

Research Article

A Quality Improvement Project to Improve First Case On-time Starts in Operating Room

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Abstract

Background: On-time start of the operating room (OR) is a good quality indicator to measure the OR efficiency. Delay in starting the first case on time has so many repercussions not only on the hospital's reputation, it also causes significant dissatisfactions for both patient and healthcare worker. We observed a significant delay in starting the first case on time, so we decided to undertake a quality improvement project to analyse the root causes and address them through a multidisciplinary team effort. We aimed to increase first-case on-time starts in the OR by at least 90% on-time start of the first case.

Method: A multidisciplinary task force is created. Six Sigma quality improvement tool, namely DMAIC (Define, Measure, Analyse, Improve and Control) was used to identify and causes of delays and apply constructive interventions to address those issues to maximise the on-time start of the first case of the day. The following constructive interventions were initiated OR booking process- streamlined, Perioperative nurse Facilitator, Notification to the surgeons, OR set up, Role of the Ward nurse emphasised, Preoperative nurse, OR staff counselling and training, Insurance and other support staff training.

Results: We identified the factors for delays and categorised them into 7 main groups, namely patient related, surgeons related, anaesthetist related, nurse or other staffs related, process related (preop assessment, investigation, pending consultation, insurance, bed availability), Premedication/antibiotic related and others miscellaneous. We analysed total of 1340 first case performed during July 2021 to December 2022 (675 in pre-intervention and rest in post-intervention phase) of which 274 (60.8%) cases were start on time in the pre-intervention phase whereas in the post-intervention phase the percentage gradually improved to 90%. (606 on time out of 674 first cases). The mean delay in minutes for starting the first case on time was also higher in the pre-intervention group (28.6 minutes) which was gradually reduced to 17.5 minutes at the final phase of our analysis.

Conclusion: A multidisciplinary team approach can identify the factors for delay in starting first case on time and the delays can be significantly improved by quality improvement tool.

Keywords: Elective case, delay in starting, quality improvement project, Multidisciplinary team

Introduction

A well-functioning Operating room (OR) is an integral part of any hospital and is a major contributor in terms of revenue generation [1]. A well-functioning OR require not only trained personnel, it involved a variety of equipment and instrument and dedicated support from a multidisciplinary team that also contribute a high running cost to the hospital. Inefficient or improper utilisation of OR may also contribute to a significant financial drain as time is the most precious factor in the OR and each minute of delay contribute a significant cost to the hospital [2]. Timely starting of the first case as well as minimising the turnover time between the cases, and accurate time allotment for particular cases are the critical factors for efficient OR time utilisation [3]. Delays in starting the first case in the Operating Room (OR) will have significant downstream effects of delays for the whole day in the OR as well as patient and provider dissat-

isfaction and also can lead to an increase in overall cost. Delay in starting the first case will invariably lead to the extension of the duty hours for the staff as the list need to be finished which can cause significant work overtime for the staff, causing dissatisfaction and frustration for both the healthcare provider and workers [4,5].

On-time start of the first case is a complex process as it involved not only the surgeon and the patients, it requires the on-time arrival of an anaesthetist, technician, nursing and other supporting staff in addition to the preparation of OR equipment, preparation of patients (shaving, antibiotic or other preoperative medications). Failure to start the first case on time reflects an inefficient and imperfect surgical pathway. On-time start of the first case is an important quality indicator of OR performance [6,7]. We observed frequent delays in our OR schedule due to delays in starting the first case on time, so plan to conduct this study to identify the factors as-

sociated with delay in starting the first case and to apply interventions to address those issues to minimise the delay in the starting the first case on time and analysed the effects of the interventions. We choose only the first case as this is easy to identify and correct the factors for the first case, focusing and addressing one issue at a time is easy and practical. This study is a retrospective review of the on-time start of the scheduled first case of the day, constructive interventions, and post interventions comparative analysis. We aimed to increase first-case on-time starts in the OR by at least 90% on-time start of the first case. The second objective was to increase the surgeon, anaesthetist, and other perioperative staff's adherence to perioperative procedures.

Method and material

Hospital set up

NMC Royal Hospital is a private secondary-level hospital with a 100-bed capacity, a total of four ORs, with 8 anaesthesiologists, 30 nursing teams and 12 technicians (anaesthesia and operating technicians) and 30 surgeons of various speciality with a monthly mean caseload of 550 cases of which around 75 cases are as the first case. The first case usually starts at either 7 or 8 AM, depending on the surgeon and patient preference, 7 days a week, on weekends only two ORs are run for elective cases. We define on-time starts as the patient being wheeled in within 15 minutes of the scheduled start time. A delay of more than 15 minutes to wheeled-in to the OR is considered a delay in starting the case, the actual time of the patient being wheeled-in, and the cause of the delay are recorded in the electronic record system. The preoperative nurses note the delays and document the reasons for the delay in all cases.

