

Elective Surgical Cancellations in a Tertiary Hospital in the Middle East: Quality Improvement Process

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Purpose: Cancellation of elective surgery negatively affects patient outcomes and the efficiency of the work environment. The purpose of this project was to analyze the cancellation of elective surgeries and identify the best evidence-based interventions to address cancellations in a tertiary hospital in the Middle East.

Design: A quality improvement study design.

Methods: A retrospective review of cancellations conducted over two 3-month periods in 2016 and 2017.

Findings: In both phases of the audit, patient-related reasons were the leading cause of cancellations. Conducting a preoperative call 2 days before surgery and doing a weekly review of the surgery schedule reduced cancellations from 3.8% to 3.5%. Cancellations because of patient-related reasons reduced from 81% to 79.7% whereas cancellations because of hospital-related reasons reduced from 17.5% to 15.9%.

Conclusions: Cancellation of surgeries is a worldwide health care issue and without understanding the causes of cancellations, it is difficult to devise an effective intervention to address this issue.

Keywords: surgery cancellations, preoperative calls, elective surgery, quality improvement, surgery delay, postanesthesia care unit.

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DELAYS AND CANCELLATIONS of scheduled elective surgical procedures are the most common system issues in health care.¹ For years, hospitals have addressed system delays and cancellations by adding more resources, such as increasing beds, recruiting more staff, extending working hours, and paying overtime.¹ In most cases, the delay is identified as a workflow problem that requires specific coordination between and among the clinical microsystems to improve the patient experience.² Delays or cancellations lead to a

cascade of negative consequences that can affect the day surgery unit (DSU), operating room (OR), and postanesthesia care unit (PACU). The workflows of these areas are interrupted and resources are wasted.²

Unexpected delays at the time of surgery can lead to frustration among patients and their families.^{3,4} These incidents can also result in prolonged waiting times, extended hospital stays, unnecessary occupancy of hospital

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beds, increased patient pain, and deterioration of the patient's clinical condition, which may consequently impair the recovery process and increase costs.^{4,5} Surgery cancellation also jeopardizes efficiency, and the health care team may undergo significant stress because of a decrease in morale and the difficulty of handling stressed patients.⁶ A review of the literature shows variation in regard to same-day surgery cancellations. Some studies examined the incidence and causes of cancellation, whereas other studies focused on the effectiveness of the intervention in reducing cancellations. Several studies indicated that most of surgery cancellations were preventable.^{1,6-8} The surgical cancellation reasons were debated among the studies. However, the most common reasons cited for cancellation in the literature were attributed to administrative and hospital factors, a range of 63% to 83%, which include a lack of OR time, inadequate OR staffing, inadequate resources, ineffective planning, and a lack of intensive care unit bed⁹⁻¹²; general surgery service is cited as the highest canceled service followed by the orthopaedic service. The second most common cause of cancellation was identified as patient-related reasons with a range between 6% and 32%. One study reported that a 25% cancellation rate was associated with patients, including financial constraints, patient self-cancellations, patients failing to show up on the surgery day, deterioration of the medical condition, and inadequate preoperative assessments.¹³ Only a small percentage (2% to 3%) of cancellations were because of lack of surgeon and anesthesia service.^{10,11,14}

Background

Before beginning the quality improvement (QI) project into cancellation interventions, it was important to determine the existing state of surgical cancellations. Initially, a retrospective data collection was collected for the entire period of 2016. The inclusion criteria were scheduled elective surgical patients aged 4 months and older who had completed the preoperative assessment within 1 month of the scheduled surgery date and who planned to have their surgery in the OR. The exclusion criteria included emergency surgeries, inpatient elective surgeries, elective procedures performed outside of the OR setting (such as cardiac catheterization), facet joint injections, and interventional radiology procedures. The first

outcome measured was the number of scheduled surgeries per month versus cancellations, along with the resulting monthly and annual percentages of unperformed scheduled surgeries. The second outcome measured was the annual cancellation rate per service. The third outcome measured was an intensive analysis of surgery cancellation reasons for the entire period of 2016.

The total number of elective surgeries scheduled during 2016 was 6,065. Of those scheduled surgeries, 239 were canceled (4%). Analysis of the scheduled and canceled cases per service during 2016 revealed that the urology service had the highest percentage of cancellations (7.7%), followed by the neurosurgery service (5.7%), dental and thoracic surgery (4%), ear, nose, and throat and plastic surgery (3.7%), plastic and ophthalmology (3.6%), orthopaedic (3.2%), general surgery (3.1%), vascular surgery (2.1%), and the lowest rate of canceled elective surgeries was in the obstetrics and gynecology service (2%).

