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Improving First Case Starts for a Neurosurgery OR

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Improving First Case Starts for a Neurosurgery OR

Section I: Abstract

Problem: On-time first cases for operating rooms (OR) is a worldwide focus for improvement. OR delays have many adverse effects, including economic costs and patient and facility staff satisfaction.

Context: The site for this improvement project is a medium-sized hospital in Northern California. There are 12 ORs, with an average of 600-700 cases. Neurosurgery was the chosen specialty due to low on-time starts and long delay minutes. The focus was working with one OR to improve first case on-time starts by 20%.

Interventions: A worksheet was created to track room setup, delay reasons, and delay minutes. A visual setup guide for neurosurgical procedures was created for placement required equipment and bed. Testing was from September 2-23, 2021, and the visual guide was presented to staff on October 12, 2021.

Measures: On-time to the OR is 7:45 a.m. or earlier. The delay minutes and reasons were tracked. The worksheet was a yes/no form confirming if the room had the case cart, equipment, and bed made each morning.

Results: August 2021 delay minutes totaled 279, September total was 259, with an improvement of 7.2%. October total was 189 minutes, with an improvement of 32.3%. Overall, surgeon-related delays led the cause for not achieving first case on-time starts; OR-related delays decreased.

Conclusion: Identifying the causes of late on-time starts is key to changing practice and to improving metrics. Deeper dives can help streamline and standardize care for the patients. Staff and leadership buy-in is needed for success.

Section II: Introduction

Having an operating room (OR) run on time is a complicated process, with many independent and dependent layers. Perioperative leaders monitor outcomes data that measure efficiency and financial performance, such as first case on-time starts (FCOTS), turnover time, block utilization, and surgical delays (Allen et al., 2019; Bender et al., 2015; Franklin & Franklin, 2017; Han et al., 2016; Matthews et al., 2015). An important metric to evaluate efficiency is known as FCOTS. The perioperative department in any healthcare facility utilizes substantial portions of the facility's operating budget (Mathews et al., 2015). Part of being a good financial steward is knowing the inefficiencies that occur in the facility. Many organizations seek to improve outlying factors, and FCOTS is one long-standing issue that perioperative leaders want to improve (Phieffer et al., 2017). The clinical nurse leader (CNL) is a driver of improvement initiatives in the OR environment. The CNL role drives quality improvement (QI), collects and analyzes data, and uses these data to develop plans to achieve goals (King et al., 2019). FCOTS is a metric used universally to improve OR delivery times.

Improving FCOTS is a priority goal for the organization because of the negative impacts when cases start late. The late start cascades from patient admission in the preoperative area to the OR and postoperative delays. The postoperative delays can leave the late starting OR holding area for patients. All these delays impact patient and staff satisfaction. This project will improve on-time starts for the surgeon(s) in the service line with the lowest on-time starts. Improvement of this goal is a priority because of the economic effect on the hospital, and perioperative leadership is looking at improving the utilization of room times.

The reduction of postponed cases from the global pandemic created an urgency to improve FCOTS, room utilization, staffing, and equipment. The success of this project will spread to other surgeons and service lines in the facility.

Problem Description

The microsystem for the improvement project is the OR at a medium-sized hospital in Sacramento, California. There are 12 ORs; the first floor has two rooms, and the remaining 10 rooms are located on the second floor. The hospital is a neurosurgery and stroke center of excellence, an orthopedic center, and includes gynecological oncology specialties. The OR staff consists of nurses, surgical technologists, anesthesia providers, surgeons, and ancillary staff who support daily functions on the floor.

As the cost of healthcare increases, each facility reviews how to reduce overhead costs. The OR is a significant source of revenue for the hospital, but the cost of doing business in this environment is high (Chua et al., 2021; Han et al., 2016; Matthews et al., 2015). OR time is expensive. When time utilization is inefficient, the overall budget is negatively affected (Allen et al., 2019). Studies indicate that the average cost of an OR minute is $15 to $20 (Chua et al., 2021; Han et al., 2016; Pashankar et al., 2020; Vassell, 2016). Each minute of room delay causes a negative downstream effect impacting efficiency for the rest of the day. FCOTS delays lead to staff overtime, underutilization of OR time, increased costs, and patient and staff dissatisfaction (Allen et al., 2019).

The published literature from 2011 through 2021, identified average FCOTS data range from 10% to 65% (Allen et al., 2019; Chua et al., 2020; Matthews et al., 2015; Pashankar et al., 2020; Sohrakoff et al., 2014). This organization’s FCOTS data range from 40% to 60%, depending on the week. The facility has been tracking these data since January 2020. The

average monthly surgical volume is 650 cases per month. While each healthcare system develops its definition of FCOTS, this organization defines it as having patients in the room by 7:45 a.m. for 90% of daily scheduled OR rooms. This daily measurement has been variable due to the pandemic pausing elective cases from March 2020 to May 2021. When the case numbers were low, FCOTS was higher. Leadership has started to focus on FCOTS now that pre-pandemic cases are starting to be rescheduled.

Available Knowledge

The PICOT question that helped guide the literature search is: In surgical cases completed in the main operating room (P), how does the implementation of an FCOTS worksheet (I), compared to no worksheet (C), effect on-time starts (O) within the next 3 months (T)?

A literature search included date ranges 2015 through 2021 utilizing the CINAHL and PubMed databases in June 2021. The initial search resulted in 57,662 articles. The terms used for the search included *first case on time, on-time, operating room, neurosurgery, surgery, OR time,* and *surgery schedule*. From the 57,662 articles, 12 were chosen for this project, and five were further analyzed in an evaluation table (see Appendix A). Each article identified information that a CNL could utilize to support improving FCOTS and support the different roles of the CNL.

Allen et al. (2019) illustrated the importance of defining what FCOTS is and educating staff on the definitions. This article evidence was rated level III B according to the John Hopkins Nursing Evidence-Based Practice (JHNEBP) tool. A CNL would use this information as an outcome manager, since this project has monetary cost and metric measurements (American Association of Colleges of Nursing, 2017).

Bender et al. (2015) highlighted the importance of buy-in and stakeholder education provided by the CNL in the role of educator. The JHNEBP rating for this article was level III B. This study utilized the Lean Six Sigma improvement model, which is the same methodology used at the study site for the QI projects program.

Chapman et al. (2020) developed clear definitions of what constitutes on-time and not on-time starts for the OR. This study helps support why the definitions must be set and understood by all unit personnel. The CNL would take on the role of educator and ensure FCOTS was well defined, understood, and advocated for in the microsystem. The JHNEBP rating for this study was level III A.

The Chua et al. (2021) study was unique, as the QI project involved three separate healthcare sites. A CNL could use the findings from this study to help guide real-time feedback, use visual cues, and work with the interdisciplinary team. The CNL's role would be systems analyst/risk anticipator and information manager.

Finally, Dexter et al. (2020) reported that late starts impact completing scheduled cases later in the day and analyzed scenarios that contribute to the consequences of untimely FCOTS. A CNL uses this information to help support why on-time start is a complex problem. A facility can then understand what specific issues impede FCOTS.

Rationale

This organization utilizes the Six Sigma methodology for QI project implementation. The framework for the model is DMAIC, an acronym for define, measure, analyze, improve, and control (Lean Six Sigma, 2021; see Appendix B). The CNL project will address gaps in improving FCOTS from the current 40% to 60%. First, the CNL will define and gain the group consensus on the definition of FCOTS to ensure concept understanding. Next, the measures of

time delays and listing out impacts of possible causes will be studied. Once listed, a CNL would run root cause analysis to dig deeper into the cause of the delays. The next step in the DMAIC model is to improve, implementing a test of change(s) on identified causes. Once desired improvements are achieved, the CNL will look to control and sustain change. A CNL will then spread the success to the remaining services in the hospital.

Specific Project Aim

This QI project aims to improve FCOTS for the main OR by 20% by using an FCOTS worksheet and standard room setup within the next 3 months. The global aim is to disseminate the findings of the QI project to the remainder of ORs so that full implementation is realized and all ORs achieve the same goal over the next year.

