Cancellation of Surgeries: Integrative Review

Narmeen Al Talalwah, BSN, MSc, DNP, RN, Kimberly H. McIltrot, DNP, CPNP, CWOCN

Purpose: *To analyze cancellations of surgeries and identify evidence-based interventions to address this issue.*
Design: *Integrative literature review.*
Methods: *An integrative literature search was conducted in four databases: CINAHL, PubMed, Embase, and Cochrane and included literature sources dated January 2011 to January 2016. The complete list of search terms consisted of the following: ambulatory surgery, day surgery center, elective surgical procedure, elective operation, elective surgery, schedule, access to care, surgery cancellation, operation cancellation, and surgery delay.*
Findings: *Twenty-three literature sources were identified. Evidence included one randomized controlled trial and multiple studies. Causes of cancellations were classified into three categories: hospital-related reasons, patient-related reasons, and surgeon-related reasons. Evidence confirmed most cancellations were avoidable.*
Conclusions: *Cancellation of scheduled surgeries has a significant impact on patients' health, resources, cost, and quality of care. It is difficult to devise a solution without understanding the cause of cancellations.*

Keywords: *surgery delay, surgery cancellation, elective surgery.*

UNEXPECTED DELAY OR CANCELLATION of elective surgeries has a significant impact on hospital performance and causes undesired patient outcomes.[1] When surgery is canceled for any reason, efficiency is in jeopardy, waiting time increases, patient care may be compromised, resources are wasted, and the cost increases. For instance, in 2007 alone, hospitals in the United Kingdom lost almost $88 million for canceling operations at the last minute because of hospital-related reasons, including lack of preanesthesia evaluation.[2] A research study at Tulane University Medical Center in the United States in 2009 reported that 6.7% of scheduled elective outpatient surgeries were canceled, costing the hospital nearly $1 million.[3] Short notice cancellation has a negative psychological effect on patient satisfaction and causes significant disappointment and frustration for patients and their families.[4] The patient may have arranged for absence from work, a postsurgery escort, or childcare—all of which may be difficult to reschedule.[5] Cancellation affects staff morale and makes dealing with the stressed patient who has waited for surgery to be scheduled difficult for the health care provider.[1] Evidence suggests that the impact of cancellation resulted in the inability of performing surgery within a reasonable time.[4] Prolonged waiting time for surgery coupled with a prolonged hospital stay causes both pain and possible deterioration of the patient's medical condition, which might lead to an impaired recovery.[1] Cancellation of planned elective surgery is a significant problem that negatively affects health care

Narmeen Al Talalwah, BSN, MSc, DNP, RN, Perioperative Department, Johns Hopkins Aramco Healthcare, Dhahran, Saudi Arabia; and Kimberly H. McIltrot, DNP, CPNP, CWOCN, Acute and Chronic Care, Johns Hopkins University School of Nursing, Baltimore, MD.

Conflict of interest: None to report.

Address correspondence to Kimberly McIltrot, Acute and Chronic Care, Suite 462, Johns Hopkins School of Nursing, 525 N. Wolfe Street, Baltimore, MD 21205; e-mail address: kmciltro@jhmi.edu.

1089-9472/$36.00
https://doi.org/10.1016/j.jopan.2017.09.012

quality, harms the patient, and wastes resources.[2] The main purpose of this integrative review is to explore the impact of unanticipated changes in the elective surgery schedule and determine the best interventions to reduce the delay and cancellation rate of surgeries. A secondary purpose is to guide the quality improvement team in measuring improvement and assessing the progress of the implemented interventions.

Background and Significance

The problem of last-minute changes in a surgical schedule is complex and involves multiple clinical systems such as the day surgery unit (DSU), operating room (OR), OR scheduling team, postanesthesia care unit (PACU), and intensive care unit (ICU). When the surgical scheduling team fails to update the DSU about a surgical case sequence change, the patient waiting time for surgery becomes uncertain, nursing assignments change, and workload increases. These consequences distress the DSU nurses, hindering their ability to prioritize patient needs and work as a team. In the event of cancellation, the OR workflow is interrupted, instrument kits previously prepared must be returned to central supply, resources are wasted, and the use of the room is reduced.[6] In a general hospital in Iran, a study conducted for 1 year during 2012 revealed that the average cost per canceled patient was $3,390, with a total cost of almost $92,049.00 for supplies and resources.[7]

Limited health care resources and inefficient scheduling processes significantly affect the decision to perform surgery.[8] When resources become available, the patient will go to the OR and then to the PACU. Unavailability of a bed in the ward or in the ICU leads to patient delay in the PACU for many hours. This delay increases safety risk, leads to poor continuity of care, and increases stress for the patient, families, and staff. Patient dissatisfaction also increases.[1] Research confirms that there is a strong correlation between the cancellation of surgery and adverse psychological concerns.[9]

The delay of surgery has a significant impact on the patient outcome as most surgical patients experience worry and uncertainty while waiting for surgery in the ambulatory surgery unit.[1] Evidence reveals that waiting for transportation to the OR is associated with anxiety and is considered the most frightening experience for surgical patients.[10] The delay in the surgery often causes concern for patients because if the waiting period becomes complicated, a cancellation or a postponement will occur. These problems will most likely impact patient satisfaction negatively.[11] In most cases, a delay is identified as a workflow problem in the microsystem that requires specific consideration to improve patient experience, whereas a cancellation of surgery is a significant problem with far-reaching consequences.

