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RESEARCH ARTICLE

IMPROVING OR TURNOVER TIME: A BETTER PROCESS STARTS WITH THE PATIENT.

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Abstract

The operating room (OR) is one of the most important areas in the hospital and increasing the utilization of the OR can pay dividends. The activities of OR Turnover can be divided into 4 distinct phases: 'incision close to wheels out', 'wheels out to OR Ready', 'wheels out to next patient ready', and 'OR Ready to wheels in'. A Six Sigma project at The Ohio State University Wexner Medical Center (OSUWMC) indicated that out of these phases, Wheels Out to OR Ready was a static process with maximum limits on efficiency and impact on turnover. In this article we introduce the dynamic nature of the 'Patient Ready' aspect and discuss its impact on the operating room turnover time based on our proposed model. Overall, increasing time efficiencies and controlling variability in 'OR Ready' and 'Patient Ready' processes and completing them concurrently will not only be beneficial to the hospital financially, but also will improve the quality of patient care and patient satisfaction.

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Introduction:-

The operating room (OR) is one of the most important revenue generators in the hospital. Increased focus on bundled reimbursement and patient satisfaction creates financial pressure on health systems. Frustration over delayed surgery from the initial scheduled time is frequently encountered on Press Ganey patient surveys, hence increasing the efficiency of OR utilization is paramount. The recommended OR utilization rate is 75%, which is achievable by decreasing the downtime between surgeries (Wood 2013). At The Ohio State University Wexner Medical Center (OSUWMC), a Six Sigma project evaluated Operating Room Turnover Time (OR TOT) in order to improve a process that was considered to be suboptimal. Commonly, OR TOT is regarded as the time between the exit of one patient and the entry of the next patient, or the time between 'wheels out' to 'wheels in'. As we started the Analyze phase of our evaluation, we found it necessary to further divide this basic process into 4 distinct phases: 'incision close to wheels out', 'wheels out to OR Ready', 'wheels out to next patient ready', and 'OR Ready to wheels in' (see Figure 1). Once the first three components are completed, the new patient can be 'greenlighted' and wheeled in to proceed with surgery. Several hospitals nationwide have attempted to increase the efficiency of the overall process (Dexter et al., 2003), though most discussions tend to focus on refining the 'assembly line processes' that occur during 'Wheels out to OR ready'. During the Measure and Analyze phases we agreed on improving the 'Wheels out to OR Ready' process; however, it is essential to concentrate on increasing the efficiency of the 'Patient Ready' process to fully optimize performance and improve OR TOT. The process to efficiently prepare patients for

surgery mirrors objectives of Perioperative Surgical Home (PSH) and Enhanced Recovery After Surgery (ERAS) initiatives implemented at OSUWMC (PSH-ASAHQ; Melnyk et al., 2011; Wang et al., 2017).

OR Turnover Time Process:-

OR turnover time is a highly variable process. As depicted in Figure 1, the OR turnover process can be broken down into 4 distinct, basic parts.

Step 1:- Incision close to Wheels out:-

The first step encompasses the conclusion of the previous patient's surgery from closure of the incision to departure from the OR. The duration of this step can be strongly impacted by anesthetic techniques used for the procedure, such as regional, local, or multimodal analgesia regimens meant to reduce opioid consumption. Proactive management of emergence from anesthesia can reduce the time to patient exit. Caggiano et al. (2015) retrospectively reviewed 566 patient charts to determine the effect of anesthesia choice on OR TOT. They found that local anesthesia with/without monitored anesthesia care (MAC) was associated with a significantly shorter in-room postsurgical time ($p < 0.001$), and by extension, total OR TOT ($p < 0.05$), when compared to general anesthesia. The OR exit time can also be influenced by hospital policies such as planning to transport intubated patients to PACU for emergence and extubation to dramatically reduce the time for Step 1.

