

RESEARCH ARTICLE

Reducing turnover time in the orthopedic department operating room at a tertiary hospital

ASAAD ABDULRAHMAN ABDULJAWAD¹, CHQ, LSSGB, MPH, DRPH, FAIHQ

¹College Of Health Sciences, Umm Al-Qura University, Saudi Arabia

Email: AAbduljawad@uqu.edu.sa; Asaad.Abduljawad@gmail.com

ABSTRACT

Background: Unsatisfied staff at the orthopedic surgery department have been staying after hours at the hospital and complaining about the lengthy waiting and turnover times in the operating room (OR), these waiting times between two procedures were on average of 60 minutes per surgeon per surgery, meaning that the daily accumulated waiting times were over 240 minutes per surgeon, which causes them to stay overtime and have lengthy working days and shifts. The estimated calculated cost in the OR is approximately \$105/ minute.

Methods: A team was created to tackle this problem using the six sigma methodology.

Intervention: The team chose the solution of making the OR only for surgery and pulling out the anesthesia step by administering the nerve block outside the OR. The hospital went through a recent renovation and redesign and constructed new nerve block rooms that became the new sites of administering the nerve blocks.

Results: At start the team was looking at a 50% time reduction of the surgeon's waiting times to 30 minutes. After implementing the new process, the waiting times were cut down to an average of 18 minutes, which is a 70% reduction in turnaround time.

The value added as result of this project is saving up time, thus happier staff, the ability of adding one more orthopedic surgery per physician each day at the hospital, meaning to two more surgeries would add at least \$8000 per day as added revenue for the hospital, and two more patients off the waiting list.

KEYWORDS:

Quality improvement, Process improvement, Surgery Six sigma, project, DMAIC improvement model, Patient experience

ARTICLE HISTORY:

Received Oct 22, 2021

Accepted Nov 16, 2021

Published Dec 02, 2021

DOI:

10.5455/jcmr.2021.12.04.19

VOLUME: 12

ISSUE: 4

ISSN: 2146-8397

INTRODUCTION

Continuous Quality Improvement (CQI) is a major cornerstone of hospital accreditation. Most healthcare accrediting bodies require CQI projects as part of their standards to be fulfilled throughout organizations that seek accreditation [1].

The orthopedic operating room (OR) is one of the most costly areas of hospital operations if not managed properly [2], however it is one of the most profitable operations in the hospital if well organized [3]. In this project the unsatisfied Orthopedic surgeons at a Joint commission accredited tertiary hospital contacted the Quality Improvement department to find solutions on the lengthy turn over and long waiting times between procedures in the Orthopedic

department OR.

Timeliness is defined to be one of the six main factors of improving quality and outcomes in the healthcare industry [4], it includes delivering services in a timely fashion that is convenient to the patient, getting results to both the patient and the care giver without delays enabling the healthcare provider to serve his patients punctually making the hospital an attainable and pleasant environment for all stakeholders.

Despite the OR being such a pillar for any hospital's profitability, there is little national or international published data, benchmarks, or formal figures on the cost per minute in the OR. According to [5] the cost per minute in a general operating room in the United States could reach \$100 per minute. However, the average time for a patient to spend in

an OR between the surgery and the anesthesia was calculated in 2017 by Costa [6] to be 2 hours and 10 minutes. Patients and their insurance companies reimbursed hospitals in the United States for the most common orthopedic surgeries ranging from 15,000-45,000 USD per procedure from time of admission to discharge [7].

There are many variables to precisely determine the cost per minute in the OR. As a result, hospital administrators at the hospital calculated a rough figure of the cost per minute in the orthopedic surgery OR, which they stated to be \$105-110 per hour.

Keep in mind that supporting staff if staying after hours are paid in most hospitals one and a half fold on their average salaries in addition to the loss of doing extra procedures in the OR and generating business and income for the hospital.

