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Using Empathic design principles to improve surgical nursing efficiency

Roberta Sutton
roberta.sutton@bobcats.gcsu.edu

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Roberta Sutton

Georgia College and State University

Susan Steele PhD, RN, Committee Chair

Catherine Fowler, DHSc, RN, CNE, Committee Member

William Wheeler, MSN, RN, Committee Member

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Abstract

Improving efficiency to increase operating room utilization, improve turnaround time, and first case on time starts, is a goal of hospitals to increase surgical case volume. Increasing case volumes improves the hospitals bottom line by increasing reimbursement. In addition, improving the utilization will improve patient and caregiver satisfaction, show less wasted time between cases, and allowing for more timely starts. In the hospital that this study was be performed, located in Atlanta, Georgia, there is a need to improve these metrics which will improve the bottom line of the facility. This study addressed inefficiencies in processes, job duties, and preparation of the operating rooms prior to the surgery start time as well as during the case turnover process. The writer used the Process Redesign model and user-centered feedback to create a guideline that will allow the end user to develop a more efficient workflow pattern. The key metrics used in this study are nationally accepted measures that allow operating room managers to measure efficiency. The guideline developed was be based on evidence already developed and new evidence from the planned survey.

Keywords: occupational stress, stress related analysis, nursing, workflow design, empathic design, user-centered design, operating room, process redesign.

Using Empathic Design Principles to Improve Surgical Nursing Efficiency

Quality care is the primary objective of healthcare providers. The Institute of Medicine (IOM) identified six domains for healthcare quality: safe, effective, patient-centered, timely, efficient, and equitable (IOM, 2001). In the acute care hospital, the quality of care greatly affects financial viability. Shifts in reimbursement from volume-based to value-based care and capitated strategies now place heavier financial risk on providers rather the payers. As a result, hospital quality improvement efforts that improve timeliness and efficiency affect both patient safety and financial viability of the organization.

In the operating room (OR) environment, safety is closely integrated with timeliness and efficiency. Each member of the surgical team has specific responsibilities to minimize known risks, adhere to the surgical schedule, and use resources efficiently. A delay in the start of a surgical procedure can negatively impact the quality of perioperative care. A delayed surgical start can be a very restrictive experience for the patient, resulting in stress and anxiety (Carr, Teucher, & Casson, 2017) that can adversely affect surgical outcomes. For the surgical care team, delays result in longer work hours, unproductive time, and increased fatigue which can compromise team performance and risk patient safety.

A late start to a planned surgery can occur for several reasons. An emergency surgery or a surgery with complications can occupy an operating room and the surgical team making it impossible for the next scheduled case to proceed. A surgical case may start late due to a non-predictable patient condition that makes positioning, anesthesia administration, or intubation difficult. However, Meyers (2020) analyzed 36,543 surgical cases and found that 94-95 percent of delayed starts were due to factors other than patient condition. This project identified ways to prevent delays in a hospital-based operating room that can be controlled by employees.

Background and Significance

The perioperative service line, including the operating room, is the most expensive area of care provided in an acute care hospital. It is estimated that surgical care represents one-third of all healthcare spending in the United States (Childers & Maggard-Gibbons, 2018). Charges to the patient or third-party payers are based on the number of minutes the patient is in the OR and costs vary widely based on institution and location. In an analysis of a California acute care hospitals' data from fiscal year 2014, Childers and Maggard-Gibbons, (2018), calculated an average per minute cost of $36 to $37, while the values ranged from a low of $7 to a high of $100.

There are three main contributors to the expense of providing surgical care, equipment, staffing hours, and supplies. Specialized equipment required for modern surgery is very costly. A surgical robot costs more than two million dollars and other needed equipment, such as microscopes, cost more than a quarter of a million dollars. These technologies require annual maintenance contracts in addition to the initial capital cost, and they are estimated to last 5-7 years (Ho et al., 2011). Employee compensation comprises the second most expensive resource in the OR, followed by disposable supplies. In this researcher's OR, the average yearly employee compensation is 2.3 million dollars, and the cost of disposable supplies is approximately 1.5 million dollars.

Efficiency in the operating room requires optimal use of physical and human resources. Underutilization of operating rooms is associated with unproductive staff time and decreased return on investment for expensive equipment. Efficiency in surgical services is measured by utilization of the operating room and utilization is measured by the percentage time used versus the available time. For example, if there are 100 minutes available, and 80 minutes are used, the

OR utilization would be 80%. Charges to the payer are based on a per-minute usage from the time a patient enters the room until they exit. Surgical nurses refer to this time interval as *wheels in-wheels out* (WIWO). Thus, actions that increase or decrease OR utilization affect hospital revenue.

There is consistent evidence that OR utilization can be increased by implementation of two strategies:

- Eliminating delay in starting the first case scheduled in a room each day
- Reducing the interval of time between cases used to clean and prepare the operating room for the next patient.

Saw, et al., (2015), focused on first case on time starts (FCOTS) in an analysis of 65,100 surgical cases between 2007 and 2014. To make improvements, they focused on completing the surgical consent ahead of time, ensuring all team members presence at the patient's bedside at a set time, and parallel processing in the OR (Saw, et al., 2015). They showed a statistically significant, $p < .0001$, improvement in FCOTS from 67.60% to 82.80%.

Olsen, et al (2017), created a strategy to increase access to the OR by reducing the turnaround time (TAT) between surgical cases. They discuss there are two components of time in the OR: operative and non-operative time. Operative time is the time in which the patient is in the operating room. Non-operative time is all of the time there is not a patient in the operating room with a surgical procedure in progress. They observed three opportunities for improvement, which were all related to workflow. This process improvement project was designed to look at the workflow of the anesthesia provider, and the circulating and recovery room nurses. Lessons learned from the project include the need to vary staff assignments and not allow both the RN and surgical technologists to break at the same time. Consistency in staff were key to efficiencies

and lost productive time. One limitation was that the authors did not include any other staff members in this project. Many staff have a hand in TAT and therefore the researchers may have seen greater improvements had they involved the full team. (Olsen et al., 2018)

Timeliness of delivering surgical care has a human as well as a fiscal impact. Patients experience physiologic and emotional stress during surgery, which can be compounded when surgery is delayed. For a scheduled surgery, the patient has planned their life around preparation for and recovery from surgery. Patients are given a scheduled OR time and expect their case to follow the timeline. For many patients, awaiting surgery that is running late can be a very restrictive experience and cause a great deal of stress (Carr, Teucher, & Casson, 2017). Delays in care cause frustration to surgeons and staff that can affect their interactions as a team. As an independent contractor, surgeons receive no compensation when they wait for staff, equipment, or rooms to be made ready for the procedure.

Problem Statement

The Association of periOperative Registered Nurses (AORN) *Guidelines for Perioperative Practice for design and maintenance of operating rooms* (AORN, 2019) cites multiple sources of evidence emphasizing the need for interdisciplinary involvement in design of operating rooms to ensure efficiency. A human-centered design approach promotes safety as well as efficiency in execution of surgical procedures (Criscitelli & Goodwin, 2017). However, many hospitals were constructed in advance of these guidelines. As surgical techniques and equipment evolve and are added to the OR environment, upgrades often fail to acknowledge changes in workflow required for successful implementation. As a result, inefficiency before, during, and after surgery can decrease OR utilization. Research has demonstrated that changes in workflow, efficiency, staff roles, and tasks can increase operating room utilization, decrease

turnaround time, and improve quality metrics observed for surgery (Olsen et al., 2018). This project looked at reasons for inefficiency in workflow and the perceived reduced quality of work life for operating room registered nurses as barriers to timeliness and efficiency.

Needs Assessment

The need for this project was identified based on assessment of the utilization and timeliness in the OR of the target organization. Standards set by the Healthcare Corporation of America (HCA) for OR indicate that the goal of OR utilization should be at 60%, TAT should be less than 30 minutes between subsequent surgical cases (wheels out to wheels in), and FCOTS should be 75%. The target institutions utilization is 52.4%, TAT is 39 minutes, the FCOTS were at 70.4% for May of 2020 (Healthcare Corporation of America, 2020).

A period of participant observation enabled the project team leader to identify behaviors contributing to delay of the start of surgical procedures.

- Equipment needed for the first case of the day was often in the wrong location requiring staff to move equipment prior to the first case.
- The operating room lacked an adequate supply of disposable items needed for a case requiring staff to locate items to prepare for a case.
- Some team members would prepare the OR in a timely manner, but then take an unscheduled break.
- Staff lacked a sense of urgency to try and compensate for delays once they occurred.

Framework Guiding the Study

Change is critical in growing and highly competitive environments such as the operating room. Organizational change is moving from a known state to the unknown or future state.

Change is very stressful to those undergoing the changes because the future is uncertain (Hussain, et al, 2016). Some may not be able to cope with the changes unless actions are taken to motivate the staff members. Kurt Lewin's change theory advises first unfreezing the process, making change, then refreezing it (Hussain, et al, 2016). Often work groups need explanation and education to understand this process. Using an empathic approach to make changes will not only help the staff to be more prepared but will likely allow the change to "refreeze" based on their involvement in the decisions that affect them and their productivity. Incorporating Lewin's change model into this project will improve the structure of the process change. Setting the targets for user center efficiency based on the unfreezing of the current process, movement or making the needed change, and then freezing the process again should allow the OR staff and leadership the ability to make sound effective decisions to improve efficiency. In addition, using this model for change will also account for assuring the changes made will last.

This project was guided by the process redesign (PR) framework described by Rojas, Ashok, Morss, & et al., (2014). Process redesign changes the way that care is delivered by conceptualizing, mapping, refining, making improvements that consider both the setting, the characteristics of the individuals and team affected. Furthermore, PR may change existing practices, structures, roles, and may result in continuous changes. This study used the PR model and the user-centered feedback to create a guideline that will allow the end user to have a more efficient workflow pattern which will change the process measures of OR utilization, TAT, and FCOTS. These key metrics are used nationwide for OR's to measure efficiency and change is required to drive these numbers down. The guideline developed will be based on evidence already developed and new evidence from the survey.

Objectives and Aims

The objective of this project was to develop an evidence-based guideline for improved timeliness and efficiency within an existing hospital based operating room. The clinical questions asked in this project are:

Clinical Question 1. What characteristics of individuals and teams are perceived as barriers to efficiency in OR workflow?

Clinical Question 2. What inner setting aspects of staff time are perceived as barriers to efficiency in OR workflow?