Cancellation on the day of the surgery is widely recognized as a common dilemma with a negative impact not only on the organization, but also on patient outcome. Cancellation and rescheduling may harm patients, influence their quality of life, and increase the cost of conventional treatment.[11] Interestingly, Smith et al[12] indicated that despite the 2% cancellation rate of cardiac surgery, the mortality within 30 days after the cancellation was estimated at 5%, whereas 20% of canceled cases were never performed, so patient health deteriorated.

Methods

Database Search and Definition of Search Terms

A literature search was conducted to identify relevant articles. Four databases were used: PubMed, Embase, CINHAL, and Cochrane. The search terms used to identify relevant articles were combined with Boolean terminology to ensure the combination of an applicable population. The complete list of search terms consisted of the following: ambulatory surgery, day surgery center, elective surgical procedure, elective operation, elective surgery, schedule, access to care, surgery cancellation, operation cancellation, and surgery delay. There was no limitation applied on the type of elective surgery, patient age, or type of admission.

Inclusion Criteria and Exclusion Criteria

Only full-text and peer-reviewed articles on human research were used in this review. Articles published within the last 6 years (January 2011 to January 2017) were considered for this study.

The articles not published in English, and those published beyond the set range, were excluded from the review.

Search Outcome

The search yielded 257 articles that were summarized and screened for inclusion criteria. A total of 126 articles were selected based on appropriate title and were reduced to 48 after abstract review. Ten articles were eliminated from review because of duplication in databases and 12 articles were removed because of the irrelevancy found after screening their full text. A manual search completed postscreening resulted in inclusion of two additional articles. Therefore, 23 articles were included after postscreening the reference list (Figure 1).

Data Extraction and Quality Appraisal

A quality appraisal is an essential step in evaluating the level of evidence and was completed to determine if the study answered the research question. A critique of the studies was also completed, a process that began with an assessment of the relevant studies to draw a reasonable conclusion. Furthermore, the strengths and limitations of each study were examined. Information about methodology, study design, and participants were also reviewed.

Twenty-three relevant studies were considered for this integrated review. The level of evidence was evaluated according to the Johns Hopkins University Research Evidence Appraisal Tool (Box 1). One of the articles included was a level 1A randomized controlled trial study that is a two-arm parallel group. Another study included was a level IIB quasi-experimental study. Twenty-one studies included were level IIIC, categorized as follows: 11 retrospective studies, 5 prospective studies, 2 mixed methods of retrospective and prospective studies, 2 observational studies, and 1 quantitative study.

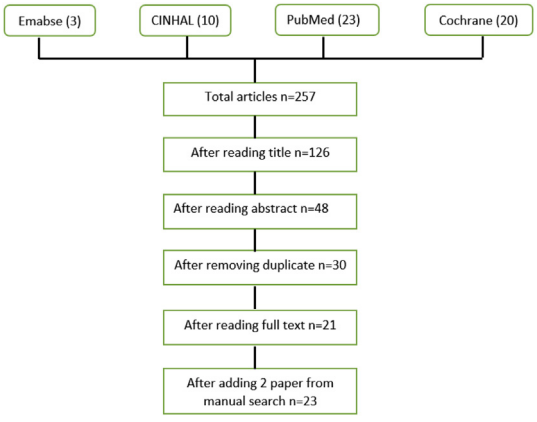

Figure 1. Flow chart of search strategy. This figure is available in color online at www.jopan.org.

Research Question

In elective surgical patients, what are the best practices in scheduling elective surgery to reduce unexpected surgery delay and cancellation?

Findings

Elective surgery cancellation is a multifactorial problem that is documented worldwide and can vary from one hospital to another.[13] Therefore, understanding the reasons for cancellations is essential to reduce the cancellation rate.[4,14] Literature revealed that cancellations were classified into two categories: preventable and nonpreventable. Evidence suggests that 86.5% of cancellations were preventable, whereas 13.5% were nonpreventable.[15] In addition, several studies classified the causes of cancellation into three broad classes: hospital-related, patient-related, and surgeon- or anesthesia-related causes.

