Cancellation of operations on the day of intended surgery at a major Australian referral hospital

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ABSTRACT

Objective: To establish the rate of and reasons for cancellations of surgery on the scheduled day in an Australian hospital.

Design: Prospective survey.

Setting: Major metropolitan tertiary hospital, 13 May to 15 November 2002.

Main outcome measures: Proportion of operations cancelled on the day of surgery, obtained each day from the operating theatre list and a separate list of additions and cancellations compiled on the day; reasons for cancellations from the cancellation list, extended or confirmed, as necessary, by questioning of bookings and ward staff, or members of the surgical team; estimated and actual duration of each operation and patient information from hospital clinical records.

Results: 7913 theatre sessions were scheduled by 133 surgeons in the study period; 941 of these (11.9%) were cancelled on the day, including 724 of 5472 (13.2%) elective procedures on working weekdays. Main reasons for cancellation were: no theatre time due to over-run of previous surgery (18.7%); no postoperative bed (18.1%); cancelled by patient (17.5%); and change in patient clinical status (17.1%). Procedural reasons (including patient not ready, no surgeon, list error, administrative cause, and communication failure) totalled 21.0%. Ear, nose and throat surgery experienced the most cancellations (19.6%), followed by cardiothoracic surgery (15.8%).

Conclusions: There were five major reasons of similar magnitude for on-the-day surgery cancellations. We estimated that 60% of cancellations of elective procedures were potentially avoidable. Change of one factor leading to cancellation (eg, provision of more postoperative beds) is not likely to lead to improvement unless the other major factors are also tackled.

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Major hospitals invest considerable resources in maintaining operating suites and having surgeons and theatre staff available on an agreed schedule. However, a problem in most hospitals is cancellation of scheduled operations at the last minute, even on the day of surgery. In some cases, patients have been prepared for theatre, and staff are assembled and expecting to operate. In others, patients and staff may not be directly affected (eg, when a surgeon has cancelled an operation, the patient has been informed, but the theatre booking has been retained).

Late cancellation of scheduled operations is a major cause of inefficient use of operating-room time and a waste of resources. It is also potentially stressful and costly to patients in terms of working days lost and disruption to daily life. There have been reports about the depressing effect of cancellation on patients and on the high level of emotional involvement before surgery.[1,2]

A variety of studies have examined reasons for late cancellations based on retrospective analysis of hospital records,[2-11] including some studies which have used limited interventions to reduce cancellations.[3,12-14] The National Health Service (NHS) in the United Kingdom has developed software to monitor and report on theatre cancellations, including on-the-day surgery cancellations.[15,16]

These studies and the NHS software rely on records maintained by theatre staff. Although useful for day-to-day monitoring of surgery, such records may not provide enough information to design policy to reduce late cancellations.

We undertook a study of on-the-day surgery cancellations in our hospital, collecting data from hospital records, including the daily operating theatre list and a list of cancellations written on the day with a brief reason for the cancellation. We confirmed, and extended if necessary, these reasons through direct questioning of clerical and clinical staff the following day.

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METHODS

We studied all operating theatre bookings, both elective and non-elective, at a major metropolitan tertiary hospital (770 resourced beds, 16 operating theatres) between 13 May and 15 November 2002.

As the study was considered a quality assurance project by the Human Research Ethics Committee of the Western Sydney Health Service, it did not require ethical approval.

Scheduled operations

Data on operations scheduled for weekdays, excluding public holidays, were obtained from the operating theatre list for that day. This list is generated at 15:00 the previous day. We also obtained a copy of the supplementary form used to make additions to this list. The theatre list provided patient and surgeon details, intended procedure, theatre used, and estimated duration of each operation.