Clinical Question 3. What inner setting physical space and equipment are perceived as barriers to efficiency in OR workflow?

Clinical Question 4. Are there processes of implementation that are perceived as barriers to improving efficiency in OR workflow**?**

Clinical Question 5. Is there a relationship between the length of time employed in the OR setting and perceived process implementation barriers?

H_0: There is not a positive statistically significant relationship between length of time working in the OR and perceived process implementation barriers.

H_1: There is a positive statistically significant relationship between length of time working in the OR and perceived process implementation barriers

Clinical Question 6. Is there a difference in the perception of individual and team barriers to efficiency between OR employees who identify as part of a team versus those who identify as working primarily independently?

H_0: There is not a statistically significant difference in perception of individual and team characteristic within the inner environment between persons who identify as part of a team versus those who identify as individual workers.

H_1: There is statistically significant difference in perception of individual and team characteristic within the inner environment between persons who identify as part of a team versus those who identify as individual workers.

Clinical Question 7. Is there a relationship between perceived environmental barriers of space and equipment and perceived barriers of staff time?

H_0: there is not a statistically significant relationship between perceived barriers of space and equipment and perceived barriers of staff time.

H_1: there is a statistically significant relationship between perceived barriers of space and equipment and perceived barriers of staff time.

Clinical Question 8. Is there a relationship between perception of the environment of the OR and perception of individual and team characteristics?

H_0: there is not a statistically significant relationship between perceptions about the OR environment and perceptions about individual and team characteristics.

Project Deliverables

The project deliverable, guidelines for improved OR efficiency, will benefit all of the key stakeholders. Efficient use, timely starts, and improved case turnovers will improve patient care and increase case volumes. Improving unexplained time that is lost at the beginning of the day, between cases, and engaging staff in the importance of OR efficiencies, will create additional time that should trigger increased surgical volume and reduce the stress placed on the RN in the operating room.

Review of the Literature

During the preliminary development of this project, a literature review was completed to identify evidence regarding interventions that increased efficiency in Operating Room nurses' work. This review provided sufficient evidence to warrant proceeding with a quality improvement project to increase efficiency of OR nurses' work within the target institution. Once the decision to develop a quality improvement process to decrease TAT and increase FCOT's, a second review was conducted to determine how a user-centered redesign of operating room workflow could be used to improve efficiency. The following will describe the results of both reviews used to shape the project.

Literature Search

The Walters Kluwer OVID, Cumulative Index to Nursing and Allied Literature (CINAHL), Medline, and ProQuest databases were used to search for literature. Search terms included turnaround time (TAT), operating room (OR), operating room efficiencies, OR utilization, and first case on time starts. Filters used were English, academic journals, scholarly articles, as well as a date range of 2014 – 2019. A total of 21 articles were reviewed. The articles that were used were determined to be appropriate based on both identifying and implementing a process improvement, or they looked at either task allocation or role designation. The studies used were published between 2014 and 2019. One study was published in Bangladesh and the rest in the United States. One study was a prospective comparative study, one was a pre- and post-interventional study, and five were process improvement studies. All of the studies reported effective interventions, which are discussed in the following sections. In addition, several internet searches were also completed using Safari, as well as a review of the Association of

Operating Room Nurses (AORN) Recommended Standards and Turnaround time toolkits (Perioperative Efficiency, 2019) were used.

The second review of the literature was conducted with the goal of determining which elements are required to develop an empathic designed workflow for operating room (OR) nurses. Using databases Cumulative Index of Nursing and Allied health (CINHAL), Medline, Walters Kluwer OVID, and ProQuest databases. In addition to the databases, publications of the Association of periOperative Room Nurses (AORN), were also searched for literature that pertains to this project. Search terms used for the evidence-based literature review included operating room nurse, efficiency, empathic design, quality of work life, surgery on time starts, operating room efficiency, and user-centered design. Filters used were English, academic journals, scholarly articles, and the primary dates for the review were within the years 2014 - 2020. A secondary search was conducted to include the years 1990 - 2014 to include the IOM's significant historical literature. A total of 67 articles were reviewed and from this sample, 31 articles were chosen for inclusion in the literature review. Articles were selected if they reported research or process improvement projects related to operating room efficiency, process redesign, empathic design, or workflow analysis.

The PICOT question used to guide this literature search was "In a hospital-based perioperative department what is the effect of stakeholder involvement in workflow redesign compared to current workflow process on departmental efficiency?"

Efficiency

Healthcare providers must focus on efficiency to meet demands for high quality, low-cost healthcare. Most studies considered turnover time between surgical cases and starting cases on time. These are nationally benchmarked metrics, so this is where the focus of most evidence lies.

First case on time starts. First case on time starts are the first cases of the day in each operating room and whether or not they start at the scheduled time. First case on time starts are delayed as the surgeons are frequently late, they state that the OR is not on time, so they do not want to arrive just to wait on the OR. Sometimes the OR is late due to patients arriving late to the hospital, staff not being prepared, and certain surgeries needing a pre-surgical block performed by anesthesia which may delay the start while the anesthesiologist is caring for another patient. These delays cause a domino effect throughout the day, which in turn creates no sense of urgency to start and finish on time.

Anesthesiologists can be the primary drivers of operating room FCOTS and TAT. Kacmar, Davidson, Victor, Bullard, and Melendez (2016) were able to increase inpatient FCOTS by 33% and TAT by 41% by using an incentivized salary plan for anesthesiologists. By changing from an income guarantee model to an at-risk model they were able to involve the anesthesia providers to be able to demonstrate significant changes. Limitations to the study were that they only used faculty attending anesthesiologists and did not incentivize the nurse anesthetists and anesthesia assistants. In addition, they did not look at other reasons for TAT delays only anesthesia related delays.

Turnaround time. Surgical robots are complex and have an increased number of tasks that are required during operating room turnover. Souders, et al (2017) decreased TAT and increased efficiency in robotic operating rooms through a process improvement effort. The

intervention included a review of the roles and tasks, creation of laminated task cards and assignment of task cards to staff, so no tasks were left undone. Implementing a motor car racing "pit stop" model allowed them to decrease TAT from 53.2 minutes to 27.2 minutes over the course of three months. These results were subject to bias due to a lack of controls. They did not see a difference in the care provided or an increase in case volumes, however they did see a decrease in OR staff overtime.

Bhatt, Carlson, and Deckers (2014) identified problems with TAT management and implementation of reproducible processes to reduce the time. They identified a systemic approach to redefine the turnover process to allow staff to act in a consistent, predictable, and sustainable way to improve turnover. To make improvements they developed a consistent "room ready" designation for each OR, and they developed a new position called a "Core Tech" (Bahatt, Carlson, & Deckers, 2014). This position was responsible to be the liaison between the OR and sterile processing, as well as ensuring accurate case carts, and gathering required equipment for cases. The results of this study were that they saw a six-month sustained 10% reduction in turnaround time. The limitation of this study was that they only used orthopaedic and vascular surgeries as a control group. In addition, they allowed the staff to use their own discretion in many situations which could allow room for interpretation and therefore not consistent practice.

Olsen, et al (2017), created a strategy to increase access to the OR by reducing the TAT between surgical cases. They observed three opportunities for improvement relating to the anesthesiologist, the circulating nurse, and the post-anesthesia nurse, were all related to workflow. The opportunities were: 1) the circulating RN would see the next patient prior to going to the OR to set up the case, 2) the anesthesiologist places the spinal in the pre-operative

area and then the pre-operative RN transfer the patient to the OR, and 3) the post-anesthesia RN picks up the patient in the OR at the end of the procedure (Olsen, et al., 2017). These changes leave the OR RN in the OR to prepare for the procedure. This process improvement project was designed to look at the workflow of the anesthesia provider, the circulating nurse, and the recovery room nurse. Lessons learned from the project were that they limited needed to vary staff assignments and not allow both the RN and surgical technologists to break at the same time. Consistency in staff were key to efficiencies and lost productivity. One other limitation was that the authors did not include any other staff members in this project. Many staff have a hand in TAT and therefore they may have seen greater improvements had they involved the full team.

Malhotra (2017) presented a prospective observational study looking at TAT in two operating rooms over four months. The author only examined reasons for delays and presented to administration ways to improve. Malhotra concluded that delays are multifactorial, unavoidable, and unpredictable. The recommendations provided were to standardize setup and clean up processes, having extra staff for turnovers, and to assure there are enough instruments to avoid turnover of trays. The limitation of this study was stated as the observations were performed in an academic medical center with residents and students that may have limited external validity.

Tagge, et al (2017) observed 612 surgical cases over six months for delays in TAT and demonstrated that a multidisciplinary team with focused tasks could improve the efficiency of the time spent turning over the operating rooms. They determined this without removing any staff or adding any new staff or technology, using Lean Six Sigma methodologies. During the study intervention they decreased the average TAT from 41 minutes to 32 minutes.

This project will use a cost neutral approach to creating a more efficient environment. Using some of the lean management principles, such as 5S which is a way to organize supplies,

will be invaluable to creating the guideline for a more efficient workspace. In addition, this project will organize a system to sustain the positive changes in the workflow.

Empathic Design

Nurses are driven to care for other human beings; therefore, they need their work to be human centered. Thomas & McDonagh, (2013) explored the role of empathy when designing new products. They also developed a wide range of empathic design strategies to help identify human needs. Thomas & McDonagh, (2013), surmised that for products and services to be effective they had to satisfy humans' functional and emotional needs. In order for the OR nurses to have a functionally and emotionally satisfying day, their workspace must be designed to create an efficient workflow pattern.

Nurses tend to modify circumstances, or create work arounds, in order to modify work life; however, they become accustomed to current work conditions and do not necessarily look for solutions to problems (Leonard & Rayport, 1997). Leaders must be aware of these work arounds, be willing to discuss these topics with the nurses, and make changes that will help them create a better environment.

Stress and burnout of registered nurses (RN) and especially OR nurses are a large contributor to higher turnover rates and the nursing shortage. The operating room can be intimidating for new nurses, thus leading to a shortage of nurses who are trained in this environment. Evidence shows that 50% of perioperative nurses in 2017 were between the age of 50 and 59, with the average age being fifty-one (NCSBN, 2020). In addition, the American Association of Colleges of Nursing (AACN), states that there is a 37% first year turnover rate of new nurses. Higher acuity patients, increased nurse-patient ratios, and inefficient workflows all

contribute to turnover. Stress related to wasted time and energy will contribute to nurses seeking jobs outside of the hospital environment or healthcare altogether.

