

# Cancellation of Elective Cases in Songklanagarind Hospital: Identification of Reason: A Retrospective Study

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**Background:** The operating theatre is the most important department of a hospital as it involves significant resources. One of the significant obstacles in overseeing a theater managing system is scheduled elective case cancellation.

**Objective:** The present study was conducted to identify preventable reasons for cancellation.

**Materials and Methods:** A retrospective study was conducted between January and December 2018. Data from scheduled elective cases were retrieved from a database of the Department of Anesthesiology, Faculty of Medicine, Prince of Songkla University. All patients who required anesthetization for surgery were divided into two groups, proceeding with the operation, and case cancellation. Baseline characteristics of the two groups were compared using the chi-square test, Fisher's exact test, and analysis of variance. All statistical analyses were performed using the R software, and the correlation was considered significant at p of less than 0.05. The reason for case cancellations was categorized into three groups, preventable, unpreventable, inconclusive, then displayed as percentages.

**Results:** In all, 12,423 patients were identified as being scheduled elective cases. The case cancellation rate was 6.4%. Cancellation rates of males and females were 7.3% and 5.6%, respectively. Patients aged 65 to 79 years exhibited a 7.6% cancellation rate, and the cancellation rate was the highest at 17.3% in the American Society of Anesthesiologists (ASA) physical status classification 4. Of the 797 canceled surgeries, 397 cases (50%) were preventable, 192 cases (24%) were unpreventable, and 208 cases (26%) involved inconclusive reasons. The preventable reasons for cancellation comprised incomplete medical evaluations in 179 cases (22.5%), overtime in 74 cases (9.3%), and the patient refused surgery in 52 cases (6.5%).

**Conclusion:** The most common cause of elective case cancellation is an incomplete preoperative evaluation, which is a preventable reason. Therefore, preoperative evaluation protocol as a one-stop service preoperative clinic should be established to prevent and decrease the cancellation rate of elective cases.

**Keywords:** Cancellation case; Elective surgery; Preventable reason

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The operating theatre is the most crucial hospital department due to affecting significant resources and the largest cost center in most hospitals<sup>(1-3)</sup>. However, one of the obstacles in operating a theater managing system is the cancellation of the scheduled surgeries<sup>(1)</sup>. It could produce useless investigations, blood cross-matching, and waste patients' time to admission contributing to delayed

patient care and potentially affecting the overall clinical outcome<sup>(2-5)</sup>.

This problem is also inconvenience for physicians and patients, leading to decreased patient satisfaction<sup>(3-5)</sup>.

The incidence of cancellations reported in the literature varied widely from 2% to 27%<sup>(4-6)</sup>. A low case cancellation rate indicates a well-functioning surgical facility, suggesting less than 5%. The causes of cancellation are multifactorial and differ from hospital to hospital. Previous studies have attempted to identify reasons for case cancellation and often categorized them as a patient factor, surgical factor, and doctor factor<sup>(7-9)</sup>. Nevertheless, these groupings are unsuitable for improving the quality of the operating theater system. Occasionally, the troubles are ignored, but the grouping as a preventable reason emphasizes the problem and reinforces facilities to compare their performance with other facilities and enhance their system. Therefore, the present study

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aimed to identify cancellations and categorize them as preventable and unpreventable reasons.

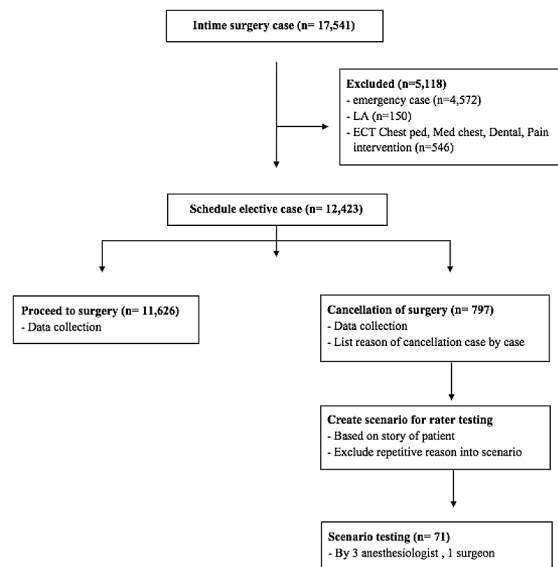
## Materials and Methods

### Hospital setting

Songklanagarind Hospital is the most prominent academic teaching hospital in southern Thailand. It consists of twenty-three operating rooms for thirteen surgical specialties, including ophthalmology, orthopedic, otorhinolaryngology, cardio-thoracic surgery, neurological surgery, plastic surgery, general surgery, vascular surgery, urology, pediatric surgery, trauma surgery, obstetrics, and gynecology. In addition, the present study hospital has three sites outside the operating room, which are cardiac catheterization suite, interventional radiology, and GI-scope. All elective cases were scheduled to be performed Monday through Friday, starting at 8.30 am and required to be finished by 4.30 p.m. Schedules of elective cases were launched at 3.00 pm before the day of surgery. On the day of surgery, elective cases were canceled at 3.30 p.m. when the procedure had no chance to be completed before 6.00 p.m.