Section III: Methods

Context

The microsystem analysis of the OR was completed to guide the improvement themes and aims (see Appendix C). An OR is a sophisticated acute care setting that operates 24/7, including off-hours and weekends. The OR in this community hospital is a microsystem that focuses on providing safe and high-quality care on a wide variety of surgical specialty services. There are 12 ORs in the hospital, which serve general surgery, plastics, orthopedics, gynecology, urology, head and neck surgery, vascular surgery, and neurosurgery. There are 10 preoperative bays to care for the patient before surgery and 21 postoperative bays to care for post-procedure. The daily average caseload for the main OR is 30-35 cases, which averages 600-700 cases per month. The staff who support the main OR are 73 registered nurses (RNs), 56 surgical technologists, seven nursing assistants, two equipment technicians, and one neurosurgery

technician. The perioperative leadership consists of a director, main OR manager, two assistant nurse managers, postoperative manager, and assistant nurse manager for the postoperative unit.

The OR microsystem is dynamic and requires adjusting the needs of the surgical population. There is a focus in the main OR to improve care and reduce risk and harm to the patients. This project will improve care and reduce the risk of delaying procedures and possible instrument or equipment contamination. The goal is not only to improve efficiency but also safety for everyone in the OR. A CNL can improve quality and safety, influence care, and educate staff on current evidence-based surgical care outcomes (King et al., 2019). A 5Ps assessment of purpose, patient, professionals, patterns, and processes projected a better understanding of the microsystem gap and identified a worthwhile QI project to increase FCOTS for the neurosurgical service.

The project charter (see Appendix D) was developed using a driver diagram (see Appendix E) to illustrate the contributing factors that delay on-time starts. A Gantt chart visualized tasks and the project deliverables—initiation, execution, and sustainment—providing a timeline for each phase, from June 1 through November 30 (see Appendix F). A SWOT analysis (strengths, weaknesses, opportunities, and threats) identified negative and positive aspects of project implementation. Strengths are the department support from frontline staff and leadership to increase efficiency and standardization of required equipment and room setup. Weaknesses are lack of standardization and expectations for room setup and inconsistency of available instruments in the morning. Project opportunities are staff willing to improve efficiency and creating a guide for room setups. Finally, threats include patient delays and surgeon delays, which are out of this project’s scope.

The project estimate is 20 hours for the project manager at an average cost of $75/hr. ($1,500). The estimate of staff participation would be 5 hours per staff, a total of three staff involved, at an average cost of $65/hr. ($975). The estimated total for participation is $2,475. Improvement in the FCOTS metric will increase efficiency, but the return on investment (ROI) will be the saved money from a decrease in delay OR minutes. The average cost of an OR minute is $20 (Chua et al., 2021; Han et al., 2016; Pashankar et al., 2020; Vassell, 2016). The delay minutes reported from May to August 2021 for OR8 not in the room at 7:45 a.m. was 887. The delay minutes equal a loss of $17,740, based on the $20/min average rate. In August 2021, the delay minutes totaled 279 minutes, with lost revenue of $5,580. Communication regarding the tests of change will be presented at staff huddles. More extensive interventions will be communicated at monthly staff meetings. Perioperative leadership will be updated biweekly on the progress of the project (see Appendix G).

Five studies were conducted from August 10 through August 25 to identify standard times for necessary activities to get the procedure case started (see Appendix H). Each time the patient arrives at the room after 7:45 a.m., it is considered late. Understanding where delays are in the room setup will help guide the interventions.

Intervention

The first PDSA (plan, do, study, act) was measured with a yes/no form completed by the assigned room nurse. This form identifies if room setup is complete (see Appendix I). These data will assist staff education on standard room setup. If there is a trend in missing items, further investigation will occur. The second PDSA will create a standard room setup guide of required equipment and surgical bed. The last activity will track what items were causing a delay in the

patient coming to the OR on time. Tracking and trending the delays can help identify future projects for improvement.

Study of the Intervention

The first PDSA was measured with a yes/no form completed by the assigned room nurse. This form identifies if room setup is complete (see Appendix J). These data will assist the education of the staff on standard room setup. Should there be a trend in missing items, further investigation will occur. The second PDSA will create a standard room setup guide of required equipment and surgical bed. The last activity will track what items were causing a delay in the patient coming to the OR on time. Tracking and trending the delays can help identify future projects for improvement.

Measures

Measurement definitions for the project are listed in Appendix K. Outcome measurements for this project will be completed by calculating the number of minutes the patient is late into the room for the FCOTS from reviewing patient operative logs. The process measure will create an algorithm/worksheet to determine the patient's pathway from admission to surgery to help staff increase the FCOTS for neurosurgical patients. Missing items from the algorithm/ worksheet will flag an intervention. Improvement of FCOTS would decrease the number of minutes the patient arrives in the OR late. For the balancing measure, a yes/no checklist will be created and used to determine if items/equipment are missing from the room, once the standard setup has been agreed upon. This checklist will provide feedback to the staff who help set up the OR before the first case.

Ethical Considerations

This project has been approved as a QI project by faculty using QI review guidelines and does not require Institutional Review Board approval (see Appendix L). This project also aligns with the values of the University of San Francisco's core Jesuit values. The university believes the common good should transcend one's interests for the betterment of everyone. This project reflects these values, as it aims to increase efficiency and cost savings and values our staff and patients' time during the perioperative procedures.

The American Nurses Association (ANA, 2015) created a code of ethics that all nurses in the United States should practice. The purpose of this code is to identify the ethical values, obligations, duties, and professional ideals of nurses as an individual or collective unit. Provision 7 of the ANA code of ethics states, "The nurse, in all roles, settings, advances the profession through research and scholarly inquiry, professional standards development, and the generation of both nursing and health policy" (p. 27). This provision guides nursing so that research is conducted safely and ethically, and the findings are disseminated to advance current knowledge. Ethical practice is at the heart of nursing, and a CNL must understand how to be ethical when performing QI projects.

The applicable CNL roles during this project are listed in Appendix M. Each role has specific responsibilities that are essential for the success of the project, which are outcomes manager, team manager, and systems analyst. Each role plays a part in providing an ethical, successful project.

Section IV: Results

The first PDSA cycle was three weeks, beginning September 2, 2021, and concluding September 24, 2021. The expectation was for the night staff to have the case cart in the room,

equipment required for the procedure, and required OR table in the room before the day staff start. The worksheet tracked the completion of those tasks and the staff to complete this each day. There were 17 opportunities to complete the worksheet. Of those, the team finished it 12 times, for 71% completion. Of the 12 entries, 5 days the case cart was in the room at the beginning of the day, the previous staff made the bed five times, and the equipment was in the room 12 times (see Appendix N). These results were not expected, as the case cart in the room was noted to be a moderate delay during the time studies. Although the night shift staff were educated on the intervention several times, the missing case carts had no real impact on delay minutes.

This facility has been trending delay reasons and minutes for over a year. The data used for this project were used from August to October 2021. The delay in minutes for August was 279 minutes, September was 259 minutes. One case had a significant delay of 83 minutes, where the patient required extensive workup prior to surgery. If that case were not included, the monthly delay minutes would be 176. September's improvement was 36.9% (not including the outlying case). If that case were included in the delay minutes, the improvement would be 7.2%. The October delay minutes were 189, for an improvement of 32.3% (see Appendix O). August's delay reasons list the number one cause of delay is surgeon-related, the second reason was OR-related, the third was preop delays, and the patient ended with no reason given. During the intervention, the reasons for delay changed to surgeons still first cause for delay, the second was a preop delay, third was no reason, and last was OR delay, which showed significant improvement. October data show OR delays are second.

Further investigation led to short-staffed days, late arrival of vendor instrument trays, and OR facility temperature control issues, which related to OR but out of scope for OR staff (see

Appendix P). Continued monitoring of these metrics will be followed and further broken by the surgeon- and procedure-specific data.

