

# Cancellation of elective surgery: rates, reasons and effect on patient satisfaction

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**Background:** The cancellation of elective surgeries is a major problem that increases wait times, exacerbates costs and can negatively affect patients, both psychologically and physically. Our objectives were to investigate the reasons for cancellations across specialties at a single centre, to compare these reasons with previous data from the same centre between 2005 and 2009 and to examine how cancellations affected patients' lives and views of the medical system in cases when the cancellations were potentially preventable.

**Methods:** Cancellation records of all elective surgeries scheduled between June 1, 2012, and Jan. 31, 2016, at a medium-sized, tertiary care, academic centre were retrospectively reviewed. We evaluated the rates and reasons for cancellation and interviewed a subset of patients whose surgery was cancelled for a potentially preventable reason (i.e., operating room running late, bed shortage, emergency case took place of scheduled surgery).

**Results:** Across 11 surgical specialties, 2933 of 20 881 surgeries (14.0%) were cancelled and of these, 2448 (83.5%) were for administrative or structural reasons. Compared with the data collected previously for general, gynecological and urological procedures, cancellation rates increased from 8.1% to 11.8%. Although patients reported inconvenience, they were generally satisfied with the availability and the quality of the health care they received.

**Conclusion:** Consistent with the previous study, our data suggest that most cancellations occur because of administrative or structural processes that are potentially preventable. Targeting these processes may help to reduce cancellations for elective surgeries and thereby improve economic efficiency and patient outcomes.

**Contexte :** L'annulation des chirurgies électorives est un problème majeur qui allonge les temps d'attente, fait gonfler les coûts et peut affecter négativement les patients, tant psychologiquement que physiquement. Nos objectifs étaient de découvrir les raisons des annulations dans les diverses spécialités d'un seul centre, afin de comparer ces raisons à des données antérieures du même centre recueillies entre 2005 et 2009 et d'examiner en quoi les annulations affectent la vie des patients et leur perception du système médical dans les cas où les annulations auraient pu être évitées.

**Méthodes :** Les dossiers d'annulation de toutes les chirurgies électorives entre le 1<sup>er</sup> juin 2012 et le 31 janvier 2016 dans un centre hospitalier universitaire de soins tertiaires de taille moyenne ont été analysés de manière rétrospective. Nous avons évalué les taux d'annulation et les motifs, et interrogé un groupe de patients dont la chirurgie a été annulée pour des raisons potentiellement évitables (p. ex., retards au bloc opératoire, manque de lits, priorisation de cas plus urgents).

**Résultats :** Entre les 11 spécialités chirurgicales, 2933 des 20 881 chirurgies (14,0 %) ont été annulées et parmi elles, 2448 (83,5 %) pour des raisons administratives ou structurelles. Comparativement aux données précédemment recueillies pour les interventions générales, gynécologiques et urologiques, les taux d'annulation ont augmenté de 8,1 % à 11,8 %. Même si les patients ont déploré des inconvénients, ils se sont généralement déclarés satisfaits de la qualité des soins reçus et de leur accessibilité.

**Conclusion :** Comme lors de l'étude précédente, nos données suggèrent que les causes les plus fréquentes d'annulation sont liées à des marches à suivre administratives ou structurelles qui sont potentiellement évitables. Cibler ces marches à suivre pourrait contribuer à réduire le nombre d'annulations de chirurgies électorives et améliorer de ce fait l'efficacité économique et les résultats chez les patients.

The cancellation of elective surgeries is a long-standing problem faced by many countries worldwide, including Canada. Operating rooms (ORs) are a major source of revenue and expenditure for many hospitals, and inefficiencies in their use often result in cancellations of elective surgeries.<sup>1</sup> The cancellations then, in turn, exacerbate inefficiencies by disrupting the continuity of the workflow and affect provider morale across multiple departments.<sup>2</sup> Cancellations also increase surgical wait times, increase costs and can have a major effect on patients and their families.<sup>3</sup> Psychological effects include disappointment, frustration and dissatisfaction.<sup>3</sup> In Canada's publicly funded health care system, patients often wait for months for surgery and may have rearranged their lives with caregivers and child care, taken time off of work or travelled long distances, only to have surgery cancelled at the last minute. Delays in medically necessary surgery may also worsen health outcomes.<sup>4,5</sup>

