staffing shortages, implementation of a new electronic medical record system, and an end-of-the-year increased workload due to insurance deductibles being met. Patient safety was kept at the forefront of the project and will never be sacrificed to meet this objective. The surgery center will continue to strive toward this goal after the initial implementation phase. This objective is the overall goal of the project and holds great value. Analyzing the value of improving the turnover time will provide benefit the surgery center's profits, even if the objective is not fully met.

Outcome objective number three, the surgery center will not see an increase in onboarding new employee expenses and overtime expenditures, which were monitored closely each month. The success of achieving this objective is dependent on the previous two outcome objectives. If employee satisfaction decreases then the surgery center will begin to lose employees and will be required to hire and onboard new employees, increasing their expenditures. Also, if the turnover times do not decrease as expected, the surgery center will continue to see overtime expenses. Evaluating the value of preventing an increase in the surgery center's expenditures improves the center's profitability. To increase the opportunity of meeting this objective, monthly meetings were held to evaluate employee concerns and suggestions, and to review the monthly turnover time averages. Management continuously encouraged employees and provided positive feedback and gratitude throughout the project's implementation phase.

The value analysis quality improvement model mimics the Lean process in numerous ways including analyzing ways to improve service by evaluating the process. This evaluation is performed by a multifunctional team that seeks to find cost-effective

alternatives to improve service. The process also evaluates the potential roadblocks which may occur and prevent the project from being a success. The assigned core team provides continuous review and progress analysis of the project. This continued review serves as the evaluation method for the project's outcome objectives.

Implementation

The project, Implementation of Lean Principles during Operating Room Turnovers, was given approval by the Nursing Research and Evidence-Based Practice Council to proceed with the implementation phase. Implementation began with educating staff about the project's process, goals, objectives, and mission statement. Staff members were provided an opportunity to ask questions and express concerns, and a project leadership team was established prior to implementing change in the turnover process. The project lead team met weekly to identify areas of improvement by breaking down the current process and analyzing each step. The new streamlined process created by the team was implemented and data collection began. A pre-implementation survey was administered to staff to score employee satisfaction. This score was compared to a post-implementation survey after collecting data for 3 months.

Threats and Barriers

There were several threats and barriers to the project that was nonmodifiable. The project was implemented during the fourth quarter of the year. The surgery center experiences an increase in surgery case volume during the last quarter of the year due to patients meeting deductibles and requesting surgery. Each department located within the center is impacted by a packed surgery schedule. This influx of patients places greater stress on the staff to be more efficient in their work and leaves little room for errors.

During the implementation process, the surgery center faced several challenges that were threats to the project; the first was a distinct increase in patients and another was adopting a new electronic documentation system.

On top of an increase in surgery patients, another threat to the project was the surgery center was still adapting to changing their documentation process. In July 2021, the center underwent a dramatic change from documenting on paper to having its first electronic medical record (EMR). In October, the center was still working through glitches in the system and getting adjusted to the new EMR. This change also affected surgeons and mid-level providers and their routine for signing consents, completing history and physicals, and reviewing medication reconciliations. This change was a threat to the project because it created delays in the pre-operative area. The surgeons had difficulty completing their history and physicals appropriately and signing off on medications which created delays with patients going to surgery.

Another threat to the success of the project was employee commitment to the process after implementation. The staff were very compliant and involved in the new turnover process at the beginning of implementation. However, as time progressed and the stress of a packed surgery schedule grew, the staff became less cooperative. The team also suffered a decrease in staff during the latter part of the implementation because several employees tested positive for COVID-19, requiring them to quarantine and two other employees were on medical leave. When asking the staff why their attentiveness declined, they explained with daily case counts well above average, and working longer hours during staffing shortages, it was difficult to remember new procedures; being so

busy forced them into a state of muscle memory and they reverted to their previous turnover routines.

Monitoring of Implementation

Prior to implementing the new turnover process, the project lead observed, on two separate occasions the original turnover process to identify ways for improvement. The first week the new process was put into effect, the project lead and project lead team members observed the staff and offered suggestions. The staff were unhappy with the new process and stated it left too much room for patient errors. The project lead team met the following week and revised the process. After revisions were made and put into place, the staff were more compliant and approved of the new process. Monitoring continued weekly after implementation until the observation period was complete. The project leadership team continued to meet monthly to discuss how the turnover process was working, evaluate monthly turnover time averages, and review any incident reports pertaining to the project. Once the observation period had ended, the project lead administered a post-implementation survey to the staff and met with the surgery center's administrator and director of nursing to discuss progress and success. The project lead then sent out an email to all the surgery center's staff to make them aware of the project's outcome.