A visual guide was created to identify the required bed, equipment, and placement in the room for neurosurgical procedures (see Appendix Q). This guide was presented to the staff on October 12, 2021 and placed in the room. This guide was the collaboration of the service lead nurse and surgical tech. This guide will assist staff who are not as familiar with room setup for neurosurgical procedures. Another intervention the team is working on that will continue outside of the project will be assessing the surgical packs and seeing if the pack can be adjusted to help with opening supplies. The craniotomy and transsphenoidal procedure packs will be the focus. These packs are supposed to have most of the soft goods required for each procedure. Currently, the staff are spending several minutes each case gathering then opening each item separately. This project could be a potential cost and time-saving improvement. Other projects the department is working on are looking at the sterile supply department and the accuracy of the instruments pulled for each procedure. This improvement will help with maintaining or improving FCOTS and improving staff and physician satisfaction. A final proposed part of this project will be increasing the skill and comfort level of the nurses who are not usually assigned to work in the neurosurgical room. It will always depend on which staff are available each day and if the service lead facilitates the flow of rooms. There was an improvement of FCOTS when one of the typical staff members was not assigned and was off for one week. This finding was reported to leadership and will be further investigated.

Section V: Discussion

Summary

The QI project to increase FCOTS for the neurosurgical room is a clear focus of the hospital leadership. This improvement gives a multitude of benefits to the facility, the largest of which are monetary savings, improved efficiency, utilization of the department, and increased satisfaction with providers, staff, and patients (Franklin & Franklin, 2017; Sohrakoff et al., 2014; Vassell, 2016).

After meeting with the frontline staff, the tests of change were created based on the evaluation of current performance. A change test was to have the night staff help set up the room for the day shift. This change was tracked using a worksheet identifying the case cart, equipment, and the correct bed in the room. The results showed that of the 17 opportunities, 12 times the equipment was in the room and five times the case cart and bed made or correct bed in the room. This intervention did not show significant improvement in FCOTS. What was noted to be an improvement in FCOTS was the change in staff assignment in the final week of the intervention. The patient arrived at the room on time four out of five days. These significant findings were reported to leadership.

Delay reasons are tracked in the electronic health record, and these reasons were broken into categories: surgeon-related, preoperative-related, operative-related, patient-related, and no delay reason given. The top three pre-intervention delay reasons were listed as surgeon first, operative delays second, and preoperative last. Post-intervention, the top three listed were surgeon first, preoperative second, and no reason given as last. Surgeon-related delays are out of scope for this project. The improvement resulted from the staff's awareness to improve and expand other areas impacting FCOTS. The staff have been looking at other areas for future

improvement projects. The room setup guide was created through staff and leadership request to assist with equipment setup when they are not familiar working in the neurosurgery specialty. The guide will also increase staff confidence, as the neurosurgery team is expanding the core staff. The improvement of FCOTS for September was 7.2% and October was 32.3%. Overall continued focus on improvement will improve quality metrics, satisfaction scores, and financial stewardship.

Conclusion

The improvement of FCOTS is a focus of many facilities worldwide. The trialed strategies for this project are simple yet effective in identifying the delay in FCOTS. The initial project started with one room, one small team of frontline workers. Their input created the tests of change, and their enthusiasm helped with staff buy-in. The staff has begun to look at the different specialties and what projects they can start. Each room will have their own reasons for delays and will need to look for specialty-specific tests of change. The sustainability of implemented changes will be based on the preoperative and operative teams' continued collaboration. Many factors affect FCOTS; triaging the causes is an important place for facilities to begin improving.

Section VI: References

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Appendix A

Evaluation Table

PICOT Question

In surgical cases completed in the main operating room (P), how does the implementation of an FCOTS worksheet (I), compared to no worksheet (C), effect on-time starts (O) within the next 3 months (T)?

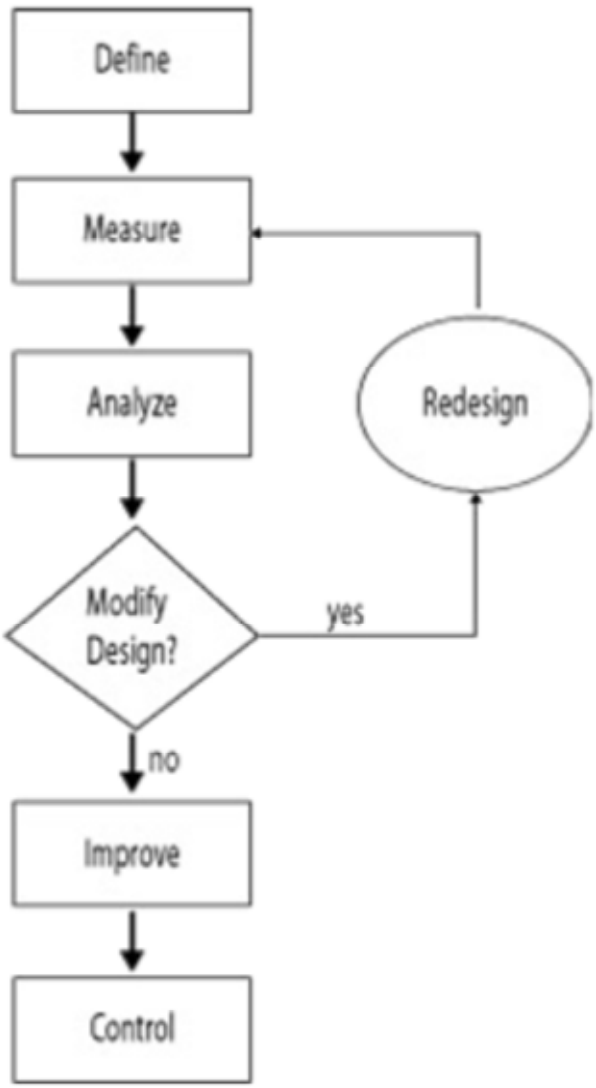
Study	Design	Sample	Outcome/Feasibility	Evidence Rating
Allen, R. W., Taaffe, K. M., Neilley, V., & Busby, E. (2019). First case on-time starts measured by incision on-time and no grace period: A case study of operating room management. *Journal of Healthcare Management*, *64*(2), 111-123. https://doi.org/10.1097/JHM-D-17-00203	Case study	Analyses were separated into three periods: Pre-implementation: Baseline data collection (*n*=5,524 cases) Oct. 2013-Sept. 2014 Implementation period: Data collection (*n*=5,163 cases) Jan. -June 2015 Post-implementation: Data collection (*n*=5,163 cases) July-Dec. 2015	Initial goal was 70% on-time start. Baseline data was 25% in the room on-time starts. Post-intervention in room, on-time start was 64.7%. Cost savings were identified, as well as types/rate of delays. A clinical nurse leader (CNL) could use the tool created in this study to identify possible barriers and types of delays, which could be a pathway for further investigation. The role a CNL would be an outcomes manager and an educator (AACN, 2017).	Level III B

Study	Design	Sample	Outcome/Feasibility	Evidence Rating
Bender, J. S., Nicolescu, T. O., Hollingsworth, S. B., Murer, K., Wallace, K. R., & Ertl, W. J. (2015). Improving operating room efficiency via an interprofessional approach. *American Journal of Surgery, 209*(3), 447-450. https://doi.org/10.1016/j.amjsurg.2014.12.007	Nonexperimental/ quality improvement (Six Sigma techniques)	2010 - 11,891 cases 2013 - 12,302 cases Main operating room (OR) and ambulatory surgery center (ASC), inpatient and outpatient cases included in study.	Initial on-time starts were 32% after Six Sigma programs were implemented, and 3 years on-time starts increased to 73%. Part of the success is interdisciplinary team buy-in, increase staffing, and better communication and financial performance. A CNL would be a team member who would assist with communication. A risk anticipator and team manager to create a business case for the new staff.	Level III B
Chapman, W. C., Luo, X., Doyle, M., Khan, A., Kangrga, I., Martin, J., Wellen, J., Chapman, W. C., Jr, & Martin, J., Jr. (2020). Time is money: Can punctuality decrease operating room cost? *Journal of the American College of Surgeons, 230*(2), 182-189. https://doi.org/10.1016/j.jamcollsurg.2019.10.017	Quasi-experimental	12,307 cases total, 6,095 cases pre-intervention, 5,978 cases post-intervention.	Before the project began, the team created a clear definition of what on-time case starts were and educated the staff and medical team. The on-time case starts initially was 76.1%, post-intervention 86.6%. Success was clear definitions on the first case start times, tracking failures of on-time starts, and clear communication with stakeholders, leadership, and staff. A CNL role is educator, to educate the new process that will help streamline a process to	Level III A