In the literature, the reasons for cancellation are divided into three categories: hospital-related reasons, patient-related reasons, and surgeon and anesthesiologist-related reasons.¹⁵ The analysis done by this study revealed that 74.3% of cancellations were because of patient-related reasons. Approximately 54% of patient cancellations were because of a lack of patient adherence, followed by self-cancellation (26%) when patients arrived without understanding that they had an appointment for surgery. Patients canceled after arriving at the DSU thinking that they were coming for a regular clinic appointment. They indicated that they were not aware of a surgery booking date or felt unable to make a spontaneous decision regarding advantages versus potential risks and complications.

On the basis of both the evidence from the literature and the results of this in-house data collection, it was determined that it would benefit this institution to do a further study on intervention techniques. The author, who is a perianesthesia nurse manager, developed a plan to overcome possible obstacles and identified at least three preoperative nurses who could alternate to conduct preoperative calls. In addition, to overcome language barriers, the nurses selected were bilingual and able to speak the patient's primary language to avoid

using additional resources, that is, hiring additional staff. Another consideration was given to selection of the stakeholders, their individual differences, background, and their contribution to the sustainability of the project implementation.

Purpose

The purpose of this QI project was to evaluate the effectiveness of evidence-based interventions to address the reasons for cancellation in a tertiary care center in the Middle East. The main aims of this project were as follows:

- To increase the utilization of the OR (reduce cancellation rate).
- To increase patient understanding and adherence with preoperative teaching and instructions.
- To increase patient satisfaction with the preoperative experience (decrease waiting time for surgery).

Methodology

Design

The design for the study was a QI study design for two independent groups with a retrospective review of elective surgical cancellations conducted over two 3-month periods (March to May 2016 and March to May 2017) before and after interventions.

Ethical Considerations

A proposal of this QI study was submitted to the organization's Institutional Review Board and approval was obtained before the implementation phase. All measures were in place to maintain patient confidentiality throughout the study period.

Participants

The sample included scheduled elective surgical patients from two independent groups (Table 1). The first group was the baseline group, which included patients scheduled for elective surgery between March and May 2016 (1,661 patients). The second group was the intervention group, which included patients enrolled for scheduled elective surgery between March and May 2017

(1,951 patients). Any elective surgical procedures scheduled and performed outside the OR were excluded from this study.

Setting

The study was conducted in a 335-bed tertiary hospital with 4 intensive care units, located in the Eastern Province of Saudi Arabia. The DSU is a 24-bed unit, operational from 6 a.m. to 7 p.m. for the preparation of surgical patients and phase two postoperative patients received from the PACU. The OR has 11 rooms and is operational from 7 a.m., finishing when the last elective surgery is completed. The PACU consists of 22 bays for phase one postoperative patients and is operational from 7 a.m. to 7 p.m. The OR and the PACU have contingency plans to cover services 24 hours a day, 7 days a week through the assignment of an on-call team for the management of emergency cases after 7 p.m.

Study Interventions

After analyzing the 1-year data of surgical cancellations that occurred in the tertiary hospital, it became evident that up to 93% of cancellations were preventable. Addressing preoperative cancellations through intervention to improve patient outcomes and to increase work efficiency was essential. The proposed interventions included a preoperative call 2 days before

Table 1. Distribution of Scheduled, Canceled, and no Show Elective Surgeries Between Baseline (March to May 2016) and Intervention Period (March to May 2017)

Month	Scheduled Elective Surgeries (n)	Cancellations (n)	Percentage of Surgeries Canceled
Baseline			
March	517	17	3.2
April	554	27	4.8
June	590	19	3.2
Total	1,661	63	3.8
Intervention			
March	694	25	3.6
April	651	18	2.7
May	606	26	4.3
Total	1,951	69	3.5

the surgery date, and a weekly review of the surgery schedule by a multidisciplinary team. The preoperative nurses played a positive role in educating the patients and their families about the system of organizing surgeries and the required preparedness.¹⁶ During the baseline period, all surgical patients scheduled for elective surgery received preoperative instruction in the preadmission clinic by preadmission nurses. However, 76.2% were canceled because of lack of patient adherence. Therefore, reinforcement of preoperative teaching was implemented through the proposed intervention preoperative call.