Hospital-Related Causes (Administrative/ Logistic)

Most causes of surgical cancellation were related to hospital- and administration-related causes such as unavailable OR time, prioritizing emergency cases, failed or missing equipment, insufficient planning of surgery, and lack of hospital beds and personnel. Unavailable OR time was considered the highest cause of surgery cancellation as reported by several studies.[5,16-18] Dimitriadis et al[5] reported a cancellation rate of 17.5%, whereas other studies such as Chalya et al[13] reported a cancellation rate of 53%. Kumar and Gandhi[19] reported a cancellation rate of 63%, and Talati et al[6] reported a cancellation rate of 78.1%.

Prioritization of emergency cases was listed in two studies[13,20] and accounted for 7.2% of the cancellation rate.[16] Cancellation related to missing equipment or failure of equipment varied among

Box 1. Individual Evidence Summary Tool

EBP Question:
Date:

Article No.	Author and Date	Evidence Type	Sample, Sample Size, and Setting	Study findings that help answer the EBP question	Limitations	Evidence Level and Quality

studies. For example, a low cancellation rate was reported by Schuster et al[16] and Dimitriadis et al[5] at 0.2% and 2.4%, respectively, followed by a cancellation rate of 5.5% reported by Dhafar et al.[15] Ezike et al[17] and Chalya et al[13] reported slightly higher cancellation rates at 17.5% and 28%, respectively. Nevertheless, another three studies confirmed that lack of equipment was indicated in many facilities without stating the rate of cancellation.[18-20]

Insufficient planning of surgery indicated that improper scheduling was responsible for a cancellation rate of 4.8%.[4,14] Similarly, a cancellation rate of 5% was documented by Schuster et al,[16] with 5% of the studies conducted in community hospitals. Changes in surgical schedule lead to surgery cancellation.[6,18-20] Moreover, there was a significant variation in cancellation reported by Kumar and Gandhi[19] at 1.2% and Bathala et al[21] at 7.6% because of differences in the sample size. Kumar and Gandhi[19] analyzed causes of cancellation for all elective surgeries, whereas Bathala et al[21] assessed reasons for cancellation for only ear, nose, and throat elective surgeries. One of the study limitations in both studies[19,21] was that the reason for cancellations was recorded by unit staff, which may possibly introduce a bias for data collection. Another limitation in Bathala et al[21] was that data collection for patients aged less than 16 years was under-reported, which may influence the overall findings of the study.

Lack of hospital beds was also considered as one of the major contributing factors that lead to case cancellation.[15,17,18,20] Interestingly, Schuster et al[16] reported a cancellation rate due to lack of beds with a mean value of 3.1% among the different types of facility settings, including general surgery, which accounted for 4.6%; the trauma orthopaedic population at 3%; and the urology population at 1.8%. Unlike the findings documented by Dimitriadis et al[5] 21.7% cases were canceled because of unblocking surgery beds for elective cases. There was a small percentage of reported cancellation (0.4%) in one of the studies that only examined the orthopaedic population.[20] Similarly, a study reported one significant finding of 0.05% after the analysis of a single genitourinary population in a national hospital.[17]

Personnel and absence of staff also lead to cancellations, and a rate of 2.6% was reported by Caesar et al,[20] who only focused on the orthopaedic population, whereas Ezike et al[17] reported that 26.5% of cancellations were because of the unavailability of the surgeon. This study was completed in a referral hospital. Surgeon unavailability also accounted for 14% of cancellations in a study conducted in a university teaching hospital.[13]

Schuster et al confirmed that hospital size had an independent effect on the surgical cancellation rate in academic hospitals, which had a significantly higher cancellation rate than nonacademic hospitals because of unpredictability of emergency operations. This study revealed that academic hospital cancellations were 2.2% higher than large community hospitals. Furthermore, Dimitriadis et al[5] conducted a retrospective review of case cancellation in two community hospitals and reported a low cancellation rate of 5% because of patient-related reasons in comparison to a cancellation rate of 16% because of

administrative-related reasons, such as lack of equipment. Similarly, two studies reported a high incidence of surgical cancellations in academic hospitals[13,17]; Chalya et al[13] reported a cancellation rate of 28%, and Ezike et al[17] reported a rate of 35%. However, Dhafar et al[15] reported a cancellation rate of 7.6% for a study conducted in a small community hospital. The variations in the percentage of cancellations reported previously were because of the various types of hospitals included in the studies, such as university hospitals, community hospitals, referral hospitals, and small hospitals (Table 1). In addition, procedures, hospital polices, and management practices vary among these hospitals.

