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## Dynamics of Elective Case Cancellation for Inpatient and Outpatient in an Academic Center

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### Abstract

**Background**—Unexpected surgical cancellation is common and can have significant adverse effects. Cancellation rates vary because of a lack of a standard definition, different patient populations and study methodology. We hypothesized that case cancellation has a different pattern in a dedicated ambulatory surgical center compared to a general operating room (OR) setting in a large academic center without an anesthesia preoperative evaluation center necessitating evaluation by the various surgeons.

**Methods**—Elective cases in general OR and in the ambulatory surgical center were included in this study. Elective cases are defined as the non-emergent cases scheduled before 8:00 am on the day of surgery. A cancelled case was defined as a scheduled procedure which is not performed on the scheduled procedure day. Case cancellation was monitored in real time using an electronic patient flow system (Navicare). As soon as the case is cancelled, the reason for the cancellation was obtained from the surgeon, the anesthesiologist, the OR coordinated nurses and/or the floor nurse. In the day surgical center, the cancelled cases were followed to determine whether/when they were rescheduled.

**Results**—4261 elective cases were included in this investigation, including 2751 cases in the general OR and 1510 cases in the ambulatory surgical center. A total of 283 cases (6.6%) were cancelled which include 206 cases from the general OR and 77 from the ambulatory surgical center. The cancellation rate in the general OR was 7.5%, among which inpatients have the highest cancellation rate of 18.1%, followed by outpatients at 4.6%, and same day admission at the lowest cancellation rate of 2.0%. The top 3 reasons for cancellation in general OR were inadequate preoperative preparation  $29.4 \pm 4.5\%$ , medical condition change  $28.5 \pm 10.2\%$ ; and scheduling issue  $20.2 \pm 7.1\%$ . Most ( $59.2 \pm 8.9\%$ ) of the cancellations was considered preventable,  $12.3 \pm 5.9\%$  was considered potentially preventable, and  $28.5 \pm 10.2\%$  were not preventable (such as patient condition changes). The cancellation rate in the ambulatory surgical center was 5.1%. The

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#### Institution

Perelman School of Medicine at the University of Pennsylvania and Emory University School of Medicine.

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major reason for cancellation was patient no show  $75.8 \pm 5.2\%$ , 61% of those no show patients were rescheduled and the mean delay in surgery was 18 days (range from 1 day to 84 days).

**Conclusions**—Case cancellation is not uncommon in a large academic center without a preoperative evaluation clinic. The dynamics of case cancellation are different in an ambulatory surgical center as compared to the general OR. Inpatients have the highest cancellation rate associated with inadequate preoperative preparation and scheduling, this should be preventable via adopting proper systems of evaluation and preparation. Most of the case cancellations in the ambulatory surgical center are from patient no show, suggesting that administrative strategies to reduce this issue should be implemented. The patients admitted on the same day of surgery had the lowest cancellation rate requiring minimal intervention.

## Introduction

Unexpected surgical cancellations are not uncommon, decrease patient satisfaction, waste medical resources, and undermine the morale of medical personnel [1–4]. Before seeking a strategy to reduce case cancellation rate, many medical providers and institutes investigate the cancellation rate and understand cancellation reasons. Due to a lack of standard case cancellation definition, and using different study methods [1–5], studies in the US have reported cancellation rates from as low as 0.21% [6] to as high as 26% [7]. Cancellation reasons also vary across studies including medical condition changes, patient no show, and scheduling issues.

Importantly, most of these studies are retrospective, which does not permit accurate assessment of time sensitive factors which might cause some inaccurate explanation of the cancellation; and the outcomes might have selection bias [2,5,8].

It is unclear whether the cause of case cancellation is different for the inpatient population and outpatient population. In this study, we hypothesized that case cancellation has a different pattern in dedicated ambulatory surgical center versus general operating room (OR). Using the same cancellation criteria, we prospectively investigated case cancellations in the general OR and an ambulatory surgical center of a large academic center without an anesthetic preoperative evaluation clinic and incorporating evaluation by the surgeon.

## Methods

This study was approved by the institutional review board of the University of Pennsylvania. Selected elective case was defined as a non-emergency case scheduled before 8:00 am on the day of surgery in both the General OR and ambulatory surgical center of the Hospital of the University of Pennsylvania. A cancelled case was defined as a scheduled procedure that is not performed on the scheduled day of procedure. Case cancellation was monitored in real time using an electronic patient flow system (Navicare). As soon as the case was cancelled, the reason for cancellation was obtained from the surgeon, the anesthesiologist, the OR coordinated nurses and/or the floor nurses. Patients who receive a surgical operation in general OR include inpatients, outpatients and same day admission patients while only outpatients receive surgical procedure at the ambulatory surgical center. The cancelled cases in ambulatory surgical center were followed by nurses to determine if they were rescheduled and they also determined the average delay. The delay was indicated by number of days from when the case was cancelled to the first rescheduled time.