Project Closure

The project did have a positive impact even though it did not meet its original objective of decreasing turnover times by 3.5 minutes. The process did decrease the time from 23.5 minutes to 23 minutes in October and November. During December, the average turnover time was 23.7 minutes. The project was unsuccessful at improving

employee satisfaction as evidenced by a decrease in employee satisfaction scores on the post-implementation survey when compared to the pre-implementation survey. This decrease in satisfaction was multifactorial. Several staff members were out on medical leave during the implementation period, leaving the remaining staff short of help during the most demanding time of year, and morale was at a low due to the current COVID-19 pandemic. These factors were unpreventable however detrimental to the success of the project. During the implementation period, the surgery center did accrue onboarding expenses for two new employees. However, these employees were hired to fill positions that were vacated prior to implementation. No surgery center employees resigned during the time of implementation and no incident reports collected during implementation were related to the project.

One outstanding outcome of the project was the surgery center's administrative team implemented a new quarterly staff bonus program. The program required the staff to reach two goals during the quarter to receive the bonus and one of the goals was to reach a turnover time of 23 minutes. The administrative team encouraged the staff to use the Lean turnover process to help meet this matrix. The staff has never been given the opportunity for a bonus program and this was greeted with much enthusiasm. Another outcome of the project was the project lead team members requested the surgery center create a Lean team to analyze and remove waste from other processes in the different departments throughout the surgery center. The staff recognized how useful the Lean principles could be in improving procedures and were encouraged by management to continue bringing ideas to the forefront. Even though the project technically did not meet

the objectives set forth in the beginning, it did bring positive change to the surgery center which will continue to benefit the center in more than one area.

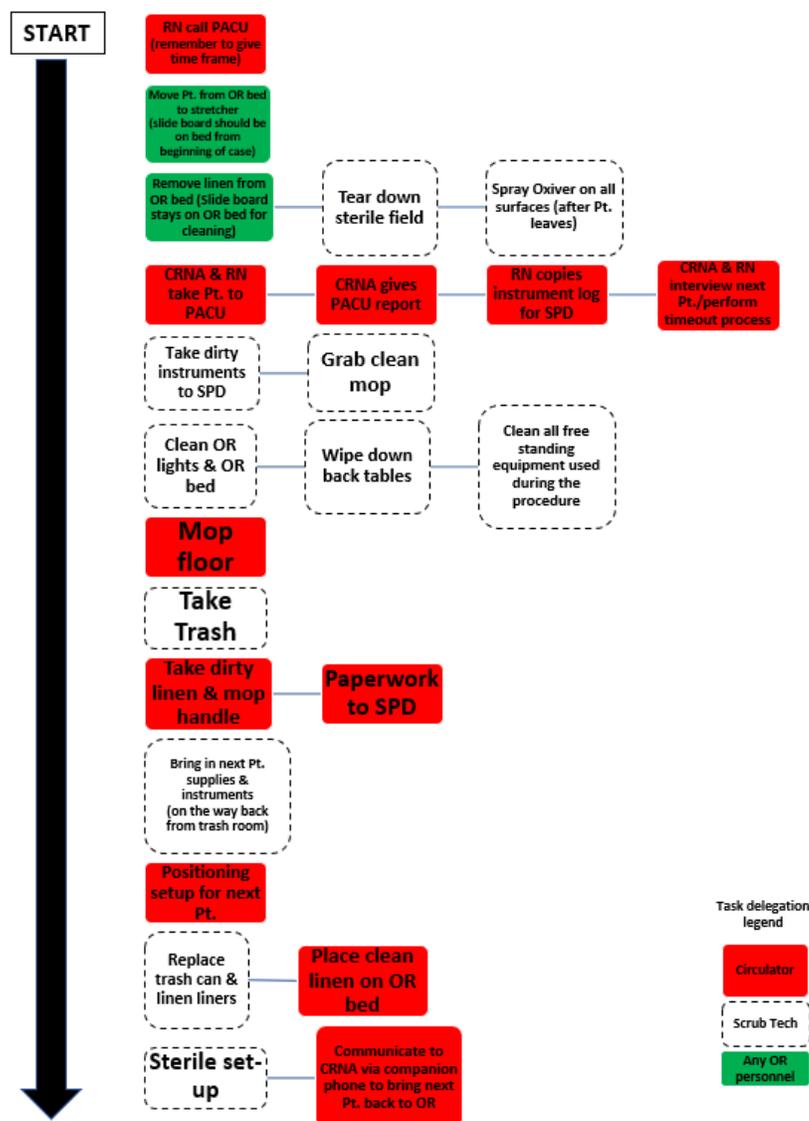
Interpretation of Data

Qualitative Data

Qualitative data was collected for this project by forming a lead project team, observing the turnover processes pre and post-implementation, and one-on-one interviews with staff members and management. The data analyzed focused on gaining insight, reasoning, and motivation as to why the project was a success or failure. The project lead observed three different turnovers prior to the implementation period to identify areas for improvement. These findings were brought to the project lead team meeting for discussion. The project lead team met weekly for 6 weeks prior to implementation day. The team used the Lean principles approach to create a new, more efficient turnover process. During the first meeting, the project lead introduced the purpose of the team, the current turnover time average, the definitions for “valuable” vs. “wasteful” according to Lean, and findings from observation of the current turnover process. In the following meetings, each step of the turnover process was broken down and reviewed for value or wastefulness. All steps categorized as wasteful were then analyzed to see if the step needed to be eliminated or changed. Prior to implementation, the team had created an efficient, detailed flowchart, Figure 3, outlining the new turnover process for the staff to follow. The project lead educated staff on the new process during lunch hours and provided copies for their review prior to implementation. Laminated copies of the turnover flowchart were visibly hung in each operating room for staff to reference.