Steps 2 and 3:-Patient Ready and OR Ready:-

Once the patient is wheeled to the PACU, the OR must be organized for the following surgery (Step 3) - removing the waste from the prior case, sanitizing the OR and procuring/setting-up the equipment for the next case. During these OR activities, the next patient is being prepared for the operation (Step 2), finalizing all pre-operative interventions. These two steps (Steps 2 and 3) should be accomplished concurrently or, ideally, step 2 completed before step 3 is finished.

Step 4:-Wheels in to Incision open:-

The final step involves 'wheels in', the time the patient enters the OR until incision is made. The duration of this step is potentially influenced by factors such as efficiency of anesthetic agents used, preparation time required for the case, and patient positioning for the procedure. The experience and training of personnel is critical to limiting the duration of this step.

The 4 distinct 'processes' flow diagram is a helpful tool to understand the OR flow and to address certain areas of the process for quality improvement. This is a system process designed to reduce errors and variability contributory to decreased efficiency of the OR (Garbey et al., 2015).

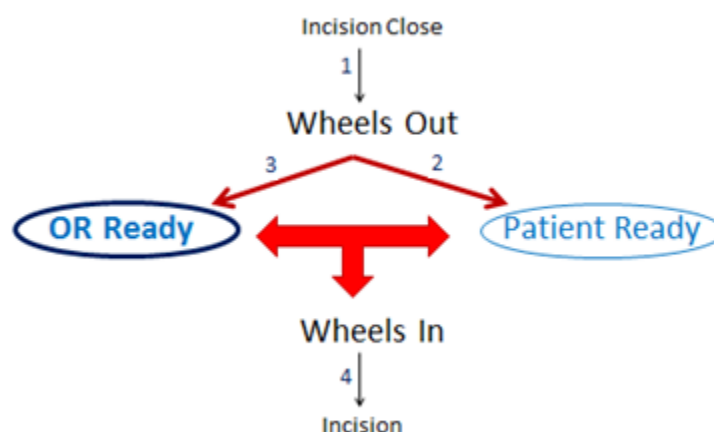


Figure 1:-Diagram of four distinct processes of 'OR Turnover Time'.

To further elucidate the reasons for delays in the OR process, the 'OR Ready' and 'Patient Ready' processes are subdivided into distinct, separate processes (Figure 2). Clearly, there are many opportunities for inefficiencies to prolong either or both of these processes.

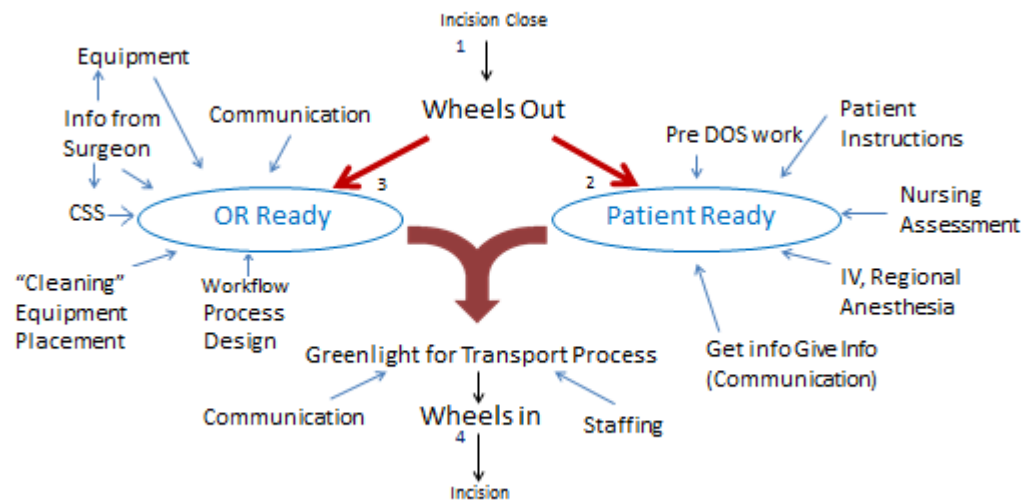


Figure 2:-Diagram of sub-processes of OR Turnover Time.

