Original Article

Elective Surgical Case Cancellations at Siriraj Hospital, a Thai University Hospital: Identification and Evaluation of the Reasons

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Objective: To determine the incidence of elective surgical case cancellations and the reasons for the cancellations at Siriraj Hospital, Thailand, during a one-year period.

Materials and Methods: A retrospective cross-sectional analytic study was conducted from May 2016 to April 2017. All data on case cancellations of elective surgical procedures were retrieved. The reasons for the cancellations were extracted from the hospital's medical records, analyzed separately for outpatient and inpatient settings, and classified into one of 6 categories: patient issue, hospital-facility issue, surgeon issue, anesthesiologist issue, medical condition, and miscellaneous.

Results: Of 48,784 scheduled elective procedures, 2,760 cases were cancelled, representing an incidence of 5.7% (95% CI 5.5 to 5.9). The highest number of case cancellations occurred in the Gastrointestinal Endoscopy Unit (37.4%). The most common category for cancellations in the outpatient department [OPD] setting was patient issue (54.1%), with the most common reason being patient no-show (41.5%). However, in the inpatient department [IPD] setting, hospital-facility issue was the most common category, with an improperly estimated case-time being the most common reason (20.8%).

Conclusion: Cancellations occurred for 5.7% of elective surgical cases, and they were due primarily to the patient and hospital-facility factors of patient no-show and improperly estimated case-time, respectively. Strategies to improve hospital management and the information sharing between medical units are needed to reduce the overall level of elective surgical case cancellations caused by patient and hospital-facility issues.

Keywords: Case cancellations, Reasons for cancellation, Hospital quality

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Unanticipated cancellations of elective surgery have a negative impact on surgical schedules, hospital resources and operating theatre efficiency[1,2]. Case cancellations are one parameter used to assess the quality of a hospital's patient care and management systems[3]. The cancellations are also inconvenient to patients, nurses and physicians, and lead to decreased patient satisfaction and diminished staff morale[4]. Additionally, case cancellations result in wasted investigations and blood cross-matchings, lead to delayed patient care, and could potentially affect the clinical outcomes[5-7]. The overall cancellation rates from studies in other countries ranged between 7% and 40%[8-12].

The causes of cancellation are multifactorial and differ from hospital to hospital. The reasons for elective surgical case cancellations can be classified into the six factors of patient issue, hospital-facility issue, surgeon issue, anesthesiologist issue, medical condition, and miscellaneous. Unexpected case cancellations have traditionally been divided into avoidable cancellations (such as scheduling errors, equipment shortages, or inadequate pre-operative evaluations) and unavoidable cancellations (such as an emergency case superseding the elective schedule, unexpected changes in the patient's medical status, or

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patient nonappearance). One study reported that the most common reason for the cancellations was a lack of operating room time, while another retrospective study of 1,063 scheduled cases in USA revealed that the most common reason for avoidable cancellations was a lack of medical clearance[13,14]. Cancellation rates related to patients' medical condition or an anesthesiologist issue have ranged between 8% and 30%[5,15].

However, the cancellation rate of elective surgical cases and the causes of cancellation at Siriraj Hospital have never been analyzed. Therefore, this study was designed to determine the cancellation rate and to identify the reasons for cancellations at the hospital.

Materials and Methods

Hospital setting

Siriraj Hospital is Thailand's largest tertiary and quaternary-care medical center, with a capacity of more than 2,200 beds and approximately 2,800,000 outpatient visits, 80,000 inpatient admissions and 40,000 surgical cases each year. The Faculty of Medicine at Siriraj Hospital consists of 25 departments and 9 specialized centers. The hospital service encompasses 63 operating theaters for 16 surgical specialties, including ophthalmology; orthopedic surgery; otorhinolaryngology; cardio-thoracic surgery; neurological surgery; plastic and reconstructive surgery; head, neck and breast surgery; general surgery (hepato-pancreatic-biliary and transplantation, minimally invasive surgery and colorectal surgery); vascular surgery; urology; pediatric surgery; trauma surgery; obstetrics and gynecology; gastrointestinal endoscopy; cardiac catheterization; and dental surgery.