Cancellation rates reported in the literature are highly variable but can be as high as 39%, with substantial differences depending on hospital type, national health care systems or policies, geographical region, patient population, providers and the perioperative management practices at that particular institution.<sup>2,3</sup> Evidence suggests that most surgical cancellations are administrative in nature and are preventable.<sup>3</sup> However, to prevent such cancellations, it is first essential to thoroughly understand the reasons for their occurrence.<sup>3</sup> Previous work from our centre evaluated cancellation rates and reasons for cancellation across 3 surgical services (general surgery, gynecology and urology) and suggested that each cancellation should be treated as an adverse event, with documentation of the sequence of events that led to the cancellation.<sup>6</sup>

The objectives of this study are to evaluate the incidence of elective surgery cancellations at a single, tertiary care, academic centre across various surgical services, to identify the most common reasons for cancellation and to compare current data with previous data from the same centre.<sup>6</sup> We also sought to interview a subset of patients for whom surgery was cancelled for potentially preventable administrative issues to determine how it affected their lives and views of the health care system.

## METHODS

We conducted this study at Kingston Health Sciences Centre (Kingston General Hospital site), a medium-sized (i.e., 471 beds), tertiary care academic teaching hospital in Kingston, Ontario. Using the hospital's patient management database, we retrospectively reviewed cancellation records of all elective surgeries that were scheduled to occur between June 1, 2012, and Jan. 31, 2016. We collected patient age, sex, American Society of Anesthesiologists (ASA) classification of physical status, estimated case duration, surgical procedure,

scheduled surgical date, arrival time at the hospital's Same Day Admission Centre, time of cancellation and reason for cancellation. Eleven surgical services (i.e., cardiac surgery, dental surgery, general surgery, gynecology, neurosurgery, orthopedic surgery, otolaryngology, plastic surgery, thoracic surgery, urology and vascular surgery) were included in the study. Same-day cancellations were defined as any surgery listed on the OR schedule that did not occur on the day it was scheduled.

The patient management database contains 50 different cancellation codes. We reduced these 50 codes to 28 by regrouping similar codes (e.g., combining the codes for "no bed," "no intensive care unit bed," "no step-down bed" and "no recovery bed" into 1 code, "bed shortage"). We subsequently reclassified the 28 codes into 3 broad reasons for cancellation: medical (e.g., change in medical condition), patient-related (e.g., patient cancelled) and administrative or structural (e.g., bed shortage). Two investigators independently classified codes; any discrepancy was discussed and subsequently re-evaluated until an agreement was reached.

We compared the results from our study to those of a previous study at the same centre. The previous study included an analysis of cancellation rates for 3 surgical services (general surgery, urology and gynecology) between January 2005 and December 2009.<sup>6</sup> Both studies were consistent in their definition of same-day cancellations, defined as any surgery listed on the OR schedule that did not occur the day it was scheduled.<sup>6</sup> In the previous study by Leslie and colleagues, reasons for cancellation were classified into patient-related, process-related and structure-related categories.<sup>6</sup> Given the differences in classifications between the current and previous studies, we did not draw comparisons between categories. However, we were able to directly compare the frequencies of the most prevalent, potentially modifiable, reasons for cancellation in both studies, including "OR running late," "standby patient cancelled," "bed shortage" and "emergency case took place of scheduled surgery." Patients listed as "standby" were classified as such by the surgical service if the estimated time of booked cases was greater than the OR time available, as predicted by the patient management database or at the discretion of the surgeon.

One investigator (W. X. K.) also conducted a standardized telephone interview to evaluate the effect that the most common and potentially preventable cancellations had on patients' lives and their opinions of the health care system. We interviewed patients who were 18 years or older and who had a surgery cancelled between June 1 and Dec. 31, 2015, because of a common administrative or structural reason, namely "OR running late," "bed shortage" and "emergency case took place of scheduled surgery." We excluded standby patients from the interview, as they were scheduled for surgery later in the day with a warning that their surgery may be cancelled, which could

have potentially biased their interview responses. However, we included these patients in the overall analysis, with “standby cancellation” treated as an independent reason for cancellation to allow comparison with the previous study from our centre.<sup>6</sup> We chose the dates to ensure that patients were interviewed at least 1 year, but no more than 18 months, after their cancellation. We designed interview questions based on a review of the literature and previous work from the same centre.<sup>6</sup> To our knowledge, there are no validated tools against which our interview tool could be validated. However, we circulated the interview among staff at our centre to ensure clarity and revised it accordingly before contacting patients for an interview. This process provided some degree of face and content validity. The first half of the interview documented patient cancellation details (e.g., demographic variables, surgical characteristics) using multiple choice questions. The remainder evaluated patient perspectives according to a 5-point Likert scale.