‘OR Ready’ Process:-

‘OR Ready’ process encompasses the following:

1. Information from the surgeon / Case scheduling
2. Equipment
3. Central Sterile Supply
4. Workflow Process Design
5. Communication

The surgeon’s input on equipment and patient positioning requirements for the operation is essential and should be communicated when the case is scheduled. Specifics on machines and instruments to be used should be conveyed to Central Sterile Supply (CSS) to prepare the equipment. CSS ensures that the right equipment is delivered to the OR before the operation. Workflow Process design configures the flow of OR tasks, and the interventions to implement if the current process is obstructed. The design is a ‘map’ indicating the placement of various ‘tools’ in the room and mirrors the workshop pattern. This workflow map provides information on who should complete each step and ‘cues’ to start the step. Communication is vital to the entire process as ineffective communication can disrupt even the best-designed system. From the surgeon conveying his preferences for the instruments and supplies to the cleaning staff knowing that an OR is ready to be cleaned, communication is the key to improving and sustaining efficiency of the ‘OR Process’.

‘Patient Ready’ Process:-

The ‘Patient Ready’ process can be subdivided into sub-processes such as:

1. Patient Instructions
2. Pre-Day of Surgery work
3. Nursing Assessment
4. Get information/Give Information
5. Day of Surgery (DOS) work including IV lines, regional anesthesia, invasive lines, medications.

Providing accurate and consistent patient instruction is an essential aspect of the ‘Patient Ready’ process. This continues until the DOS and, ideally, begins at the outpatient surgeon’s visit, when the surgery is scheduled. The instructions for the patient include general information regarding hospital address and arrival time on the day of surgery, and instructions to prepare for surgery (washing and scrubbing the surgical site, medications to take/discontinue, and NPO guidelines). The information should be handed to the patient when the surgery is scheduled and placed on a website or internet/Electronic Medical Record (EMR) system (MyChart) for continual access and availability to the patient. Better patient compliance prevents delays, so the patient should receive a phone call and fully comprehend instructions 24-48 hours before the surgery. Other activities performed at the pre-

DOS appointment include a preliminary nursing assessment, gathering and reviewing medical records, and scheduling of tests such as pacemaker interrogation and imaging or lab work. 'Get Information/Give Information' is paramount for this encounter: we need to '*get*' information to assess the patient's readiness for surgery and '*give*' information in order to clarify anesthesia/surgical procedure and assure overall patient readiness for OR without delays. As an added benefit, the patient is scheduled in the appropriate venue (outpatient facility vs. inpatient hospital), improving appropriate utilization of OR facilities, and patient satisfaction. Finally, by anticipating activities such as invasive lines and regional anesthesia, appropriate patient arrival time and staffing allocation can be pre-planned.

Preoperative anesthesia clinic visits can reduce hospital stay and costs while improving patient satisfaction. Ferschl et al. (2005) concluded that preoperative visits improved surgical cancellations and scheduling delays. At OSUWMC, we addressed these issues by developing the Comprehensive Pre-Anesthesia Center (ComPAC) (Figure 3), and offering the patient the opportunity to meet with an Office Associate (OA) and a pre-operative nurse (RN) before the surgery. A real-time consultation by a Nurse Practitioner or Physician's Assistant (APP) provides immediate assistance in the pre-operative management with ultimate oversight by an attending Anesthesiologist. Patients are seen at ComPAC in-person on the same day as the pre-operative surgeon appointment, or via video chat or telephone call ideally within several days depending on patient availability/preference. There is a standardized package reviewing anesthesia-specific items, addressing any DOS-related questions or concerns, and providing NPO and medication instructions to follow before surgery. This information package is designated to improve efficiency and assure patient safety.