All elective cases are scheduled to be performed from Monday to Friday; they begin at 9 AM and are required to be finished by 4 PM. Elective cases are cancelled at about 3 PM if the corresponding procedure has no reasonable prospect of being completed by 6 PM. If no emergency theatres are available, emergency or urgent procedures are performed in the elective theatres by cancelling elective cases. Elective surgical lists are distributed before 4 PM on the day prior to surgery, and provide data relating to the patients' names, genders, ages, surgeons' names, diagnoses, intended procedures, and planned procedure times (skin-suture times).

Data collection

A retrospective cross-sectional analytic study was conducted at Siriraj Hospital after approval by the Siriraj Institutional Review Board (Si. 410/2016). All data relating to the surgical cases, surgical schedules and case cancellations were retrieved from the operating theatre lists, operating theatre case log books, and statistical units of the Department of Anesthesiology and of the Quality Improvement Center, Division of Quality Development of the Faculty of Medicine, Siriraj Hospital, for the period May 2016 to April 2017. Surgical cases performed without anesthesia involvement were excluded, as were the data for patients undergoing emergency or urgent surgery (which meant that the patients' names did not appear in the elective surgical lists).

A cancelled case was defined as an elective surgery that was cancelled on the planned day of surgery and at some time point after the release of the elective surgical lists. When a cancellation occurs, the primary reason for the cancellation is routinely recorded in patients' medical records and reported to all relevant personnel. The error reports for case cancellations and repetitive reported data for the same scheduled cases were excluded from our analysis. The reasons for the cancellations were extracted from the associated incident reports held in both the Department of Anesthesiology and the hospital's central medical record system; the medical records, including the outpatient department [OPD] and inpatient department [IPD] charts for each case, were explored in depth if necessary.

The collected data included the number of scheduled cases, number of cancellations, demographic data of the cancelled patients, surgical specialty, date, and reasons for the cancellations. The reasons were categorized into one of 6 categories, namely, patient issue, hospital-facility issue, surgeon issue, anesthesiologist issue, medical condition, and miscellaneous. No single cancellation could be assigned to more than one category. More information about the categorization is at Appendix 1.

Statistical analysis

The primary objective of this study was to estimate the incidence of case cancellations. The sample size for the study was calculated using historical data retained by Siriraj Hospital on the assumption of a 7% incidence of case cancellations. A sample size of 2,501 patients with a scheduled-case cancellation was needed to achieve a 95% confidence interval [CI] with a 1% margin of error.

The data were collected in a private computer

database and analyzed with Microsoft Excel 2010 (Microsoft, Redmond, WA, USA) and SPSS Statistics for Windows, version 18.0 (SPSS Inc., Chicago, IL, USA). The incidence of cancellations was calculated by the number of actual cancelled cases for certain reasons divided by the total number of elective surgical cases during the study period. The incidence was displayed as the mean and the 95% CI. Patients' demographics were presented as numbers and percentages. The reasons for case cancellation were categorized into six groups, as described previously, and displayed as percentages.

Results

During the study period, a total of 48,803 elective surgical cases that required anesthesia were performed, and a further 3,003 cases underwent emergency or urgent operations. A small percentage of patients were excluded due to repetitive reported data. Therefore, the incidence of case cancellations was 5.7%, with a 95% CI of 5.5 to 5.9; this represented 2,760 cancelled cases out of the initial 48,803 elective surgical cases. The flow diagram for STROBE checklist of patients in this study is in Figure 1.

For each month, the incidence of case cancellations ranged from 4.3% to 6.7%, with the highest incidence occurring in May 2016 (6.7%) and the lowest in March 2017 (4.3%; Figure 2). The average number of monthly cancellations was 232, ranging between 189 and 286 cases.

Patients' demographics, OPD/IPD status, and information on their pre-operative consultations are at Table 1. The total numbers of the OPD and IPD patients were about the same size, and the male:female gender ratios were similar, at approximately 50%: 50% for each setting. The average age of patients was 54 years in the case of OPD patients (range: 0 to 93 years), and 51 years for the IPD patients (range: 0 to 99 years). Among the cancelled cases, 84 patients received preoperative clinic consultation [SiPAC] before admission.