### Statistical analysis

We completed data analyses using Microsoft Excel and IBM SPSS version 24. Fisher exact tests were used for exploratory analyses to assess the effect of demographic variables and the surgical characteristics surrounding the cancellation on the patients’ life and views of the medical system.

### Ethics approval

This study was approved by the Queen’s University Faculty of Health Sciences and Affiliated Teaching Hospital’s Research Ethics Board (ANAE-286-15).

## RESULTS

The demographic characteristics for patients with surgical cancellations ( $n = 2933$ ), those contacted for a telephone interview ( $n = 175$ ), the respondents ( $n = 72$ ) and non-respondents ( $n = 103$ ) are shown in Table 1. A total of 20881 elective surgeries across 11 surgical services were

scheduled between June 1, 2012, and Jan. 31, 2016. Of these, 2993 (14.0%) were cancelled on the day of surgery (Table 2). Cancellation rates varied according to surgical service. Neurosurgery and vascular surgery had the highest cancellation rates (20.8% and 20.5%, respectively). Gynecology and thoracic surgery had the lowest cancellation rates, both at 10.2% (Table 3).

When limited to the 3 surgical services (general, gynecology and urology) evaluated in the previous study, our cancellation rate was 11.8%, higher than previously reported for the same centre (1544 cancellations of 19 141 surgeries, 8.1%) between January 2005 and December 2009.<sup>6</sup> The cancellation rates observed in the current study were also higher for each surgical service individually (general, 13.5% v. 8.2%; gynecology, 10.2% v. 6.8%; urology, 12.1% v. 9.5%).

In our study, 83.5% of the cancellations were for administrative or structural reasons, 8.8% were for medical reasons and 7.8% were because of patient-related factors (Table 2). Of the 2448 surgeries cancelled for administrative reasons, the most prevalent reasons were because the OR was running late (24.9%), because a standby patient was cancelled (19.8%), because of a bed shortage (16.6%) and because an emergency case took the place of a scheduled surgery (11.5%).

Although the rates of cancellations in general surgery, gynecology and urology caused by the OR running late (30.9% v. 29.3%) and by cancelled standby patients (both at 17.2%) remained fairly consistent across the previous and current studies, respectively, cancellations because of emergency cases decreased (13.0% v. 6.3%) and cancellations because of bed shortages increased (7.2% v. 13.4%). Interestingly, and probably for multiple reasons, the volume of surgical procedures in these surgical services has actually decreased since the previous study (320 per month v. 217 per month).

Of the 175 patients who met eligibility criteria and received a telephone call, 72 (41.1%) completed the interview. The mean age of respondents was 58.4 (standard deviation [SD] 15.2) years; 33 respondents (45.8%) were male (Table 1). In total, 61 patients (34.8%) were unreachable and 42 (24.0%) refused to participate. About

**Table 1. Demographic characteristics of 20 881 surgeries scheduled between June 1, 2012, and Jan. 31, 2016**

Characteristic	No. (%) of cancelled surgeries* $n = 2933$	No. (%) of patients contacted for interview $n = 175$	No. (%) of patients interviewed $n = 72$	No. (%) of nonrespondents† $n = 103$
Male	1527 (52.1)	90 (51.4)	33 (45.8)	57 (55.3)
Female	1398 (47.7)	85 (48.6)	39 (54.2)	46 (44.7)
Age, yr, mean $\pm$ SD	56.5 $\pm$ 18.7	57.2 $\pm$ 17.3	58.4 $\pm$ 15.2	60.7 $\pm$ 16.0
ASA 1–2	1650 (56.2)	33 (18.8)	41 (56.9)	49 (47.6)
ASA 3–4	891 (30.4)	125 (71.4)	22 (30.6)	45 (43.7)

ASA = American Society of Anesthesiologists physical status classification; SD = standard deviation.