### Data collection

The present study was conducted after obtaining approval from the Institutional Review Board of Prince of Songkla University (REC 62-348-8-1). The authors received a list of patients assigned in scheduled elective surgeries throughout 2018 from the database of the Anesthesiology Department. Anesthetic and electronic medical records were retrieved from the database of Songklanagarind Hospital. Baseline data were collected, including age, gender, body mass index (BMI), the American Society of Anesthesiologists (ASA) classification, order of the day, date of operation, surgical specialty, and cancellation reasons. Excluded in the present study were surgical cases performed without involving anesthesia, electroconvulsive therapy from the Department of Psychiatry, pain relief procedures from chronic pain of the Department of Anesthesiology, and cases performed in the emergency room such as dental, pediatric chest, and chest medicine because these cases were conducted at the emergency room and might be interrupted by an emergency case at any time. A canceled case was represented as a scheduled surgery not performed on the scheduled day. Typically, the reason must be documented by an anesthesiologist, surgeon, and scrub nurse. Therefore, the authors explored the anesthetic notes, progress notes, and discharge summaries. The authors



**Figure 1.** Flow of process.

collected and omitted redundant reasons from 797 canceled cases over one year, then constructed a scenario-based questionnaire for 71 reasons. Each scenario was classified as preventable, unpreventable, and inconclusive by three anesthesiologists and one surgeon independently, as illustrated in Figure 1. The experience of raters in the surgical field was at least three years. They could not allocate cancellation reasons to more than one section. The raters discussed and considered again if the cause was not consensus to categorize. Definition of the preventable reason involved a situation that declined if the system had developed. The unpreventable reason was an unexpected situation that was unable to be prevented. An inconclusive reason was unknown.

### Statistical analysis

The sample size for the present study was calculated by n4studies. Prevalence of cancellation case in Songklanagarind Hospital was 0.14<sup>(10)</sup>. From the calculation, the sample size was 1463 calculated by increasing the drop out by 10%<sup>(11)</sup>. The data were collected on a private computer. The baseline characteristics of the two groups were compared using the chi-square test, Fisher's exact test, or analysis of variance. All statistical analyses were performed using the R software, and the correlation was considered significant at p-value less than 0.05. Case cancellations were categorized into preventable, unpreventable, and inconclusive, then displayed as percentages.