Surgical pathways

Before the start of this project, in our institution we follow a preset preoperative process set by the hospital, the primary surgeon assesses the patient and once a decision is made for the surgical intervention, a tentative date of surgery is given to the patient, the surgeon sends the patient for pre-anaesthesia assessment, a qualified anaesthetist conducts the preoperative assessment, ordered the investigation and if any further optimization or consultation needed will document in the system. The patient is instructed to come for admission at least 2 hours before the surgical time. Once the patient reported to the admission desk, admission consent is taken and the patient is allocated a room, the ward nurse prepares the patient for the surgery, a checklist is used for risk stratification, the ward nurse is responsible for part preparation, ordering preoperative antibiotic and administration of antibiotic test dose after IV canulation, and timely shifting the patient to the preoperative holding area. In the preoperative holding area, the preoperative nurse received the patient and notify the surgeon/anaesthetist, rechecked the consent forms, site marking by the surgeon and administered the antibiotic prophylaxis if any. Once the operative room is ready, the anaesthesia team wheeled the patient to the operating room.

Interventions

A multidisciplinary task force is created, consisting of members from the administration department, quality manager, nursing supervisor, head nurse from the OR, lead anaesthetist, chief surgeons, OR manager. The task force meets on weekly basis to analyse and implemented several strategies to improve the on-time starts of the first case. This quality improvement project started in April 2022 but there was no additional funding for the project since this was a quality improvement project and as such no direct impact on the patient healthcare without any ethical concern- institutional ethical clearance was not sought.

Six Sigma quality improvement tool, namely DMAIC (Define, Measure, Analysed, Improvement and Control) was used to identify and causes of delays and apply constructive interventions to address those issues to maximise the on-time start of the first case of the day [8]. In the Define phase

– we defined the delay as 15 minutes delay in the wheeled-in of the patient to OR, In the measure and analysed phase- we collected the previous 6 months' data using the electronic data sheet to analyse and determined the major causes of delays and categorised them into a different subgroup. Delays in starting the cases are recorded by the preoperative nurses and the reason for delays and documented electronically. To get a better understanding of the various causes of delays and to increase awareness among the staff caring for the surgical patients, two brainstorming sessions were conducted with ward nurses and OR staff regarding the causes, and suggestions for interventions to improve the on-time start of the first cases. We identified the factors for delays and categorised them into 7 main groups, namely patient-related, surgeons related, anaesthetist-related, nurse or other staffs related, process-related (preop assessment, investigation, pending consultation, insurance, bed availability), Premedication/ antibiotic-related and other miscellaneous.

Based on our analysis – the following constructive interventions were initiated.

OR booking process- streamlined

The OR booking process is streamlined, and a written circular mail send to all the surgeons, anaesthetists and supporting staff to adhere to the OR booking process. All elective cases need to undergo pre-anaesthesia evaluation at least 48 hrs in advance and once the anaesthetist cleared and accepted the patient for the surgery, the patient is given a final date and time of the surgery with proper instruction for the fasting, premedication if any. Adherence to the OR booking process is monitored daily and any deviation from the process is considered a violation of the process and incident report was raised to prevent the occurrence of such deviation, and the concerned surgeons and support staff are counselled. A total of 14 incidents were raised during the 9 months.

Perioperative nurse Facilitator

A dedicated nurse is assigned to facilitate timely evaluation of Preoperative anaesthesia evaluation, and timely checking of preoperative investigation and inform anaesthetist, surgeons for any abnormal laboratory report, the preoperative nurse also communicate and counselled with the patients and ensure preoperative fasting status and on time arrival to the hospital.

Notification to the surgeons

We have identified some surgeons who were usually late to start the first case, those chronically late surgeons were notified through the hospital higher management regarding their timing and monitored their punctuality. The surgeons who used to arrive late are notified upon the patient admission and also just prior to shifting to the ward regarding the readiness of the patient and OR.

OR set up

The OR preparation and readiness for the surgery used to be done by night shift nurses and OR technicians but it was not on a consistent basis, the morning staffs have to prepare the OR on many occasions. The OR manager and head nurse enforced a policy that the night shift prepares the OR during the night itself and the OR to be ready before 6 AM every day. Compliance and strict adherence to the policy were monitored and any violation was reported as an incidence report.