Workflow Analysis

Designing a better workflow is not without its challenges. Leaders and workers must be able to voice concerns in a non-punitive environment. There must be a just culture in place to allow the nurses to open up and discuss how they perform work arounds each day in order for leaders to understand how to make improvements. This project will be using the empathic design to assist the OR staff in finding and creating a safe, efficient workflow design that works for them. Workers will feel more involved and in control of their work life if they can be involved in the design.

Every person constantly strives for a work life balance, and the quality of their work defines how they cope with their work time. Those that are constantly stressed or overwhelmed at work, will take some of that frustration home with them making it difficult to relax on down time. The quality of work life (QWL) is a priority of leaders in hospitals; they know workers cannot heal others when they are not taking care of themselves (Heidari Gorji et al., 2018). QWL of nurses is influenced by social, administrative, managerial factors, as well as cultural situations. The research study by Heidari Gorji et al., (2018), using the NIOSH QWL survey, showed that for operating room RN's only 37% of those surveyed felt they had a good quality of work life and 26% had a desirable work life. However, only 13% of the participants felt their efficiency was at a high level, 42% felt it was relatively high, 33% average and 13% felt their efficiency was low (Heidari Gorji et al., 2018). They found a statistically significant relationship between efficiency and QWL in the participants ($r = 0.48$; $P<0.001$), (Heidari Gorji et al., 2018). Employee satisfaction regarding their opinions about their work have been a long-term concern

for most employers. Therefore, improving the QWL for staff members is a very important plan to sustain health care facilities.

In the OR, patient care is very dynamic, and is dependent on the knowledge, judgement, and reasoning of the circulating nurse. The nurse has the distinct responsibility of being the advocate for the patient who is anesthetized and cannot speak for themselves. In addition, the nurse is the most mobile person in the OR by working outside the sterile field and serving as the link between sterile field and non-sterile field. Because of this required mobility of the nurse, flow disruptions due to OR layout, availability and location of equipment and supplies, cause inefficient workflow for the nurse resulting in delays (Bayramzadeh et al., 2018). Bayramzadeh et al., demonstrated that the layout of an OR will influence movement patterns as well as disruption of the workflow. They also discovered that the environment of the OR is a risk factor that has impact on both patient and staff member safety as the nurse encounters difficulties presented by the environment.

There are many areas in a hospital in which a nurse may choose to work. All areas or specialties have their own efficiency challenges; however, structure and process are always linked to outcomes (Fay, MSArch, Carll-White, & Real, 2017). A research project revealed that the structure and process in the emergency department (ED), including the configuration of the unit, technology, lighting, storage, staff stress, data access and teamwork, were associated with perceptions of efficiency and staff satisfaction with the workflow design (Fay et al., 2017).

The research articles show a strong correlation between department designs or structure and workflow design that affect the staff perception of their efficiency. Once built, it is difficult and costly to redesign the physical layout of nursing departments, however there are ways to redesign the workflow processes and the location of required equipment to be more efficient.

Framework

The theoretical framework for this project was the Process Redesign (PR) framework developed by Rojas, Ashok, Morss, Wines, & Teixeira-Poit, (2014). The PR framework was developed for the Agency for Healthcare Research and Quality as an adaptation of the Consolidated Framework for Implementation Research (CFIR) of Damschroeder et al. (2009). The process of redesign, using an empathic design, for workflow of OR nurses will be the basis of this project. The developers did not use the term "empathic design"; however, their model considers the characteristics of the individual and the team as a critical component of the success of the process change which supports the empathic approach this project will use. Even though this project will not be implementing a process redesign, the end goal for this project is creation of guidelines for redesign of workflow to improve OR efficiency in the target hospital. The model is pictured in figure 1.

This model was chosen for the desire to use an empathic approach along with the vision of developing guidelines for re-design that will result in greater acceptance and willingness to change workflow processes. There is both external (research) and internal (corporate) evidence that greater efficiency and improved OR utilization can be achieved in TAT and FCOTS. The hospital is part of a corporate environment; the changes in payment structure are driving the need for increased efficiency, and technological changes in the types of equipment needed for surgery require more time for OR turnaround time.

This study used the PR model and the user-centered feedback to create a guideline that will allow the end user to have a more efficient workflow pattern which will change the process measures of OR utilization, TAT, and FCOTS. These key metrics are used nationwide for OR's to measure efficiency and change is required to drive these numbers down. The guideline will be

based on evidence already developed by AORN and in other research and new evidence from the survey.

Methods

The objective of this translational research and clinical project was to develop an evidence-based guideline for workflow improvement using an empathic approach to process redesign. Using the process redesign (PR) framework along with the use of current evidence and evidence discovered with the survey results, a guideline was developed to guide OR leaders and staff members to create a workflow design that is centered on the end user. This new workflow will guide a more efficient process for starting the surgical day and for turning over the OR between surgical cases.

Design

This quality improvement project used a cross-sectional survey to identify barriers to potential change in workflow processes within the OR. The timeline for completion of this project is represented in figure one.

Setting

The setting for the project is a 350-bed community hospital in a suburban area. The surgical volume in this OR averages 420 cases per month. The surgical services department has 10 operating rooms and employs 65 professional and support staff. Permission to complete the translational project in this setting was secured from Amy Wheeler, CFO. A copy of the letter is in Appendix 1.

Population

The research population was comprised of the nursing staff of the target hospital-based operating room and the AORN eChapters 1200 members. The hospital-based nursing staff is

comprised of RN's and surgical technologists, the eChapter consists of perioperative RN's, both currently working and retired, as well as vendor and industry partners that are also members. This group of healthcare workers provided a good representation of the OR population as a whole.

Sampling Method

This project used a sample of convenience. The inclusion criteria were staff members currently working in the operating room. The link to the online survey was emailed to participants, and they could choose to consent to be a part of this project by answering the first question. Persons who are not actively working in the operating room were excluded from the study when they answered no to the second question.

Sample Size

Sample size was calculated *a priori* for the Spearman correlation coefficient for an effect size of 194 with $\alpha=.05$, $\beta=.2$, questions regarding relationships it was determined to be statistically significant. In addition, a Chi square was used to determine sample size, of 122 to gain a power of 0.803087 for the questions regarding the difference between the team versus the individual feedback. For this project it would be ideal to obtain at least 250 survey responses to account for the possibility of incomplete survey responses.

Subject Recruitment

Potential subjects were contacted by email requesting their participation in the project. The email content is included in Appendix 2. A reminder email was sent seven days after asking individuals to complete the survey and thanking them if they have already participated. Text of the follow-up email is in Appendix 3.

Data Cleansing

The survey data was downloaded from the Qualtrics™ survey tool directly into an SPSS file. The data was checked and assessed for missing values, then checked to see that all variables were available. IP addresses were checked for duplicate responses. There were six occurrences that two responses came from the same IP address. This could be related to staff completing the survey at work on the same computer or could be two family members using the same computer at home. Because the survey responses were different in the duplicated address, a decision was made to retain all of the responses. The IP addresses as well as the longitude and latitude data for the participants was deleted to protect the anonymity of the respondents. The Qualtrics software identified the level of measurement for all variables as a default of scale. Errors in the level of measurement in the SPSS file were corrected.by setting questions 1-7, 9 and 10 to the ordinal level. Question labels were entered into the variable view to aid in data interpretation. The new labels provided a shorter version of the original question. Finally, question 10.11 required reverse coding.

Data Manipulation

To enable answers to all of the clinical questions, four additional variables were created by summing other items. These new variables were named human characteristics, perceived time barriers, perceived environmental barriers, and implementation process barriers. Table two lists the questions that were used to compute these new variables.

Data Collection

A survey link was sent to participants requesting that they respond within two weeks. Participants were recruited from AORN eChapter members and OR staff members in this authors

department. Data was collected from returned surveys and analyzed based on demographics and responses to questions using a 5-point Likert scale.

Instruments

This project used a 10-question survey tool developed by this researcher. The survey questions were developed using the researcher's knowledge of the OR, AORN guidelines, the 5S lean concept. A Quality of Worklife (QWL) questionnaire published by the National Institute for Occupational Safety and Health (NIOSH) also served as a source for several items (2010). With the goal of keeping the survey under 15 minutes for response time, questions were eliminated, and others have been added to be more in line with work in the operating room. Additional items were developed using concepts from the Process Redesign framework (Rojas, Ashok, Morss, Wines, & Teixeira-Poit, 2014), and the literature review. A copy of the survey instruments is located in Appendix 4. As the responses are evaluated the guidelines will be developed.

Survey questions were designed to measure the perceived barriers to process redesign concepts of individual and team characteristics, inner setting, and process of implementation. For the purposes of the survey, the inner setting was assessed by two sub-concepts: staff time and physical space and equipment. Table 2 presents the composition of the survey. A copy of the survey is in Appendix 4.

Data Analysis

This project used the Software Package for the Social Sciences (SPSS) version twenty-four for data analysis. Descriptive analysis provided is appropriate for the level of measurement for each variable. Demographic and human characteristics are reported using frequency tables.

Sums for time barriers, environmental barriers, and process barriers are reported using frequency, measures of central tendency, and measures of dispersion.

This project used a Chi square goodness of fit test to evaluate the null hypothesis. In addition, a Spearman correlation coefficient was used to show the relationship between the variables. The alpha will be set to .05 for all calculations.

Sample Size

A priori sample size was calculated for a power of .80 and a small effect size (.30). A sample of 194 was needed for the Spearman correlation calculation and a sample of 122 is needed for the Chi Square test. Every attempt will be made to obtain a sample of 225 with the goal of obtaining at least 195 completed surveys.

Results

The survey was distributed to 1215 individuals and 235 consented to participate for an overall response rate of 19.34%. A screening question about current employment in the operating room eliminated 79 ineligible respondents. Therefore, this left 155 participants or 66.24% of the original 235 participants. Of these, only 118 or 49.4% of the original participants finished the entire survey. See *Figure 2, Process of obtaining completed surveys*, for an illustration of the process.

Demographic Characteristics

Demographic items were included in the survey to obtain an understanding of work hours, roles, and credentials of respondents. The largest portion of the sample reported working 36-40 hours per week (20.9%) or more than 40 hours per week (22.6%). These findings are consistent with full time employment and normal OR call situations. A small percentage (5.9%) work less than 35 hours a week, and 50.6% declined to answer. The majority (41.4%) of

respondents reported being Registered Nurses or working in roles that require licensure as a Registered Nurse such as OR Educator or leadership and managerial roles. Respondents had a great deal of experience in operating room nursing with more than 90% indicating a work history of 6 or more years. See *Table 3, Demographic Characteristics of Survey Respondents,* for additional details.

