

Analysis of 43 Intraoperative Cardiac Surgery Case Cancellations

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Objective: Late cancellation of surgery cases imposes significant emotional distress on the patient and their family and results in wasted resources, including loss of operating room and personnel time. This study was designed to determine the causes of cancellation, preventability, total operating room time, and postoperative destination.

Design: This study was a retrospective review of the 43 cardiac surgical cases that were cancelled while the patient was in the operating room (OR) but prior to surgical incision.

Setting: The cases were performed at the Massachusetts General Hospital, a teaching hospital of Harvard Medical School.

Participants: Forty-three out of 5,110 scheduled cardiac cases were identified that were cancelled after the patient had entered the operating room between January 1, 2010 and December 31, 2013.

Interventions: No interventions were made. This was a retrospective study.

Measurements and Main Results: The most common causes of cancellation included a change in the patient's health status (44%), problems associated with central catheter placement (18.6%), and unsatisfactory donor organs for planned transplantation (12%). The majority were inpatients (65%) prior to the procedure. The cumulative OR time for all cancelled cases was 5,374 minutes (89 hours and 34 minutes).

Conclusions: The reason for cancellation, preventability, total operating room time, and postoperative destination were determined. The information can be utilized to decrease the number of future cancellations.

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CANCELLATION of a cardiac surgical case on the day of surgery, especially after the patient has entered the operating room, imposes significant emotional distress on the patient and their family. Equally important are the wasted resources resulting from unused equipment, loss of productive operating room and personnel time, and the prevention of other patients from receiving timely procedures. The authors performed a retrospective review of 43 cases cancelled in the cardiac operating room to analyze the indication for cancellation, preventability, and clinical and financial impact. Based on the findings, the authors offer suggestions to decrease the incidence of preventable case cancellation.

METHODS

The authors performed a retrospective review of all cardiac surgical cases that were cancelled prior to incision after a patient physically entered the operating room over a 4-year period between January 1, 2010 and December 31, 2013 at the Massachusetts General Hospital. The study was approved by the Partners Healthcare Human Research Committee. Information regarding date of surgery, planned procedure, preprocedure status (inpatient or outpatient) and surgeon was obtained through the operating room dynamic schedule system (RSVP/MOSAIC). The anesthesia automated record system (Metavision) and the hospital electronic medical record (EMR) were utilized to obtain the reason for cancellation, total operating room time, postoperative destination, results of additional studies related to the cancellation, and anesthesia course. The preventability of cancellation was determined by consensus review of the authors. Surgical input was included in the consensus as the authors consist of 3 cardiac anesthesiologists and 1 cardiac surgeon.

RESULTS

A total of 43 (0.84%) of 5,110 scheduled cardiac cases between January 1, 2010 and December 31, 2013 were cancelled after the patient had entered the cardiac surgical operating room. The decision to cancel the cases was made by the surgical and anesthesiology attending physicians involved

in the case. The total operating room time was determined by the time the patient entered the operating room until the time the patient departed the operating room for the floor, intensive care unit, or postanesthesia care unit (PACU). The average operating room time (ORT) for the cancelled cases was 123.5 minutes (range: 19-306 minutes) (Table 1). The cumulative ORT for all cancelled cases was 5,374 minutes (89 hours and 34 minutes).

The causes of the cancellation and patient admission status were determined for each case. The majority of the cancellations 28 (65%) were inpatient, of which 6 were in the intensive care unit (ICU.) The remaining 15 (35%) were patients admitted on the same day as the surgery (Table 2). A change in the patient's health status was the cause of cancellation for 19 (44%) of the cases. This included information obtained after the patient entered the OR and included infection, laboratory abnormalities, or new diagnostic information resulting in cancellation. Problems associated with central line placement were the cause in 8 (18.6%), followed by cancellation due to unsatisfactory donor organs for planned organ transplantation in 5 (12%) of the cases (Table 3).

The preventability of cancellation and phase of care at which cancellation could be prevented were determined through the consensus of the research group. A cancellation was determined to be preventable if there was an existing issue that was discoverable prior to entering the operating room such

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Table 1. Operating Room Time by Procedure

Case	Number	Average OR Time in Minutes (Range)
Aortic valve replacement	10	138.4 (60-219)
Coronary artery bypass graft	9	129 (20-215)
Heart transplant	6	175 (123-306)
Mitral valve replacement	3	134 (126-148)
LV apex-to-aortic conduit	2	125 (45-205)
Myectomy	2	121 (85-157)
Re-exploration for bleeding	2	72.5 (61-84)
Aortic root abscess	1	195
Aortic root aneurysm	1	168
Aortic dissection	1	97
Common AV canal repair	1	49
LV lead placement	1	241
MAZE	1	94
Pulmonary valve replacement	1	167
Retained chest tube	1	19
Right ventricular assist device	1	51
All cases	43	123.5 (19-306)