Study	Design	Sample	Outcome/Feasibility	Evidence Rating
			reduce delays. Also, an advocate for communicating delays and feedback on improvement.	
Chua, M. J., Lewis, K., Huang, Y., Fingliss, M., & Farber, A. (2021). A successful organized effort to improve operating room first-case starts in a tertiary academic medical center. *American Surgeon, 87*(2), 259-265. https://doi.org/10.1177/0003134820951430	Nonexperimental/ quality improvement	Study locations were over 3 campuses, 1st site - 10 OR, 2nd site – 8 OR, 3rd site – 6 outpatient OR, total 24 OR used. Working with 13 surgical services. Observation period was Apr. 2015 - Jul. 2016. Intervention occurred May 2015.	Before interventions, the on-time case starts were 40%. Initial post-project, on-time case starts were 95%, 12 weeks post-observation, the on-time case starts averaged 81%. A CNL could use the three tools implemented in this project, including real-time feedback on delays, design visual cues for patient readiness, and work with interdisciplinary team if want to adjust room start times. This CNL role is educator, system analyst, and information manager.	Level III B
Dexter, F., Epstein, R. H., & Penning, D. H. (2020). Late first-case of the day starts do not cause greater minutes of over-utilized time at an endoscopy suite with 8-hour workdays and late running rooms. A historical cohort study. *Journal of Clinical Anesthesia, 59*, 18-25. https://doi.org/10.1016/j.jclinane.2019.06.013	Historical cohort study	331 workdays, 14,571 cases	Analysis of room utilization between rooms that are 5 mins or more late over rooms starting on time. When rooms started 10 minutes late, did not necessarily mean rooms ended later. The CNL role would be an information manager, as the use of these data support improving on-time starts.	Level IV A

Appendix B

DMAIC Model



Appendix C

Microsystem Analysis

Main Operating Room Microsystem Profile

A. Purpose: To provide high-quality, safe surgical services to our members for the following specialties:

General Surgery, Orthopedics, Ortho spine, Neurosurgery, Podiatry, Gynecological, Head and Neck , Urology, and Plastic surgery

Service Area: Main Operating room	Site Contact: J.B OR Manager	Date: 9/30/21
Peri-operative Director: J.T. Chief Nurse Executive: L. D.	OR ANM: D.S.	Physician in Chief: R.V Chief of Anesthesia: K. D.

B. Know Your Patients: Take a close look into your unit, create a "high-level" picture of the PATIENT POPULATION that you serve. Who are they? What resources do they use? How do the patients view the care they receive?

Patient Demographics: Race (Sept 2020-2021)	**%**
White/Caucasian	70.3%
Mexican	6.21%
Hispanic/Latino	3.14%
Non-Hispanic/Non-Latino	14.43%
Native Hawaiian/Pacific Islander/Filipino	2.74%
Other	3.19%

List Your Top 10 Surgeries (Sept 2020-Sept 2021	
1. Cystoscopy	6.Posterior lumbar fusion 2-5 levels
2. Laparoscopic total abdominal hysterectomies	7. Diagnostic laparoscopy
3.Laparoscopic salpingo oophorectomy	8. Laparoscopic intra-abdominal lysis of adhesions
4. Laparoscopic Cholecystectomy	9. Laparoscopic appendectomy
5.Ureteral stent placement	10. Total knee replacement

Patient Satisfaction Scores	**% Always**
Nurses	
Doctors	
Environment	
Pain	
Discharge	% Yes

Patient Demographics: Age (Sept 2020-2021)	**%**
<18	1.27%
19-25	3.51%
26-35	8.77%
36-45	12.35%
46-60	25.18%

Service Specialty Blocks	**Days in the week**
Neurosurgery	Mon, Tues, Wed, Thurs, Fri
Orthopedics	Mon, Tues, Wed, Thurs, Fri
Spine	Mon, Tues, Wed, Thurs, Fri
General Surgery	Mon, Tues, Wed, Thurs, Fri
Head and Neck	Tues, Thurs, Fri

Patient Point Entry: (Sept 2020-2021)	**%**
Admission Department	57.84%
Emergency Department	24.39%
Nursing Units	17.78%
Patient Discharge Disposition: (Sept 2020-2021)	**%**
Outpatient/Home	45.21%

61-74	33.71%		Plastics	Mon, Wed, Thurs, Fri		Inpatient	30.6%
>75	15.22%		Urology	Mon, Tues, Wed, Fri		Nursing Units	24.05%
Patient Demographics: Sex (Sept 2020-2021)	**%**		Podiatry	Tues, Thurs			
Male	40.52%		GYN	Mon, Tues, Wed, Thurs, Fri			
Female	59.48%		Red room/Spine NSG red room	Mon, Tues, Wed, Thurs, Fri			
			Blue room	Thurs, Sat			
Payors			**Capacity:** 12 OR Suites			**Number of Cases per Quarter**	
Kaiser Health Plan			**Customers who are frequent uses of Microsystem**	**Other serviced that interact as regularly within normal workflow process**		Sept-Dec 2020 : 3160	
Kaiser Foundation Hospital			Patients have multispecialty procedures	Pre-op and Post Anesthesia care department		Jan-Apr. 2021: 3046	
The Permanente Medical Group			Surgeons and Anesthesia Providers	Clinic Schedulers, OR schedulers and system administrators		May-Aug 2021: 3350	
Medicare			Company vendors and reps for technical support during a surgical procedure	Supply chain for providing disposable supplies and case cart picking		Sept 2021: 782	
Medical			Sterile processing department supplying sterile process surgical instruments for surgery	Facility Engineering and Clinical Biomed for equipment maintenance, and environment of care			
			Materials Management department, supplying surgical goods to support surgery procedures.	Laboratory and Pathology department to process patient specimens			
				Pharmacy			
				Radiology for imagining during procedures			
				Nursing units for admission and			

			sending of surgical patients		
			Emergency Department, admission place for urgent procedures		
			Quality, Risk, Infection prevention and safety specialist.		

C. Know Your Professionals: Use the following template to create a comprehensive picture of your unit. Who does what and when? Is the right person doing the right activity? Are roles being optimized? Are all roles who contribute to the patient experience listed?

Current Staff	FTE: Total	Role/Functions	Days of operation	Shifts worked
Registered Nurses	37	Circulating, scrubbing, facilitating rooms, and service leads	Mon-Sun	0700-1530, 1030-1900. 1445-2315, 2315-0715
RN Per Diem	13	Filling scheduling holes for staff	Mon-Sun	0700-1530, 1030-1900. 1445-2315, 2315-0715
Surgical Techs	35	Assisting surgery by providing instrumentation to surgical field, facilitating rooms, service leads	Mon-Sun	0700-1530, 1030-1900. 1445-2315, 2315-0715
Surgical Tech Per Diem	13	Filling scheduling holes for staff	Mon-Sun	0700-1530, 1030-1900. 1445-2315, 2315-0715
Equipment Tech	1 1	Bring equipment into OR Suites, helping turnover cases	Mon-Sun	0700-1500, 1500-2330
Department Secretary	1	Assist in staffing, payroll entries, clerical, and admin support	Mon-Fri	
OR Schedulers	1	Assists maintain Operating room schedule, assist with cancelations, add - on procedures	Mon-Fri	0630-1500
System Administrators	1	Data management	Mon-Fri	0600-1530
Assistant Managers	1 1	Daily operations and performance management of staff, assist manager	Mon-Sun	0700-1530, 1100-2030
Surgeons	Variable	Performs surgical procedures	Mon-Sun	
Physician's Assistant	Variable	Assist surgeons	Mon-Sun	
Anesthesia	22	Provides anesthesia to patients	Mon-Sun	
CRNA	53	Provides anesthesia to patients	Mon-Sun	
Anesthesia Tech	12	Assist anesthesia staff	Mon-Sun	

D. Know Your Processes: How do things get done in the microsystem? Who does what? What are the step-by-step processes? How long does the care process take? Where are the delays? What are the "between" microsystems hand-offs?

1. Daily OR staff assignments by role to each OR Suite, staff huddle are daily at 0710 and 1450. Assignments change daily depending on staffing and departmental needs
2. Surgical procedures require the following staff roles: Circulating nurse, surgical tech, Anesthesia provider (Physician or CRNA), Anesthesia tech, other core store staff as needed.