Answering Clinical Questions

To develop an evidence-based guideline for improved timeliness and efficiency within an existing hospital based operating room, answers were sought for the following clinical questions. See *Table 4. Frequencies Grouped by Calculated Variables* for additional data.

Clinical Question 1: What characteristics of individuals and teams are perceived as barriers to efficiency in OR workflow? Participants were asked about individual performance and team functioning issues that delay surgery. Delays is surgery due to unavailability of surgeons and anesthesia providers was rated as "rarely" by most respondents, although a few rated these items as "always".

The majority of the respondents feel that safety is a priority of their organization, however, more than one third of respondents feel that safety is not a priority. Additionally, many of respondents felt that their organization takes no compromises when it comes to worker safety. Responses for the question "I have enough help and equipment to get the job done" were widely dispersed with no clear pattern.

Clinical Question 2: What inner setting aspects of staff time are perceived as barriers to efficiency in OR workflow? Respondents identified three primary barriers that contribute to inefficiency in workflow. These barriers were (a) time spent searching for needed equipment, (b) searching for supplies, and (c) waiting for completion of room cleaning. Each of

these events delays turnover and extends the time between cases. Many of these OR employees feel they must work very fast and that there is too much work to do to do it all well. The majority of respondents agree or strongly agree that the conditions on their job allow them to be as productive as they can be, and more than half of respondents agree or strongly agree that their place of work is run smoothly and effectively. Responses for all routines for TAT have a specific system that makes it easy for all to see what needs to be done, were widely dispersed and did not show a clear pattern.

Clinical Question 3: What inner setting physical space and equipment are perceived as barriers to efficiency in OR workflow? Physical space and equipment issues were identified as environmental barriers to efficiency. Having the necessary equipment and supplies available for first case was rarely a concern but did happen occasionally. In addition, TAT can be extended due to equipment and supplies not being available, as well as waiting for the room to be cleaned.

The majority respondents feel that cords and equipment present a trip hazard in the OR. However, responses to items about ineffective lighting, and large equipment interfering with workflow were widely dispersed. More than half indicated that there was not a person in their work setting with responsibility to assure that equipment is in good working order at the end of the day.

Although some issues were identified, such as equipment not being in a convenient place and a need for better organization of required items, there was no clear pattern of response to the item about use tools for organization. Additionally, the necessary equipment to start the first case is not working properly was fairly evenly spread between rarely and sometimes.

The majority of respondents said the OR's are set up for safety of both patients and workers, however the acoustics of the OR can often be distracting. Many of the respondents also

said that the air quality in the OR is good or very good and most agree that it is easy to move around the OR during procedures and that equipment has a designated location in the OR.

Clinical Question 4: Are there processes of implementation that are perceived as barriers to improving efficiency in OR workflow? Some survey items assessed potential barriers that often hinder the process of implementing change. For the question regarding the freedom to do their own work, the majority of respondents answered either strongly agree or agree. The majority of respondents feel their hospital OR gives good or better care than the competitors and that their care is patient centered. More than half of the respondents feel like they will stay in their current job however that means more than one third may be looking for another job within the next year.

About one half of respondents felt their coworkers were receptive to changes, and nearly all felt they were receptive to changes in the way they work. Interestingly, the majority feel that their organization needs to make changes. The survey results showed that respondents were generally more positive about change then was expected.

Clinical Question 5: Is there a relationship between the length of time employed in the OR setting and perceived process implementation barriers?

H_o: there is not a statistically significant difference in the length of time employed in the OR setting and perceived process implementation barriers.

H_1: there is a statistically significant difference in the length of time employed in the OR setting and perceived process implementation barriers.

A Kendall's tau rank-order correlation was run to determine the relationship between the length of time employed in the OR and perception of barriers to process implementation. There was weak but statistically significant negative correlation, and a small effect size, (r_τ (116) =.18, p =

.019) between these factors. Coefficient of determination (correlation value squared) is .023 indicating that the number of years of employment in the OR explains only 2.3% of the variation in perceptions of barriers to the process of implementing change. For guideline purposes, it would suggest that use of empathic principles in planning change can work well whether staff are novices to the OR or have been working there a long time.

Clinical Question 6: Is there a difference in the perception of individual and team characteristics between OR employees who identify as part of a team versus those who identify as working primarily independently?

H_o: there is not a statistically significant difference in perception of individual and team characteristic barriers to efficiency between persons who identify as part of a team versus those who identify as individual workers.

H_1: there is a statistically significant difference in perception of individual and team characteristic barriers to efficiency between persons who identify as part of a team versus those who identify as individual workers.

A large difference in the number of respondents who perceived their work as part of a team (n=100) and those who perceived their work as independent (*n*=16) resulted in violation of the assumption of equal variance necessary for a student *t*-test, therefore a Welch's *t*-test was required. There was not a statistically significant difference perception of team characteristics between those who identify as working on part of a team versus those who report they work independently, (*M* = 13.25, *SD*= 2.68), as compared to those who reported working independently (*M*= 13.31, *SD*=2.82) conditions; *t(19.59*= -1.82, *p* = .857). These results suggest that those who believe they work independently do not perceive barriers to efficiency any greater than those who believe they share the work with a team.

Clinical Question 7. Is there a relationship between perceived environmental barriers of space and equipment and perceived barriers of staff time?

H_O: there is not a statistically significant relationship between perceived barriers of space and equipment and perceived barriers of staff time.

H_1: there is a statistically significant relationship between perceived barriers of space and equipment and perceived barriers of staff time.

A Spearman's rank order correlation was run to determine the relationship between perceived barriers of space and equipment and perceived barriers of staff time. There was a strong positive and statistically significant correlation (r (111) = .782, p = .000) between these variables. This supports the idea that the more barriers staff perceive related to the physical environment the more likely they are to also perceive a lack of time to work efficiently.

Clinical Question 8: Is there a relationship between perception of the environment of the OR and perception of individual and team characteristics?

H_O: there is not a statistically significant relationship between perceptions about the OR environment and perceptions about individual and team characteristics.

H_1: there is a statistically significant relationship between perceptions about the OR environment and perceptions about individual and team characteristics.

A Pearson's correlation was calculated to test this hypothesis. It revealed a statistically significant strong positive relationship between environmental perceptions (M = 13.43, SD =2.68) and perceptions about human characteristics (M = 20.99, SD = 3.56); r = .49, p = .000. This suggests that the more barriers a worker perceives based on environmental factors such as space and equipment, the more likely they are to also perceive more individual and team characteristics that could negatively affect process improvement. Although considered only a

moderate effect size, it does indicate that 27.77% of the variation in the way workers perceive the human characteristics of the workplace can be affected by the physical work environment.

Discussion

The Association of periOperative Registered Nurses (AORN) *Guidelines for Perioperative Practice* for design and maintenance of the surgical suite cites multiple sources of evidence emphasizing the need for interdisciplinary involvement in design of operating rooms to ensure efficiency. A human-centered design approach promotes safety as well as efficiency in execution of surgical procedures (Criscitelli & Goodwin, 2017). However, many hospitals were constructed in advance of these guidelines. As surgical techniques and equipment evolve and are added to the OR environment, upgrades often fail to acknowledge changes in workflow required for successful implementation. As a result, inefficiency before, during, and after surgery can decrease OR utilization. Research has demonstrated that changes in workflow, efficiency, staff roles, and tasks can increase operating room utilization, decrease turnaround time, and improve quality metrics observed for surgery (Olsen et al., 2018).

The survey results differ from the informal interviews discussed in the needs assessment. Perceived FCOT delays due to providers was not supported in the survey findings and therefore needs further investigation. In addition, statements about equipment not being where it is supposed to be or that it is broken was also not supported in the survey findings. The layout of the surgery department and that it required more walking because equipment is not stored close to where it is used, was also not completely supported. Survey responses were dispersed between somewhat agree and somewhat disagree, which could warrant further investigation. Safety concerns about trip hazards and acoustics were supported but sufficient task lighting was not. The survey indicated areas that are definite concerns and some that need more investigation in each specific setting.

One of the major findings was that the turnaround time between surgical cases can be extended due to supplies and equipment not being in a convenient place, or not being prepared on time. Therefore, one may assume that the lack of preparedness with equipment and supplies will cause a delay in FCOTS and TAT on surgical cases. In addition, several safety concerns were discussed. All of these responses show a need for safety to be a real priority for organizations.

The results of the survey support the process redesign framework. Human characteristics lead us to perceived time, environmental, and implementation barriers within the inner setting of the workplace. These barriers determine the likelihood of success with process redesign barriers, whether perceived or real, must be eliminated before the team can make improvements in efficiency. The guideline developed to assist leaders and OR staff to create a more efficient workflow and find ways to make effective changes. By considering process re-design from the perspective of the user, team members are more likely to sustain the changes.

The survey results contradicted several key findings in the literature. This study revealed that environmental barriers to efficiency exist in most OR's and that there must be changes for the team to be effective to create a better, more efficient, workflow. However, in the literature review, (Kacmar, Davidson, Victor, Bullard and Melendez (2016), Bhatt, Carlson, and Deckers (2014), and Tagge, et al, (2017)), the data regarding OR efficiency were mostly related to TAT and FCOTS. In addition, the informal assessment at the target hospital revealed delays were surgeon and anesthesia related. However, the results of the survey showed that delays in FCOTS and TAT were rarely related to the surgeon or anesthesia being late. The research also showed complexity of surgical equipment as well as required items not being ready for cases also caused delays (Souders, et al (2017). However, the survey results showed that "rarely" were equipment

and supplies not available when they were needed. These contradictions could warrant further investigation.

Another interesting finding was that respondents that felt more like individuals, may be required to work alone based on their setting, they may not know how to ask for help, or no one is willing to help them. This trend may be based on things such as work ethic, perceived ability, or desire to help them, or their attitude or behavior towards others. Interruptions in workflow, such as trip hazards, could affect turnover time and on time starts, as well as injury to the staff. When operating rooms are built, not enough attention to adding equipment, and future needs are taken when designing workflow patterns and equipment location. Trip hazards due to equipment cords and other items on the floor should be a high priority. These responses would lead one to agree that their workflow is dependent on how the OR is set up. Whether it is during construction or simply organization of the space is not determined. In the modern OR, many procedures are performed in the dark such as laparoscopic and robotic cases. The surgeon needs a darkened room to be able to see the monitors, the staff need adequate lighting to care for the patients and the team while not having to worry about not being able to see any potential hazards.