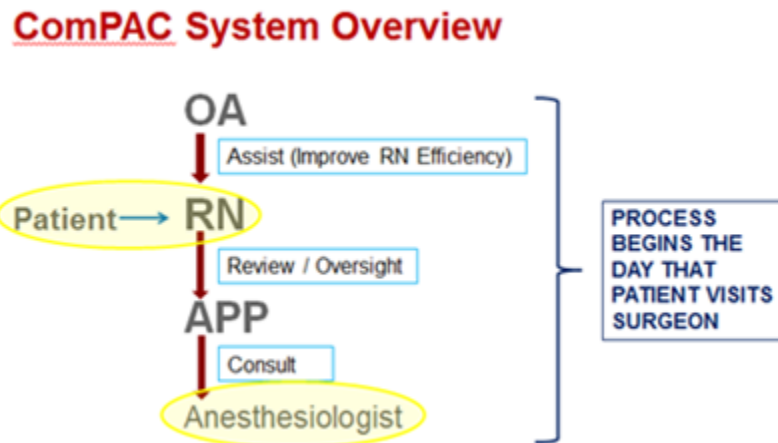


Figure 3:-Comprehensive Pre-Anesthesia Center (ComPAC) at OS OA-Office Associate, RN –preoperative nurse, APP – Advance Practice Provider

Results:-

Compared to our previous practice of contacting the patient by phone 1-2 days prior to the DOS, ComPAC is a more efficient and effective way to prepare the patient for surgery. A patient spends an average of 15 minutes with the nurse in a specifically designed area at OSUWMC in order to optimize the readiness for surgery. This process reduced cancellations within 48 hours of surgery by 56% compared to the previous period, triggered a 16% reduction in OR turnover time at the facility, and it was part of several changes that improved standardized patient satisfaction scores from the 75th percentile to the 99th percentile (OSUMC EEI).

Period considered for review	Cases	Avg. TOT	% Change
Jan 2012 – Aug 2015	15,359	12.09	-----
Sept 2015 – April 2017	8,146	10.1	-16.5

Turnover Time Management:-

Attempts have been made to improve the 'OR Ready' process using Six Sigma principles for a number of years. It is important to simultaneously streamline the 'Patient Ready' and 'OR Ready' processes, considering the dependence

of 'wheels in' on the 'Patient Ready' process. To increase the overall efficiency of OR TOT, both processes must be controlled (Ferschlet al.,2005).

During the Analyze phase of the Six Sigma project at OSUWMC, we found that greater than 50% of patients were not ready when the OR was ready; the result is comparable to the industry benchmark (Owen et al., 2012; El-Dawlatlyet al.,2008). The reasons for this occurrence include the patient violating NPO guidelines or arriving late to the facility and lack of an updated medical history and physical (H&P) on file. We are working on elaborating guidelines to better educate patients to arrive on time and properly prepare for their surgery. Moreover, Epic's Procedure Pass initiative promises to reduce the incidence of missing elements from the patient record. Often, the most difficult shortcoming to rectify on the DOS is an incomplete preoperative assessment. This includes improper medication continuation or discontinuation and lack of necessary testing (i.e. Pacemaker evaluation, labs, etc.). Proactive and timely preoperative evaluation -CompPAC - can reduce or eliminate these delays and educate patients, with positive impact on NPO requirement and arrival time. Creating a consistent and reliable method of coordinating all four parts of the process helps reduce both average OR TOT and the variability in OR TOT and facilitates reproducibility (Bhatt et al.,2014).

Economics:-

Controlling OR TOT variation and delays are vital to reducing the costs and maximizing revenue in the OR (Kumar and Gandhi 2012). The cost of OR time in the US has been estimated to be \$62/minute (Macario 2010). Therefore, a 10 minute wastage in 5,000 turnovers per year (an estimate from our 18 OR 'Main' hospital) equates to 800 hours of OR time, and yields to lost revenue in excess of \$3 million per year. Dexter et al. showed that reducing OR TOT by 3-9 minutes can save 0.8-1.8% of staff costs, thereby reducing the likelihood of previous sunk costs (Shih et al.,2015) associated with OR TOT.