Figure 3

Initial Lean Turnover Process Flowchart



During the first week of implementation, the project lead observed the transition to the new turnover process and offered feedback and suggestions. The project lead talked to various operating room team members and asked for their opinions on the new process. It was brought to the project lead's attention that multiple steps to the new process were not working as planned. Some of the new process steps were not beneficial

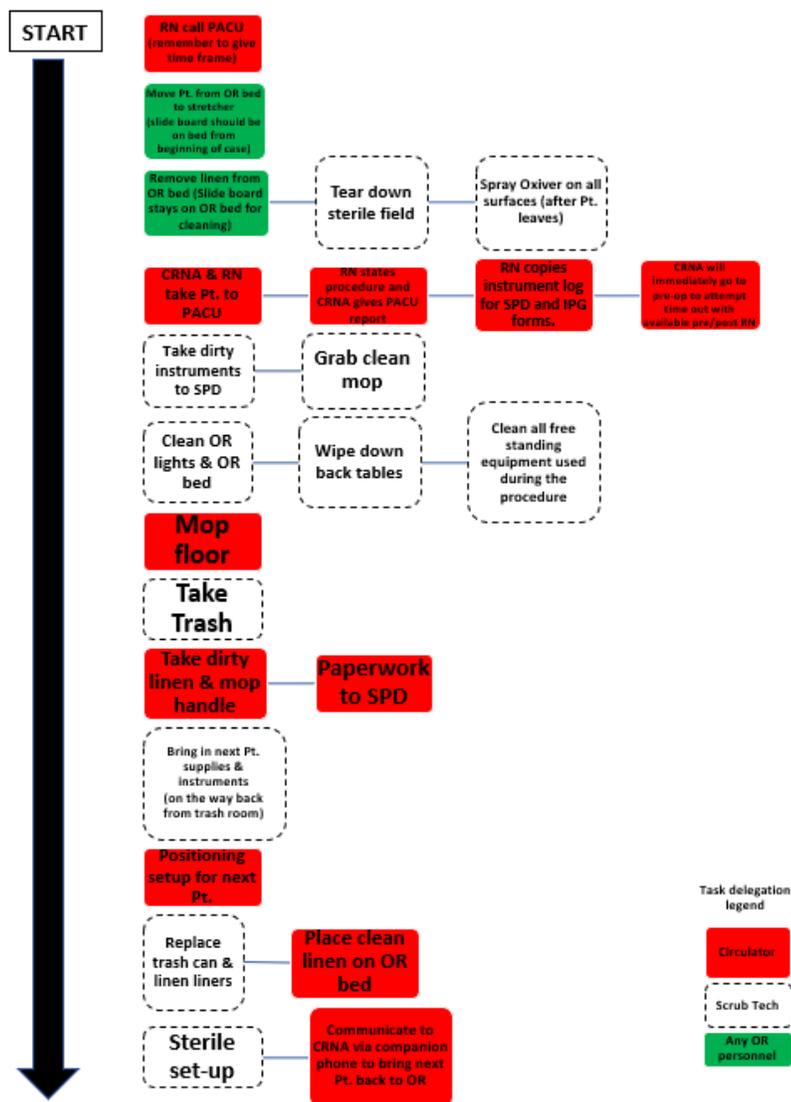
to the turnover or the team. The specific steps in question were the elimination of the circulating nurse providing a report to the PACU nurse, and the circulating nurse assisting in the timeout process with the CRNA in pre-op. The PACU nurses felt the circulating nurse's report was vital because it gave them the surgical procedure if any local anesthetics were used, and what type of dressing the patient was going home with. This information is documented in the EMR system; however, it was difficult to find. Therefore, the PACU nurses relied on the circulating nurse for this information. The second step in question was having the circulating nurse be a part of the timeout process with the CRNA in pre-op. Prior to the patient being transported to the operating room, a timeout procedure must be completed as a final safety check to make sure all proper documentation is correct, filled out, and signed by all parties, and the surgeon has seen the patient and placed a mark on the operative site. This information is confirmed with the patient and reviewed by two licensed providers in the medical record. Considering both the circulating nurse and the CRNA had already interviewed the patient prior to them being transported to the operating room, the project lead team believed it would be conducive for these individuals to complete this task together. However, the CSTs that were left in the room to start the cleaning process felt the new step caused the circulating nurse to be gone from the operating room too long and they were left to clean the room by themselves.

As soon as these concerns were brought to the project lead team's attention, the process was reevaluated, and the decision was made to change the process. Figure 4 is the revised draft of the initial turnover flowchart. The decision was made to have the circulating nurses provide the PACU nurses with a shortened handoff report limiting the

information to only the key components the PACU nurses requested, i.e., stating the surgical procedure, if any local anesthetic was used, and the type of dressing the patient would be going home with. The other stated concern of the circulating nurse being gone too long from the room was addressed by exempting them from being involved in the timeout process with the CRNA in pre-op. The step was changed to have the CRNA complete the timeout process with a pre-op nurse.