**Table 1.** Characteristic of elective cases

Variables	Proceed; n (%)	Cancellation; n (%)			p-value
		Preventable	Unpreventable	Inconclusive	
Total	11,626 (93.6)	397 (3.2)	192 (1.5)	208 (1.7)	
Sex					<0.001
Male	5,341 (92.7)	201 (3.5)	97 (1.7)	123 (2.1)	
Female	6,285 (94.4)	196 (2.9)	95 (1.4)	85 (1.3)	
Age group (year)					<0.001
≤15	2,167 (92.6)	62 (2.7)	67 (2.9)	43 (1.8)	
16 to 64	6,917 (94.3)	227 (3.1)	80 (1.1)	114 (1.6)	
65 to 79	1,962 (92.4)	88 (4.1)	33 (1.6)	41 (1.9)	
≥80	580 (93.2)	20 (3.2)	12 (1.9)	10 (1.6)	
BMI*					0.002
<18.5	724 (91.5)	37 (4.7)	15 (1.9)	15 (1.9)	
18.5 to 24.9	4,214 (94.3)	158 (3.5)	43 (1.0)	52 (1.2)	
25 to 29.9	2,423 (95.9)	63 (2.5)	25 (1.0)	16 (0.6)	
30 to 34.9	832 (95.6)	21 (2.4)	10 (1.1)	7 (0.8)	
35 to 39.9	196 (96.1)	4 (2.0)	1 (0.5)	3 (1.5)	
≥40	130 (94.9)	4 (2.9)	3 (2.2)	0 (0.0)	
ASA classification					<0.001
1	1,036 (91.8)	31 (2.7)	21 (1.9)	41 (3.6)	
2	7,291 (94.7)	202 (2.6)	95 (1.2)	112 (1.5)	
3	3,189 (92.1)	155 (4.5)	62 (1.8)	55 (1.6)	
4	110 (82.7)	9 (6.8)	14 (10.5)	0 (0.0)	
5	2 (66.7)	0 (0.0)	1 (33.3)	0 (0.0)	
Technique of anesthesia					<0.001
General anesthesia	9,168 (93.1)	344 (3.5)	165 (1.7)	170 (1.7)	
Regional anesthesia	2,232 (95.1)	52 (2.2)	27 (1.1)	37 (1.6)	
MAC	226 (99.1)	1 (0.4)	0 (0.0)	1 (0.4)	
Type of ward admission					<0.001
General	8,015 (93.3)	299 (3.5)	138 (1.6)	135 (1.6)	
ICU	301 (89.9)	18 (5.4)	15 (4.5)	1 (0.3)	
Private	3,310 (94.5)	80 (2.3)	39 (1.1)	72 (2.1)	
Case					0.001
IPD	10,693 (93.4)	385 (3.4)	180 (1.6)	186 (1.6)	
OPD	933 (95.3)	12 (1.2)	12 (1.2)	22 (2.2)	
Day of operation					0.073
Monday	2,322 (92.9)	92 (3.7)	32 (1.3)	53 (2.1)	
Tuesday	2,370 (93.3)	82 (3.2)	42 (1.7)	45 (1.8)	
Variables	Proceed; n (%)	Cancellation; n (%)			p-value
		Preventable	Unpreventable	Inconclusive	
Wednesday	2,480 (93.0)	93 (3.5)	40 (1.5)	53 (2.0)	
Thursday	2,379 (94.4)	65 (2.6)	44 (1.7)	33 (1.3)	
Friday	2,075 (94.4)	65 (3.0)	34 (1.5)	24 (1.1)	
Month of operation					0.038
January	1,001 (92.0)	46 (4.2)	20 (1.8)	21 (1.9)	
February	923 (92.4)	35 (3.5)	21 (2.1)	20 (2.0)	
March	970 (93.5)	37 (3.6)	14 (1.4)	16 (1.5)	
April	857 (92.7)	31 (3.4)	13 (1.4)	23 (2.5)	
May	1,026 (94.1)	33 (3.0)	7 (0.6)	24 (2.2)	
June	1,035 (94.6)	26 (2.4)	13 (1.2)	20 (1.8)	
July	925 (91.7)	41 (4.1)	26 (2.6)	17 (1.7)	
August	930 (95.1)	28 (2.9)	9 (0.9)	11 (1.1)	
September	968 (94.9)	28 (2.7)	16 (1.6)	8 (0.8)	
October	1,076 (93.6)	34 (3.0)	18 (1.6)	21 (1.8)	
November	1,048 (94.4)	33 (3.0)	17 (1.5)	12 (1.1)	
December	867 (93.7)	25 (2.7)	18 (1.9)	15 (1.6)	
Order of schedule					<0.001
1 to 3	9,819 (94.5)	265 (2.5)	161 (1.5)	148 (1.4)	
4 to 6	1,603 (89.9)	107 (6.0)	27 (1.5)	46 (2.6)	
≥7	204 (82.6)	25 (10.1)	4 (1.6)	14 (5.7)	
Department					<0.001
Cathlab	192 (97.5)	3 (1.5)	2 (1.0)	0 (0.0)	
CVT	376 (90.8)	24 (5.8)	11 (2.7)	3 (0.7)	
ENT	1,403 (95.0)	41 (2.8)	27 (1.8)	6 (0.4)	
Ophthalmology	852 (90.8)	30 (3.2)	28 (3.0)	28 (3.0)	
General surgery	1,960 (95.4)	41 (2.0)	22 (1.1)	32 (1.6)	
Gastroenterology	169 (90.9)	14 (7.5)	2 (1.1)	1 (0.5)	
Neurosurgery	418 (93.9)	18 (4.0)	8 (1.8)	1 (0.2)	
Ob-gyn	1,834 (96.9)	29 (1.5)	22 (1.2)	8 (0.4)	
Orthopedics	1,696 (95.3)	48 (2.7)	16 (0.9)	20 (1.1)	
Pediatric surgery	468 (92.7)	16 (3.2)	14 (2.8)	7 (1.4)	
Plastic surgery	501 (94.9)	13 (2.5)	6 (1.1)	8 (1.5)	
Radiology	625 (85.7)	41 (5.6)	14 (1.9)	49 (6.7)	
Trauma	66 (94.3)	3 (4.3)	1 (1.4)	0 (0.0)	
Urologic surgery	648 (88.9)	41 (5.6)	10 (1.4)	30 (4.1)	
Vascular surgery	418 (87.6)	35 (7.3)	9 (1.9)	15 (3.1)	