The OR is a very fast paced environment. The need to perform more procedures per day, per OR, is based on volume needs, revenue, and productivity. Therefore, the more procedures performed, the more revenue received. The key to maximizing surgical volume and productivity is adhering to the OR schedule especially for FCOT and turnaround time. The target hospital data for these metrics, needed improvements compared to national standards (AORN) as well as their corporate goals. In the study by Heidari Gorji et al., (2018) found a significant relationship between efficiency and the quality of work life in the participants. This study found the majority of respondents were also confident in their productivity and efficiency. Understanding staff

needs and making change from an empathic perspective will more than likely lead to success. Upon analyzing workflow in both the literature as well as this studies survey results, there are several challenges discovered. First, key stakeholders must be involved in creating the potential changes. When the team is involved in making changes that affect them, they will be more likely to stick with the changes made. Leadership must also be willing to allow them to fail and not make it punitive. Changes take time and must be constantly followed and reviewed until the change is ingrained in everyone. In one study, only 13% of the participants felt their efficiency was at a high level, 42% felt it was relatively high, 33% average and 13% felt their efficiency was low (Heidari Gorji et al., 2018). In the results of this study, the majority of the respondents (76.9%), felt that the department needed to be better organized to allow them to be more efficient. Therefore, one could determine that increased organization could create a better workflow and allow staff to be more efficient.

The study demonstrated a strong relationship between perceptions about the environment and barriers to improving efficiency. Indicated safety concerns for workers were trip hazards, large equipment interferes with workflow, and that acoustics in the OR are distracting. In order to make the environment conducive to improving efficiency the leadership needs to address the trip hazards, workflow, and concerns with acoustics. This is especially important in hospitals that have added large equipment without doing major construction to modify the environment.

One point regarding the nurse's perception of a safe environment that was found, was that the majority of staff feel that the equipment presents a trip hazard. Trip hazards due to equipment cords and other items on the floor should be a high priority. The majority of OR staff feel that the OR could be better organized and that the lighting could be better. In the modern OR, many procedures are performed in the dark such as laparoscopic and robotic cases. The surgeon needs a darkened room to be able to see

the monitors, the staff need adequate lighting to care for the patients and the team, while not having to worry about not being able to see any potential hazards. Additionally, the majority of respondents stated they have worked in the OR 10 or more years (82.2%), and the average age of nurses in the workforce is 51 years (NCSBN, 2020). When operating rooms are built or remodeled, more attention needs to be paid to adding equipment, better lighting and potential future needs are considered when designing workflow patterns and equipment location. Attention to detailed workflow should be observed and acknowledged when designing OR's so that the staff can be more efficient when performing their tasks. There needs to be special safety concerns regarding the environment. The potential of falls is more devastating for older adults; therefore, trip hazards pose a greater concern. As workers age there are also hearing changes. Presbycusis results in difficulty distinguishing sounds with background noise. The survey results did not show acoustics as problem such as was observed in needs assessment phase.

There was one surprising finding in the survey which was a strong relationship between negative perceptions about work environment and negative perceptions about the team. It is not known how much making changes would improve working relationships, and that the environment is a cause of staff conflict, but it indicates that it may be a factor. This information warrants additional research in future.

The results of this study provide information about potential barriers in the internal setting that indicate the need for an empathic approach in working on process redesign, particularly if beliefs are deeply embedded in the work culture. Perioperative leaders need to be keenly aware of how changes affect their staff members. When changes must be made assessing staff perceptions about potential barriers prior to setting process improvement may be the key to sustaining the change.

Strengths

There were at least three strengths found within this project. The strengths of this project are a contribution to change in a positive way. First, this project adds the element of empathy to a

guideline about workflow in the operating room. Starting with a clear understanding by leadership of staff perceptions of barriers before determining realistic measures and initiating lean process change. Second, this project helped this student not only to grow professionally, but to look at every decision in a more empathetic way. This student observed that decisions made in the OR were based on financial metrics. This student has made changes in her behaviors that included the influences of a more empathetic decision-making process.

Developing a more user-centered method of feedback, as well as including the staff members in decisions that affect them has made significant changes in previously negative individuals. The student was able to step back and look at the differences in staff perception versus the survey responses. The study revealed there was a disconnect between the target hospital and the survey results. Thirdly, using traditional QI to make changes misses the empathic element needed to allow the frontline workers to be involved in decisions that affect them. This is a new perspective that leaders need to be aware of and could learn more about. Focus on the front-line workers when changing one's work environment, is less stressful and more productive if the people involved are able to help make the changes.

Limitations

To increase anonymity of participants, no items were included that would reveal the respondent's place of employment. Therefore, there was no way to know how the responses were distributed geographically, so it is possible that respondents collaborated in formulating answers. It is also possible that respondents employed in leadership positions have a different perspective from those who work constantly in staff positions.

Another limitation of this project was a low response rate, leading to a small sample size. Because the sample was small, it was underpowered for the analysis that was conducted thus

increasing the potential for type I error. Another limitation of this project is the survey instrument, there is no existing instrument to measure the concepts in the theoretical model, so the student was unable to pre-test the survey. Although some items from the Quality of Worklife survey (CDC, 2010) were used, it did not address the issues that were identified in the literature search and internal data analysis. This is an area of future research that could be worth investigating. Another limitation of this project was the inability to use question eight regarding the percentage of time the respondents spend of their day performing certain tasks. This data was lost because the question left the number to chance by the respondent and did not force a total of 100%, even though it tallied a total. Lastly, the 2020 coronavirus (COVID-19) pandemic, had an impact on the ability to carry out the project as originally intended and the need to revise the project. As a result, the end work product is a set of guidelines, however it was not possible to implement the guidelines and the full change process during the DNP program.

Implications for Practice

Process improvement efforts require changes that are sometimes met with resistance. People do not like change; it makes them uncomfortable and causes disruption to their daily routine. They may experience anxiety that if they do not perform adequately following the change their employment may be in jeopardy. This project supports the importance of empathic design in the change process and suggests that staff involvement can make change easier and sustainable. Re-designing work processes and environments is more likely to be successful if workers needs and perceptions are used to drive goals.

It is not clear with these survey results why the target hospital feels that the surgeon seems to be the cause of delays, but it certainly warrants a deeper look at finding the reasons and looking for ways to correct them. Other barriers to efficiency were identified are that equipment

and supplies were not always readily available. Not being prepared to start the first case of the day and for turnovers between cases will slow down the cases and cause frustrations with staff and physicians. These frustrations could lead to staff and or physicians leaving for a better organized facility. In most cities there are a lot of competing hospitals that may be better at efficiency. Therefore, using the empathic approach can identify needs for further evaluation and potential changes.

When making changes in the OR one needs to consider all potential stakeholders to be involved in the decisions regarding workflow and efficiency. Potential stakeholders to be involved with making positive changes will be the OR staff, surgeons, anesthesia providers, as well as executives and quality department staff, as well as others based on your facility. In order to make effective changes for efficiency, the key stakeholders in your facility should be consulted. Making stakeholders aware of the internal environment concerns that have been validated. One of the implications might be to consider assessing the internal environment before setting any targets.

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Table 1.

Proposed Timeline for Project Completion

Task	Weekly Schedule											
	1	2	3	4	5	6	7	8	9	10	11	12
Present proposal to committee												
Prepare changes requested by committee												
Obtain committee approval												
Submit IRB application												
Obtain notice of IRB approval												
Distribute survey to potential participants												
Send reminder email to sample												
Download data from survey tool												
Analyze data												
Write results of data analysis												
Create guidelines												
Present guidelines to stakeholders												
Write discussion of results												
Present final project to committee												
Prepare final edits requested by committee												
Submit completed paper to Knowledge Box												

Table 2.

Survey Items Used to Assess Variables

Concept	**Variable name**	**Survey items**
Characteristics of individuals and teams	Human characteristics	3, 4, 5, 6, 7, 9d, 9e, 10n
Inner setting: staff time	Perceived time barriers	9f, 9g, 9h, 10a, 10b, 10c, 10e, 10f, 10n, 10o, 10p,
Inners setting/physical space and equipment	Perceived environmental barriers	9a, 9b, 9c, 10g, 10l, 10m, 10q, 10r, 10s, 10t, 10u, 10v, 10w
Process of implementation	Implementation process barriers	10,h, 10i, 10j, 10k, 10x, 10y, 10z

Table 3.

Demographic Characteristics of Survey Respondents

Question	Values	n	%
Question 3, Hours worked per week			
	<20	7	2.9
	21-35	7	2.9
	36-40	50	20.9
	>40	54	22.6
	No response	121	50.6
Question 4, Role in OR	Values	n	%
	Staff/Team member	16	6.7
	Unlicensed	2	.8
	Licensed	52	21.8
	Educator	12	5.0
	Manager/Dir/Leader	35	14.6
	No response	122	51.
Question 5, Years on the OR	Values	n	%
	<1	1	.4
	1-5	9	3.8
	6-10	11	4.6
	>10	97	40.6
	No response	121	50.51
Question 6, Work as team or on own	Values	n	%
	Yes, I work as part of a team	102	42.7
	No, I work on my own	16	6.7
	No response	121	50.6
Question 7, Minutes spent cleaning from prior shift	Values	n	%
	<10	70	29.3
	10-15	24	10
	16-30	14	5.9
	>30	10	4.2
	No response	121	50.6

Table 3

Question 9, Events that Frequently Happen in the OR on Scheduled Cases.

Label	Never	Rarely	Sometimes	Often	Always
Equipment not working	7	46	51	14	0
Equipment not available	12	55	41	8	0
Supplies not available	10	57	39	9	0
Surgeon not available	11	34	44	26	2
Anesthesia not available	23	63	22	10	0
TAT extended equipment	9	42	58	9	0
TAT extended supplies	9	55	47	6	0
TAT extended cleaning	8	46	41	22	1

Table 4

Question 10, Statements about Work and Environment.