Cancellation reasons were collected from residents, attendings or OR nurses. The reasons were then categorized into eight groups for data analysis purpose: inadequate preoperative preparation, medical condition changes, no show, no consent, scheduling issue, staff availability, and miscellaneous. In order to guide further OR efficiency study, cancellation

reasons of general OR were further grouped as preventable which include: inadequate preoperative preparation, scheduling and consent; potentially-preventable which include: patient no show, staff availability, OR availability and miscellaneous; and Nonpreventable which is medical condition change.

### Statistical analysis

The cancellation rate was calculated by the number of cancelled cases for certain reason divided by total cancelled elective cases in general OR or ambulatory surgical center; and indicated by mean  $\pm$  SD (standard deviation). The cancellation rate between general surgical center and ambulatory surgical center were analyzed with chi-square,  $p < 0.05$  is considered statistically significant. In the ambulatory surgical center, the average delay time was presented as median and range. Data were analyzed using Graph Pad Prism 6.0 (Graph Pad Software, Inc.) software.

### Results

A total of 4261 elective cases were included in this study, of which, 2751 cases were from the general ORs and 1510 cases were from the ambulatory surgical center. 283 cases (6.6%) were cancelled which includes 206 cases (7.5%) from the general OR and 77 (5.1%) from the ambulatory surgical center (Table 1). The general OR had a significantly higher cancellation rate than the ambulatory surgical center ( $p < 0.01$ ).

#### General OR Cancellations

In general OR, inpatients had the highest cancellation rate of 18%, 166 cancelled out of 918 scheduled cases; followed by outpatients at 4.6%, 28 cancelled out of 607 scheduled cases; and same day admission had the lowest cancellation rate of 2%, 13 cancelled out of 655 scheduled cases (Table 2).

The top 3 reasons for the high cancellation rate in general OR were inadequate preoperative preparation  $29.4 \pm 4.5\%$ , (such as high International Normalized Ratio (INR), Nil per os status (NPO), and need for further workup); medical condition change  $28.5 \pm 10.2\%$ , (such as fever, new onset stroke); and scheduling issue  $20.2 \pm 7.1\%$  (Figure 1). Other reasons were no consent, no show and surgeon availability.

$59.2 \pm 8.9\%$  of the cancellations in general OR were considered preventable which includes inadequate preoperative preparation, scheduling and consent;  $12.3 \pm 5.9\%$  potentially-preventable, such as no show, staff and OR availability;  $28.5 \pm 10.2\%$  were Non-preventable, such as patient condition changes.

#### Ambulatory surgical center cancellations

In the ambulatory surgical center, patient no show was the most common reason  $75.8 \pm 5.2\%$ , followed by inadequate preoperative preparation  $8.6 \pm 3.8\%$ , and medical condition changes ( $7.1 \pm 5.7\%$ ) (Figure 2).

Only 61% of the no show patients were rescheduled and the mean delay for surgery was 18 days, range from 1 day to 84 days.

### Discussion

#### Case cancellation rate

Using the same cancellation criteria, the overall case cancellation in general OR is significantly higher than ambulatory surgical center, 7.5% versus 5.1% ( $p < 0.01$ ).

Patients in the general OR were dominantly inpatients. Inpatients in the general OR had the highest case cancellation rate of 18.1%, which is similar to other large academic surgical centers prior to establishing a preoperative clinic [5,9]. Outpatients operated in general OR or ambulatory surgical center have the same case cancellation rate although the reasons for cancellation were different. The outpatient case cancellation rate is within the range reported in settings in which a preoperative clinic exists (from 1.8% to 8.4%) [5,10]. Same day admission has the lowest cancellation rate at 2.0%.

### Reasons of cancellation

**General OR**—Inadequate preoperative preparation was the top cancellation reason in the general OR ( $29.4 \pm 4.5\%$ ). It was also the top reason in each of the individual subgroups: inpatient, outpatient and same day admission. High INR, NPO violation and “not cleared by internal medicine” were often included in the inadequate preoperative preparation category as noted by medical staff on the day of surgery. Due to the late notice of the patient’s medical condition, these patients need further workup which leads to cancellation. Inadequate preoperative preparation should be prevented.

A medical condition change was the second most common reason for cancellation in general OR ( $28.5 \pm 10.2\%$ ). It was also the second most common reason in inpatient, outpatient and same day admission. Usually, a sudden medical condition change leads to an unavoidable cancellation, however, if patients are under close monitoring, the risk can be reduced and this will also lead to decrease in case cancellation rate.