Intervention 1: Preoperative Call 2 days Before Surgery

A preoperative nurse was assigned to conduct preoperative calls using the efficiency toolkit created by the Association of periOperative Registered Nurses. Evidence supports that introducing a preoperative call 2 days before surgery day to confirm attendance, discuss surgical preparations, resolve patient queries, ensure adherence to preoperative instructions, and check escort availability can help prevent surgery cancellation.^{7,17} The call can also help to detect any illness in the immediate preoperative period, which might be a valid reason for cancellation.

Intervention 2: Weekly Review of the Surgery Schedule

One study concluded that an effective intervention to reduce surgery cancellation was a proactive weekly review of the surgery schedule by a multidisciplinary team.¹¹ The surgery scheduling process is very complicated because of the involvement of multiple systems and the priorities for service, the variety of surgical specialties, emergency services, and postsurgical capacity. The literature has described significant improvements in the incidence of preoperative cancellations because of the proactive role played by a team reviewing the surgery schedule.¹¹ In this study, the professionals involved in reviewing the surgery schedule came from different backgrounds (sterile processing supply, OR, surgery scheduling coordinator, and ambulatory surgery). All members of the team had valuable input and could initiate action plans based on this

feedback. The process of a weekly surgery schedule review creates an opportunity for the stakeholders to discuss serious scheduling issues such as surgery duration, turnover time, and the flexibility of adding, removing, or changing the surgery sequence.

Data Collection

Data were collected and analyzed for the baseline and intervention periods using Statistical Package for the Social Sciences 24 (SPSS, Chicago, IL). Demographic variables included patient gender, age, type of admission, and group (baseline or intervention). The intervention categorical data contained dichotomous data for preoperative instruction, preoperative call, and weekly schedule review. The outcome variables were categorical variables that included cancellation event, surgical cancellation by service, and identified cancellation reasons during the preoperative call or on the day of surgery. A histogram was used for continuous variables (age) to compare the frequency of cancellation between the baseline and intervention groups. Bar charts were used to compare differences in cancellation categories between the baseline and intervention groups. The cross tab analysis was conducted and χ^2 test was used to compare variables between the baseline and intervention group.

Results

The total number of elective surgeries scheduled during the baseline period of March 1 to May 31, 2016, was 1,661. Of those scheduled surgeries, 63 (3.8%) were canceled. Analysis of the scheduled and canceled cases per service during the baseline period revealed that the cancellations were spread evenly across most of the service types. Neurosurgery service accounted for the highest number of cancellations with 4 (10.8%), followed by 19 in urology surgery (8.2%), 2 in pediatric surgery (7.6%), and 8 in dental surgery (6.3%). The cancellation percentage for some services range from 1.2% to 4.7% (Table 2).

The most common reasons for cancellation were patient-related reasons, which accounted for 51 (81%) of the cancellations. These include, 27 canceled because of acute illness (42.9%), followed by 8 canceled for noncompliance with

preoperative instructions (12.6%), 6 canceled by the patient when arrived to the hospital (9.5%), 5 canceled for noncompliance with nil per os (nothing by mouth) instructions (8%), 3 canceled because of a change in medical condition (4.8%), and 2 patients failing to show up on the surgery day (3.2%). Of these reasons for cancellation, change in medical condition was unpreventable and about 76.2% were considered as lack of patient adherence to preoperative instructions.

The other 11 cancellations were for hospital-related reasons (17.5%). These included 7 canceled because of lack of OR time (11.1%), 3 canceled because of lack of equipment of surgical instruments (4.8%), and 1 canceled because of an incomplete evaluation (1.6%). One cancellation was related to the unavailability of the surgeon during the baseline period (Table 3).

The demographic baseline data for the canceled elective cases include gender, age, and type of admission. The baseline gender analysis revealed that male patients had a slightly higher rate of cancellation (33, 52.4%) than female patients (30, 47.6%). The highest cancellation frequency occurred for patients who were aged 50 years and older. The type of admission for canceled cases during the baseline period indicated that there were only 21 same-day admission cancellations

(33.3%), whereas there were 42 day surgery cancellations (66.6%).