Figure 4

Final Lean Turnover Process Flowchart



The revised process was implemented in the second week of the implementation phase. After the staff initiated the revised process, they became content with the outcome. The two areas of weakness were no longer a concern, and the revised process became the final flowchart. The initial laminated copies were replaced with the revised version in each operating room and staff members were given the opportunity to ask questions and voice other concerns. Another concern that was brought to the attention of the project lead during interviews with staff members was the surgeons and mid-level providers not completing their orders, history, and physicals, and consents for surgery in a timely manner. This information is part of the pre-op timeout process and must be completed prior to the patient being transported to surgery. The delay in having these documents completed slowed down the turnover time because the CRNA was not able to complete the timeout process in a timely manner. This also caused the pre-op nurse to stop what they were doing to track down the surgeon and inform them to complete the necessary paperwork. Much of this delay was due to the new EMR system which the surgeons and mid-level providers were still becoming accustomed to. The providers were under the impression the information was complete due to improper entry of orders and wrong documentation for history and physicals. After reeducation by the Epic superuser team, the vast majority of these issues were corrected.

The project leadership team continued to meet monthly during the implementation period and the project lead continuously monitored the turnover time progress. The project leaders met with the administrative team monthly to discuss average turnover time and incident reports. During the quarterly staff meeting, the project lead updated the staff on the project's progression, gave the opportunity for them to discuss issues or

concerns, and advised them on how the rest of the implementation period will move forward.

While observing the turnovers towards the end of the implementation period, the project lead noticed that several of the staff members were not following the steps on the flowchart. When asked why the steps were not being followed, they stated they felt too much stress from being short-staffed during the busiest time of year for surgical cases. The staff stated they resorted back to their old way of doing the turnover process because they could not concentrate on a new process with added stress.

All healthcare facilities are currently struggling with staffing shortages. These shortages generally fall into two categories, an overall lack of qualified staff and staff reductions due to sickness, mostly related to the current COVID-19 pandemic. COVID-19 quarantine requirements, at a minimum of 5 days, far exceed what is normally experienced for other sicknesses and have certainly impacted staffing levels during the implementation period. Furthermore, the shortage of qualified staff in the healthcare industry across the country has increased demand for these individuals and thereby increased compensation. This is most notable in the market for traveling medical staff. While no staff was lost during implementation, the surgery center is not fully staffed and has struggled to do so in competition with other facilities.

Prior to implementation, the surgery center went live with a new electronic medical record system. This process was a complete change and adjustment for all staff and doctors. The learning curve of this new system undoubtedly affected all aspects of the center's operations in non-quantifiable ways. This system removes certain flexibility that existed when utilizing paper documentation and places hard stops in the patient care

process to ensure patient safety is maintained. This system depends heavily on providers entering the appropriate orders in a timely fashion. Tackling two new processes in the same timeframe is not ideal and unfortunately, it was unavoidable.

One activity that benefits the overall efficiency of the surgery center and specifically helps reduce turnover times is the purposeful scheduling of back-to-back similar cases. The personnel that handles scheduling always look to place cases in sequence with other cases that are similar in nature. An example would be total joint cases that are always scheduled sequentially in the same room so that all the same equipment is staged, thus reducing wasted energy of moving different equipment in and out of the rooms. While the scheduling personnel tries to schedule back-to-back similar cases, this specific tool to help reduce turnover time is not being followed as closely as it could be. The schedulers battle patient arrival time conflicts, surgeon preferences of surgery order, and equipment conflicts on a daily basis which influence the order arrangement of surgical cases. Moving forward to combat this issue, the scheduler, administrative team, and surgeons should collaborate on a set of guidelines to be followed so that efficiency is kept at the forefront. There should be an emphasis placed on how critical it is to schedule like cases back-to-back to help efficiency and reduce turnover time.