Furthermore, the cost per minute can easily surpass \$105 depending on the complexity of the procedure, if fixed overhead costs, and/or physician fees are included, or how the OR staff is paid and many other variables. Although OR costs and potential profits are prone to an array of variables, one thing is certain: Time is an OR's most valuable resource. Even a slight delay in a case's start time, a lengthy turnover, or a few minutes spent looking for a piece of missing equipment, can severely hinder an OR's efficiency and ability to maintain a positive contribution margin [8].

The project started out with the goal to decrease turn over time at Orthopedic OR from 60 minutes by at least 50% in the first six months after fully implementing the project. There is an electronic health records (EHR) and monitoring system called the advisory board, and it takes the stamp time and aggregates the data. The key measurement to understand and acknowledge improvement would be through the reduction in waiting and turnover times obtained from (Advisory board system), and from the satisfaction of the staff in the orthopedic surgery department, as the OR staff members would eventually be leaving earlier than later in the evenings.

METHODS

The Quality improvement department along with the orthopedic surgery department formed a team to start searching for solutions of increased waiting times and turnover times in the operating room. There are several types of Quality and process improvement methodologies used in healthcare and other industries ranging from the Plan Do Check Act (PDCA cycle), to FOCUS PDCA, to Lean management, and six sigma and a blend of the later both [9], the team used the Lean six sigma management model DMAIC to identify opportunities for improvement.

Lengthy waiting times is a chronic problem, as all the surgeons, anesthesiologists, nurses, scrub technicians, and the OR supporting medical and nonmedical staff, have all complained from the late stay at the hospital along with excessive overtime paid for this department specifically. The

hospital has four orthopedic surgeons, and two ORs. Two of the surgeons work and operate on patients on Monday and Wednesday, and eventually the other two on Tuesday and Thursday of each week.

Data has been gathered and aggregated from the Electronic Health Record (EHR) (advisory board and epic software), for the previous 6 months and the waiting times collected from the system ranged to be between 40 to 60 minutes prior to each surgery. This elongated waiting time happens before the start of the operation (cutting time) and start of the surgery, and after the local anesthesia (Nerve block), as all the OR staff wait for the surgeon to arrive back at the OR, as the OR is being set up, in addition to the patient setup and preparation for surgery. Physicians would go out to the lounge waiting, and on many occasions the setup takes longer than usual, the surgeon would get caught up into something else, causing the whole OR staff and the patient to wait for the orthopedic surgeon to arrival back to the OR. The problem persisted and there were no signs of it being sporadic.

The team's target performance level was that the waiting and turnaround time in the orthopedic surgery department was desired to be at 30 minutes maximum, which is a 50% reduction of time. This means that physicians and surgery department staff would be able to leave 3 hours earlier than they usually do before starting the QI project, and/or each surgeon would be able to add one additional surgery case each shift day per surgeon, adding up to two additional surgeries at least per working day, thus increasing the hospital's revenue, and improving the patient's experience, and OR staff satisfaction.

The QI team analyzed the reasons for this problem to find the remedy. The team started out with a qualitative understanding of the process, as the team outlined the patient's journey on the day of surgery from start to end. The team produced a detailed process map to visualize the full details of the journey from a patient's perspective. The patient's experience at the orthopedic surgery department at the hospital, on the day of his/her operation. The process map before the start of the QI project can be illustrated in the following process map in Figure 1:

The only possible limitation in the data collected from EHR, is that there was no actual and physical delay time collection from any of the team's observers. Efforts to overcome limitations of the reliability of the electronic health records reporting, was done by having team members collect data of waiting times in person to validate the electronic records and to be able to show any discrepancies in the collected EHR data. After getting the rough waiting times data from the EHR in the measure step, the team decided to depend on the EHR results, and to increase the validity of the data PI personnel will observe on random days and calculate the end and start cutting times of surgeries at the orthopedic surgery OR. The numbers were aggregated and compared with the EHR stamp times and showed almost perfect consistency.

The results were collected meticulously for the first several months of the project. The three months results for the four physicians are outlined in detail and are summarized in Table 1.