For the intervention period between March 1 and May 31, 2017, the number of scheduled elective surgeries was 1,951. Of these scheduled elective surgeries, the total number of canceled cases was 69 (3.5%). Analysis of the scheduled and canceled cases per services during the intervention period revealed that the neurosurgery accounted for the highest number of cancellations at 9 (14.2%). Followed by 19 in urology service (9.4%), 5 in dental surgery (4.8%), 3 in vascular surgery (4.4%), 1 in podiatric surgery (3.8%), 9 in orthopaedics (3.3%), 8 in ophthalmology (2.6%), 1 in pediatric surgery (2.7%), 3 in plastic surgery (2.7%), 5 in general surgery (1.9%), and 2 in the ENT service (0.8%). Interestingly in both phases of the study neurosurgery remained the highest canceled service followed by urology service (Table 2).

In the intervention period, the most frequent reasons for cancellation were again patient-related reasons and accounted for 53 (79.7%) cancellations. A total of 19 surgeries were canceled by patients after arrival at the hospital (27.5%), 13 cases were canceled because of the patient not being fit for surgery (18.8%), 6 were canceled because of a change in medical condition (8.7%), 6 patients failed to show on the day of surgery (8.7%), 6 patients

Table 2. Distribution of Surgical Cancellations by Service During Study the Period

Service	Baseline			Intervention			Utilization
	No. of Scheduled	No. of Canceled	%	No. of Scheduled	No. of Canceled	%	
Dental surgery	126	8	6.3	103	5	4.8	↓18.2
ENT surgery	242	8	3.3	250	2	0.8	↑3.2
General surgery	243	3	1.2	254	5	1.9	↑4.3
Neurologic surgery	37	4	10.8	63	9	14.2	↑41.2
OB/GYN surgery	145	2	1.37	227	4	1.7	↑36.1
Ophthalmologic surgery	223	9	4.03	306	8	2.6	↑27.1
Orthopaedic surgery	240	5	2.08	267	9	3.3	↑10.11
Pediatric surgery	26	2	7.6	36	1	2.7	↑27.7
Plastic surgery	106	5	4.7	126	3	2.3	↑15.8
Thoracic surgery	15	0	0	24	0	0	↑37.5
Urologic surgery	195	16	8.2	202	19	9.4	↑3.4
Podiatric surgery	0	0	0	26	1	3.8	NA
Vascular surgery	63	1	1.5	67	3	4.4	↑5.97
Total	1,661	63	3.8	1,951	69	3.5	↑14.8

NA, not applicable; OB/GYN, obstetrics and gynecology.

Table 3. Distribution of Cancellation Categories and Reasons During Baseline and Intervention Period

Cancellation Category	Cancellation Reasons	Baseline		Total %/ Category	Intervention		Total %/ Category
		n	%		n	%	
Hospital-related reasons	Lack of equipment	3	4.8	17.5	5	7.2	15.9
	Lack of theater time	7	11.1		6	8.7	
	Incomplete evaluation	1	1.6		2	2.9	
Patient-related reasons	No show	2	3.2	81	6	8.7	79.7
	Patient refused surgery	6	9.5		19	27.5	
	Patient not fit for surgery (sick)	27	42.9		13	18.8	
	Patient is not fasting	5	8		6	8.7	
	Lack of adherence to preoperative instructions	8	12.6		3	4.3	
Surgeon or anesthesia-related reasons	Changes in medical condition	3	4.8	1.5	6	8.7	2.1
	Surgeon or anesthesiologist not available	1	1.5		3	4.3	
Total		63	100		69	100	

were in noncompliance with NPO (nil per os; nothing by mouth) instructions (8.7%), and 3 patients were in noncompliance with preoperative instructions (4.3%). Most interestingly, when change in medical condition was excluded, about 71% of patient cancellations were because of lack of patient adherence to preoperative instructions.

Hospital-related reasons accounted for 13 other cancellations (15.9%), including 6 for lack of OR time (8.7%), 5 for lack of equipment (7.2%), and 2 for incomplete evaluation (2.9%). A total of 3 surgeries were canceled because the surgeon was not available on the day of surgery (4.3%) (Table 3).

For the intervention period, cross tab analysis was completed to analyze demographic data, which revealed that the frequency of cancellations for male patients (34, 49.3%) was nearly the same as the frequency for female patients (35, 50.7%). The highest cancellation frequency occurred for patients who were aged 50 years and older. The data analysis of admission type for canceled cases indicated that 23 same-day admission cases were canceled (33.3%), whereas 46 day surgery cases were canceled (66.6%) (Figure 1).