\*Sex was not documented for 8 of 2933 patients; ASA classification was not documented for 392 patients.

†Respondents and nonrespondents did not differ significantly;  $p = 0.216$  for sex,  $p = 0.341$  for age and  $p = 0.108$  for ASA.

**Table 2 (part 1 of 2). Reasons for cancellation of 2933 surgeries scheduled between June 1, 2012 and Jan. 31, 2016**

Codes*	No. (%) of surgeries n = 2933
Medical reasons	257 (8.8)
Change in medical condition	218 (7.4)
Change in medical condition after PSS	159 (5.4)
Acute illness or condition < 24 h	43 (1.5)
Change in medical condition > 24 h	16 (0.5)
Insufficient workup	19 (0.6)
Abnormal lab work	16 (0.5)
Difficult anesthesia event	1 (0.0)
Case aborted before anesthetic started	1 (0.0)
Patient expired	2 (0.1)
Patient-related reasons	228 (7.8)
Patient refused procedure	75 (2.6)
Patient unavailable	56 (1.9)
Patient cancelled	26 (0.9)
Patient did not show for surgery	24 (0.8)
Patient did not adhere to surgical instructions	47 (1.6)
Patient not NPO	25 (0.8)
Patient noncompliant	16 (0.5)
Surgical instructions not followed by patient	6 (0.2)
Administrative or structural reasons	2448 (83.5)
Emergency case took place of scheduled surgery	282 (9.6)
Emergency case from other service	37 (1.3)
Emergency case from same service	245 (8.4)
OR running late	610 (20.8)
Previous case ran over booked time	263 (9.0)
Insufficient time remaining	213 (7.3)
Room running late because of computer delay	1 (0.0)
Unexpected surgical complication from previous case	133 (4.5)
QBP target volumes met	2 (0.1)
Code gridlock called	94 (3.2)
PSS — surgery cancelled	1 (0.0)
Incomplete presurgical screening	8 (0.3)
Incorrectly booked — surgeon's office	70 (2.4)
Standby patient cancelled	486 (16.6)
Case substitution	247 (8.4)
Equipment or resource unavailable	28 (1.0)
No platelets or blood available	4 (0.1)
Case cart unavailable	1 (0.0)
Imaging unavailable	1 (0.0)
Equipment broken or unavailable	22 (0.8)
No bed	406 (13.8)
No ICU bed	6 (0.2)
No bed	371 (12.6)
No step-down bed	24 (0.8)
No recovery bed because of previous case	5 (0.2)
Staff unavailable	82 (2.8)
Other staff unavailable	4 (0.1)

**Table 2 (part 2 of 2). Reasons for cancellation of 2933 surgeries scheduled between June 1, 2012 and Jan. 31, 2016**

Codes*	No. (%) of surgeries n = 2933
OR nursing staff unavailable	24 (0.8)
Surgeon ill or not able to operate	12 (0.4)
Surgeon unavailable	27 (0.9)
Anesthesiologist late	1 (0.0)
Anesthesiologist unavailable	14 (0.5)
Surgeon's decision	50 (1.7)
Environmental crisis cancellation	29 (1.0)
Other reasons not listed	3 (0.1)
Surgery no longer required	29 (1.0)
Already done	18 (0.6)
Already done	14 (0.5)
Already done as an emergency > 24 h	3 (0.1)
Already done as an emergency < 24 h	1 (0.0)
Room availability	3 (0.3)

ICU = intensive care unit; NPO = nothing by mouth (i.e., patient had recently consumed food or liquids); OR = operating room; PSS = presurgical screening; QBP = quality-based procedure.  
\*Codes are organized as 50 individual codes, regrouped into 28 groups and 3 overarching categories.

half of the respondents (51.3%) were cancelled after registration at the Same Day Admission Centre and 38.9% reported having at least 1 surgery cancelled during the previous 5 years (Table 4). Overall, approximately half of the respondents (48.6%) and their family/friends (55.6%) missed at least 1 day of work and more than one-third of patients and their families travelled more than 80 km only to have the surgery cancelled (34.4% and 33.3%, respectively, Table 4).