3.	RN sets up the room, moving equipment to the required location in the room makes the surgical bed, sets up radiology films on the computer, and coordinating with the surgical tech for the timing of bringing the patient into the OR.
4.	Hand-off occurs from pre-operative nurse to circulating staff, hand-off at staff breaks, and shift changes. After procedures from circulating nurse and PACU staff
5.	The patient is transported to the OR suite by the anesthesia providers, via gurney or bed from the nursing units
6.	Surgical tech hand-off occurs, and shift change and breaks
7.	Safety time-out occurs with all involved staff before to anesthesia is given to the patient. Just before the surgical incision, there is a safety time out. There is post-operative de-briefing. All these steps are to increase patient safety, reduce retained foreign bodies, and wrong-site surgery.
8.	The surgical tech sets up the sterile back table, open sterile supplies, and instruments
9.	Surgical counts occur before the procedure, during and after the procedure to identify if there are possible retained objects
10.	After the procedure, documentation is completed, and the RN utilizes RF technology to sweep surgical site for retained sponges.
11.	Surgical tech cleans up the sterile supplies and places dirty instruments in the case cart and sprays with a pre-cleaner.
12.	Room is exited and turn over process occurs for the next case

First case on time starts goal is to be in the room by 0745

E. Know Your Patterns: What patterns are present but not acknowledged in your microsystem? What is the leadership and social pattern? How often does the microsystem meet to discuss patient care? Are patients and families involved? What are your results and outcomes?

"Metrics that Matter" • Productivity • Staffing • OR utilization • First case on-time starts • Turnover projects • SSI reduction • Prevention of surgical complications • Hand hygiene • Waste management rounding	• Do the members of the unit regularly review and discuss safety and reliability issues? • Leadership meets with physician leadership to discuss next day surgical schedule.	Does every member of the unit meet regularly as a team? • Daily huddles, and staff meeting 1st and 3rd Thursday each month

Appendix D

Project Charter

Project Charter: Improving First Case Starts

Project Charter: Improving first case on-time starts for the main operating room at a large healthcare facility.

Global Aim: To achieve first case on-time starts (FCOTS) for the 10 scheduled operating rooms (OR). The definition of on-time is the patient in the room by 0745 for 90% of the 10 rooms.

Specific Aim: Improve the FCOTS in the service line with the lowest on-time starts by 20% within 3 months.

Background:

As the cost of healthcare increases, each facility looks at how to reduce overhead costs. The operating room (OR) is a major source of revenue for the hospital, but the cost of doing business in this environment is high (Chua et al., 2021). Operating room time is expensive, and when time utilization is inefficient, the overall budget is negatively affected (Allen et al., 2019). Studies indicate that the average cost of an OR minute is $15 to $20 (Chua et al., 2021; Pashankar et al., 2020; Vassell, 2016). Each minute of room delay causes a negative downstream effect impacting efficiency for the rest of the day. Allen (2019) reports that FCOTS delays lead to staff overtime, underutilization of OR time, increased costs, and patient and staff dissatisfaction.

Sponsors:

Perioperative Services Director	J.T.
Operating Room Manager	J. B
Lead Surgeon	H.H

Goals:

To standardize and implement a process to improve FCOTS with the input of a multidisciplinary team. This streamlined process will look at the following:

- Patient flow through the preoperative process
- Initial room setup
- Equipment availability
- Improved communication between departments

Measures:

Measure	Data Source	Target
Outcome		
% minutes late the patient is in OR by 0745	Chart Review - [EPIC]	90%
Process		
Create OR FCOTS algorithm with the team	Chart Review - [EPIC]	Within the next 4 weeks
Develop FCOTS template	Chart Review - HealthConnect [EPIC]	
Create standard room setup	Team input	Within the next 4 weeks
Balancing		
Looking at the # missing consent	Chart Review - HealthConnect [EPIC]	During the implementation
Identifying # of missed H&P interval notes	Chart Review - HealthConnect [EPIC]	During the implementation

Team members:

RN lead	T. G
Education mentor	J. S
Surgical tech	E. S
Circulating nurse	E. P
Pre/Post manager	D. P.
Data Analyst	M. W.

References

Allen, R. W., Taaffe, K. M., Neilley, V., & Busby, E. (2019). First case on-time starts measured by incision on-time and no grace period: A case study of operating room management. *Journal of Healthcare Management, 64*(2), 111–123. https://doi.org/10.1097/JHM-D-17-00203

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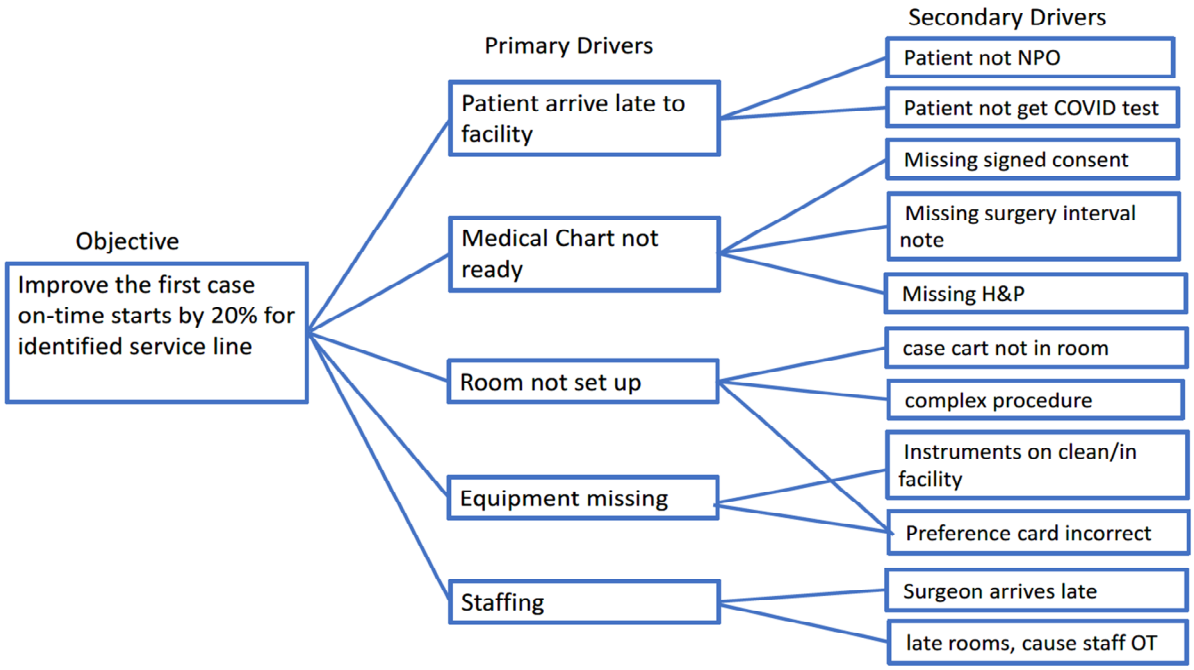
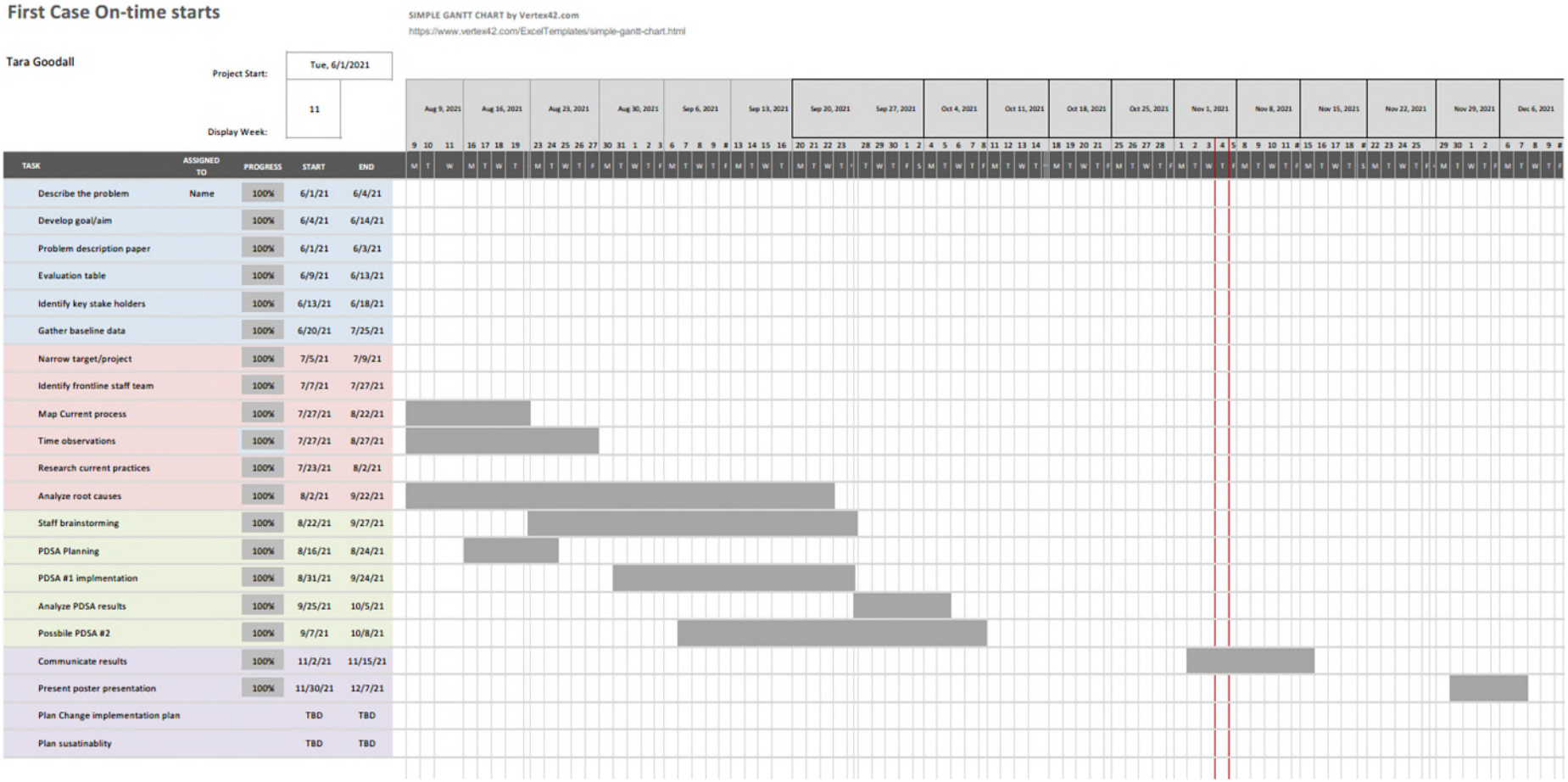
Appendix E