Discussion

After analyzing the baseline data, it became evident that most surgery cancellations were preventable. Addressing preoperative cancellations through an

intervention to improve patient outcomes and to increase work efficiency was essential. The proposed interventions in this study included a preoperative call 48 hours before surgery and a proactive weekly review of the surgery schedule by a multidisciplinary team. These interventions have been shown to improve the utilization of hospital resources, reduce health care costs, increase patient adherence to preoperative instructions, and ultimately increase patient satisfaction with the care provided.^{3,12-14,16,18,19} Therefore, planning successful implementations requires intensive preparation and careful examination of potential risks such as the risk of team disengagement. The stakeholders and delegates for the weekly meeting were identified and agreed to the proposed date and time for the weekly surgical schedule review. Moreover, understanding the stakeholder's contributions to the project is a crucial element to identify advocates and potential opponents and ultimately reduce the impact of opponents on the implementation.

At the initial stage of building the multidisciplinary team, the author met with all stakeholders together and explained the purpose of the project, provided a clear direction to team members regarding the task and the expectations to enable them to do the work required. Meetings were held weekly, and an invitation was sent as a calendar invite in advance to allow for proper planning and attendance. Nevertheless, effective

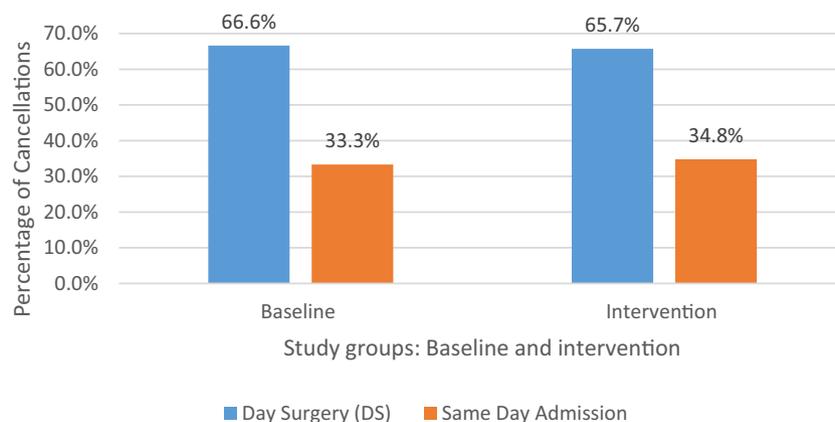


Figure 1. Type of admission of cancelled cases during baseline and intervention period. This figure is available in color online at www.jopan.org.

communication among stakeholders was the main factor for project success. Evidence showed that usages of various communication methods are required in different phases of the project to reduce the risk of communication breakdown.²⁰ Therefore, the author used more than one form of communication to suit project team communication needs. This includes the scheduling of a routine face-to-face meeting along with informal communication via group emails. To assist with a “buy-in” by all stakeholders, a copy of the planned project was provided, which identified the purpose, cost effectiveness for the organization, and improvement of the patient, family, and staff satisfaction.

Potential challenges identified before implementing the preoperative call intervention included organizational constraints, lack of time, and an inability to access resources. Therefore, a plan to overcome possible obstacles was put in place, a preoperative nurse to conduct preoperative calls for elective surgical services was identified, and the workload was discussed with the unit charge nurse. Furthermore, the risk of failure to contact a patient because of lack of a current telephone number was addressed through encouraging all patients to update their contact information at every outpatient visit including their preadmission clinic visit. Posters indicating the importance of obtaining updated contact information were displayed in all reception areas, also as a way to improve contact with patients to assess satisfaction with the care provided.

Comparing the results for both phases, scheduled surgeries increased 14.8% from the baseline period to the intervention period, whereas the overall cancellation rate decreased from 3.8% to 3.5%. Moreover, there was a significant difference in the cancellation rate between the baseline and intervention groups ($P < .001$). Demographic data analysis done across both study periods revealed that the frequency of day surgery cancellation is almost double that of same-day admission surgery cancellation (Figure 1). The type of admission (day surgery or same-day admission) was not statistically significant between the baseline and intervention groups ($P = .994$).

Although the frequency of surgical cancellation was slightly higher for male patients than female patients during the baseline period, the cancellation rate for male and female patients was similar in the intervention period. Therefore, the gender demographic was homogeneously distributed between the baseline and intervention periods ($P = .52$). The highest cancellation per age group occurred for patients who were aged 50 years and older (Figure 2). The overall findings for age group indicated no statistically significant differences between the baseline and intervention periods ($P = .30$, $\chi^2 = 7.15$).