Patient-Related Causes

Cancellation because of patient-related factors occurred because of several reasons, such as patient absenteeism, self-cancellation, financial constraints, medical reasons, and inadequate preoperative assessments (POAs). Case cancellation because of patient no-show was reported at a rate of 20% by both Dhafar et al[15] and Kumar and Gandhi,[19] whereas Appavu et al[28] and Bathala et al[21] reported a cancellation rate of 63% and 65%, respectively, because of patient absenteeism. Comparatively, the cancellation rate because of self-cancellation at a patient's request was 3.8%.[21] Dhafar et al reported a self-cancellation rate of 4.7%, and two studies[5,16] reported a self-cancellation rate of 6.8%. Ezike et al[17] reported that 25% of canceled cases were because of patient-related reasons, such as failure to turn up on the day of surgery, incompliance with preoperative instruction, and refusing surgery on the day of scheduled surgery. The inadequate POA was associated with 10% to 20% of cancellations in 2011.[17] However, a study published a year later reported a significant reduction in surgery cancellation at 2.1%.[13]

In addition, there was a debate in research about cancellations that occurred because of the patient's medical condition. Chalya et al[13] stated that 17.5% of cancellations were related to uncontrolled hypertension and diabetes mellitus. As a result, these types of cancellations significantly increased the patient's length of stay ($P < .001$). Moreover, insufficient POA accounted for 11.6% cancellations.[19] Other studies highlighted a noticeable reduction in cancellation incidents because of the role of the preadmission clinic and the use of a standardized preadmission protocol for operative patients at 8.2%, reported by Talati et al,[6] and 5.1%, documented by Dhafar et al.[15]

Surgeon- or Anesthesia-Related Causes

Unavailability of the surgeon, lack of anesthesia staff, failure to administer anesthesia, and overbooking are examples of physician-related causes that may lead to cancellation. On one hand, surgeon unavailability is considered one of the cancellation reasons identified in many studies, providing a range of 2.6% to 41%.[13,15-17] One study revealed that overbooking was responsible for at least 77.4% of cancellations.[17] Another cancellation reason was anesthesia-related matters. Included were documented cases where failure to administer anesthesia accounted for 0.07% and 22.7% in two studies.[13,16] A cancellation rate of 31.8% was reported due to lack of anesthesia facilities, whereas a rate of 36.4% was reported due to an inadequate number of anesthesiologists.[13]

To sum up, reasons for surgical cancellation varied among studies (Figure 2). However, most of the literature related a high incidence of cancellation to hospital and administrative causes.[5,13,16-18,20] Of these studies, the leading cause of cancellation was due to lack of OR time. The second leading cause of cancellation was identified as patient-related reason, with patient absenteeism on the day of surgery being the most frequent reason followed by lack of POA before the surgery date. Unavailability of surgeons or anesthesia service was the least likely cause of cancellation among the studies.

Discussion

Cancellation of elective operations per surgical specialty was identified in several studies. Evidence confirmed that general surgery and orthopaedic surgeries are the most frequently canceled surgeries. In 2011, two studies conducted in academic hospitals reported that general surgery cancellation was the highest, with a rate of 21% because of patient-related reasons[16] and 31% because of hospital-related reasons.[13] This is followed by the cancellation rate of orthopaedic surgery.[13,16] Similar findings were also reported due to the lack of operating time, as presented in a

Table 1. Cancellation Rate According to the Type of Hospital

Study	University Hospital (Academic)	Large Community/ Governmental Hospital	Small Community	Cancellation Percentage
Schuster et al[16]	Yes	Yes	Yes	2.2% higher than large community compared with 0.5% for small community hospital
De Avila et al[22]	Yes			19%
Boudreau and Gibson[23]	Yes			6%
Cihoda et al[24]	Yes			16.1%
Talati et al[6]	Yes			22.5%
Ehrenfeld et al[25]	Yes			11.6%
				10.7%
Chalya et al[13]	Yes			21%
Talati et al[6]	Yes			22.5%
Ezike et al[17]	Yes			35.8%
Caesar et al[20]		Yes		39%
Singhal et al[26]		Yes		10%
Sultan et al[27]		Yes		23.7%
Dimitriadis et al[5]		Yes		5.19%
Pohlman et al[4]		Yes		13.3%
Kumar and Gandhi[19]		Yes		17.6%
Hewawasam and Maduwanthi[18]			Yes	6%
Bathala et al[21]			Yes	4.5%
Wang et al[14]			Yes	12.7%
Hovlid et al[11]			Yes	4.9%
Dhafar et al[15]			Yes	7.6%

study conducted in a large community hospital by Kumar and Gandhi.[19] In contrast, another study conducted in 25 community hospitals in Saudi Arabia reported a total of 2,387 patients scheduled for orthopaedic surgeries. Of these scheduled surgeries, 419 were canceled, resulting in a cancellation rate of 17.6%. A total of 4,426 patients were scheduled for general surgery, and of these, 340 were canceled, resulting in a cancellation rate of 7.7%.[15] The most common causes of cancellations in these hospitals were patient-related reasons. Most significantly, university hospitals had higher cancellation rates than smaller hospitals and general surgery has highest cancellation incidents among the service because of the highest number of patients scheduled for general surgery. In addition, Cihoda et al[24] reported cancellations of orthopaedic surgeries as the highest among other specialties at 32.4%, followed by a general surgery cancellation rate of 21.4%, with patient-related reasons being the main reason for cancellations.