Discussion:-

One of the challenges for the system is to increase time efficiencies in the 'OR ready' process. OSUWMC OR managers started an 'OR Ready Initiative' that developed a standardized flow scheme for the OR nurses and scrub technicians. The initiative also included step-wise room cleaning education for perioperative technicians. With standardization, there was a set checklist for the team to follow. Additionally, a pre-initiative survey of OR staff members was conducted and indicated that 84% of the staff sought a 'consistent communication method such as overhead paging.' Clearly, the OR staff recognize that the process will flow better if there is enhanced communication among members. Currently, this overhead paging system is being installed.

The Surgical Executive Committee at OSUWMC, recognizing the critical importance of OR TOT (OSU warehouse), organized an 'OR TOT Task Force' to increase time efficiencies in OR turnover. The first step was to establish goals for the process. The goals were defined as having 'wheels out' to 'OR ready' in less than 20 minutes and overall OR turnover time (TOT) less than 30 minutes, at least 80% of the time to reduce variability. After the OR Ready Initiative started, 'wheels out to OR ready' time from June 2015-January 2016 improved in April 2016 as shown in Figure 4. This was directly attributable to an improved work flow process. However, despite the shorter time to OR Ready, there was no improvement in total OR TOT. This was a direct result of the fact that the patient was not ready to go to the OR in 40-65% of the time when the OR was marked as ready for the patient (Figure 5). OR TOT will not be optimized, in spite of improvement in OR Ready time, unless 'Patient Ready' is addressed. This involves a coordinated and comprehensive plan that occurs days or weeks before the surgery date.