Although both the baseline and the intervention group received preoperative instruction in the preadmission clinic as a routine preparation for preoperative patients, patient-related reasons such as a patient not being fit for the surgery and compliance with preoperative instructions were mostly responsible for the surgical cancellations. These

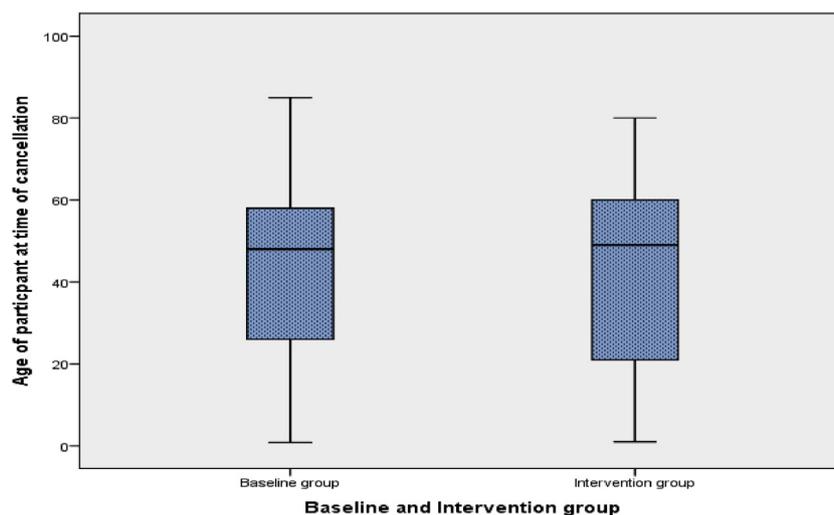


Figure 2. Age of participants at the time of surgery cancellation for baseline and intervention groups. This figure is available in color online at www.jopan.org.

reasons included failure to show up on the surgery day, refusing surgery on the day of surgery, lack of adherence to preoperative instructions, and a change in medical condition. Of these cancellations, a change in medical condition is the only uncontrollable factor whereas the rest of the cancellation causes are preventable.

After identification of the leading causes of cancellations, we determined that patients and their families may benefit from reinforcing the preoperative instruction through a preoperative call. During the baseline period, patients enrolled for elective surgery did not receive a preoperative call to identify possible causes of cancellation. Therefore, the baseline was zero. Unlike the intervention period, total of 1,505 (90%) of scheduled patients received a preoperative call.

During the intervention period, 63 patients were canceled and of these patients the preoperative call was received by 46 (66.7%). This finding is statically significant ($P < .001$) and of those called and canceled cases, the preoperative nurse was able to identify reasons that may cause a cancellation for 2 (4.3%). However, the two patients decided to come in on the surgery day to confirm and discuss rescheduling the surgery with their surgeon. The cancellation rate because of patient-related reasons slightly decreased from 81% (51 cases) to 79.7% (53 cases) after the implementation of a preoperative call (Figure 3).

The second leading cause of cancellations was hospital-related reasons, which included lack of equipment, lack of OR time, and incomplete medical evaluation. Evidence suggested that a weekly review of the surgery schedule within each service is an effective approach to reduce cost, improve OR utilization, and reduce cancellations.²¹ The proactive weekly review of the surgery schedule allowed the team to work collaboratively to confirm availability of resources and act according to team member recommendations. During the intervention period, the multidisciplinary team approved 1,698 (87%) of scheduled patients during the weekly review of surgery schedule. Only 253 (13%) patients were added to the surgery schedule after the review to improve OR slot utilization and improve patient satisfaction with waiting time for surgery. The finding was statistically significant ($P < .001$). The cancellation rate because of hospital-related reasons decreased from 17.5% (11 cases) to 15.9% (13 cases) after the successful implementation of a surgery schedule review (Figure 3).

Analysis of Surgical Cancellation by Service

Contrary to our expected results, a few of the services had an increased percentage of cancellations during the intervention period, for explainable reasons. During the baseline period, the highest percentage of cancellations occurred in the neurosurgery service and accounted for 10.4%.