Figure 3 displays the number of case cancellations for the ten-highest cancellation units during the study period, classified by OPD and IPD status. The highest number of elective case cancellations occurred in the gastrointestinal endoscopy unit (1,032; 37.4%). The number of OPD case cancellations was greater than that of IPD patients in 4 surgical units (the gastrointestinal endoscopy, ophthalmology, plastic and reconstructive surgery, and trauma surgery units). Conversely, in the remaining 6 units, IPD patients represented more than 60% of each

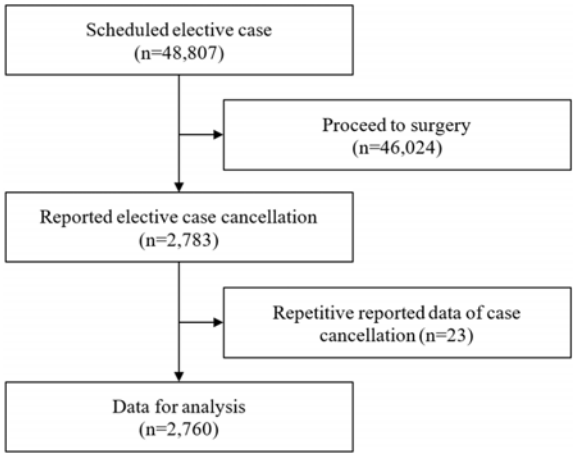

Figure 1. Flow diagram for STROBE checklist of study patients.

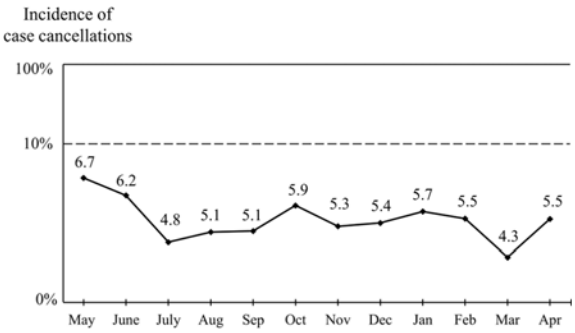

Figure 2. Incidence of case cancellations, classified by month.

Table 1. Demographic data

Elective surgical case cancellation	Total (n = 2,760)	
	OPD patients (n = 1,346)	IPD patients (n = 1,414)
Gender		
Male	593 (44)	743 (52)
Female	754 (56)	671 (48)
Age		
<18 years	89 (6.8)	200 (14.6)
18 to 65 years	821 (62.4)	721 (52.5)
>65 years	436 (33.2)	452 (32.9)
SiPAC consultation (patients)	22 (2)	62 (4)

The data are presented as n (%)
OPD = outpatient department; IPD = inpatient department

unit's total number of cancellations. The top 5 units for cancelled OPD cases were the gastrointestinal endoscopy (56.2%), ophthalmology (15.5%), plastic and reconstructive surgery (12.4%), orthopedic surgery (6.8%), and otorhinolaryngology (2.2%) units. as for IPD patients, the top 5 were the gastrointestinal endoscopy (19.4%), otorhinolaryngology (14.2%), orthopedic surgery (12.4), cardio-thoracic surgery (8.2%) and neurological surgery (6.9%) units.

The reasons for case cancellations were grouped into 6 categories (Figure 4). The most common category among the OPD patients was patient issue (728 patients), which represented more than 50% of the cancelled OPD cases. In contrast, the three most common categories in the IPD setting were hospital-facility issue (428 patients), medical condition (413 patients) and surgeon issue (360 patients); each accounted for 25% to 30% of IPD cancellations. There were 24 patients who had no information about the reasons for cancellations, they were categorized into the category 'miscellaneous'.

Regarding the in-depth analysis of the individual reasons for each category, the most common fifteen reasons for both OPD and IPD patients are presented at Table 2. The top 3 reasons for the high cancellation rate among the OPD patients were patient no-show (41.5%), changed line of surgical management (11.5%), and patient refusal (10.5%); these three reasons together accounted for approximately 60% of the OPD case cancellations. As for the IPD patient setting, improperly estimated case time was the most common reason (20.8%), followed by changed line of surgical management (17.2%), with medical condition (respiratory tract problems; 17.2%) ranking third.