Most respondents (62.5%) reported that the cancellation caused them or their families moderate to extreme inconvenience (4–5 on Likert scale). Overall, however, patients were moderately satisfied (mean 3.2 [SD 1.5]) with the way their cancellation was handled by hospital staff and 29.2% reported being very satisfied (5 on Likert scale) (Table 5).

Although most patients (75.0%) agreed that fundamental changes should be implemented in the current health care system, respondents had varying opinions regarding the establishment of an alternative health care system (mean 2.8 [SD 1.3], Table 5). Twenty-seven respondents (37.5%) were in favour of establishing an alternative health care system, 15 (20.8%) were neutral and 30 (41.7%) disagreed or strongly disagreed with there being a need for one. Overall, patients were satisfied with the availability (mean 3.8 [SD 1.3]) and quality (mean 3.8 [SD 1.1]) of affordable health care.

Age, sex, surgical procedure and administrative reasons for cancellation had no effect on patient reports regarding the cancellation or their attitude toward the health care system in general. However, patients classified as

**Table 3. Cancellation rate and reasons for cancellation by surgical specialty and case duration**

Surgical specialty	Estimated mean duration (min)	No. (%) of scheduled surgeries <i>n</i> = 20 881	No. (%) cancellations by specialty	No. (%) of cancellations by specialty		
				Cancelled for medical reasons	Cancelled for patient-related reasons	Cancelled for administrative reasons
Cardiac surgery	283	2008 (9.6)	315 (15.7)	12 (3.8)	11 (3.5)	292 (92.7)
Dental surgery	86	150 (0.7)	26 (17.3)	6 (23.1)	3 (11.5)	17 (65.4)
General surgery	146	2916 (14.0)	395 (13.5)	46 (11.6)	19 (4.8)	330 (83.5)
Gynecology	103	3600 (17.2)	366 (10.2)	26 (7.1)	41 (11.2)	299 (81.7)
Neurosurgery	181	1271 (6.1)	265 (20.8)	17 (6.4)	11 (4.2)	237 (89.4)
Orthopedic surgery	135	4783 (22.9)	707 (14.8)	40 (5.7)	38 (5.4)	629 (89.0)
Otolaryngology	119	410 (2.0)	44 (10.7)	6 (13.6)	7 (15.9)	31 (70.5)
Plastic surgery	124	833 (4.0)	120 (14.4)	12 (10.0)	19 (15.8)	89 (74.2)
Thoracic surgery	121	557 (2.7)	57 (10.2)	4 (7.0)	9 (15.8)	44 (77.2)
Urology	104	3035 (14.5)	368 (12.1)	58 (15.8)	50 (13.6)	260 (70.7)
Vascular surgery	129	1318 (6.3)	270 (20.5)	30 (11.1)	20 (7.4)	220 (81.5)
Total	—	20 881	2933 (14.0)	257 (8.8)	228 (7.8)	2448 (83.5)

**Table 4. Details of cancellation among interviewed patients**

Interview question	No. (%) of responses <i>n</i> = 72*
1. When were you notified of the cancellation?	
A. Before arrival at the hospital	10 (14)
B. Before registration at the Same Day Admissions Centre	25 (35)
C. After registration at the Same Day Admissions Centre	37 (51)
D. I was not notified	0 (0)
2. How far did you travel to the hospital?	
A. Less than 30 km	35 (57)
B. 30 km to 80 km	5 (8)
C. More than 80 km	21 (34)
D. Out of province	0 (0)
3. How far did your loved ones travel to attend your surgery?	
A. Less than 30 km	32 (53)
B. 30 km to 80 km	7 (12)
C. More than 80 km	20 (33)
D. Out of province	1 (2)
4. How much time did you take off work for your surgery at the time of the cancellation?	
A. Less than a week	18 (25)
B. Between a week and a month	8 (11)
C. More than a month	9 (13)
D. None	37 (51)
5. How much time did your family member(s) or caregiver(s) take off work to care for you at the time of the cancellation?	
A. Less than a week	32 (44)
B. Between a week and a month	6 (8)
C. More than a month	2 (3)
D. None	32 (44)
6. How many times have you had a surgery cancelled in the past five years?	
A. Once	44 (61)
B. More than once	28 (39)

\*Total number of responses was 61 for question 2 and 60 for question 3.