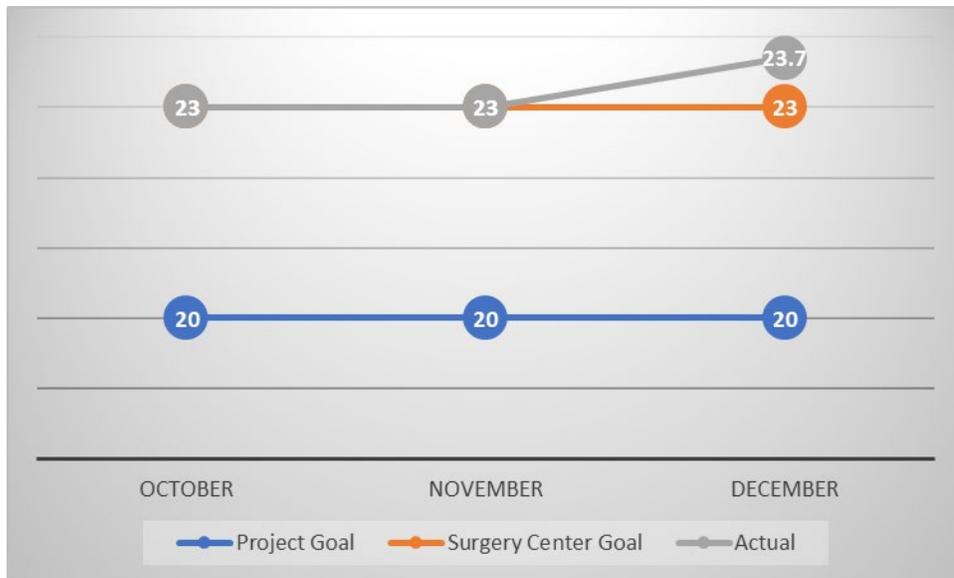
Another positive influence on the implementation and overall goal of reducing turnover times is a new incentive program introduced by the executive leadership of the surgery center. This incentive program provides a financial incentive to the staff for achieving a quarterly average of 23-minute turnover time as well as maintaining a predetermined patient satisfaction score. While this project did not influence the incentive

program, the staff are now motivated to continue to implement the principles taught and exercised during this project.

Safety is of utmost importance in health care. Perhaps the most important outcome of this project was focusing on patient safety and achieving zero incidents. The project was successful in maintaining the safety of staff and patients while implementing the new process. The surgery center witnessed zero incidents during the implementation process, both in the turnover process as well as overall. This project has demonstrated that Lean strategies can be implemented in the surgical environment without compromising patient safety. This conveys an important message to nurses and other support staff who are, many times, the patient's advocate and guardian of safety.

Quantitative Data

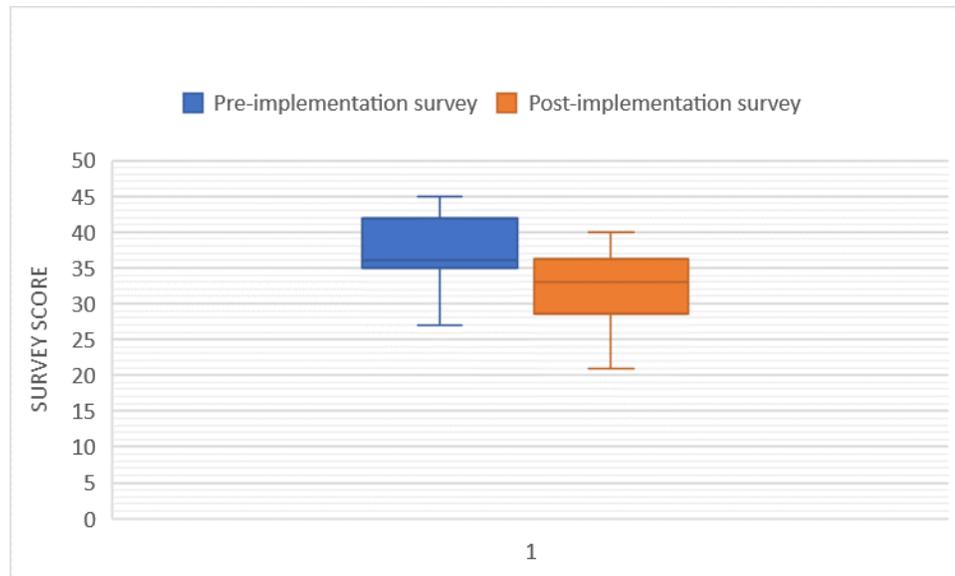
When charting the average turnover times versus the goals of the facility and the project goals, no trending is visible, as depicted in Figure 5. The turnover time did decrease from the original average of 23.5 minutes to the surgery center's new goal of 23 minutes in 2 of the 3 months observed. To further the efforts of this project, the surgery center should gather more data and consider collecting the data at more frequent intervals. More data would hopefully identify trends that the leadership could utilize to target specific processes or problems to drive additional reductions in turnover times.

Figure 5*Average Turnover Time vs. Anticipated Goals*

Comparing the pre-implementation scores of surveyed employee satisfaction with the scores post-implementation on a box and whisker plot, shown in Figure 6, provides a comparison of the variation in the data. The overall shape of each plot is very similar to each other with similar-sized upper and lower quartiles as well as a similar span for the middle quartiles. However, the pre-implementation survey showed that 25% of the data (quartile 2) is clustered between 35 and 36 showing consensus among employees on satisfaction. The post-implementation plot shows a data set that is much more evenly distributed, which statistically speaking would be considered normal distribution.