After an operation, details are entered into an operating theatre database and passed on to the hospital patient information system. From this, we obtained patient demographic characteristics, morbidity, category (ward, day-of-surgery, day-only or emergency

1 Reasons for cancellation of operations on the day of surgery

Reason	No.	% of all cancellations (95% CI)
No theatre time	176	18.7% (16.3%–21.30%)
No postoperative bed	170	18.1% (15.7%–20.7%)
Cancelled by patient*	165	17.5% (15.2%–20.1%)
Patient clinical change	161	17.1% (14.8%–19.7%)
Emergency priority	72	7.6% (6.0%–9.5%)
Patient not ready†	55	5.8% (4.4%–7.5%)
List error‡	45	4.8% (3.5%–6.3%)
Administrative cause§	43	4.6% (3.3%–6.1%)
No surgeon available	37	3.9% (2.8%–5.4%)
Equipment/transport/organ¶	10	1.1% (0.5%–1.9%)
Communication failure**	7	0.8% (0.3%–1.5%)

* Cancelled by patient or patient's custodian through a telephone call on the day; or failure to present.
† Patient not fasted; patient not adequately prepared; or necessary tests not undertaken.
‡ For example, surgery cancelled before the operating list was finalised (ie, before 15:00 on the previous day), but patient remained on the theatre list.
§ For example, booking error; patient given wrong date; bed not requested; surgeon not operating that day; or patient not contacted in time.
¶ Necessary instrument or equipment not available; patient transport failure; or no organ for transplant.
** For example, patient cancelled in time, but theatre staff not informed; wrong patient sent home from ward; postoperative bed available, but surgeon not informed and cancelled.

admission), and date and actual time of start and end of surgery. For this study, emergency admissions were defined as admissions which were unplanned.

Cancellations and reasons

A cancellation on the day of intended surgery was defined as any operation that was either scheduled on the final theatre list for that day (generated at 15:00 on the previous day) or was subsequently added to the list, and that was not performed on that day.

During the day of surgery, theatre staff compiled a list of cancellations. The form for this included a column for "classification and comment", where theatre staff recorded a reason for the cancellation. Sometimes this was merely by whom cancelled (eg, "by doctor"). We obtained copies of these lists each day.

In addition, the reason for each cancellation was investigated on the following working day, by checking in person or by telephone with:

- Staff of the booking office;
- For day-only and day-of-surgery admissions, the day-only ward records ("sticky label book") and senior clerical and nursing staff; and
- For ward patients, the clinical case coordinators or clerical assistants of the respective wards.

For cancellations where no reason was recorded on the cancellation list, or the recorded reason was inconsistent with that reported by staff, the patients' clinical records were audited. If the reason was still not clear (ie, there were gaps in the reasoning, or the reason given was not consistent with events in the clinical record), the registrar or surgeon was asked.

Data analysis

Cancellation reasons were entered into a database both as coded variables and as text, using the words appearing on the theatre list and as found by investigation. Textual material was searched for keywords and coded by computer. Cancellation reasons were classified by the authors into 22 broad categories, which were then reduced to 11 (see Box 1). For example, the text "ate chocolate frog" was classified as "patient not fasted", which was then reduced to the category "patient not ready" (which also included "patient not adequately prepared" and "necessary tests not undertaken").

Cancellations were classified as:

- Potentially avoidable (no theatre time, no postoperative bed, list error, administrative cause, equipment or transport problem, communication failure, patient not ready, and no surgeon available); or
- Non-avoidable (cancelled by patient, patient clinical change, emergency priority, patient not ready, and no surgeon available).

As this classification was based on the detailed reason given for the cancellation, some of the 11 major categories appear in both the avoidable and unavoidable groups. For example, "patient not ready" could be due to failure to adequately prepare the patient (avoidable) or to a factor outside the control of hospital staff, such as that the patient did not fast (unavoidable).

Statistical analyses were performed using SPSS for Windows 12.1.0 statistical software.[17]

RESULTS

A total of 7913 theatre sessions were booked by 133 surgeons during the 6-month study, involving 6227 patients (3524 female; 56.6%). They included 5472 elective sessions (69%).

On-the-day surgery cancellations

Of the 7913 theatre sessions, 941 (11.9%) were cancelled on the day of surgery, including 724 of 5472 (13.2%) elective procedures scheduled on working weekdays. There were an average of 5.2 on-the-day surgery cancellations per day.

On-the-day cancellation rates are shown in Box 2 by category of surgery, patient category (elective surgery only) and specialty. Surgery most likely to be cancelled was ear, nose and throat surgery (19.6%), followed by cardiothoracic surgery (15.8%). Least likely were gynaecological oncology, neurosurgery, transplant surgery and gynaecology and obstetrics surgery.