Label	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Have to work fast	60	44	10	4	0
Too much work for time	16	34	30	26	11
Safety is priority	54	25	16	16	7
Worker safety shortcuts	42	35	16	15	9
Feel productive	28	51	12	21	6
Workplace effective	21	39	21	26	10
Help and equipment to do job	19	46	13	29	11
Freedom for own work	32	43	21	15	6
Care good or better	62	34	14	6	2
Patient centered	55	45	12	4	1
New job within 12mo	13	15	17	15	59
Cords cause trip hazard	44	29	16	15	13
Equipment designated location	30	33	21	26	8
Responsibility for equipment	13	18	20	29	37
TAT routines	11	34	20	30	22
Tools organized	16	31	12	20	38
OR setup for safety	28	50	16	17	7
OR better organized	49	41	18	5	4
Acoustics distracting	22	46	20	27	3
Air quality is good	38	39	22	10	8
Task lighting is good	44	36	21	14	3
Ease of movement in OR	26	34	19	23	15
Equipment interfere flow	17	33	18	33	17
Coworkers receptive change	15	47	22	21	12
My receptive to change	52	44	9	2	0
Need for change	43	40	19	11	4

Table 5

Items Frequencies Grouped by Calculated Variables

Individual and Team Characteristics		
Rating	Frequency	Percent
Surgeon not available		
Never	11	9.4
Rarely	34	29.1
Sometimes	44	37.6
Often	26	22.2
Always	2	1.7
No response	1	
Anesthesia not available		
Never	23	19.5
Rarely	63	53.4
Sometimes	22	18.6
Often	10	8.5
Always	0	0
Safety is a priority with management		
Strongly agree	54	47.4
Somewhat agree	25	22.1
Neither agree nor disagree	16	13.7
Somewhat disagree	16	13.8
Strongly disagree	7	6.7
No safety compromises		
Strongly agree	42	35.9
Somewhat agree	35	29.9
Neither agree nor disagree	16	13.7
Somewhat disagree	15	12.8
Strongly disagree	9	7.7
Have enough equipment and help		
Strongly agree	19	16.1
Somewhat agree	46	39.0
Neither agree nor disagree	13	11.0
Somewhat disagree	29	24.6
Strongly disagree	11	9.3
Inner Setting: Time		
Job requires working fast		
Strongly agree	60	50.8
Somewhat agree	44	37.3

Neither agree nor disagree	10	8.5
Somewhat disagree	4	3.4
Strongly disagree	0	0
I have too much work to do		
Strongly agree	11	9.4
Somewhat agree	26	22.2
Neither agree nor disagree	30	25.6
Somewhat disagree	34	29.1
Strongly disagree	16	13.7
Working conditions allow maximum productivity		
Strongly agree	28	23.7
Somewhat agree	51	43.2
Neither agree nor disagree	12	10.2
Somewhat disagree	21	17.8
Strongly disagree	6	5.1
Runs smoothly and efficiently		
Strongly agree	21	17.9
Somewhat agree	39	33.3
Neither agree nor disagree	21	17.9
Somewhat disagree	26	22.2
Strongly disagree	10	8.5
Use a specific system for turnaround		
Strongly agree	11	9.4
Somewhat agree	34	29.1
Neither agree nor disagree	20	17.1
Somewhat disagree	30	25.6
Strongly disagree	22	18.8
Inner Setting: Space and Equipment		
Necessary equipment not working		
Never	7	4.5
Rarely	46	29.7
Sometimes	51	32.9
Often	14	9.0
Always	0	0
Necessary equipment not available		
Never	12	10.3
Rarely	55	47.4
Sometimes	41	35.3
Often	8	7.8

Always	0	0
Necessary supplies not available		
Never	10	8.7
Rarely	57	49.6
Sometimes	39	33.9
Often	9	7.8
Always	0	0
Equipment not available between cases		
Never	9	7.6
Rarely	42	35.6
Sometimes	58	49.2
Often	9	7.6
Always	0	0
Supplies not available between cases		
Never	9	7.7
Rarely	55	47.0
Sometimes	47	40.2
Often	6	5.1
Always	0	0
Room not yet cleaned between cases		
Never	8	6.8
Rarely	46	39.0
Sometimes	41	34.7
Often	22	18.6
Always	1	.8
Trip hazards on floor		
Strongly disagree	13	8.4
Somewhat disagree	15	9.7
Neither agree nor disagree	16	10.3
Somewhat agree	29	18.7
Strongly agree	44	28.4
Location of large equipment does not interfere with workflow		
Strongly agree	17	14.4
Somewhat agree	33	28.0
Neither agree nor disagree	18	15.3
Somewhat disagree	33	28.0
Strongly disagree	17	14.4

One person responsible for equipment		
Strongly agree	13	11.1
Somewhat agree	18	15.4
Neither agree nor disagree	20	17.1
Somewhat disagree	29	24.8
Strongly disagree	37	31.6
Tools are used to help organize room and equipment		
Strongly agree	16	13.7
Somewhat agree	31	26.5
Neither agree nor disagree	12	10.3
Somewhat disagree	20	17.1
Strongly disagree	38	32.5
The OR is set up for safety		
Strongly agree	28	23.7
Somewhat agree	50	42.4
Neither agree nor disagree	16	13.6
Somewhat disagree	17	14.4
Strongly disagree	7	5.9
Acoustics are distracting		
Strongly disagree	3	2.5
Somewhat disagree	27	22.9
Neither agree nor disagree	20	16.9
Somewhat agree	46	39.0
Strongly agree	22	18.6
Air quality in OR is good		
Strongly agree	38	32.5
Somewhat agree	39	33.3
Neither agree nor disagree	22	18.8
Somewhat disagree	10	8.5
Strongly disagree	8	6.8
Task lighting sufficient		
Strongly agree	44	37.3
Somewhat agree	36	30.5
Neither agree nor disagree	21	17.8
Somewhat disagree	14	11.9
Strongly disagree	3	2.5
It is easy to move around the room during procedures		
Strongly agree	26	22.2

Somewhat agree	34	29.1
Neither agree nor disagree	19	16.2
Somewhat disagree	23	19.7
Strongly disagree	15	12.8
Equipment has a designated location		
Strongly agree	30	25.4
Somewhat agree	33	28.0
Neither agree nor disagree	21	17.8
Somewhat disagree	26	22.0
Strongly disagree	8	6.8
Process of Implementation		
Freedom to decide how to do work		
Strongly agree	32	27.4
Somewhat agree	43	36.8
Neither agree nor disagree	21	17.9
Somewhat disagree	15	12.8
Strongly disagree	6	5.1
Care is as good or better than other hospitals		
Strongly agree	62	52.5
Somewhat agree	34	28.8
Neither agree nor disagree	14	11.9
Somewhat disagree	6	5.1
Strongly disagree	2	1.7
Care is patient centered		
Strongly agree	55	47.0
Somewhat agree	45	38.5
Neither agree nor disagree	12	10.3
Somewhat disagree	4	3.4
Strongly disagree	1	.9
Intend to find another job within year		
Strongly disagree	59	50.0
Somewhat disagree	14	11.9
Neither agree nor disagree	17	14.4
Somewhat agree	15	12.7
Strongly agree	13	11.0
OR could be better organized		
Strongly disagree	4	3.4
Somewhat disagree	5	4.3
Neither agree nor disagree	18	15.4

Somewhat agree	41	35.0
Strongly agree	49	41.9
Coworkers are receptive to change		
Strongly agree	15	12.8
Somewhat agree	47	40.2
Neither agree nor disagree	22	18.8
Somewhat disagree	21	17.9
Strongly disagree	12	10.3
I am receptive to change		
Strongly agree	52	44.1
Somewhat agree	55	46.6
Neither agree nor disagree	9	7.6
Somewhat disagree	2	1.7
Strongly disagree	0	0
There is a need for change		
Strongly agree	43	36.8
Somewhat agree	40	34.2
Neither agree nor disagree	19	16.2
Somewhat disagree	11	9.4
Strongly disagree	4	3.4

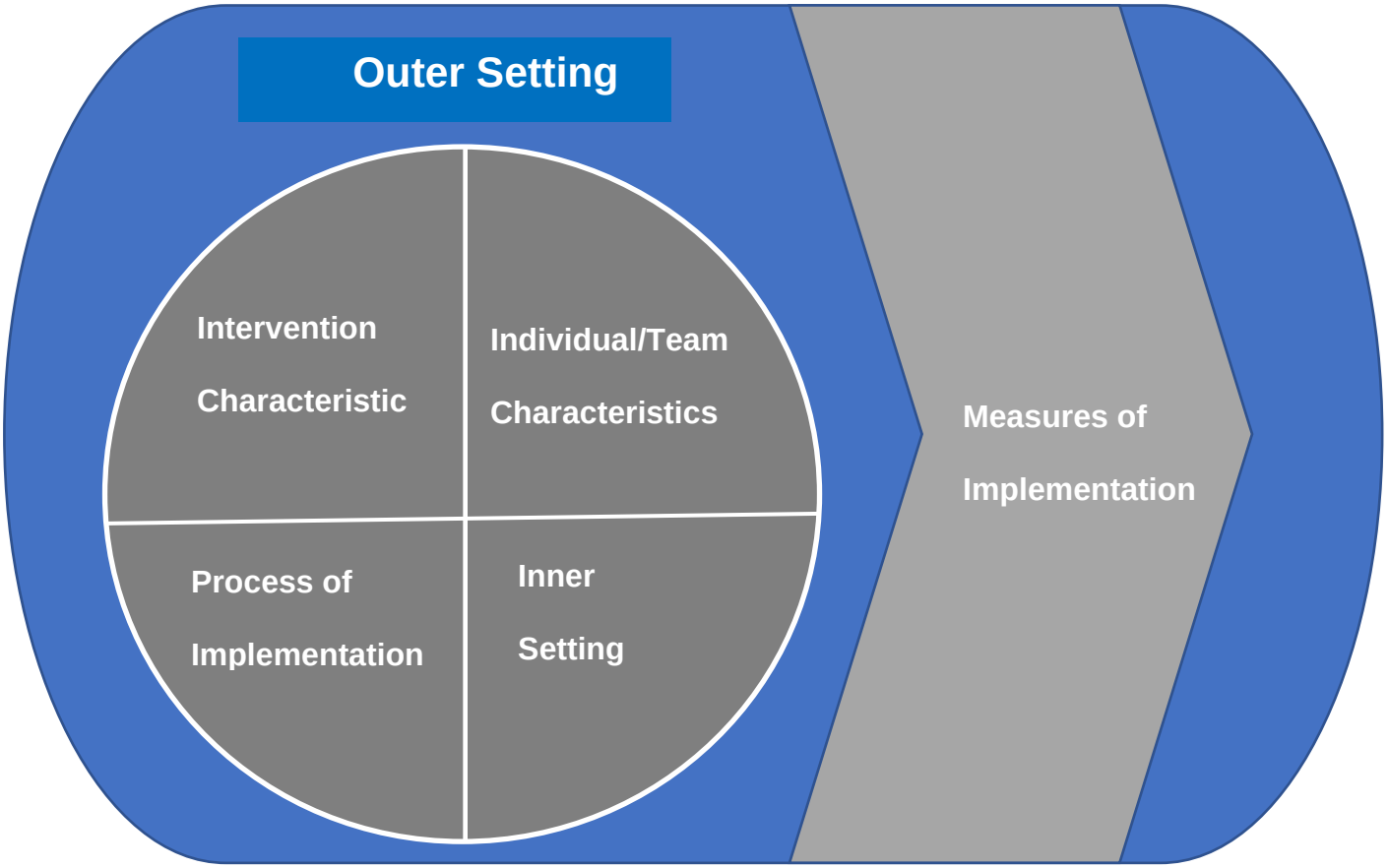

Figure 1. Process Redesign Framework. Adapted from "Contextual Frameworks for Research on the Implementation of Complex System Interventions" by L.S. Rojas, M. Ashok, S.D. Morss, R.C. Wines, and S.Teixeira-Polit, S, 2014, Prepared for Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services under contract No. 290-2007-1056