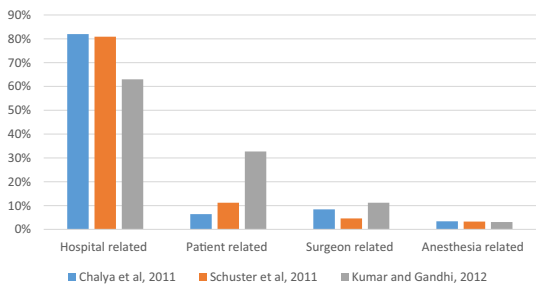

Figure 2. Reason of surgery cancellation categories. This figure is available in color online at www.jopan.org.

Cancellation reasons vary among the studies, and cancellation rates vary among specialties. In two studies, the highest cancellation rate of cardiovascular surgeries was because of hospital-related reasons such as lack of an ICU bed postoperation.[21,24] However, another two studies reported that cancellation of ear, nose, and throat surgeries attributed to patient nonattendance and

accounted for a range of 5% to 20% of the cancellation rate.[24,27]

Number of Canceled Cases Versus Number of Canceled Minutes

Only one of the studies included in this review assessed cancellation rates based on the cases scheduled versus the estimated minutes of scheduled surgery, aiming to evaluate OR performance.[25] The calculation of the amount of canceled cases and the amount of canceled minutes reported no significant financial impact on the productivity of the OR as the workload is interchangeable. However, a short case cancellation may have less impact on the surgeon's productivity when compared with long case cancellation because of time and resources wasted. The study recommended further research to examine the differences between cancellations based on a number of cases and cancellations based on the estimated duration of surgery to determine the impact on the productivity of surgeons accurately.

Cancellation Frequency

The frequency of cancellation was examined in two studies[13,20] and revealed that some patients experienced a cancellation at least once, whereas others had experienced cancellations more than one time (Figure 3). These cancellations are certainly associated with an adverse outcome for both patients and the health care system, leading to unnecessary stresses for patients, lost trust in health care services, wasted budget because of loss of surgery slot, and the consequential burden of accommodating canceled cases. Chalya et al[13] highlighted that approximately one-third of cancellations were based on patient request, whereas Caesar et al[20] indicated that 82% of cancellations were due to lack of OR time, which was confirmed to be the highest administrative reason responsible for 63% and 78% of cancellations.[5,19]

Cancellation Rate According to the Type of Hospital

Table 1 highlighted that academic settings had much higher cancellation rates than nonacademic settings. In other words, university hospitals had the highest cancellation rates, followed by large community hospital cancellations due to lack of resources. Small community hospitals were shown to have the lowest cancellation rate.[15] The main reason for cancellations was because of administrative reasons and lack of POA before surgery. Another study conducted in a university hospital in Brazil reported a 16.1% cancellation rate because of patient absenteeism.[24] Similarly, a governmental hospital with a 500-bed capacity had a 17.6% cancellation rate attributed to lack of OR time and patients not showing up on the day of surgery.[19] One study conducted in a rural setting reported a high cancellation rate of elective gynecological surgery at 12.7% when compared with a developed country.[14] Cancellation rates were attributed to factors such as limited access to care, poverty of the population, and language barriers, which lead to difficulty in understanding treatment. Overall, cancellations in larger hospitals were because of patient absenteeism and lack of POA.

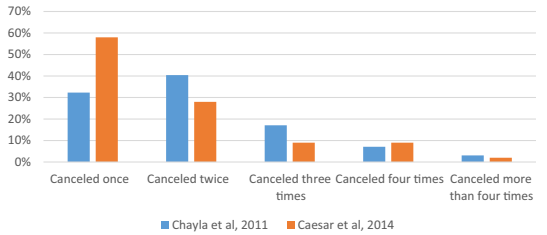

Figure 3. Frequency of surgery cancellation. This figure is available in color online at www.jopan.org.

Preoperative Telephone Confirmation Intervention

Three studies evaluated the effectiveness of phoning preoperative patients to confirm attendance on the surgery date. De Avila et al[22] reported that preoperative phoning led to a significant reduction in the cancellation rate, from 18% to 5.4%. Correspondingly, Singhal et al[26] used a similar intervention and found that the rate of cancellation was reduced from 10% to 1.6% ($P = .01$), and cost was reduced from £25,881 to £1,650 ($P < .001$). A recent randomized controlled trial examined a preoperative seven-item telephone checklist and reported the rate of cancellation before the intervention as 3.6%. After the intervention, the rate of cancellation dropped to 0.3% ($P = .46$).[29] In addition, Hovlid et al[11] evaluated the intervention of contacting patients 2 days before the surgery date as part of the surgery

pathway with other elements. The evaluation not only reported a reduction in the cancellation rate, but also, with continued education for more than 2 years, there was a noticeable increase in operations performed. Kaye et al[30] reported that the preoperative call is an essential element that not only reduced the surgery cancellation rate, but also reduced the patient no-show rate significantly from 26% to 10.8%.