Role of the Ward nurse emphasised

Ward nurses were given the importance of time management, two extra wall clocks were installed to have time awareness, and the head nurse in the ward is given the assignment for allotment of room for surgical patients before the arrival of patients, Surgical part preparation by dedicated nurses and their assistants. Timely shifting of the patient at least 30 minutes before the scheduled surgical time and time compliance is strictly

monitored through the incident reporting system.

Preoperative nurse

The preoperative nurses notify the surgeons and anaesthetist on received of the surgical patients in the preoperative holding area. Cross-checked regarding fasting status, allergies, completeness of the consents, site marking and timely administration of antibiotic test dose.

OR staff counselling and training

All the OR staff were made aware of the time punctuality and adherence to on-time arrival, any late arrival for 2 consecutive days is notified directly to the concerned staff and was considered as non-punctual of duty timing. Preparations of surgical equipment were done on the night itself.

Insurance and other support staff training

The front desk officer responsible for the admission /discharge process is counselled periodically regarding the importance of adherence to time management and timely admission and discharge of the patient so that the room can be allotted on time to the new patient. The insurance teams also enforce to do cross-checking of the approval status of all surgical patients' day before the scheduled surgery.

In the control phase, every effort is made to ensure that every intervention is strictly adhered to. All concerned surgeons and the OR staff were updated periodically about the project progression and target results.

Data Analysis

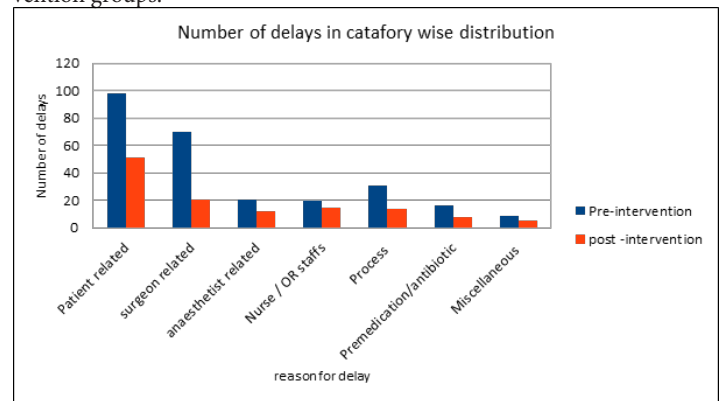
We used pre-intervention data from July 2021 to March 2022 (9 months) and post-intervention data from April 2022 to December 2022 (9 months). We collected data on weekly basis from electronic data sheet, the percentage of on-time start of first cases and calculated the delays in minutes for all first schedule cases that were late to start. The average minutes of delays and main reason for the delays were also analysed and focus our interventions as per the causes in delays and try to implement the measures to address those concern which were re-evaluated on subsequent data analysis. Data were collected in percentage and mean. Paired student t test was used to compare the data from the pre-intervention to post intervention phase. Data were analysed on weekly basis in the post-interventions as compared to average values of pre-intervention phase [9].

Results

We analysed a total of 1340 first cases performed from July 2021 to December 2022 (675 in pre-intervention and the rest in the post-intervention phase) of which 274 (60.8%) cases were started on time in the pre-intervention phase whereas in the post-intervention phase the percentage gradually improved to 90%. (606 on time out of 674 first cases).

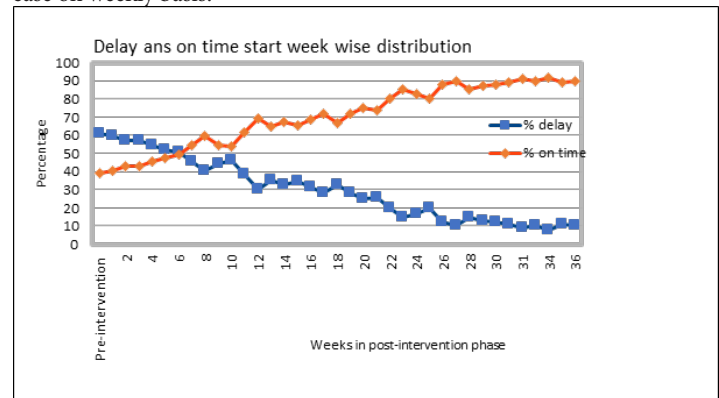
The main reasons for the delays in starting the cases were patient-related, mostly related to late arrival to the hospital, followed by surgeon-related (late arrival, busy attending emergency, taking rounds). Other significant contributing reasons were late arrival or non-availability of anaesthetists due to emergency cases, and inadequate nursing or technicians. A significant number of delays were also attributed due to the process related- mostly related to the non-availability of beds, inadequate fasting, and pending investigation or consultation. Timely prescription and administration of preoperative antibiotic prophylaxis also contributed to a measurable number of delays, other miscellaneous causes included malfunctioning of the air conditioner or equipment, non-availability or delay in getting equipment from the sterilisation unit. After the initiation of active intervention most of these issues were significantly reduced in frequency as shown in the graph below but the overall pattern remains more or less similar in trends.