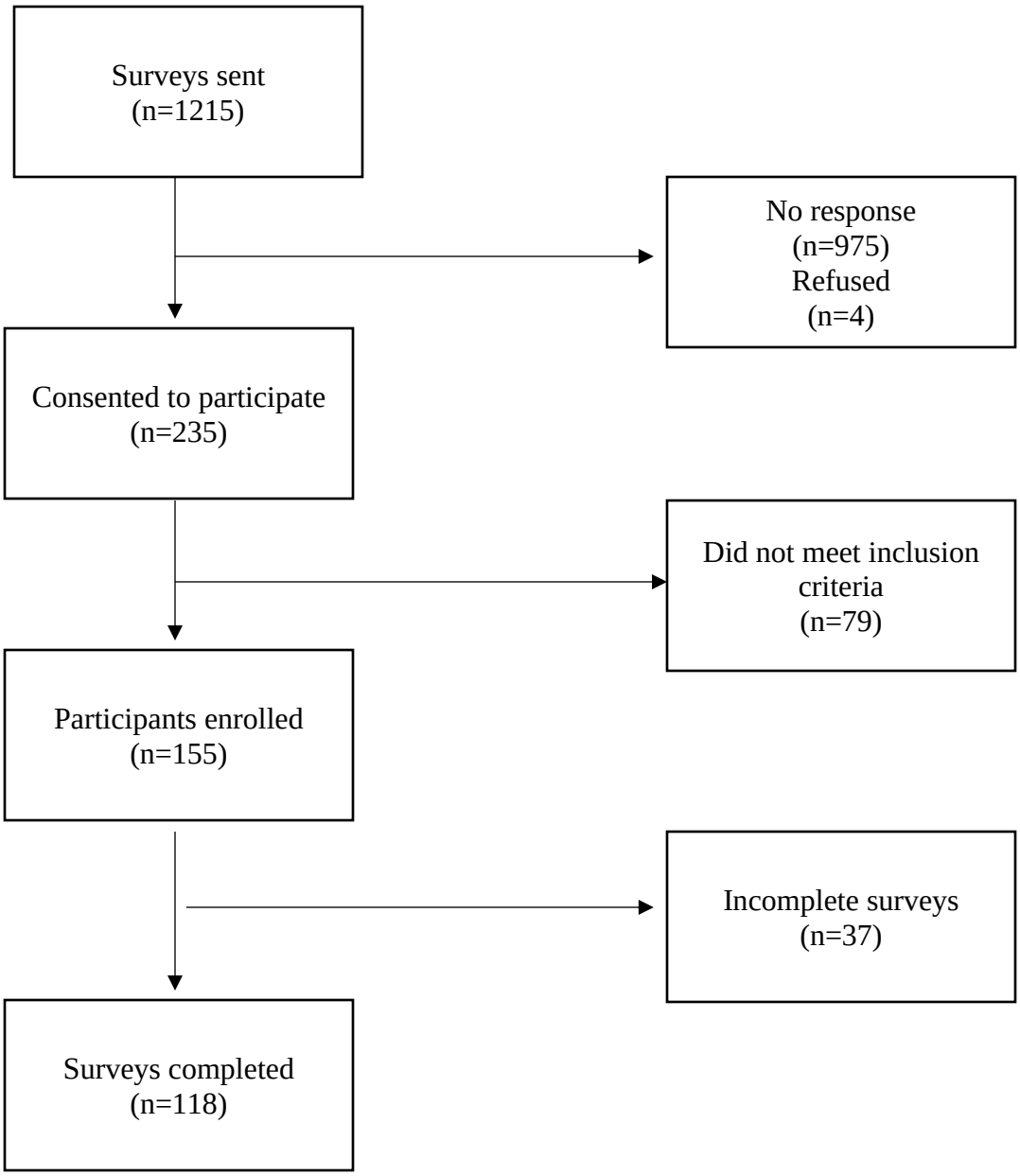

Figure 2. Sample enrollment and completion.

Appendix A

Letter of Permission from Hospital

Eastside MEDICAL CENTER

Amy Wheeler, MHA
Chief Financial Officer
Eastside Medical Center
1700 Medical Way | Snellville, GA 30078
Office: 770.736.2420
Amy.Wheeler2@hcahealthcare.com

January 28, 2020

Re: Roberta Sutton

To whom it may concern,

Roberta Sutton has approval to conduct her DNP project here at Eastside Medical Center. This project will address and improve operating room utilization. There will be no usage of either patient or staff information and surgeon names will be blinded.

Regards,

Amy Wheeler, MHA
Chief Financial Officer
Eastside Medical Center

Appendix B

Recruitment Email

Date: August 7, 2020

To: Operating room personnel,

Dear OR personnel,

Hello, my name is Roberta Sutton, and I am a veteran OR nurse and surgical technologist as well as a DNP student at Georgia College and State University, School of Nursing. As part of my DNP Translational Research and Clinical Project, I am conducting a research study on how a user-centered design workflow guideline could affect the quality of work life in operating room personnel. You will receive an email with the survey link and the first question will ask if you want to participate in the research study. If you answer no, the survey will end. The second question will ask if you currently work in the operating room and if you answer no, the survey will end.

If you choose to complete the survey it will take approximately 15 minutes. Confidentiality of all participants will be maintained, and all data will be securely stored, and password protected.

Thank you so much for your time,

Respectfully,
Roberta Sutton, MSN, RN, CST, CNOR, CSSM
DNP Student
Georgia College and State University

Appendix C

Survey Reminder Email

Date: August 16, 2020

To: Operating room personnel,

Dear OR personnel,

Hello, my name is Roberta Sutton, and I am a veteran OR nurse and surgical technologist as well as a DNP student at Georgia College and State University, School of Nursing. As part of my DNP Translational Research and Clinical Project I sent you an email with a survey link approximately seven days ago requesting your voluntary participation in the research study. If you have completed the survey, thank you very much. If you have not had a chance to complete the survey, please complete within the next week.

Thank you so much for your time,

Respectfully,
Roberta Sutton, MSN, RN, CST, CNOR, CSSM
DNP Student
Georgia College and State University

Appendix D

Hospital Staff Member and AORN eChapter Member Survey

1. Do you agree to have your responses recorded and used for this project?
   Yes No – A no response stops the survey and says thank you
2. Are you currently employed in a hospital-based perioperative/operating room department?
   Yes No – A no response stops the survey and says thank you.
3. How many hours do you typically work per week?
   Less than 20
   21-35 hours
   36-40 hours
   More than 40 hours
4. Which best describes your current role in the perioperative department?
   Manager/Director
   Educator
   Licensed Staff (RN)
   Staff/team member
5. How long have you been employed in perioperative nursing?
   Less than 1 year
   1-5 years
   6-10 years
   More than 10 years
6. In your job, do you normally work as part of a team, or do you work mostly on your own?
   1 Yes, I work as part of a team
   2 No, I work mostly on my own

These questions are about your workplace. Please answer them based on a typical workday.

7. How many minutes do you and your coworkers spend at the start of the day cleaning up from the previous shift?
   < 10 minutes
   10-15 minutes
   16-30 minutes
   > 30 minutes

Work Activities

8. Please estimate the percentage of your work hours involved in each of the following activities. Your total must be 100.

	Setting up an operating room prior to the first case of the day
	Setting up an operating room between cases
	Circulator during surgical procedures
	Scrubbing during surgical procedures
	Cleaning room after surgical procedure
	Transporting patients to or from the operating room
	Communicating with preoperative or post-anesthesia nurses about a patient
	Waiting before the start of the first case for any reason
	Waiting in between cases for any reason

	TOTAL MUST EQUAL 100 (will set up survey to calculate)

9. These questions are about events that frequently happen in operating room departments. Please indicate how often each of these events occur during a typical work week in your operating room. Consider only **scheduled** surgical procedures.

	Never 1	Rarely 2	Sometimes 3	Often 4	Always 5
a. Necessary equipment to start the first case of the day not working properly.					
b. Necessary equipment to start the first case of the day not available.					
c. Necessary supplies to start the first case of the day not available.					
d. Surgeon not available at time scheduled for first case of the day.					
e. Anesthesia provider not available at time scheduled for first case of the day.					
f. Time between cases extended because equipment needed is not available.					
g. Time between cases extended because supplies needed are not available.					
h. Time extended between cases because room not cleaned.					

10. The following is a list of statements about your job and workplace. Please rate whether you strongly disagree, disagree, undecided, agree, or strongly agree.

	Strongly DA 1	Disagree 2	Undecided 3	Agree 4	SA 5
a. My job requires that I work very fast.					
b. I have too much work to do everything well.					
c. The safety of workers is a high priority with management where I work.					
d. There are no significant compromises or shortcuts taken when *worker* safety is at stake.					
e. Conditions on my job allow me to be about as productive as I could be.					
f. The place where I work is run in a smooth and effective manner.					
g. I have enough help and equipment to get the job done.					
h. I am given a lot of freedom to decide how to do my own work.					
i. The surgical care provided at my hospital is as good as or better than similar hospitals.					