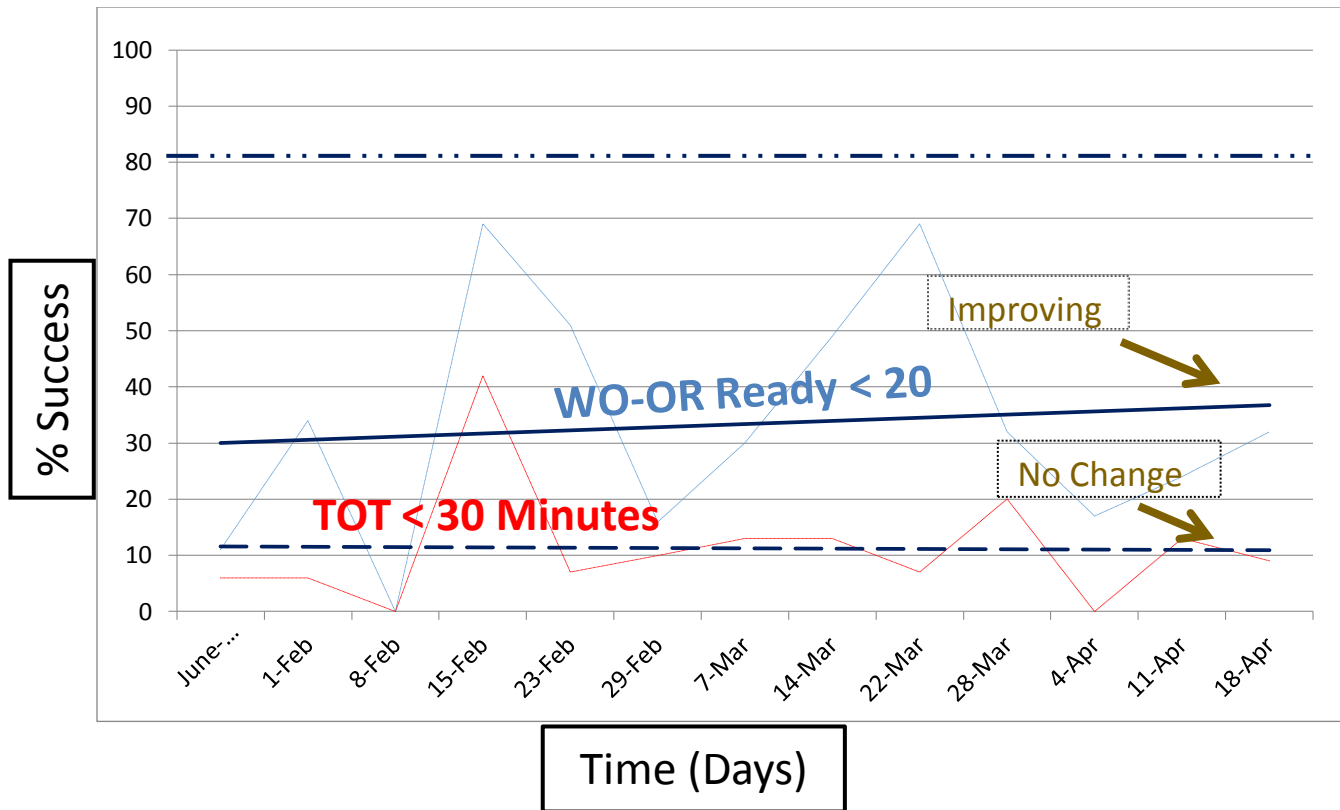


Figure 4:-Results of initiatives to increase efficiencies in ‘wheels out to OR ready’ and OR turnover time (TOT) at The Ohio State University Wexner Medical Center (OSUWMC)

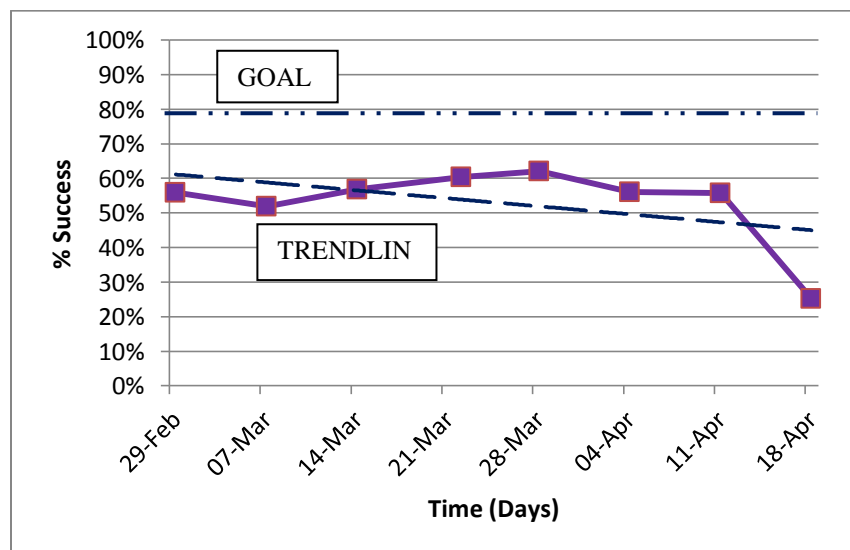


Figure 5:-Percentage of patients ready when OR is ready

Conclusion:-

What does OR turnover really mean? The healthcare providers define it as the interval between incision close and incision open of the subsequent case, and assume that everything in between is a static process. However, the 'OR ready' and 'Patient ready' processes are not necessarily linked, with the former being a static assembly-line process and the latter more of a dynamic process. Focus on 'OR turnover' is very important because no revenue is generated during this time. Additionally, patient experiences are influenced not only by quality of care, but also by on-time service. Press Ganey surveys reflect patient satisfaction, which is increasingly linked to bundled reimbursements. One aspect of the patient experience is the on-time service of the procedure. The key opportunities for improving efficiency and reducing variability in OR turnover should concentrate on developing an 'assembly line' workflow to get the OR ready component while also ensuring that the patient is completely prepared concurrently. On the Day of Surgery both the processes 'OR Ready' and 'Patient Ready' should be completed simultaneously. The 'Patient Ready' step, a complicated process, can be achieved with proper and timely communications with the patient, and a system of pre-preparation of the patient, such as our ComPAC, can help. Perioperative Surgical Home/Enhanced Recovery After Surgery (ERAS) model intends to increase OR utilization, decrease number of OR cancellations, and enhance patient satisfaction.

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