ASA level 3 or 4 were more often dissatisfied with how providers handled the cancellation ( $p = 0.02$ ) and were less often satisfied with the availability of affordable health care ( $p = 0.02$ ) than patients classified as ASA level 1 or 2. The other factors that affected the patients' lives and views of the health care system included the financial impact associated with the distance travelled for surgeries ( $p = 0.03$ ) and the time off work for patients ( $p = 0.03$ ) and for their family and friends ( $p = 0.01$ ). Patients whose surgeries had been cancelled more than once in the previous 5 years also reported a more negative view of the health care system ( $p = 0.04$ ).

## DISCUSSION

Our overall cancellation rate was 14.0% across all 11 elective surgical services, which is well within the range of that reported in the literature for academic centres (i.e., 6%–39%).<sup>3</sup> Cancellation rates attributed to administrative or structural factors (83.5%), which are considered to be largely preventable, are also comparable to those reported in the literature (87%),<sup>3,5</sup> but medical (8.8%) and patient-related (7.8%) cancellations account for a smaller proportion than previously reported.<sup>5,7,8</sup> This may be explained, at least in part, by the long wait times for elective surgery in Canada, leading to greater patient adherence to the surgical schedule and preoperative instructions.<sup>9</sup> Moreover, many centres have implemented presurgical screening clinics near the scheduled surgery date to medically optimize the patient, improve patient compliance with presurgical instructions and offset patient no-shows.<sup>10–13</sup> This is supported by the fact that, of the 257 patients cancelled for medical reasons, 61.9% were attributed to changes in their medical condition after presurgical screening.

**Table 5. Effect of cancellation on patients' lives and views of the current health care system among interviewed patients**

Interview question	No (%) of responses* n = 72					Mean ± SD
	1	2	3	4	5	
I was very satisfied with the way the cancellation was handled by the hospital staff.	15 (21)	9 (13)	13 (18)	14 (19)	21 (29)	3.2 ± 1.5
The cancellation had a significant financial impact on me (including transportation costs, lodging costs, child care arrangements, loss of income, extended time off work etc.).	29 (40)	7 (10)	8 (11)	13 (18)	15 (21)	2.7 ± 1.6
The cancellation caused extreme inconvenience to myself and/or my family.	16 (22)	4 (6)	7 (10)	15 (21)	30 (42)	3.5 ± 1.6
The cancellation had a strong negative impact on my view of the Canadian health care system.	23 (32)	12 (17)	11 (15)	10 (14)	16 (22)	2.8 ± 1.6
The public should have access to an alternative health care system within Canada.	18 (25)	12 (17)	15 (21)	21 (29)	6 (8)	2.8 ± 1.3
There needs to be fundamental changes in the current Canadian health care system.	5 (7)	3 (4)	10 (14)	29 (40)	25 (35)	3.9 ± 1.1
I am satisfied with the availability of affordable health care in Canada.	8 (11)	6 (8)	7 (10)	26 (36)	25 (35)	3.8 ± 1.3
I am satisfied with the quality of health care in Canada.	3 (4)	8 (11)	8 (11)	35 (49)	18 (25)	3.8 ± 1.1

SD= standard deviation.  
\*1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

Similar to other studies,<sup>2,7,8</sup> we found that OR delays were responsible for a substantial number of cancellations, both in this study and the previous study from the same centre (31.5% and 29.3%, respectively). A closer look at the current data revealed that only 22% of the OR delays were caused by unexpected surgical complications; in contrast, 78% could be attributed to potentially modifiable logistical factors. One study attributed the main cause of OR delays to surgeons underestimating case duration or turnover time, particularly for shorter procedures.<sup>7</sup> Furthermore, the surgeons who consistently underestimated surgical durations had significantly more cancellations.<sup>7</sup>

An insufficient number of beds also contributed to a substantial proportion of cancellations at our centre, and this problem appears to have worsened since the last report (7.2% v. 13.4%). A perioperative simulation study from Canada identified bed availability as the bottleneck of our health care system.<sup>14</sup> The 2017 report from the Fraser Institute found that Canada has the fewest acute care beds per capita of all 27 Organisation for Co-operation and Economic Development (OECD) countries with universal health care.<sup>9</sup> According to a discrete event simulation study conducted at Toronto General Hospital, cancellations can be significantly reduced by adding just 2 beds to the surgical ward, although adding any more than 2 did not further improve efficiency.<sup>1</sup>