Maximum use of the operating suite by a single surgeon was 222 bookings. For the 35 surgeons who booked more than 100 operations in the period, the on-the-day cancellation rates ranged from 3.0% to 23.3%. On average, surgeons underestimated the time needed for surgery by 19.5 minutes (95% CI, 17.5–21.5 minutes) (assessed as estimated time at booking minus actual time taken, for elective surgery on working weekdays). Those who underestimated the time needed for operations by an average of more than 10 minutes had a cancellation rate of 11.3%, compared with 6.1% for those who overestimated time needed ($P < 0.001$).

Of the 941 cancelled operations, 469 (49.8%) were rebooked. For 305 of these (65%), the new booking was for within 7 days, and for 422 (90%) it was within 1 month.

Of the 6227 patients given a booking for an operation, 914 (14.7%) experienced at least one on-the-day cancellation. These included 110 (12.0%) who experienced two on-the-day cancellations, five (0.6%) who

experienced three, and one (awaiting cardiothoracic surgery) who experienced four.

Reasons for cancellations

The main reasons for on-the-day surgery cancellations are shown in Box 1. Most common were lack of theatre time, lack of a postoperative bed, patient cancellation, and clinical or diagnostic change in the patient's condition (about 17%–19% for each). Procedural reasons together accounted for 21% of cancellations.

The cancellations list gave a reason for 793 of the 941 cancellations. They included no bed available (18.9%), run out of theatre time (16.1%), patient non-arrival (10.5%), patient unfit (9.2%), and cancelled by patient or relatives (8.2%).

From the full list of 941 cancellations, it was found that for patients admitted on the day of surgery, by far the most frequent reason for cancellation was lack of a postoperative bed (96/195 cancellations; 49%). The most frequent reason for day-only patients was cancellation by patient or carer (71/187; 38%) and for ward patients was clinical change (51/196; 26%).

The main specialties experiencing cancellations for the five major reasons are shown in Box 3.

We estimated that 60% of elective procedures that were cancelled on the day were potentially avoidable.

2 Day-of-surgery cancellations by category of surgery, category of patient and specialty

	Total	Operations cancelled	
		No.	% (95% CI)
Category of surgery			
Elective*	5472	724	13.2% (12.3%–13.2%)
Emergency†	1242	128	10.3% (8.7%–12.1%)
Weekend (no category)‡	585	–	–
Addition§	542	88	16.2% (13.2%–19.6%)
Return to theatre	20	1	5.0% (0.1%–24.9%)
Not specified	52	0	0
Total	7913	941	11.9% (11.2%–12.6%)
Patient type (elective surgery only*)			
Day-only patient	1990	190	9.5% (8.3%–10.9%)
Day-of-surgery admission	1761	197	11.2% (9.8%–12.7%)
Ward patient	1575	213	13.5% (11.9%–15.2%)
Not recorded	146	124	84.9% (78.4%–90.1%)
Specialty			
Gynaecology and obstetrics	1689	118	7.0% (5.8%–8.3%)
General surgery	1468	140	9.5% (8.1%–11.2%)
Cardiothoracic	784	124	15.8% (13.3%–18.6%)
Orthopaedic	683	69	10.1% (7.9%–12.6%)
Urology	614	70	11.4% (9.0%–14.2%)
Vascular	549	71	12.9% (10.2%–16.0%)
Plastic	529	70	13.2% (10.5%–16.4%)
Neurosurgery	350	20	5.7% (3.5%–8.7%)
Ophthalmology	350	34	9.7% (6.8%–13.3%)
Ear, nose and throat	204	40	19.6% (14.4%–25.7%)
Gynaecological oncology	179	6	3.4% (1.2%–7.2%)
Trauma	74	11	14.9% (7.7%–25.0%)
Transplant	46	2	4.3% (0.5%–14.8%)
Other	241	13	5.4% (2.9%–9.0%)
Unspecified	na	146	–

* Elective operations were defined as those planned in advance of the theatre booking being made and intended for 07:30 to 17:30 Monday to Friday, excluding public holidays.
† Emergency operations were defined as unplanned (non-elective) operations usually performed on patients admitted through the emergency department.
‡ Weekend theatre records do not specify whether an operation was an emergency or held-over elective surgery.
§ Additions were defined as operations added to the theatre list after it was finalised at 15:00 the previous day.
na = not available.