Study Limitation

Because of gaps in the literature, several limitations identified in this literature review may influence the translation of the evidence and affect the decision to apply such interventions. Some studies were conducted for a short period and did not take into consideration the variation in cancellation because of seasonal illness or weather-related matters such as ice and snow, which may prevent a patient's transport to the hospital.[4,20] However, studies conducted for a longer period also had some limitations. For example, one of the studies included did not indicate any measure taken to overcome adverse events during data collection, which may influence findings.[13] Also, the reliability and number of independent observers were not assessed in some studies, which is an essential component in observational studies to validate and overcome any disagreement that may influence findings.[15,20]

In addition, some studies reported that data collection was completed by the nursing staff, which may have under-reported the population group,[18,21] whereas another study allowed the OR manager to categorize case cancellation under more than one category.[15] In one of the studies, the surgeon was allowed to prepare his OR schedule and reserve a surgical slot for emergency cases, and the ward anesthesiologist evaluated patients. However, difficult cases appeared to be a concern for the anesthesia consultant as anesthesia was not involved in the decision of the surgery date and preoperative preparation.[17] This study was a retrospective study with its own limitations in the collecting of data from the past and the difficulty in assessing confounding factors that might influence the outcome. Similarly, Hovlid et al[11] confirmed that acknowledging causality between interventions and observed findings was difficult to prove in his retrospective study. In addition, the setting varied among studies, so special consideration should be given to setting type.

Implications for Clinical Practice and Research

Evidence supports that reducing the cancellation rate cannot be achieved without addressing each reason.[27] Cancellation of elective surgeries because of prioritizing emergency cases was identified and found to be the cause for cancellation in 9% of scheduled surgeries.[20] Therefore, separating emergency from elective cases, blocking an OR, and assigning staff for emergency cases results in an improvement in the quality of care and reduction in cancellation.[13,20]

Similarly, poor preoperative medical optimization was responsible for approximately 40% of cancellations[15] and 38.7%.[18] Studies recommended addressing cancellations through POA in a preadmission clinic.[15,26] Further studies recommended that POA be done within 30 days before the surgery to increase patient compliance with preoperative instructions and reduce no-show patients on the day of surgery.[5,24] Equally, a surgery coordinator or nurse-led preoperative clinic with centralized patient preparation, including a nurse role in educating the patient and family for surgery preparation, also reduced the cancellation rate from 10% to 1.6% ($P = .01$).[22] Furthermore, reducing patient absenteeism on the day of surgery can be approached by calling patients 2 days before the surgery date to confirm attendance and assess patient compliance with a preoperative instruction, which has proven to reduce the cancellation rate by 30%.[26] Although cancellation on the day before surgery may be inconvenient, Dimitriadis et al[5] stated that some arrangement could be made to minimize waste of resources, such as scheduling another patient, adjusting staff, or possibly allocating staff for other tasks.

Chalya et al[13] reported cancellation rates of 53% due to lack of OR time and inadequate OR staff, whereas Kumar and Gandhi[19] reported a cancellation rate at 63% for similar reasons. Therefore, redesigning the scheduling process along with the involvement of the multiprofessional team to ensure availability of adequate staff and resources

is critical in managing not to overbook and reducing potential reasons for cancellation.

Caesar et al[20] reported that 33% of cancellations were related to the patient's request to have surgery at a later date, to reschedule because of family reasons, or being unable to wait and choose other alternatives. Therefore, patient involvement in choosing the day of surgery can reduce self-cancellation, and the concept of the patient being integrated into the health care system may reduce patient disappointment and lead to a positive outcome and increase patient trust in the services provided.

Translating Evidence into Practice

Translating evidence into practice and implementing interventions to reduce surgical cancellation require support from the organization's management team, along with the approval from all stakeholders. Key members include the OR scheduling team, chief of nursing and medical staffing (anesthesia and surgeon units), quality improvement team, and frontline nursing staff. Considering the culture of the organization and identifying the causes for surgical cancellations are essential steps in establishing appropriate interventions that will apply to the population at Johns Hopkins Aramco Healthcare. Therefore, the author reviewed the most common reasons for surgery cancellation and selected three interventions to reduce the cancellation rate accordingly.

The first intervention is to block a surgical slot for emergency cases; however, the implementation of this intervention requires a special arrangement as blocking some surgical slots may result in reducing utilization and increasing the waste of resources if slots are not used. In addition, redesigning the surgical scheduling process and considering bed occupancy and securement of a hospital bed for same day postoperative patient after surgery is essential. Improper scheduling accounted for 41% of cancellations at Johns Hopkins Aramco Healthcare because of unbalanced scheduling of day surgery and same-day admission cases, as well as a lack of consideration to the bed occupancy status. When hospital beds are not available, the postoperative patient is held in the PACU for many hours, thus causing patient and nurse dissatisfaction with the medical service provided.