The prioritization of emergency cases is another major reason for cancellations of elective surgeries. In the current study, it accounted for 9.6% of the cancellations across all 11 surgical services. However, the decreased proportion of cancellations because of emergency cases since the previous study (13% v. 6.3%), despite the fact that we still do not have a dedicated OR for emergencies, is encouraging. This suggests that there has been some improvement in the management of emergency cases.<sup>6</sup>

Despite the short notice of cancellations and the prolonged wait times for treatment, interviewed patients were generally satisfied with both the availability and quality of health care. Objectively, despite being the third most expensive health care system, Canada ranks below the OECD average with respect to the availability and accessibility of resources, while generally doing well on indicators for quality of health care.<sup>9</sup> This apparent discrepancy between public perception and international performance rankings of our health care system has also been reported elsewhere.<sup>15</sup> Our interview revealed a potential explanation for this discrepancy. We found that same-day cancellations (51.3%) had only a minor effect on patients' negative view of the health care system (mean 2.8 [SD 1.6]), perhaps because the cancellations were handled by the hospital staff in a satisfactory manner (3.2 [SD 1.5], 48.6% reported 4–5 on Likert scale). Our findings are consistent with those of the previous study conducted at this centre, which found that patients were modestly satisfied with the perioperative process despite the fact that approximately half of the cancellations occurred within an hour of the scheduled surgery.<sup>6</sup>

**Limitations**

Our study provides a report of elective surgical cancellation rates, as well as reasons for cancellation reported over time from an academic tertiary care centre. This is important because it serves as a comparison not only for this centre, but also for similar centres within Canada in terms of cancellation rates, reasons and potential starting points for mitigation strategies. However, being a single-centre study, these findings may not be generalizable to other institutions with different demographics and perioperative practices. It may be difficult to accurately

compare our study with that done previously since each study evaluated different time periods. Leslie and colleagues<sup>6</sup> collected data from 5 complete calendar years (60 mo), whereas our study examined a 44-month period that did not correspond to complete calendar years. We therefore could not account for changes in the coding of cancellations over time or for seasonal fluctuations in surgical volumes and cancellations.

Furthermore, given that data were retrospectively collected, we were unable to verify the reasons for cancellation or evaluate the precipitating factors. Only a small group of patients were contacted for an interview ( $n = 175$ ), of which only 41% responded, potentially resulting in response bias. We chose an interview period of 12–18 months after cancellation to increase the likelihood that all patients had undergone their surgery in an attempt to reduce bias, but 28 (38.9%) respondents had had more than 1 surgery cancelled within the previous 5 years, and the overall cancellation rate was 14.0%, suggesting that responder bias may be present. As a result, the responses collected during the interview can be considered specific only to this small group and cannot be generalized to the entire population of patients with surgeries cancelled for administrative or structural reasons at our centre. Nevertheless, it is encouraging that the demographic distributions (i.e., sex, age and ASA classification) of the respondents and nonrespondents were similar to one another and these appear similar to that of all patients with cancelled surgeries (Table 1).

## CONCLUSION

The cancellation rates observed in the current study are within the range reported for other academic centres.<sup>3</sup> In addition, our results are consistent with the literature in that most cancellations occurred for administrative reasons (e.g., OR running late, emergency case took place of scheduled surgery, bed shortage) that are potentially preventable.<sup>3</sup> Previous studies, including the one from our centre, have suggested that thorough documentation of cancellations (and the events leading up to them) is necessary before mitigation strategies can be identified.<sup>3,6</sup> The observed increase in cancellation rates provides evidence that same-day elective surgery cancellations continue to impede timely care for patients at our centre. However, the small cohort that we interviewed was still satisfied with the quality and availability of health care, despite the fact that their surgery was cancelled for a potentially preventable reason, suggesting that the provider management of the cancellation can influence how it affects the patient, at least psychologically. Finally, the current data also suggest that potentially preventable administrative or structural issues may be a good starting point upon which to focus potential mitigation strategies.

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