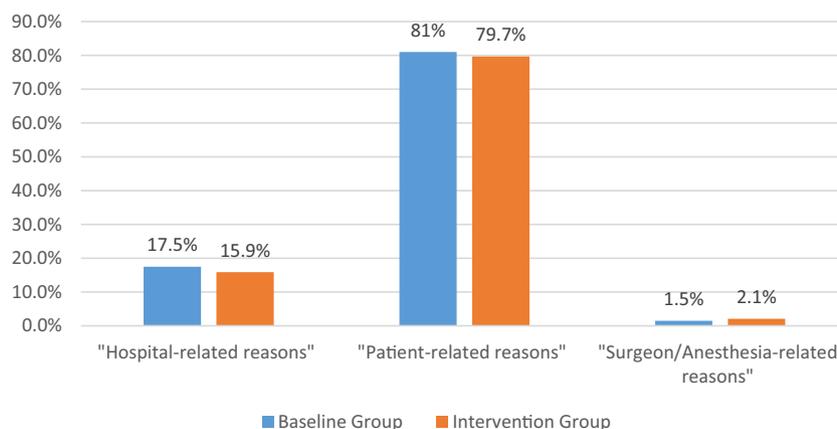


Figure 3. Cancellation categories during baseline and intervention groups. This figure is available in color online at www.jopan.org.

Furthermore, the cancellation percentage of the neurosurgery service increased dramatically from 10.4% in the baseline period to 14.2% in the intervention period because of an increased demand for neurosurgery, with a corresponding 41.1% increase in surgery booking. During the baseline period, there were 37 neurosurgery cases scheduled, and of these cases, there were 4 cases canceled because of patient-related reasons. Three patients were canceled for lack of patient adherence to preoperative instructions and one for being sick on the day of surgery. However, during the intervention period, there were 63 scheduled neurosurgery cases. Of these cases, nine were canceled on the day of surgery, three of them for hospital-related reasons (one for lack of equipment and two for lack of OR time), and six of them for patient-related reason (two no shows and four patients canceling surgery).

The second highest cancellation service occurred in both study periods was the urology service. During baseline period, urology surgery cancellation accounted for 8.2% of their scheduled surgeries. Patient-related reason such as lack of patient adherence to preoperative instruction, self-cancellation on the day of surgery accounted for most of the cancellations, whereas a few cases were canceled because of hospital-related reasons (lack of theater time). In the intervention period, the number of cancellations in the urology service increased and the percentage increased to 9.4%. Moreover, the number of scheduled urology cases increased by 3.4% from baseline to intervention period.

The cancellation percentage of the orthopaedic surgery increased from 2% in the baseline period to 3.3% in the intervention period, with patient-related reasons predominant in both periods. The increases in cancellation percentage may have been because of the 10% increase in orthopaedic surgery bookings in the intervention period compared with the baseline period. Similarly, the cancellation rate of vascular surgery increased from 1.5% to 4.4% as the number of scheduled surgeries slightly increases during the intervention period at 5.9%. This slight increase in vascular surgery occurred during intervention period as endovenous procedures were shifted from the OR to the outpatient setting allowing slots for additional vascular cases. Furthermore, general surgery also had a slight increase in the booking of surgery at 4.3% during the intervention period. There was one cancellation reported because of patient-related reason (patient being sick on the day of surgery) during the baseline period in comparison to the intervention period that accounted for four canceled cases (one for lack of equipment, one for lack of theater time, and two cancellations because of patient being sick on the day of surgery).

Many of the remaining services reported a reduction in the cancellation rate and a remarkable increase in the number of scheduled cases during the intervention period. Most significantly, the pediatric surgical cancellation rate dropped down from 7.6% in the baseline period to 2.7% during the intervention period. There was a significant increase in the utilization of 27.7% from baseline

to intervention period. There was also a significant improvement in patient compliance with preoperative instructions and no cancellation occurred for hospital-related reasons during the intervention period. Similarly, ophthalmology surgery reported a significant increase in the utilization at 27% in the intervention period. The cancellation rate for ophthalmology surgeries also decreased. During the baseline period, 9 cases were canceled of 223, resulting in a 4.3% cancellation rate, whereas in the intervention period, 8 cases were canceled of 306 scheduled (2.6%). The leading cause of cancellation among the ophthalmic surgeries was a lack of patient adherence to preoperative instructions. There were no cancellations reported for hospital-related reasons during study periods for ophthalmology service. Moreover, the utilization of podiatric surgery slots increased by 3.8% as there was no podiatric surgeon available during the intervention period.

The cancellation rate of plastic surgery dropped from 4.7% to 2.3% with 15% increase in utilization. The cancellation in both study periods was mainly because of lack of patient adherence to preoperative instruction. In particular, patients gaining weight before abdominoplasty surgery accounted for the cancellation of two cases in each study period. Interestingly, the obstetrics and gynecology surgery services reported a significant increase in utilization of 36% and slight increase in cancellation from 1.3% to 1.7%.