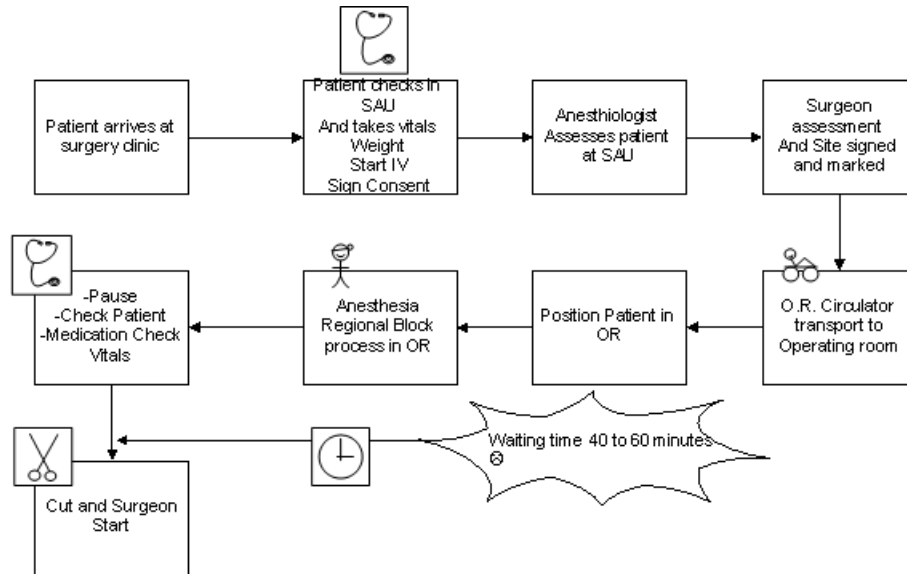


Fig.1: Orthopedic surgery department process map before QI project

Table 1: The 4 hospital surgeons average orthopedic OR turn over times from first 3 months of the project and prior to the launch of the QI project

Physician	Average waiting times Month 1	Average waiting times Month 2	Average waiting times Month 3	Average Waiting Times For All 3 Months
A	59.96	50.40	53.03	54.46
B	63.15	63.53	62.34	63.00
C	59.37	55.59	59.37	58.11
D	55.96	50.40	53.03	53.13
AVG for all Dr.'s	59.61	54.98	56.94	57.17

Throughout the project the team met and used several tools used in quality improvement, such as statistical analysis, Ishakawa fish bone illustrated in Figure 2 (in attached mono color file), multi-voting, process mapping, and brainstorming

to understand possible solutions to the delay of the cutting time in the orthopedic department O.R. [10] and to prioritize choosing the one top method to improve the turnaround times, and to have that solution implemented immediately for improvement and employee satisfaction.

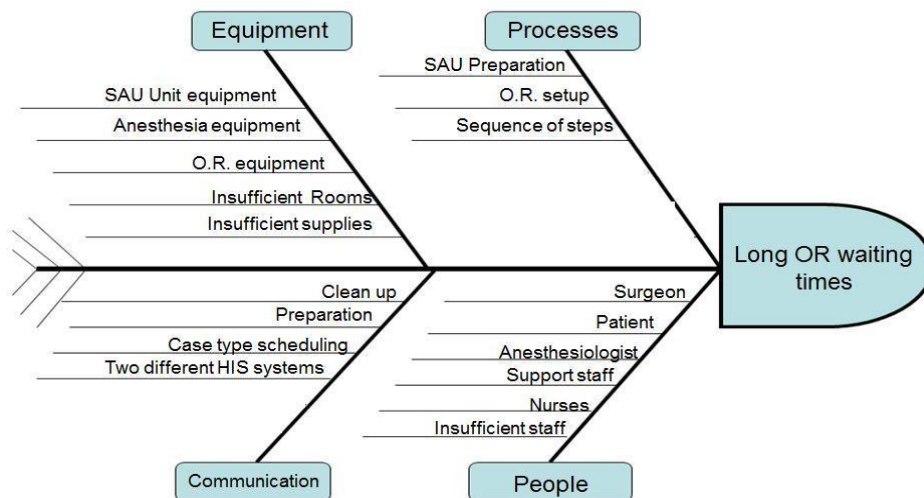


Fig.2: Ishikawa fish bone (Cause and effect diagram) of long turnover times

Of these solutions the team chose the following top remedies:

1. Improvement of the communication system: The team

suggested a simplified new communication system since the current paging communication is very complicated and time consuming especially if several caregivers such as the surgeon or anesthesiologist must be paged for the set

- up and for the start of the procedure.
- 2. Having same procedures setup back-to-back: Since there are several types of orthopedic surgeries that occur, such as knee, hip, and total joint replacement, etc., surgeries in the O.R. The suggestion was to have the same type of surgeries set back-to-back or on the same day.
- 3. Increasing the orthopedic staff members and numbers: Of the suggestions that took place was to have the surgery department to hire “floaters” that would be assigned to the surgery departments and have them handy as needed.
- 4. Making the Orthopedic OR a cutting room only: The suggestion was to have the orthopedic surgeons always stick to the Operating room, and have the patients

prepared outside the operating room, along with administrating the anesthesia nerve block somewhere else other than the operating room.

All the above suggested solutions needed to be tweaked to fit the structure of the organization, the current processes that are in place, and therefore to show an improvement in the wanted outcome and was to be discussed in detail after one of these four solutions was chosen.

The 7 team members started voting and took in consideration the time, cost, and effect of implementing of each one of the top four remedies. (1 being the best solution- 4 the least) After adding the columns up the lowest grade would be the best solution and is summarized in Table 2.

Table 2: Weighted voting for the best solution to reduce turnaround waiting times at the Orthopedic Surgery department

Team member/Solution	Communication improvement	Same type Surgeries Back-to-Back	Hiring floaters	O.R.for surgery only
Member 1	2	3	4	1
Member 2	4	1	3	2
Member 3	4	2	3	1
Member 4	2	3	4	1
Member 5	4	2	3	1
Member 6	3	2	4	1
Member 7	4	3	2	1
TOTAL	23	16	23	8

From the above weighted voting, it appears that the members chose to administer the nerve block somewhere else other than the operating room, as it had the lowest score meaning it was the top solution from all the stakeholders’ perspectives, as they almost reached a perfect consensus.

The final solution was to administer the nerve block by the anesthesiologist somewhere outside the operating room. The physicians chose to administer the anesthesia nerve block prior to incision and outside the OR in the Post Anesthesia Care Unit (PACU), temporarily, then have the facility management form nerve block rooms near the OR, at a later time.

RESULTS

The process has changed and was implemented, as the legal department approved the new consent form. The project results showed sustainability. The hospital changed the whereabouts and location of the administration of anesthesia

from the PACU to new nearby built Nerve block rooms.

The consent form is one of the important factors for the patient’s satisfaction and a method to prevent healthcare organizations and providers of care to litigation. Due to the transfer of the location of the nerve block from the OR to the PACU, the risk management department changed the consent form Bajada et al.[11].

The team members continued monitoring the time manually and comparing the data figures with those on the Electronic health record’s timestamp.

The results of the turnover times at the hospital’s orthopedic surgery department after the implementation of the project are shown in and summarized in Table 3.

The average waiting time in the Operating room is actually 18.10 minutes after the implementation of the project.

The final improved process can be illustrated and summarized in the map on Figure 3

Table 3: The surgeons average orthopedic OR turn over times after implementing the QI project.

Physician	Average Waiting Times MAY 2021	Average Waiting Times JUNE 2021	Average Waiting Times JULY 2021	AVERAGE Waiting Times For All 3 Months
A	17.40	17.56	18.84	17.93
B	20.93	18.65	17.65	19.07
C	19.21	15.53	17.25	17.33
D	18.28	16.78	19.15	18.07
AVG for all Dr.’s	18.95	17.13	18.22	18.10