Driver Diagram



Appendix F

Gantt Chart



Appendix G

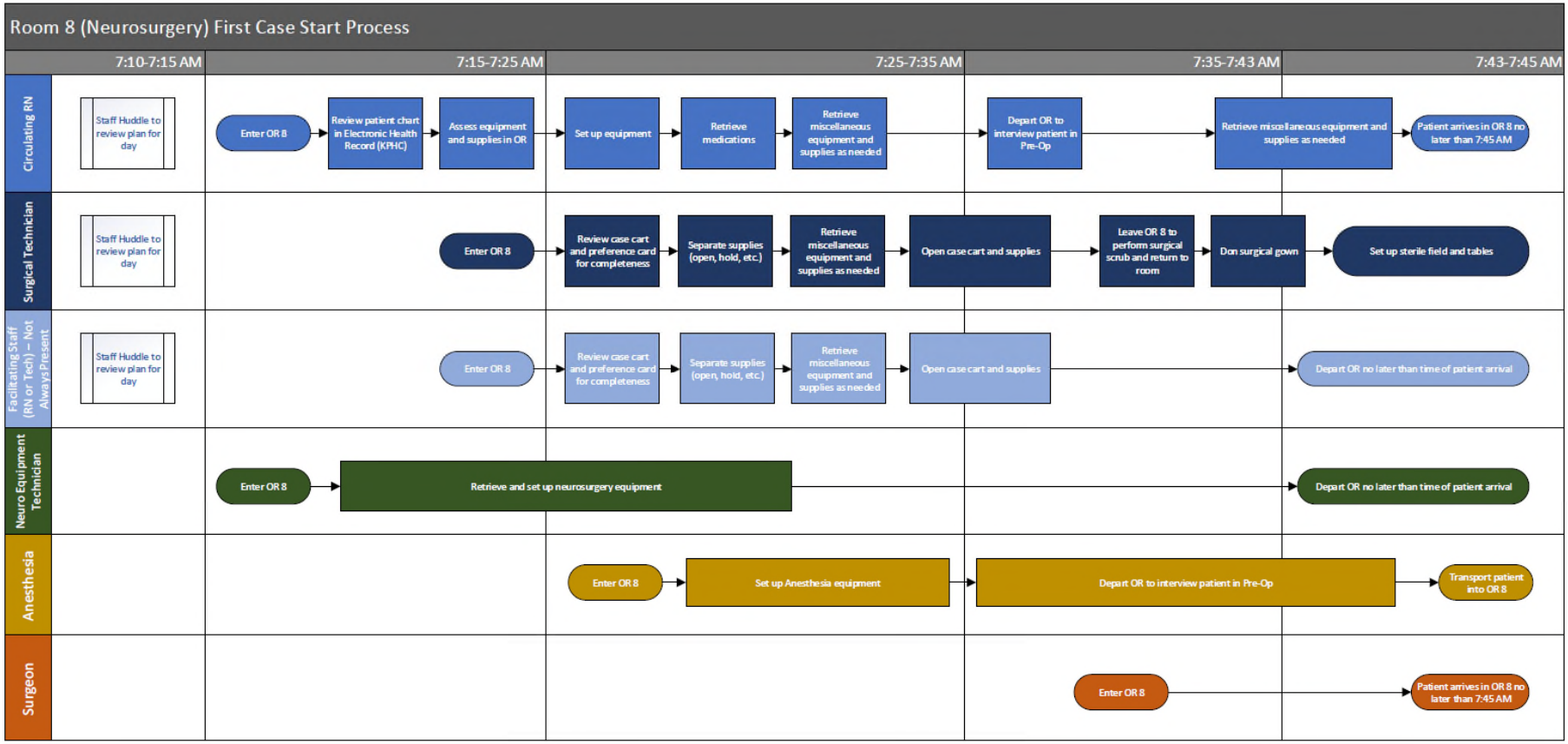
Budget/ROI

People Budget								
	Baseline State	**Unit Cost**	**Number of Units (days, adverse events, procedures, visits, referrals, etc.)**					Total
Estimated cost of staff	**Total Baseline Costs**							
			July	**August**	**September**	**October**		
								0
Project manager	**$1,500**	$75	2	8	7	3		20
RN #1	**$325**	$65	1	1	2	1		5
RN #2	**$325**	$65	1	2	1	1		5
Surgical tech	**$325**	$65	0	2	2	1		5
SUB TOTAL	**$2,475**							
	New State	**Unit Cost**	**Number of Units (days, adverse events, procedures, visits, referrals, etc.)**					Total
Actual cost of staff	**Total Costs**							
			July	**August**	**September**	**October**		
								0
Project manager	**$1,875**	$75	2	8	10	5		25
RN #1	**$520**	$65	1	2	3	2		8
RN#2	**$260**	$65	1	2	1	0		4
Surgical tech	**$390**	$65	0	2	2	2		6
Description # 5	**$0**							0
Description # 6	**$0**							0
SUB TOTAL	**$3,045**							
Net Projected Staff Financial Benefit of Project:	-$570							

OR Minute ROI								
	Baseline State	**Unit Cost**	**Number of Units (days, adverse events, procedures, visits, referrals, etc.)**					Total
Cost of Operating room delay (prior to intervention)	**Baseline Costs**							
			May	**June**	**July**	**August**		
								0
OR Delay minutes	**$14,920**	$20	253	168	79	246		746
SUB-TOTAL	**$14,920**							
	New State	**Unit Cost**	**Number of Units (days, adverse events, procedures, visits, referrals, etc.)**					Total
Cost of Operating room delay (post intervention)	**Total Costs**							
			Sept	**Oct**				
								0
OR Delay minutes	**$8,960**	$20	259	189				448
SUB-TOTAL	**$8,960**							
Net Projected Delay Minutes Financial Benefit of Project:	$5,960							

Appendix H

Process Map



Appendix I

Plan-Do-Study-Act

Description of change and experiment plan: Create an FCOT worksheet to identify the reason why the patient is not in the OR by 0745.	**Data and observations to collect:** Data will be a retrospective chart audit.
Possible decisions based on results: Identify delay causes, allow staff and leadership to minimize delays.	**How you will evaluate and draw conclusions:** Compare delay minutes to before and after implementation to identify if there is a downward trend in delay.
Description of change and experiment plan: To standardized room setup, with pictures and minimum equipment required in the room. Create a standardized audit tool for room setup	**Data and observations to collect:** Real-time audits.
Possible decisions based on results: Review if the room standardization will work for other service lines.	**How you will evaluate and draw conclusions:** The effectiveness of standard room is set on the number of FCOTS.