ASA=American Society of Anesthesiologists; BMI=body mass index; IPD=inpatient department; OPD=outpatient department; ICU=intensive care unit; MAC=monitored anesthetic care; CVT=cardiothoracic; ENT=ear nose throat; Ob-gyn=Obstetrics and gynecology

\* Included patients who was more than 20 years old

## Results

### Characteristics compared between performed and canceled surgeries

Between January and December 2018, 12,423 patients were identified as having scheduled elective cases at Songklanagarind Hospital. Eleven thousand six hundred twenty-six patients proceeded with surgery plans as expected, while 797 patients canceled. The case cancellation rate was 6.4%. The study showed that 7.3% and 5.6% of canceled surgeries involved males and females, respectively, as presented in Table 1. Patients aged 65 to 79 exhibited

a 7.6% cancellation rate, and the cancellation rate was highest (17.3%) in the ASA physical status classification 4. Comparing outpatient departments (OPD) and inpatient departments (IPD) cases, IPD patients revealed a higher cancellation rate than OPD patients. The cancellation rate was 10.1% among patients admitted to the intensive care unit (ICU). Based on surgery schedule characteristics, the number of cases at seven or greater in the schedule indicated a cancellation rate of approximately 17.4%, and the cancellation rate was higher on Mondays (7.1%) than any other day. The incidence of canceled

**Table 2.** Reasons of cancellation

Reason	Case
Preventable reason (397, 50%)	
Incomplete medical evaluation	179
Overtime	74
Patient refused surgery	52
Change in treatment plan	15
Incomplete surgical evaluation	15
Did not follow preoperative instructions (fasting, stop antiplatelet, and anticoagulants)	14
Relative refused surgery	13
Financial problem	12
Unavailable bed	9
Equipment not available	8
Unavailable intensive care unit	6
No insurance authorization	4
Unavailable mechanical ventilators, blood component	3
Falling	3
Patient had a panic attack	2
Surgeon not available	1
Unpreventable reason (192, 24%)	
Medical status changed	140
Abnormal laboratory	20
Unpredictable event (flood, labor already)	18
Death	8
Emergency case prioritized	4
Inconclusive reason (208, 26%)	
No show	183
Rule out pulmonary tuberculosis	26

cases varied from 4.9% to 8.3% each month. The highest percentage occurred in July, and the lowest appeared in August. Regarding surgical aspects, the Department of Radiology exhibited the highest cancellation rate of 14.3%, followed by vascular surgery (12.4%) and urology (11.1%). Gender, age group, BMI, ASA classification, type of ward admission, the month of operation, order of schedule, and department had statistical significance among the preventable, unpreventable, and inconclusive reasons for cancellation case ( $p < 0.05$ ).

### The reasons for the cancellation

The reasons for cancellation were arranged following the causes of surgical cancellation, as presented in Table 2. Of the 797 canceled surgeries, 397 cases (50%) were preventable, 192 cases (24%) were unpreventable, and 208 cases (26%) implicated inconclusive reasons. The preventable reasons for cancellation contained incomplete medical evaluations in 179 cases (22.5%), overtime in 74 cases

(9.3%), and the patient refused surgery in 52 cases (6.5%). The unpreventable reasons involved medical status change in 140 cases (17.6%) and abnormal laboratory results in 20 cases (1.3%). Surgeries canceled by inconclusive reasons involved patient no-shows in 183 cases (23%).