DISCUSSION

We found that 11.9% of all scheduled operations (including emergency operations), and 13.2% of elective operations scheduled for weekdays, were cancelled on the day of surgery. Investigation revealed five major reasons for these cancellations, with similar frequencies: "procedural reasons"; no theatre time due to over-run of earlier surgery; lack of a postoperative bed; patient cancellation or failure to present; and patient clinical or diagnostic change. We believe that around 60% of the on-the-day surgery cancellations of elective surgery were potentially avoidable.

As our data were obtained from disparate sources, validity might be a problem. However, fundamental details, such as patient and surgeon identity, type of surgery, and whether it was cancelled, are not likely to be in doubt. Operation details, including time of the patient entering and exiting the theatre are recorded at the time, and inconsistencies would be readily apparent.

Inconsistencies between the reasons given for cancellations in theatre records (compiled from the theatre list and the list of cancellations) and those found by investigation appeared to be caused by incomplete information available to theatre staff. For example, "no radiographer" was correctly entered on the cancellation list as the reason for the cancellation of major cardiothoracic surgery, but investigation revealed the underlying reason to be illness of a surgeon. By the time a substitute was found, the radiographer had moved to another commitment.

Our results imply that hospitals will not succeed in reducing the rate of on-the-day cancellations unless they tackle each problem in the process, beginning with the initial booking and patient notification. Providing more beds or quarantining beds for surgical patients is one component of an improved system, but will be insufficient unless all sources of problems receive attention. Similarly, improved methods of booking and allocating theatre time,[7,12-14,18] and an operational research approach to patient flow,[18-21] can only have practical value when linked in an overall quality improvement strategy. We believe that up to 60% of on-the-day cancellations of elective surgery may be prevented using quality improvement techniques.

Last-minute cancellation by a patient or failure to present is especially difficult to resolve. It may be due to the patient's last minute doubts and fears. A solution in the United States is to charge patients for failing to attend.[22,23] Obviously, this is not feasible for public hospitals in Australia. Our findings suggest a need for further study of patient failure to present on the day of surgery and for the development of improved methods of ensuring attendance.

We found that cancellations due to lack of theatre time (ie, earlier operations over-ran estimated time) were not a scheduling or booking problem but caused by surgeons

3 Main cancellation reasons and specialties most affected

Reason and specialty	No.	% (95% CI)
Procedural* (*n* = 204)		
Gynaecology	32	16% (11%–21%)
General	31	15% (11%–21%)
Cardiothoracic	31	15% (11%–21%)
Urology	25	12% (8%–18%)
No theatre time (*n* = 141)		
Gynaecology	30	21% (15%–29%)
Cardiothoracic	28	20% (14%–27%)
No postoperative bed (*n* = 144)		
General	45	31% (24%–40%)
Cardiothoracic	41	29% (21%–37%)
Cancelled by patient (*n* = 121)		
Gynaecology	39	32% (24%–41%)
Plastic	22	18% (12%–26%)
General	20	17% (10%–24%)
Patient clinical change (*n* = 121)		
Gynaecology	19	16% (10%–23%)
Cardiothoracic	18	15% (9%–23%)
General	16	13% (8%–21%)

* Including administrative or booking errors.

underestimating the time needed for the operation. For some procedures, there was consistent underestimation, and we found that surgeons who consistently underestimated the time needed experienced significantly more cancellations than those who did not. Consistent underestimation biases the system against shorter procedures of known and stable duration, and this could explain why ear, nose and throat surgery had the highest proportion of cancellations.

Our data were collected specifically for this study and contained information not available in patient medical records or hospital data sets. Similar reliable information will be needed by hospitals seeking to improve and maintain improvements in theatre services. Software tools developed by the UK NHS appear to meet this need.[16] However, they depend on the accuracy of information provided by hospitals, and it seems unlikely that theatre staff will have enough time to trace basic reasons for late cancellations. Even when they do, theatre quality-maintenance systems will need built-in procedures for providing random episodes of independent, in-depth, monitoring.[24,25] Surgical cancellations could be regarded as adverse events and monitored routinely in hospital clinical incident monitoring systems.

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COMPETING INTERESTS

None identified.

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