Figure 6

Comparison of Pre-implementation Survey Scores to Post-implementation Survey Scores

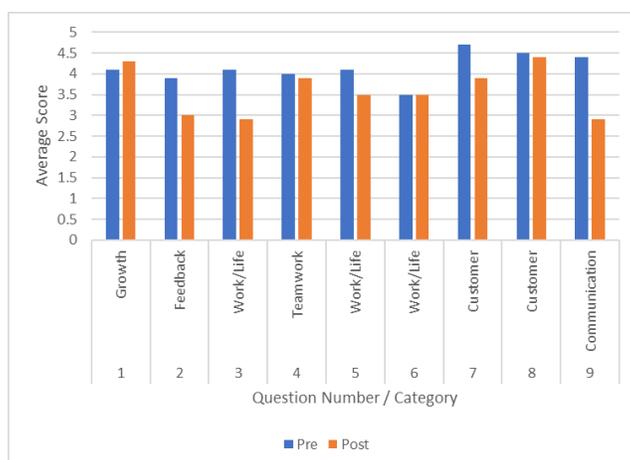


The survey questions were focused on opportunities for growth, teamwork, work/life balance, feedback, quality and customer focus, and communication. Three questions were geared toward work/life balance, one question toward opportunities for growth, one question toward teamwork, one question on feedback, two questions on quality and customer focus, and one question on communication. The last question on the survey reflected the staff member's opinion of the project adding value to the organization. The survey scale used to measure the employee's answers is the 5-point Likert scale ranging from strongly disagree to strongly agree. The scoring system is as follows: 1-strongly disagree, 2-disagree, 3-neutral, 4-agree, and 5-strongly agree. Each question was given the corresponding numeric score based on the employee's answer. These numeric values were then summed for each individual and then the average across all employees was calculated. After the further breakdown of the questions, the categories that decreased by the greatest amount, according to the survey results, were

communication and work/life balance. Figure 7 is a representation of each category and how the values changed according to survey results. When asked, “The environment in this organization supports a balance between work and personal life,” the survey results dropped from an average of 4.1 on the pre-implementation survey to 2.9 on the post-implementation survey. When asked, “Information and knowledge are shared openly within this organization,” the survey results decreased from an average of 4.4 to 2.9. After reviewing the results with the staff, the feedback from them was the drops in communication and work/life balance were more a product of increased stress felt by the staff due to increased case volume and decrease in available staff, and less a product of the new turnover process. When reviewing the last question on the survey regarding the staff’s feeling as to if the project added value to the organization, out of the eight post-implementation surveys, three surveys were left blank, three surveys were in favor of the project adding value, and two surveys stated they did not feel the project added value. The leadership of the surgery center should collect additional data over an extended period of time to truly understand the impact on employee satisfaction.

Figure 7

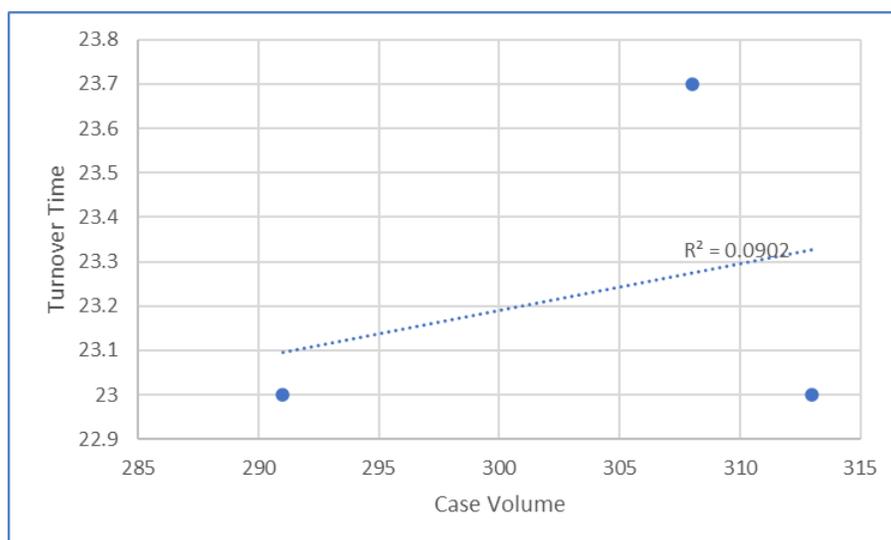
Comparison of Average Scores from Pre and Post Implementation Surveys



To determine if a correlation existed between case volume and turnover time, these two data sets were plotted together to determine the R^2 value. R^2 values can range from 0 to 1.00. A higher R^2 value means the data is directly correlated. If the R^2 value is close to 0, the data sets are not well correlated (Frost, 2022). During October, the surgery center completed a total of 291 cases and averaged a turnover time of 23 minutes. In November the surgery center captured its highest case volume during implementation totaling 313 cases and kept its average turnover time at the goal of 23 minutes. In December the case volume dropped to 308 surgical cases and the turnover times increased to 23.7 minutes. In Figure 8, the resultant R^2 value was calculated as 0.0902 and therefore this data shows very little signs of correlation. It does seem reasonable that turnover times are less a function of a number of cases and more a function of other factors, perhaps staffing levels, or various other non-numerical items. This information will aid management in the future to understand what factors to focus on in the effort to further reduce turnover times.