Appendix J

Worksheet

Date: _____

Was Case cart in room: Y/N Was Bed made: Y/N Was equipment in room: Y/N

Date: _____

Was Case cart in room: Y/N Was Bed made: Y/N Was equipment in room: Y/N

Date: _____

Was Case cart in room: Y/N Was Bed made: Y/N Was equipment in room: Y/N

Date: _____

Was Case cart in room: Y/N Was Bed made: Y/N Was equipment in room: Y/N

Date: _____

Was Case cart in room: Y/N Was Bed made: Y/N Was equipment in room: Y/N

Appendix K

Measurement Strategy

Background (Global Aim). To achieve the first case on-time start (FCOTS) for the 10 scheduled Operating Rooms (OR). The definition of on-time is the patient in the room by 0745 for 90% of the 10 ORs.

Population Criteria: First scheduled surgical case in the OR for the identified surgical service.

Data Collection Method: Data will be obtained from chart audits, utilizing an FCOTS template.

Data Definitions

Data Element	Definition
First case on-time starts (FCOTS)	Patient in OR by 0745
Delayed	Patient in OR after 0745
Delay reason	The reason was given for not being in the room on time

Measure Description

Measure	Measure Definition	Data Collection Source	Goal
% of patients in the room by 0745	N = # patients in room by 0745	Chart review	90%
# of minutes the room is late	N = # minutes from 0745 the patient enters the room	Chart review	0%

Appendix L

Statement of Non-Research Determination

UNIVERSITY OF SAN FRANCISCO | School of Nursing and Health Professions

CNL Project: Statement of Non-Research Determination Form

Student Name: Tara Goodall

Title of Project:

Improvement of First Case On-time Starts (FCOTS)for the Main Operating Room

Brief Description of Project:

Perioperative leaders monitor outcome data that measure efficiency and financial performance such as FCOTS, turnover time, block utilization, and surgical delays. As healthcare costs increase, leaders look to reduce overhead costs. An operating room (OR) is a major source of revenue for a hospital, but the cost of doing business in this environment is high. Operating room time is expensive, and when time utilization is inefficient, the overall budget is negatively affected. This project is seeking to improve the FCOTS for the main operating room, for the neurosurgery room with the lowest FCOTS.

A) Aim Statement: The aim of this quality improvement (QI) project is to increase the first case on-time starts (FCOTS) in the main operating room by 20% over the next three months to reduce overhead costs, extended delays in the PACU, and staff overtime.

B) Description of Intervention: Create a standardized FCOTS worksheet to identify barriers in the process, and create a standard room set up for neurosurgical service. This will include the minimum required equipment in the room.

C) How will this intervention change practice?

The intervention will improve the first case on-time starts for the identified service; the success of this intervention will positively impact the financial revenue from surgical procedures. This improvement will also decrease staff overtime and extended delay in PACU care areas.

D) Outcome measurements:

First case on-time starts will improve by 20% within three months of implementation of the project.

To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: (http://answers.hhs.gov/ohrp/categories/1569)

x☐ This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.

☐This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

Project Title:	**YES**	**NO**
The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.	**X**	
The specific aim is to improve performance on a specific service or program and **is a part of usual care**. ALL participants will receive standard of care.	**X**	
The project is **NOT** designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does **NOT** follow a protocol that overrides clinical decision-making.	**X**	
The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards.	**X**	
The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience.	**X**	

The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.	**X**	
The project has **NO** funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.	**X**	
The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., **not** a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients.	**X**	
If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: *"This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."*	**X**	

ANSWER KEY: If the answer to **ALL** these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. **IRB review is not required. Keep a copy of this checklist in your files.** If the answer to ANY of these questions is **NO**, you must submit for IRB approval.

*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print): Tara Goodall

Signature of Student: *Tara Goodall* **DATE: July 2, 2021**

SUPERVISING FACULTY MEMBER NAME (Please print):

_____

Signature of Supervising Faculty Member

_____**DATE**_____

Appendix M

Clinical Nurse Leader Competency

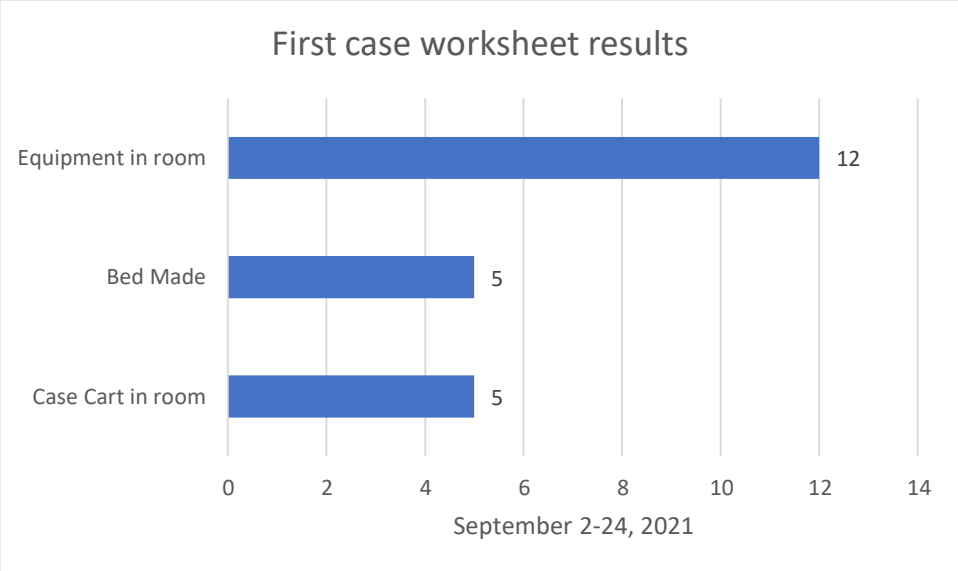
1. Outcomes Manager: The CNL, using the historical data to identify the service with the lowest first case on-time starts, looks at the delay reasons and comes up with a small test of change to improve the on-time start.

2. Team manager: Works with the staff in the OR to identify possible breakdowns/delays impacting the first case on-time starts. Be a leader and delegate key parts of the improvement project. Key communicator with the team, hospital staff, and leadership.

3. Systems analyst: Review current and past data to deep dive into the cause of delay. Use current technology to help with the projects.