Several incidents have been reported where a hospital has experienced a high bed occupancy resulting in unavailable beds in the ICU. As a result, the postoperative patient was held in the PACU. In other scenarios, patient safety was also compromised because of the premature transfer of another ICU patient to a regular ward to accommodate the postoperative patient. In fact, elective surgical cases are scheduled without predicting the demands for the ICU bed from an emergency room or add on the case. Nevertheless, the literature examined the link between the number of elective surgical cases and availability of ICU beds. Developing a methodology aimed to control some elective cases and secure ICU beds accordingly required blocking some of the surgical schedule slots. These blocked surgery slots would be used to shift and reschedule elective cases relative to bed availability. Consequently, the patient could be waiting for at least 2 months, and some patients may not be able to wait.[31]

Therefore, the organization established a daily bed huddle to discuss bed occupancy, admission, discharge and operational needs. This proactive process resulted in reducing waiting time for hospital beds and better use of hospital staff. The need for an ICU bed was also discussed during bed huddle meeting and between anesthesiologist and intensivist before commencing surgery and resulted in a significant improvement in communication among anesthesiologists.

A possible second intervention is proposing a teaching role for the preoperative nurse to educate the patient and family about preparations for surgery. The educational role of the preoperative nurse could detect illness in the immediate preoperative period and consequently prevent cancellation. The need was identified due to frequent incidents of changes in patient medical conditions and patient failure to show up for the surgery date that led to cancellations. Patients tend to forget essential information provided during the POA in preadmission clinic and patients may benefit from instruction reinforced during the preoperative call.

A third intervention could be standardizing a preoperative checklist in which patients will receive a telephone call 2 days before surgery. The main purpose of this preoperative call is to confirm patient attendance, surgery preparation, and escort availability. Such a call could also address patient questions about the preoperative instructions.

On one hand, the translation of evidence has some positive aspects, which would require obtaining initial approval from management and frontline staffing. The aim would be the improvement in patient outcome and reduction in cost, along with the improvement in utilization and efficiency. The addition of the quality improvement team will assist in measuring improvement and assessing the progress of the implemented interventions. This strategy may include some limitations, such as having a large multidisciplinary team who may have various levels of interest and understanding of the whole process. This may slow down the return of evidence to indicate improvement after the implementation of the interventions. However, effort must be made to highlight the significance of the problem, identify barriers to the implementation of the interventions, and the importance of achieving the desired outcome of improved patient care, along with efficient and cost-effective management of resources and staff.

Conclusions

Surgical cancellations are a significant quality issue in health care. These cancellations are associated with the undesired outcome of wasting resources, patient dissatisfaction, and increased health care costs. It is essential to analyze the reasons for cancellation to reduce the cancellation rate. Most cancellation causes are preventable.

The findings of this literature review provided sufficient recommendations for interventions that will assist in reducing cancellation of elective surgery. However, special attention must be given to cancellation causes at one's individual hospital when implementing interventions. Every effort should be made to enhance cost-effectiveness and efficiency as well as to prevent unnecessary cancellations.

References

1. Magnusson H, Fellander-Tsai L, Hansson M, Ryd L. Cancellations of elective surgery may cause an inferior postoperative course: The 'invisible hand' of health-care prioritization? *Clin Ethics*. 2011;6:27-31.
2. McIntosh B, Cookson G, Jones S. Canceled surgeries and payment by results in the English National Health Service. *J Health Serv Res Policy*. 2012;17:79-86.
3. McCook A. *Cancelled Surgeries Costing Hospitals Millions*. Anesthesiology News – 2015. Available at: http://www.anesthesiologynews.com//ViewArticle.aspx?ses=ogst&d=Policy+%26+Management&d_id=3&i=ISSUE%3a+May+2012&i_id=839&a_id=20765#. Accessed October 18, 2016.
4. Pohlman G, Staulcup S, Masterson R, Vemulakonda V. Contributing factors for cancellations of outpatient pediatric urology procedures: Single center experience. *J Urol*. 2012;188:1634-1638.
5. Dimitriadis P, Iyer S, Evgeniou E. The challenge of cancellations on the day of surgery. *Int J Surg*. 2013;11:1126-1130.
6. Talati S, Gupta A, Kumar A, Malhotra S, Jain A. An analysis of time utilization and cancellations of scheduled cases in the main operation theater complex of a tertiary care teaching institute of North India. *J Postgrad Med*. 2015;61:3.
7. Maimaiti N, Rahimi A, Afzal Aghaie L. Economic impact of surgery cancellation in a general hospital. *Iran Ethiop J Health Dev*. 2016;30:92-95.
8. Sanjay P, Dodds A, Miller E, Arumugam P, Woodward A. Canceled elective cancellations of outpatient pediatric urology procedures: Single center experience. *J Urol*. 2007;188:1634-1638.
9. Ivarsson B, Larsson S, Sjoberg T. Postponed or canceled heart operations from the patient's perspective. *J Nurs Manag*. 2004;12:28-36.
10. Al-Hakim L, Gong XY. On the day of surgery: How long does preventable disruption prolong the patient journey? *Int J Health Care Qual Assur*. 2012;25:322-342.
11. Hovlid E, Bukve O, Haug K, Aslaksen A, von Plessen C. A new pathway for elective surgery to reduce cancellation rates. *BMC Health Serv Res*. 2012;12:154.
12. Smith M, Mauermann W, Cook D, Hyder J, Dearani J, Barbara D. Same-day cancellation of cardiac surgery: A retrospective review at a large academic tertiary referral center. *J Thorac Cardiovasc Surg*. 2014;148:721-725.
13. Chalya P, Gilyoma J, Mabula J, et al. Incidence, causes and pattern of cancellation of elective surgical operations in university teaching hospital in the lake zone Tanzania. *Afr Health Sci*. 2011;11:438-443.
14. Wang T, Samaranayaka C, Tout S. Cancellation on the day of elective gynecological surgery: The Counties Manukau Experience. *N Z Med J*. 2013;126:96-99.
15. Dhafar K, Ulmalki M, Felemban M, et al. Cancellation of operations in Saudi Arabian hospitals: Incidence, reasons, and suggestions for improvements. *Pakistan J Med Sci*. 2015;31:1027-1032.
16. Schuster M, Neumann C, Neumann K, et al. The effect of hospital size and surgical service on case cancellation in elective