Figure 8

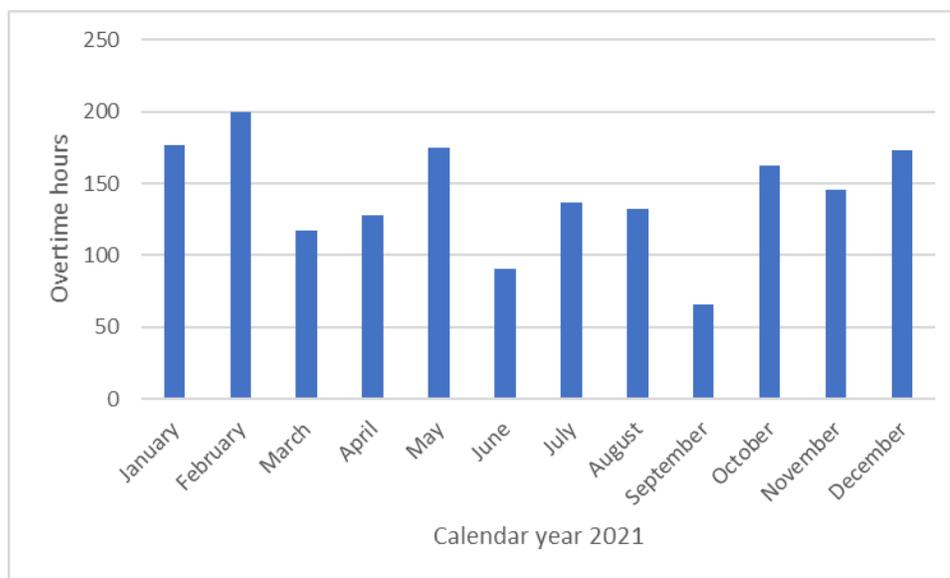
Relationship Between Case Volume and Turnover Time



Process Improvement Data

Two of the three outcome objectives of the project were not met after implementation. For outcome objective one, the perioperative team's job satisfaction score from the pre-implementation survey did not increase by the projected minimum of two points on the post-implementation survey. The post-survey decreased by 4.45 points from the pre-survey. For outcome objective two, the monthly average turnover time did not decrease by 3.5 minutes to reach the goal of 20 minutes. The monthly average turnover time did decrease by 0.5 minutes from 23.5 minutes to 23 minutes for 2 of the 3 months observed. For outcome objective three, the surgery center did onboard two new employees during the implementation period. However, this was due to filling positions vacated prior to the implementation period.

Another subset of the third outcome objective referred to overtime expenditures. The objective stated the surgery center will not see an increase in overtime expenditures during the implementation period. Considering the fourth quarter of the year is notoriously the busiest time of year for surgeries, the surgery center administration could not avoid this costly expense. Figure 9 outlines the surgery center's cumulative overtime hours for each month for all employees. Even though the fourth quarter was extremely busy, the overtime accumulated during the months of implementation was not the greatest amount of overtime seen during the year 2021.

Figure 9*Monthly Cumulative Overtime Hours for 2021*

Even though the original project outcome objectives were not met, the project was successful at creating positive change in different areas of the surgery center. The project brought to the surface a lack of equipment in the pre-operative area. With the dramatic change of switching from a paper-based charting system to an electronic medical record, the new turnover process identified the need for more computers. During implementation, one additional computer was installed, giving the staff more resources for charting without interfering with others' workflow. Another positive change for the center was the enactment of a staff incentive program. The program allows staff members to receive a quarterly bonus if certain metrics are achieved. One metric is to reach a monthly turnover time average of 23 minutes. This change was not a product of the project; however, the new turnover process implemented is a valuable resource staff members can continue to use to help reach their incentive program goals. A third positive change from the project was the project lead team members requested the surgery center create a Lean team to

analyze and remove waste from other processes in the different departments throughout the surgery center. The staff recognized how useful the Lean principles could be in improving procedures and were encouraged by management to continue bringing ideas to the forefront.

An unmeasurable change produced by the implementation of the project was the increase in knowledge and awareness of the proper, most efficient way an operating room should be cleaned between surgical patients. The reiteration of the standards and guidelines set by the Association of Perioperative Nurses (AORN) was an important piece in educating the staff because the surgery center follows these guidelines. Coupling these guidelines with an efficient method creates a unified process that properly aligns with patient safety, proper sanitation technique, and efficiency.

While this project did not meet its intended objectives, it will still have a lasting impact on the surgery center. With assistance from management to continue encouraging and monitoring the turnover process, the project will be sustained. The measurement of success was based upon improvement in turnover times over the duration of the project. As stated previously the first 2 months experienced a reduction in turnover times versus pre-implementation numbers but did not reach the project goal. Despite not meeting the objectives, the project served to educate staff and leadership that efficiencies can be achieved while still aligning with AORN standards for patient and staff safety and proper sanitation techniques. Stress factors existed both pre-implementation and post-implementation and continue post-project. These factors include pandemic fatigue, staffing shortages, and a new electronic medical record system. Added stress is shown to reduce productivity which undoubtedly influenced the project outcome (Street et al.,

2018). The success metric of this project was purposefully picked to be a standard metric already measured and tracked by the surgery center. The goal of managing turnover times is an eternal one in surgical facilities, and the leadership of the surgery center and the tenured staff has been given tools that will help them improve these numbers over time. The Lean principles taught during this implementation process are capable of impacting change long after the completion of the project.