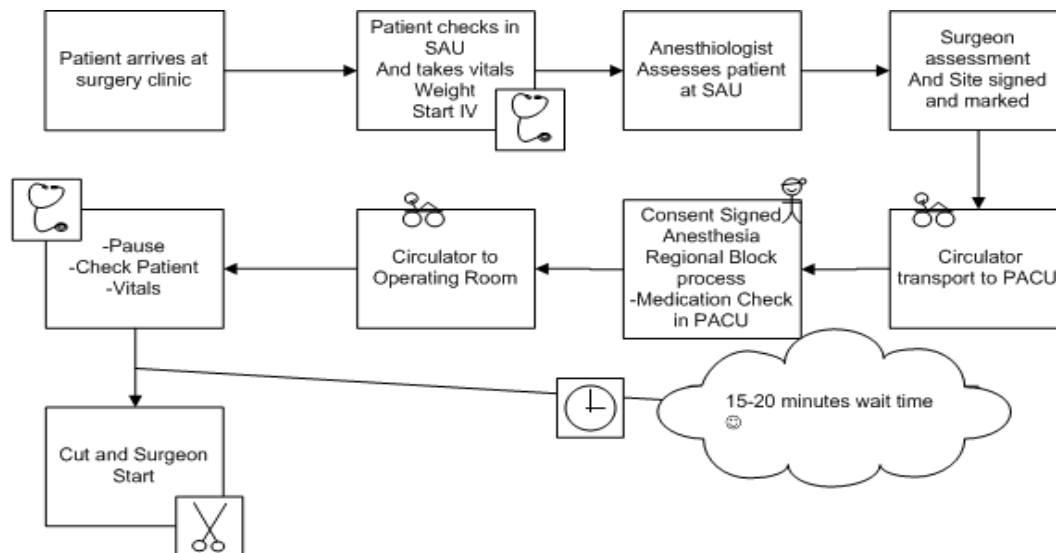


Fig.3: The improved state process map at Orthopedic Surgery Department

DISCUSSION

With the implementation of this quality improvement project and any successful lean six sigma project in healthcare, there are many outcomes to be gained, of these many tangible benefits; a better patient experience, patient and provider satisfaction, cutting out waste, and an increase in profit for the organization [12].

With the least orthopedic procedure to be ranging from \$4000-8000 USD, the hospital with this kind of change increased its daily revenue at least by \$8000 USD, with a total of 2 million dollars of savings and gross income for the hospital annually.

REFERENCES

1. Scrivens E. 1997. Putting continuous quality improvement into accreditation: improving approaches to quality assessment. *BMJ Quality & Safety*. 16(4):212-8.
2. Overdyk FJ, Harvey SC, Fishman RL, Shippey F. 1998. Successful strategies for improving operating room efficiency at academic institutions. *Anesthesia & Analgesia*. 86(4):896-906.
3. Bert JM. 2002. The efficient, enjoyable, and profitable orthopedic practice. *Clinics in sports medicine*. 21(2):321-5.
4. Baker A. 2001. Crossing the quality chasm: a new health system for the 21st century: British Medical Journal Publishing Group.
5. Childers CP. 2018. Maggard-Gibbons M. Understanding costs of care in the operating room. *JAMA surgery*. 153(4):e176233-e.
6. Costa Junior A. 2017. Assessment of operative times of multiple surgical specialties in a public university hospital. *Einstein*. 15(2): 200-5.
7. Robinson JC, Brown TT. 2013. Increases in consumer cost sharing redirect patient volumes and reduce hospital prices for orthopedic surgery. *Health Affairs*. 32(8):1392-7.
8. Cardoen B, Demeulemeester E, Beliën J. 2010. Operating room planning and scheduling: A literature review. *European journal of operational research*. 201(3):921-32.
9. Varkey P, Reller MK, Resar RK, 2007. Basics of quality improvement in health care. *Mayo Clinic Proceedings*. Elsevier.
10. Shaw P, Carter D. 2019. Quality and Performance Improvement in Healthcare: Theory, Practice, and Management: AHIMA Press.
11. Bajada S, Dwamena S, Abdul Z, Williams R, Ennis O. 2017. Improving consent form documentation and introduction of procedure-specific labels in a district general hospital. *BMJ Open Quality*. 6(1):u211571. w4730.
12. Jayasinha Y. 2016. Decreasing turnaround time and increasing patient satisfaction in a safety net hospital-based pediatrics clinic using Lean Six Sigma methodologies. *Quality management in health care*. 25(1):38-43.