	Strongly DA 1	Disagree 2	Undecided 3	Agree 4	SA 5
j. The service provided by the surgery department at my hospital is patient centered.					
k. I intend to try and find another job within the next 12 months.					
l. The location of cords or other items on the floor in the operating room pose a potential trip hazard.					
m. All surgical equipment has a designated location in the operating room(s) where it is used.					
n. At least one person has specific responsibility to make sure that equipment is in good working order at the end of the shift					
o. All routines for turnaround between cases have a specific system that makes it possible to see what must be done and who is responsible.					
p. We use photographs, diagrams, checklists, or other tools in each OR so that everyone knows how the room and equipment should be organized.					
q. All of the ORs are set up for safety of both patients and workers.					
r. The ORs at my facility could be better organized for efficiency					
s. The acoustics of operating rooms (music, external noise) are often distracting.					
t. The air quality in our operating rooms is good or very good.					
u. Task lighting is sufficient to prevent eye strain.					
v. It is easy to move around within the operating room during a surgical procedure.					
w. The location or configuration of large equipment such as fracture tables, x-ray equipment and surgical robots does not interfere with the workflow of the surgical team...					
x. In general, I think my coworkers are receptive to changes in the way they work.					
y. I feel receptive to changes in the way I work.					
z. There is a need for change in the way we get our work done in the OR.					

	Strongly DA 1	Disagree 2	Undecided 3	Agree 4	SA 5
NOTE: REVERSE CODE 10c, 10q, when analyzing data in SPSS					

Appendix E.

Guideline

Guideline for User-centered Operating Room Design to Improve Efficiency

Introduction

Optimum surgical case volume is a goal of hospitals. Improving efficiency to increase operating room utilization often requires improvement in turnaround time, and first case on time starts. Increasing case volumes improves the hospital's bottom line by increasing surgical reimbursement. In addition, increasing efficiency improves patient and caregiver satisfaction when cases start at the scheduled time.

Purpose

The purpose of this guideline is to assist surgical leadership and operating room staff members in developing a more efficient workflow pattern. It introduces the concept of empathic design for process redesign.

Establish key stakeholders

- Perioperative registered nurses
- Surgical technologists
- Surgeons
- Anesthesia providers
- Sterile processing technicians and leadership
- Operating room leadership
- Executive leadership
- Consider the following when applicable:
    - Infection prevention

- Environmental services
- Pre/Post-operative nurses
- Radiology
- Pharmacy
- Laboratory
- Plant operations
- Architects/designers
- Equipment representatives

Recommendation One:

Incorporate a user-centered process redesign framework to guide implementation of strategies to increase surgical nurses' efficiency.

Rationale. Conceptual frameworks have long been used to organize all phases of the research process and can be used in a similar manner to organize quality improvement efforts. Evidence-based practice often involves translation of research findings into practice for the purpose of improving patient outcomes. The use of a user-centered framework presents several advantages. This type of framework is more likely to meet human needs of workers and enhance safety of the work environment while enhancing efficiency.

Nurses are driven to care for other human beings; therefore, they need their work to be human centered. Thomas & McDonagh, (2013) explored the role of empathy when designing new products. They also developed a wide range of empathic design strategies to help identify human needs. Thomas & McDonagh, (2013), surmised that for products and services to be effective they had to satisfy humans' functional and emotional needs. In order for the OR RN's to have a productive and emotionally satisfying day, their workspace must be designed to create an efficient

workflow pattern. A user-centered approach ensures that changes made to improve efficiency meet human needs and are more likely to be accepted. If change does not meet the needs, staff members will continue to use old, inefficient work processes. Often, workers will simply tolerate an inefficient process rather than identify needed change (Leonard & Rayport, 1997).

A user-focused framework for work re-design can enhance worker safety by decreasing "work arounds" and modifying the environment to prevent worker injury. Data from 2017 revealed that 50% of perioperative nurses were between the ages of 50 to 59, with a mean age of 51 (NCSBN, 2020). Modifying the work environment to meet the needs of older worker may result in prolonging their continued work. In the current study there were concerns expressed about inner aspects of environment that can negatively impact change process. Both the literature and the current study indicate that rip hazards disorganized workspace are reality in many OR settings. Nurses actively working in the environment are most knowledgeable about environmental issues that decrease safety and efficiency.

Recommendation Two:

Develop realistic, achievable outcomes for improvement of efficiency based on careful assessment of internal environmental factors.

Rationale. The AORN has presented standards for first case on time starts (FCOTS) and turnaround time (TAT) that can be used as external guidance for goal setting. In many hospitals, there may also be corporate, or system standards based on external factors such as reimbursement. These external environmental pressures may be useful in setting long-term goals, however continuous quality improvement outcomes need to be set for incremental improvement of the baseline outcomes. A number of studies have identified successful strategies for improving FCOT and TAT measures (Olsen, et al, 2017; Saw et al.2015). However, the internal working environment in an individual facility may create barriers that influence the likelihood of success with these same

strategies. In this current quality improvement effort, informal interviews in the needs assessment phase were not fully supported by data collected in a more formal manner. If strategies supported in the literature had been implemented without addressing some of the identified barriers, they would not likely succeed.

Recommendation Three:

Set threshold levels or specific triggers for investigation of problems in a timely manner.

Rationale. Healthcare leaders have an obligation to continually discuss unexpected or unacceptable delays with staff as an ongoing process rather than simply reviewing data during staff meetings. Investigating problems at the time they occur, rather than allowing the pattern to continue, provides the best opportunity to investigate the source of the delays from the workers' perspectives. This ongoing assessment and monitoring can serve as a type of early warning system when the re-designed processes start to deviate.

Recommendation Four

Create tools to assist staff in organizing the work environment and completing assigned tasks using new processes.

Rationale. A number of studies have reported success through use of tools such as laminated cards reviewing specific tasks and roles and the use of a motor car racing "pit stop" model (Souders, et al., 2017), and development of a "room ready" designation for each OR (Bahatt, Carlson, & Deckers, 2014). In the current study, many respondents reported a lack of such tools. When learning a new process, work tools can help workers learn to do things in a different manner with the help of readily available tools.

Recommendation Five:

Include changes to the physical environment of the OR when budgeting for large equipment capital expenditures. For large equipment purchases must include, how change in the physical

environment will affect staff efficiency, safety, and mobility within the operating room. New equipment must be

Rationale. Leaders must consider how addition of new equipment will affect the efficiency, safety, and mobility of staff. Often, additional expenditures for construction must be included in the budgeting process to ensure that new equipment is located closest to where it will be used to minimize staff time in retrieving or moving large equipment. Once built, it is difficult and costly to redesign the physical layout of nursing departments, however there are ways to redesign the workflow processes and the location of required equipment to be more efficient. When operating rooms are built or remodeled, more attention needs to be paid to adding equipment, better lighting and how the new design affects workflow patterns and equipment locations. Attention to detailed workflow should be observed and acknowledged when designing OR's so that the staff can be more efficient when performing their tasks.

Recommendation Six:

Recognize that physical environment may influence the way workers perceive the characteristics of coworkers and their attitudes about the work team.

Rationale. Teamwork is essential in all healthcare delivery settings. Workers' perceptions about co-workers can greatly impact their willingness to work with other team members. The survey results in this study identified a strong correlation between negative aspects of the physical environment and negative attitudes about characteristics of individuals and the team in which they worked.

Action plan for guideline implementation

Action Plan					
Date: _____					
The purpose of this action plan is to assist surgical leadership and operating room staff members in developing a more efficient workflow pattern.					
Key stakeholders: OR RN's, CST's, OR Aides, OR Leadership, Materials Management Manager, Anesthesia provider, Surgeon, Executive Leadership,					
Recommendation	Objective/ Goal	Tasks	Success Criteria	Time Frame	Who/ Resources
Incorporate a user-centered process redesign framework to guide implementation of strategies to increase surgical nurses' efficiency.	Create a staff centered plan for how we will increase efficiency in our daily work starting and turning over surgical cases.	List items discussed and then prioritize based on need and biggest wins.	Successful implementation would be demonstrated by implementing the prioritized list of needs for efficiency.	6 months	OR RN's, CST's, OR Aides, OR Leadership/ Time spent observing and talking with staff
Develop realistic, achievable outcomes for improvement of efficiency based on careful assessment of internal environmental factors.	Create a staff centered plan for how we will improve efficiency based on the Individual/Team characteristics, Intervention characteristics, and the Process of implementation.	Meet with staff members to discuss needs and potential outcomes. Then discuss and list tasks needed to complete.	Successful implementation would be demonstrated by implementing the prioritized list of needs and potential outcomes..	3 months to develop, 6 months to implement	OR RN's, CST's, OR Aides, OR Leadership/ Time spent observing and talking with staff
Set threshold levels or specific triggers for investigation of problems in a timely manner.	Create a staff centered plan for how we will increase efficiency by investigating issues and concerns as soon as they happen. Threshold for the investigation should be 72 hours M-F.	Meet with staff members to discuss needs and potential outcomes. Then discuss and list tasks needed to complete.	Successful implementation would be demonstrated by investigating problems/concerns within the 72 hours timeframe.	Ongoing weekly rounding with staff and providers.	OR RN's, CST's, OR Aides, OR Leadership/ Time spent observing and talking with staff

Create tools to assist staff in organizing the work environment and completing assigned tasks using new processes.	Create tools that the staff choose to show how each OR should be organized, and where equipment lives when not in use.	Using staff feedback, take pictures and/or create diagrams for location of equipment.	Monitor weekly and track compliance. Success can be attained by 90% of items being in the correct location after 6 months.	3 months, 6 months	Charge RN and Manager
Include changes to the physical environment of the OR when budgeting for large equipment capital expenditures. Large equipment purchases must include, how a change in the physical environment will affect staff efficiency, safety, and mobility within the operating room.	Involve OR staff when deciding capital equipment purchases.	Review capital budget plan with staff at each staff meeting. Review with surgeons and anesthesia at OR Governance meeting quarterly.	Success will be demonstrated when the next large item is purchased, and it doesn't interfere with staff workflow.	1 year	OR RN's, CST's, OR Aides, OR Leadership, Materials Management Manager, Anesthesia provider, Surgeon, Executive Leadership/ Capital dollars
Recognize that physical environment may influence the way workers perceive the characteristics of coworkers and their attitudes about the work team.	To assure that the environment doesn't affect staff relationships.	Discuss with staff in rounds and staff meetings the affects the environment has on them and their working relationships .	Success would be measured when staff are open and honest about relationships and how it affects their work.	6 months	OR RN's, CST's, OR Aides, OR Leadership, Materials Management Manager, Anesthesia provider, Surgeon, Executive Leadership/ Time for each staff members to provide concerns in open communication