### Discussion

The present study is the first to identify preventable and unpreventable reasons associated with cancellations of elective surgery in Thailand. Moreover, the reasons for cancellation were categorized by raters that assessed using a scenario-based basis. The study indicated that the cancellation rate was 6.4%, which was higher than the reported rates in other medical schools in Thailand, with Siriraj Hospital at 5.7%, Ramathibodi Hospital at 5.1%, and King Chulalongkorn Memorial Hospital at 3.9%<sup>(12)</sup>. This issue may occur because the present study hospital is a tertiary medical center in the South of Thailand. Therefore, the hospital must accept referral cases from other provinces. In comparison, the central part of Thailand had multiple medical tertiary centers. However, the outcome of the present study institute was considered a satisfactory rate of cancellation. In countries with qualified health care systems, the incidence of cancellation cases varied from 4.0% to 8.2%<sup>(3)</sup>. Regarding factors associated with the cancellation, the present study demonstrated that patients at high risk with ASA of 3 or greater, exhibited a cancellation rate similar to related literature<sup>(13)</sup>. In addition, the month of surgery could influence the cancellation rate. For example, July revealed the highest cancellation rate because this month had more long weekends than other months in Thailand. Nevertheless, as indicated in Yu et al's study, the Monday Effect did not discover a cancellation factor in the present study<sup>(5)</sup>.

The main reason for the cancellation was patient no-shows accounting for almost one-fourth, which is also a common cause in other literature<sup>(3,14,15)</sup>. The previous studies specified the causes of this reason with patients forgetting their appointments, fear, and doubt. The recommendations for resolving "Patient no-show" include improving the booking process and establishing a preoperative clinic to appropriate advice and prevent the patient's misunderstanding about the operation<sup>(16)</sup>. Most raters in the present study categorized "Patient no-show" as an inconclusive cause and challenge to manage. However, one study showed that effective communication and excellent system alarms such as short message service (SMS)

alerts before admission would reduce this problem. For example, the Mayo Clinic could diminish the incidence of a patient's no-show by SMS alert system to zero cases over one year<sup>(17)</sup>. However, the main reason differed from Ratanasuwan et al study<sup>(2)</sup> in Thailand, which revealed that the patients' medical problem was the most reason for case cancellation.

The second most common cause was an incomplete medical evaluation that raters classified as preventable reason. The present study had a high incomplete medical evaluation because patients had complicated comorbidity. Surgeons or interventionists did not completely evaluate and treated the patient's comorbidity before scheduling the surgery. When these patients were admitted and then evaluated by anesthesiologists, their uncontrolled comorbidities were not corrected. Therefore, they had to postpone the surgery on the day of the surgery. The preoperative anesthesia clinic may reduce the cancellation rate suggested in the existing literature<sup>(18,19)</sup>. Not only the cancellation rate was lessened, but other parameters such as operating theatre flow would also improve. Besides, it could decrease emergent consultations on admission.

The present study categorized items as preventable, unpreventable, and inconclusive to facilitate the improvement of the systems. Overall, preventable reasons were the highest, up to one-half of all the causes. The three most causes of the preventable condition were incomplete medical evaluation, overtime, and the patient refusing surgery. The second preventable reason comprised overtime. This reason occurs from referral cases, operative room limitations, and resident training practice. Due to the institute being a tertiary hospital, an overburdened schedule and complex surgical cases occurred. According to the study by Amina et al, lack of time to perform surgery was the most common cause, up to 34%<sup>(8)</sup>. The expanded operative theater will resolve the problem.

The strength of the present study was using a rating scale of cancellation by four doctors, three anesthetists, and one surgeon who have experience in the surgical field for more than three years to define reason in preventable, unpreventable, and inconclusive categories. Grouping of reasons will support clinicians to understand the valid reasons for elective cancellations better. Furthermore, the present study hospital uses a computer-based system to reduce paperwork on admission. Therefore, it might be helpful to organize and analyze the data in the future. The limitation of the present study was the

high rate of unknown causes, and the raters did not have a diversity of medical experience due to similar age and only doctor that may influence the judgment in the grouping of reasons. A prospective study of this issue should be analyzed further.

## Conclusion

In conclusion, the most common cause of elective case cancellation involved preventable reasons. The incomplete medical evaluation was the main reason for postponing the operations. Therefore, the hospital should create a multidisciplinary team containing internists, surgeons, and anesthesiologists to implement interventions or protocols such as establishing preoperative clinics in the hospitals. It can improve perioperative management and decrease preventable reasons in elective cancellation case.

## What is already known on this topic?

Cancellation cases affected the healthcare system. One of the obstacles in operating a theater managing system is the cancellation of scheduled surgeries. The causes of cancellation are multifactorial and differ from hospital to hospital. However, the common cause of the cancellation is incomplete evaluation of medical problem.

## What this study adds?

This study identified reasons for cancellations and categorized them into preventable and unpreventable reasons. Using this grouping make it easy to recognize the causes. The preventable reason can bring new strategies for improving the healthcare system, especially surgery and operative theater management such as preoperative anesthetic clinic and SMS alert.

## Conflicts of interest

The authors declare they have no conflict of interest.

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