Appendix N

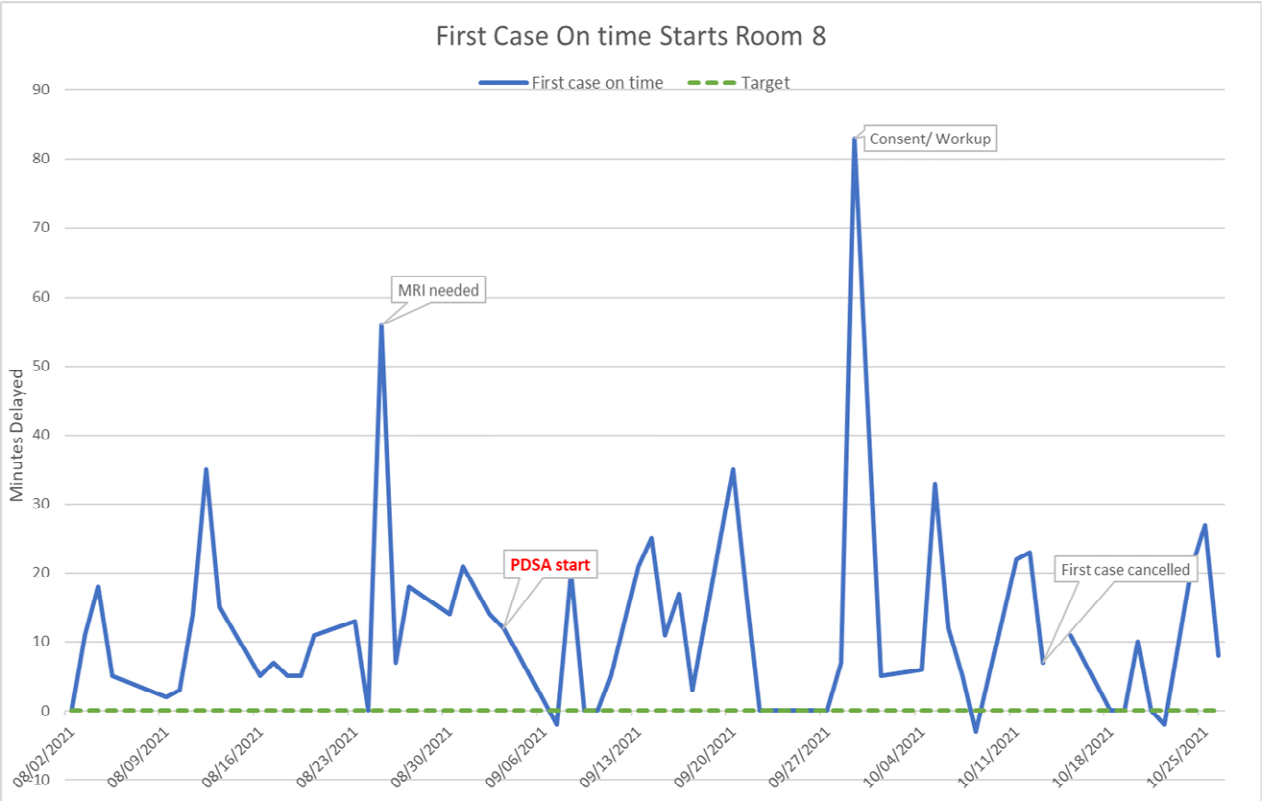
First Case Worksheet Results

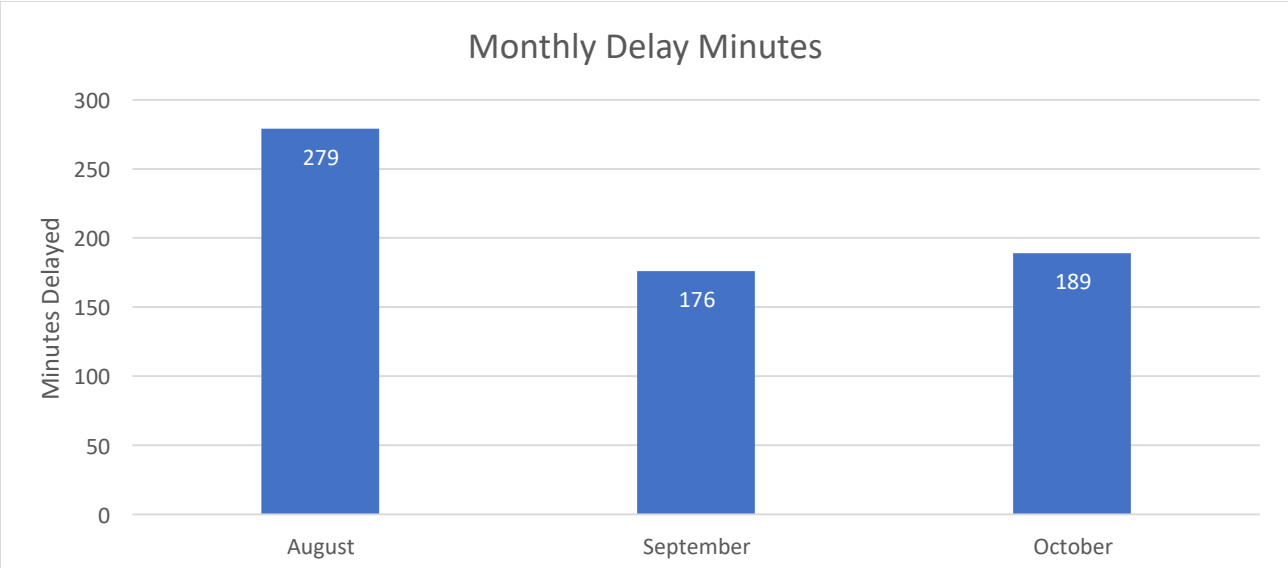


Date	Case Cart in Room	Bed Made	Equipment in Room	Delay Reasons	Delay Minutes
9/2/21	Y	Y	Y	Surgeon late (accident on freeway)	12
9/9/21	N	Y	Y		0
9/13/21	N	N	Y	Surgeon late, no interval notes	25
9/14/21	N	N	Y	No consent on file	11
9/15/21	N	N	Y	Surgeon arrived late, no consent on file or interval notes or surgical marking	17
9/16/21	N	Y	Y	No interval notes	3
9/17/21	Y	N	Y	Preop not ready with pat.	35
9/20/21	N	M	Y	Surgeon arrived late, speaking with surgeon	17
9/21/21	N	N	Y		0
9/22/21	N	N	Y		0
9/23/21	Y	Y	Y		0
9/24/21	Y	Y	Y		0

Appendix O

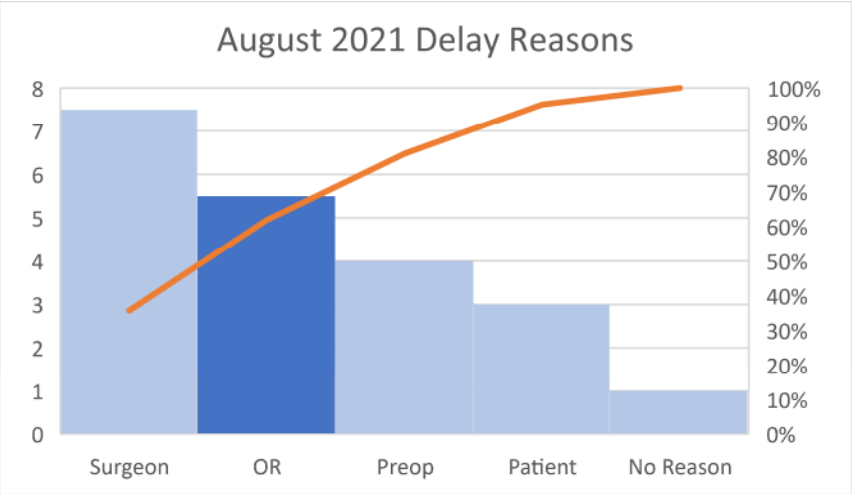
First Case On-Time Starts Room 8

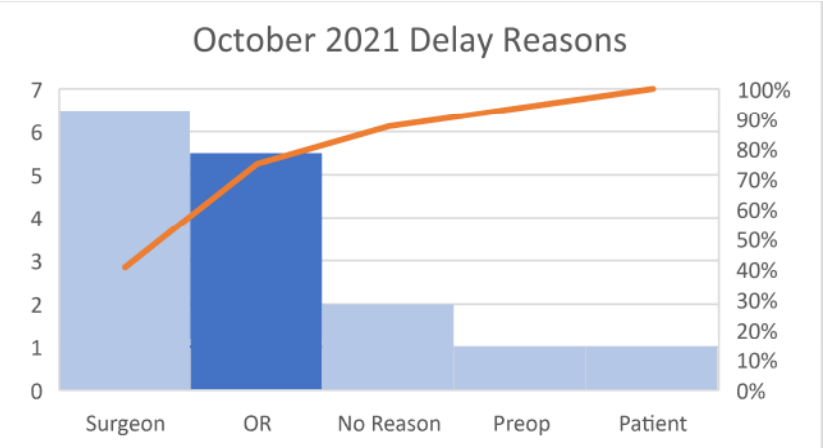




Appendix P

Delay Reasons





Appendix Q

Visual Setup Guide