The cancellation percentage of the dental service decreased from 6.3% in the baseline period to 4.8% in the intervention period, with patient-related reasons predominant in both periods. The difference in cancellation percentage may have been because of the 18% decrease in dental surgery bookings in the intervention period compared with the baseline period as one of the dental surgeons resigned during the intervention period.

In addition, a patient satisfaction survey was conducted by the Press Ganey Company for both baseline and the intervention groups. Data were obtained to measure patient satisfaction with information given before surgery and patient satisfaction with waiting time before surgery. The result revealed that patient satisfaction with

information given before surgery increased from 91.5% in the baseline period to 92.5% in the intervention period. Patient satisfaction with waiting time for surgery also increased from 78.5% in baseline period to 81.3% in the intervention period.

Implication to Practice

Although the literature indicated that the most common reasons for cancellation were administrative and hospital factors, the most common reasons for cancellation in this tertiary hospital were patient-related cancellation because of the diversity of the population included in this study. Patient-related reasons include patients not showing up, self-cancellation at the time of operation, lack of patient adherence to preoperative instructions, or a change in medical condition. Hospital-related reasons were less common but included lack of OR time, lack of equipment, and incomplete evaluation, followed by surgeon and anesthesia-related reasons. One of the most effective ways to reduce surgical cancellation is to take sufficient time for planning and reviewing an operation schedule.

This study revealed that the primary cause of cancellation was patient-related reason at 74.3% and of those 54% were canceled because of lack of patient adherence. Therefore, an effective intervention to address patient cancellation required conduction of a preoperative call 2 days before surgery using the preoperative toolkit. The strength of the toolkit includes high-quality evidence that comes in a simple and flexible form and facilitates changing practice in a health care setting.²²

The purpose of preoperative call was to confirm attendance, ensure adherence to instructions, and detect any illness in the immediate preoperative period, which could lead to cancellations. The preoperative call intervention has been shown to be the best practice model to increase patient adherence, reduce cancellation, and increase patient satisfaction^{23,24} Findings confirmed that patient adherence to preoperative instructions reduced cancellations for patient-related reasons by 1.3% from 81% to 79.7%. Findings from press Ganey patient satisfaction survey revealed that patient satisfaction with information

given before surgery increased from 91.5% in the baseline period to 92.5% in the intervention period.

A collaborative effort is required at multiple levels by a multidisciplinary team with careful selection of individuals with varied background such as the surgical sterile supply, OR, surgical scheduling, and day surgery departments. A significant improvement was reported in communication between the OR scheduling team and surgeons through sharing of the list of patients waiting for elective surgery with the aim of reducing patient wait time for surgery. Findings from the Press Ganey patient satisfaction survey revealed that patient satisfaction with waiting time for surgery also increased from 78.5% in baseline period to 81.3% in the intervention period. Moreover, the cancellations for hospital-related reasons reduced by 1.6% from 17.5% to 15.9%. Overall, the scheduled review and preoperative call interventions reduced the cancellation rate from 3.8% to 3.5% for a 3-month period, increased the overall utilization of the ORs, increased surgery bookings by 14.8%. The sustainability is paramount to ensure long-term quality of care for patient. Dissemination of project outcomes to the stakeholders and frontline staff is one way to sustain positive project outcome. The author of this article shared project results using a poster, which was presented at the research day for the organizational staff. The audience included professional staff from other medical and research facilities within the Kingdom.

Study Limitations

Several limitations were identified in the literature. Some studies were conducted for a short period without a consideration to the variation in cancellations because of seasonal illness, whereas other studies do not acknowledge the effect of hospital size on cancellation rate. Furthermore, studies vary in the purpose of the study as some focused on specific populations or analyzing cancellation reasons or evaluating the effectiveness of a particular intervention in reducing the cancellation rate of surgery.

In this study, there are few limitations acknowledged within this QI process. This project was a single site project, which was conducted over a short duration. Evidence supported that QI study required longer duration to show results.¹⁶ During the last month of the intervention period, one of the vascular procedures was shifted to an outpatient setting, which might influence the outcome of overall utilization of the vascular service.

Conclusions

Surgical cancellations have a significant impact on patient outcomes and hospital performance. Cancellation of surgery is associated with a large consumption of hospital resources and increased health care cost. However, most cancellations are preventable. Analyzing the reasons for cancellation is a crucial step toward finding a solution to address cancellation and to improve the performance efficiency of the OR.

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