Abbreviations: AV, atrioventricular; LV, left ventricle; OR, operating room.

as pre-existing infection, laboratory abnormality, hemodynamic problem, or other patient factor. Twenty-two (51.2%) cancellations were found to be preventable, and 17 (39.5%) were not preventable (Table 4). The preventability of 4 (9.3%) cases could not be determined. The majority of preventable cancellations, 14 (64%), could have been avoided by improved physical examination or timely review of available laboratory results and studies immediately before the patient entered the operating room.

Eight cases were cancelled due to anesthesia-related complications, all of which occurred during attempted central catheter placement. The use of ultrasound was documented for 5 of the attempted placements and could not be ascertained for 3 of the cases. Definitive inadvertent carotid artery puncture was noted in 6 cases. The arterial vessel was not cannulated with a large bore introducer in any case. The 2 remaining cases were cancelled after a hematoma developed at the site of the attempted central catheter placement in 1 case, and inability to place a central catheter after multiple attempts in the other case. The needle types and sizes were not documented in all cases. The prevailing practice at the authors' institution is utilization of a thin-wall needle under real-time ultrasound guidance.

The 17 cancellations determined to be "not preventable" included 5 cancellations due to donor organ unsuitability. New transesophageal echocardiography findings resulted in

Table 2. Preventability of Cancellation by Location

Preop location (n = 39)	Cancellation preventable (%)	Cancellation not preventable (%)
Same-day admission (14)	8 (57)	6 (43)
Inpatient (floor) (19)	13 (68)	6 (32)
Inpatient (ICU) (6)	1 (17)	5 (83)

NOTE. Preventability could not be determined in an additional 4 cases. Three of these cases were inpatient; 1 was an SDA.

Abbreviation: ICU, intensive care unit; preop, preoperative; SDA, same-day admission.

Table 3. Causes of Cancellation by Preoperative Location

Cancellation Reason (n)	Same-Day Admission	Inpatient Floor	Inpatient ICU
Change in health status (19)	4	14	1
Anesthesia issue/complication (8)	5	3	0
Donor organ issues (5)	2	0	3
Surgeon unavailable (3)	0	3	0
Emergent issue resolved (2)	0	0	2
Traumatic urinary catheter placement (2)	1	1	0
Displaced by emergency case (1)	0	1	0
Unknown (3)	1	2	0

Abbreviation: ICU, intensive care unit.

cancellation of 2 cases, both of which were not preventable. These included a new left atrial mass and the absence of the expected, previously diagnosed, hypertrophic obstructive cardiomyopathy.

The majority of patients, 28 (65%), were admitted to an intensive care unit (ICU) after cancellation. All 6 patients residing in the ICU prior to the planned procedure returned to the ICU while 22 (51%) of the patients who were either on the floor or admitted from home also were admitted to an ICU setting. Preoperatively, 9 of the patients were same-day admission patients, 6 were ICU patients, and the remaining 13 were floor patients. The reasons for the escalation of care in the 22 patients who were not admitted previously to the ICU varied. Postoperative destination was determined by both the surgeon and the anesthesiologist involved in the case. Patients were transferred to the ICU if they came to the OR from the ICU or in any case in which a higher level of monitoring was thought to be necessary for the well-being of the patient. The majority of patients were those who had previously unknown complex underlying issues (eg, pulmonary hypertension at systemic levels, etc.). Patients with central line complications were monitored in the ICU for untoward sequelae, including neurologic deterioration or airway compromise. Per hospital protocol, patients who underwent placement of invasive monitors and catheters were transferred to the unit. Patients with postoperative ventilatory dependence were extubated in the ICU.

After cancellation, 12 (28%) of the 43 cancelled cases either were not performed or an alternate procedure was scheduled.

Table 4. Phase at Which Prevention Could Have Occurred by Preop Location

Phase	Inpatient	ICU	SDA	Number (%)
Preop history or physical examination	9	1	1	11 (25.6)
Preop laboratory evaluations	1	0	1	2 (4.7)
Preop evaluation studies (x-ray, U/S)	0	1	0	1 (2.3)
Anesthesia issues	3	0	5	8 (18.6)
Unclear	3	0	1	4 (9.3)
Unpreventable	6	5	6	17 (39.5)
Total				43

Abbreviations: ICU, intensive care unit; preop, preoperative; SDA, same-day admission.

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