We found scheduling was another common reason for case cancellation rate in general OR. Lack of adequate communication between surgical staffs and overbooking might contribute to scheduling issues.

**Ambulatory surgical center**—Patient no show was the single most common reason ( $75.8 \pm 5.2\%$ ) for cancellation in the ambulatory surgical center. Argo’s study in Veterans Health administration system during 2006 also found that the top cancellation reason is patient no show [2]. Most often, a patient not showing is due to patient’s changing their mind at the last moment, or could not make to the hospital due to the traffic and/or weather. While it seems that patient no show is difficult to avoid, Tentamen reported there was no single no show case at the Mayo Clinic in Arizona over one year during June 2009 to July 2010, and the author attribute the reason to a good schedule system and thorough preoperative evaluation, a shared medical record, and timely communication [11].

The second most common cancellation reason is inadequate preparation, which should be avoidable.

Only 61% cancelled cases were rescheduled within one year follow up period. Boudreau [12] reported that reschedule rate might be associated with the national economic recession based on the findings that year 2010 had lower reschedule rate (56%) than year 2008 (76%) even overall case cancellation rate was decreased.

### Potential Strategies to reduce case cancellation

Our results agree with many studies, in which most cancellations ( $59.2 \pm 8.9\%$ ) are preventable [11]. Attempts should be made to decrease case cancellation starting with the most prevalent preventable reasons. For example, in general OR, the leading causes of case cancellation are inadequate preoperative preparation and scheduling related issues which can be and should be prevented.

It has been shown that the preoperative clinic can effectively bring down the cancellation rate, and therefore increase the OR efficiency. A preoperative clinic dramatically decreased cancellation rate from >10% to <5%, and for some hospital to as low as <1% through anesthesiologists reducing cancellation rate caused by inadequate preparation [5, 11,13–15]. However, these are for outpatients who went through preoperative clinic. Theoretically, inpatients should have best preoperative preparation since they are already in the hospital and have access to readily available services. However, this study demonstrates an opposite occurrence in our hospital. The question is whether an inpatient preoperative clinic/unit operated by the department of anesthesiology is cost-effective, through which anesthesiologists could involve patient care for preoperative evaluation and preparation as early as possible to have a proper plan in place if a patient is scheduled for an elective procedure during the hospitalization.

Other than preoperative evaluation, Boudreau [12] found it important to educate patients to take simple and proper precaution before procedure to reduce potential cancellation. For example avoiding contact with sick individuals to prevent upper respiratory infection diseases can significantly decrease the case cancellation rate caused by a medical condition change [16].

To reduce the patient no show in ambulatory surgical center, Basson [17] suggested an adjustment of patient scheduling to book the inpatient patients at the end of the surgical day. This is a simple strategy to put in practice. Providing help to patients with transportation to the hospital and timely communication may also help to decrease case cancellation rate. Moreover, preoperative evaluation can dramatically decrease no show.

## Conclusions

Case cancellation is not un-common in a large academic center. The dynamics of case cancellation is different in an ambulatory surgical center compared to the general OR settings for inpatients. Inpatients have the highest cancellation rate associated with inadequate preoperative preparation and scheduling which should be preventable via adopting proper systems of early evaluation and preparation. Most of the case cancellations in the ambulatory surgical center are from patient no-show, suggesting that administrative strategies to reduce this issue should be implemented. The patients admitted on the same day of surgery had the lowest cancellation rate requiring minimal intervention.