As mentioned previously, the metric used to judge success was already tracked and evaluated consistently. Surgical facilities are always looking for ways to improve turnover times but must balance safe and effective sanitation techniques with this goal. Every minute of operating room time is costly, so reducing turnover time is a key part of controlling cost and increasing revenue; however, this must be balanced with a focus on patient and staff safety and sterility. Striking this balance was a key aspect of this project. As the leader of the surgery center continues to monitor the turnover times, it is in their best interest to make use of the principles taught during this project to drive further reductions in turnover times.

The surgery center will continue to measure turnover times as a measurement of staff efficiency and cost control. Currently, however, turnover times are only calculated monthly which limits the data available for mining. It would be advisable that the surgery center track this data daily and compare this data to staff levels for the day, as well as case counts for the day to develop trends. Other data that may point to trends could be types of cases. It is understandable that a total joint surgery may require a longer turnover than a simple carpal tunnel surgery. If leadership truly wants to perform causation analysis on turnover time fluctuations, other non-numerical data may be important such

as surgeon punctuality, anesthesia delays, late patient arrival, etc. Understanding specific reasons for variations in turnover time will help the leadership remove outlier data.

Employee satisfaction can continue to be monitored and addressed by management, tackling staff morale concerns as soon as they are reported. Employees should be encouraged to come forward with any concerns regarding daily processes, patient safety, efficiency tactics, and team camaraderie. An exit interview or survey would be beneficial in identifying the reasons why staff members have resigned. The common denominators mentioned can be addressed to help make the surgery center a more conducive working environment.

References

- AHRQ. (2020, January). *Section 4: Ways to approach the quality improvement process*. Agency for Healthcare Research and Quality.
<https://www.ahrq.gov/cahps/quality-improvement/improvement-guide/4-approach-qi-process/sect4part2.html>
- Do, D. (2017, August 5). *The five principles of Lean*. The Lean Way.
<https://theleanway.net/The-Five-Principles-of-Lean#:~:text=The%20five%20principles%20are%20considered,detailed%20over view%20of%20each%20principle>
- Frost, J. (2022). *How to interpret r-squared in regression analysis*. Statistics by Jim.
<https://statisticsbyjim.com/regression/interpret-r-squared-regression/>
- NEJM Catalyst. (2018, April 27). *What is Lean healthcare?* NEJM catalyst: Innovations in care delivery. <https://catalyst.nejm.org/doi/full/10.1056/CAT.18.0193>
- Ninan, D., Zhu, J., Amanda, K., Wasson, E., Fullerton, T., & Ninan, B. (2017). The role of organizational culture in operating room turnaround time. *Cureus*, 9(5)
<https://www.cureus.com/articles/7254-the-role-of-organizational-culture-in-operating-room-turnaround-time>
- Shrank, W.H., Rogstad, T.L. & Parekh, N. (2019, October 7). Waste in the US health care system: Estimated costs and potential for savings. *JAMA Network*.
<https://jamanetwork.com/journals/jama/article-abstract/2752664>
- SkyMark. (2020). *Larry miles and value engineering*. SkyMark Corporation.
<https://www.skymark.com/resources/leaders/larrymiles.asp>

Spear, M. (2016). How to facilitate change. *Plastic Surgical Nursing*, 36(2), 58-61.

https://www.nursingcenter.com/journalarticle?Article_ID=3554759&Journal_ID=496448&Issue_ID=3554734

Stern, V. (2015, September 1). *Improving cost-effectiveness in the OR: Six areas of focus*.

OR Management News. <https://www.ormanagement.net/Feature/Article/09-15/Improving-Cost-Effectiveness-in-the-OR-Six-Areas-of-Focus/46726>

Street, T. D., Lacey, S. J., & Somoray, K. (2018). Employee stress, reduced productivity, and interest in a workplace health program: A case study from the Australian

mining industry. *International Journal of Environmental Research and Public Health*, 16(1), 94. <https://doi.org/10.3390/ijerph16010094>

Toussaint, J. S. & Berry, L. L. (2013, January). The promise of lean in health care. *Mayo*

Clinic Proceedings, 88(1), 74-82. <https://doi.org/10.1016/j.mayocp.2012.07.025>

White, K. M. (2019, December 19). Change theory and models: Framework for

translation. In White, K. M., Dudley-Brown, S., & Terhaar, M. F. (Ed.),

Translation of evidence into nursing and healthcare (3rd ed., pp.59-62). Springer Publishing Company.

Zaccagnini, M. E. & Pechacek, J. M. (2021). A template for the DNP project. In

Zaccagnini, M. E. & Pechacek, J. M. *The doctor of nursing practice essentials: A new model for advanced practice nursing*. (4th ed. p.372-383). Jones and Bartlett

Learning.