surgery: Results from a prospective multicenter study. *Anesth Analg*. 2011;113:578-585.

17. Ezike H, Ajuzieogu V, Amucheazi A. Reasons for elective surgery cancellation in a referral hospital. *Ann Med Health Sci*. 2011;1:197-202.

18. Hewawasam G, Maduwanthi A. Cancellation of elective surgical procedures in the Genito-Urinary section of National Hospital of Sri Lanka—Can we do better? *Sri Lankan J Anaesthesiol*. 2013;21:68-71.

19. Kumar R, Gandhi R. Reasons for cancellation of operation on the day of intended surgery in a multidisciplinary 500 bedded hospital. *J Anaesthesiol Clin Pharmacol*. 2012;28:66.

20. Caesar U, Karlsson J, Olsson L, Samuelsson K, Hansson-Olofsson E. Incidence and root causes of cancellations for elective orthopedic procedures: A single center experience of 17,625 consecutive cases. *Patient Saf Surg*. 2014;8:24.

21. Bathala S, Tardolli A, Jaramillo M, Morgan N, Thomas M. Cancellations in elective ENT surgery. *Br J Healthc Manage*. 2013;19:136-139.

22. De Avila MG, Bocchi SM. Telephone confirmation of patient's intent to be present for elective surgery as a strategy to reduce absenteeism. *Rev Esc Enferm USP*. 2013;47:189-193.

23. Boudreau S, Gibson M. Surgical cancellations: A review of elective surgery cancellations in the Tertiary Care Pediatric Institution. *J Perianesth Nurs*. 2011;26:315-322.

24. Cihoda J, Alves J, Fernandes L, de Souza Neto E. The analysis for the causes of surgical cancellations in a Brazilian University Hospital. *Care Manag J*. 2015;16:41-47.

25. Ehrenfeld J, Dexter F, Rothman B, Johnson A, Epstein R. Case cancellation rates measured by surgical service differ whether based on the number of cases or the number of minutes cancelled. *Anesth Analg*. 2013;117:711-716.

26. Singhal R, Warbuton T, Charalambous C. Reducing same day cancellations due to patient-related factors in elective orthopedic surgery. *J Perioper Pract*. 2013;24:70-74.

27. Sultan N, Rashid A, Abbas S. Reasons for cancellation of elective cardiac surgery at Prince Sultan Cardiac Centre, Saudi Arabia. *J Saudi Heart Assoc*. 2012;24:29-34.

28. Appavu S, Al-Shekaili S, Al-Sharif A, Elawdy M. The burden of surgical cancellations and no-shows: Quality management study from a large regional hospital in Oman. *Sultan Qaboos Univ Med J*. 2016;16:e298-e302.

29. Gaucher S, Boutron I, Marchand-Maillet F, Baron G, Douard R, Béthoux J. Assessment of a standardized preoperative telephone checklist designed to avoid late cancellation of ambulatory surgery: The AMBUPROG Multicenter Randomized Controlled Trial. *PLoS One*. 2016;11:e0147194.

30. Kaye A, McDowell J, Diaz J, Buras J, Young A, Urman R. Effective strategies in improving operating room case delays and cancellations at an academic medical center. *J Med Pract Manage*. 2015;30:24-29.

31. Kolker A. Process modeling of ICU patient flow: Effect of daily load leveling of elective surgeries on ICU diversion. *J Med Syst*. 2008;33:27-40.