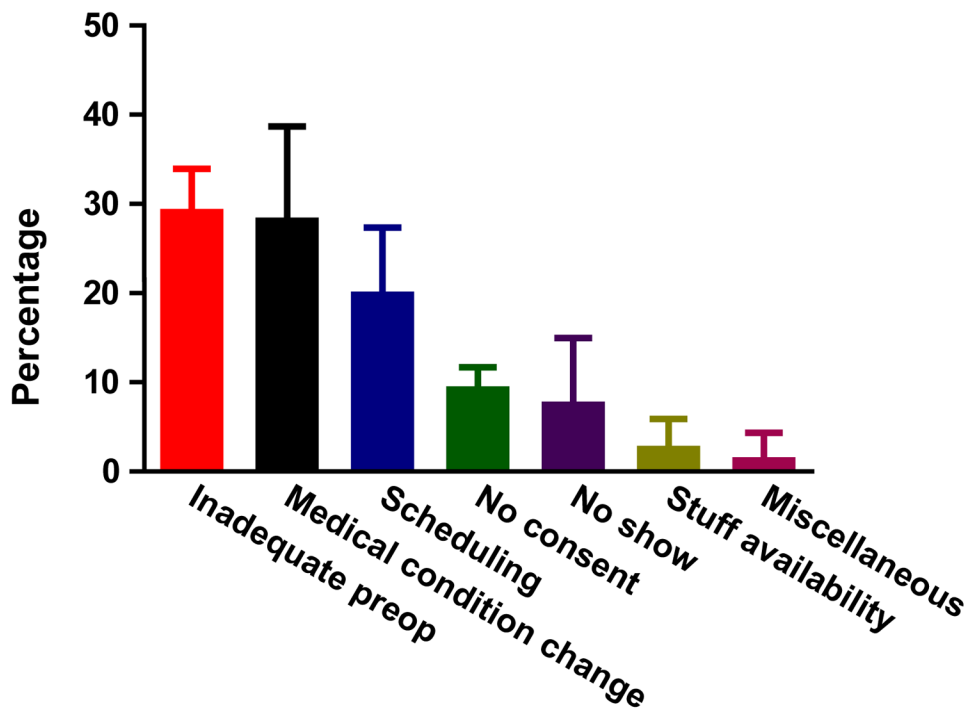
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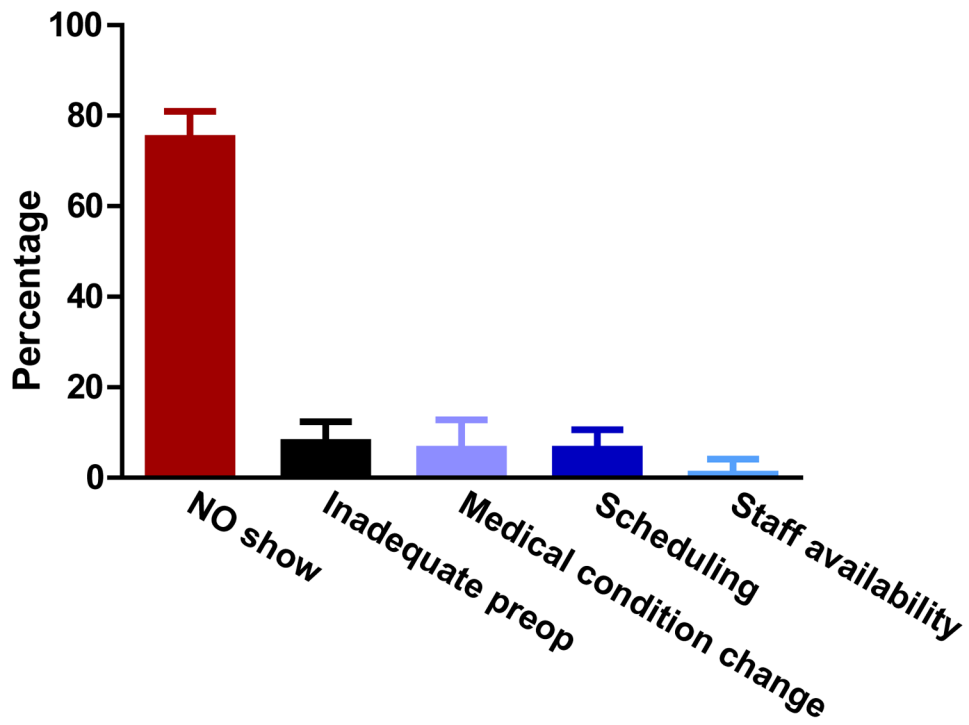
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**Figure 1.** Cancellation Reasons in general operating room. Major reasons were inadequate preoperative, medical condition change and scheduling issue. Data are presented as Mean  $\pm$  SD.



**Figure 2.** The preventability of cancellation reasons in general surgical center. Among which,  $59.2 \pm 8.9\%$  were preventable (=inadequate pre-operative preparation+schedule+consent);  $12.3 \pm 5.9\%$  were maybe preventable (=patient no show+staff availability+OR availability +miscellaneous);  $28.5 \pm 10.2\%$  were non-preventable (=medical condition change). Data are presented as Mean  $\pm$  SD.



**Table 1**

Overall cancellation rate for the elective cases.

	<b>General Operating Rooms</b>	<b>Ambulatory Surgical Center</b>	<b>Total</b>
Scheduled	2751	1510	4261
Canceled	206	77	283
Cancellation Rate	7.5%*	5.1%	6.6%

\*P=0.0049 as compared to that in the ambulatory surgical center

**Table 2**

Cancellation rate in general operating rooms.

	<b>Inpatients</b>	<b>Outpatients</b>	<b>Same Day Admission</b>
Total cases	918	607	655
Cancelled cases	166	28	13
Cancellation rate	18.1%	4.6%	2.0%