Figure 1. Distribution of category wise delay in both pre and post intervention groups.



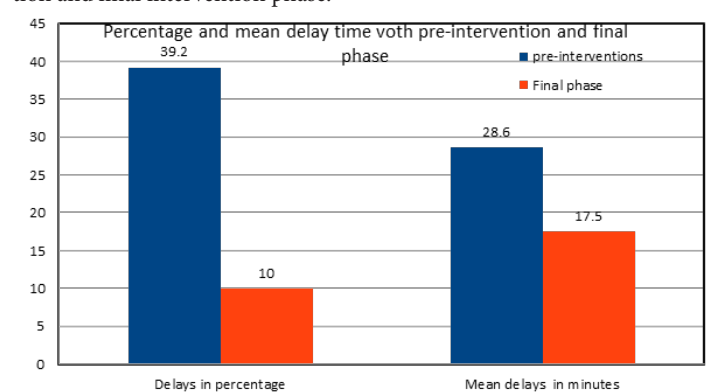
Following our interventions- the percentages of delays reduced gradually over a few weeks, we achieved a significant difference from the first month onward and the trend continue to improve, and we reached a value of only 10% delay by the 31st week during the intervention phase.

Figure 2. Percentage wise distribution of delay and on time start of first case on weekly basis.



The mean delay in minutes for starting the first case on time was also higher in the pre-intervention group (28.6 minutes) which was gradually reduced to 17.5 minutes at the final phase of our analysis.

Figure 3. Percentages of delay and mean delay in minutes in pre-intervention and final intervention phase.



Discussion

We achieved a significant improvement in the timely start of the first case of the day from 60 % to 90% using quality improvement tools and details analysis and constructive interventions. It is worth noting that the majority of delays were related to patient-related factors which is not directly in our hands, however, strategies were applied like the preoperative nurse facilitator giving a reminder call day before the scheduled surgery, ensuring the fasting status, another reminder call on the morning of the surgery,

prioritizing the admission process for surgical patients. Other areas we focus mainly on are the process and manpower such as streamlining the surgical process and reporting a violation of the process as a case report, ensuring the availability of surgeons and anaesthetists and other supporting staff, new staff were also recruited to gap the shortage of staff.

As the demand for elective surgeries grows, there is a critical need to improve OR utilisation. For efficient utilization of OR, time and resource management are important factors. The timely start of the operating case is one of the quality indicators of the performance of the OR [1,2]. If the first case is not started on time it will have downstream effects on the subsequent cases. This will lead to not only frustration not only for the patient it will hurt the healthcare provider, disruption of planned personal activities, and increased work overtime, for the surgeons it also disrupts other clinical activities and for the healthcare institute -it leads to not only an extra cost, but it also negatively impact from the patient experience and expectation and will have a negative impact on the hospital.

Ideally, all scheduled cases should be started on time. We choose the first case on -time start as this is easy to identify and measure. One more reason for selecting the first case in our set-up was due to the lack of a dedicated OR for emergency cases, we do routinely adjust the emergency cases in between the elective list since a dedicated separate emergency OR is missing in our set-up.

There are many studies in the literature on improvement in OR on-time start of cases, but none of the studies has been reported from the Middle Eastern countries and only a few studies have used the quality improvement tools for root cause analysis and targeted intervention to key factors for the delays.

Patient-related factors were the significant cause of delay in both the pre and post-intervention phases. Late arrival of the surgeon was also a significant contributor to the delays, our study support that timely reminder to the surgeons and regular email notifications for usual late comer has helped in reducing the delays caused by the late arrival of the surgeons, some situation cannot be solved without adding extra manpower such as attending an emergency case.

In our project, we have focused mainly on the improvement in the process and there were multiple areas we focus on simultaneously, it is difficult to ascertain which intervention has contributed how much to the overall improvement on on-time start. We have not analysed the financial im-

plication of saving the extra time, and neither any attempt was made on evaluating the extra cases that were accommodated within the scheduled hours of the OR due to the timely start of the first case.

Conclusion

We achieved a 90% on-time start of the first case from 60.2% without costing significant extra financial resources. A multidisciplinary approach can identify the factors associated with delays and applying common quality improvement tools can significantly reduce the delay in starting the first case on time.

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