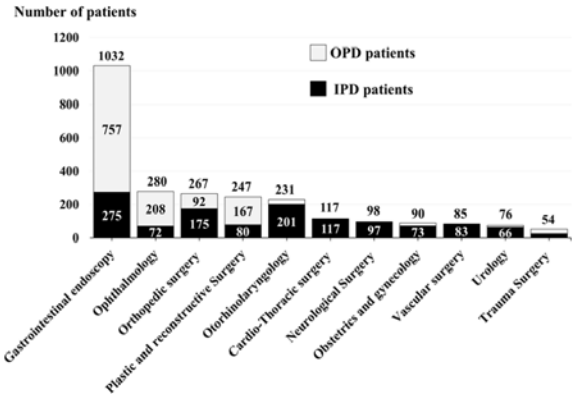

Figure 3. Incidence of case cancellations, classified by surgical unit.

Discussion

The incidence of elective surgical case cancellations at Siriraj hospital was 5.7%, which was similar to the 5.1% found at Ramathibodi Hospital, another medical school under the control of Mahidol University[16]. Other teaching hospitals in Thailand have demonstrated incidences of 3.9% (King Chulalongkorn Memorial Hospital) and 14.3% (Songklanagarind Hospital)[17,18]. The result from our institute is similar to those found in other Asian

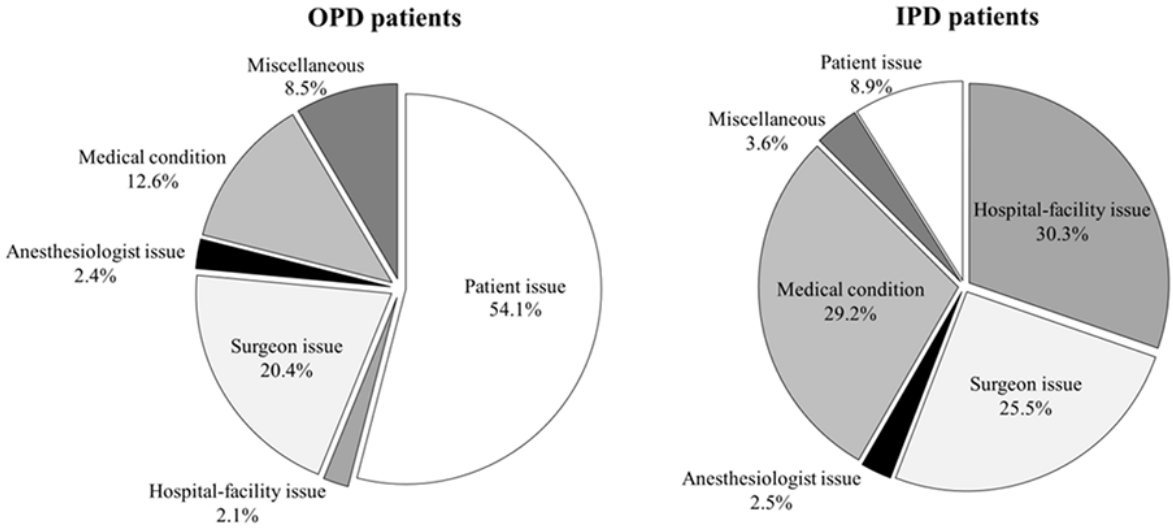

Figure 4. Categories of reasons for elective case cancellations.

Table 2. Reasons for case cancellations

Range	Reason	Category	Number
IPD patients (n = 1,414)			
1	Patient no-show	Patient issue	558 (41.5)
2	Changed line of management	Surgeon issue	155 (11.5)
3	Patient refusal	Patient issue	141 (10.5)
4	Scheduling problems	Surgeon issue	83 (6.2)
5	Health insurance	Miscellaneous	53 (3.9)
6	No specific reason	Miscellaneous	47 (3.5)
7	Respiratory tract problems	Medical condition	45 (3.3)
8	Cardiovascular problems	Medical condition	36 (2.7)
9	Patient dead	Patient issue	29 (2.2)
10	Skin infection	Medical condition	28 (2.1)
11	Inadequate preparation	Surgeon issue	25 (1.9)
12	Preoperative drug error	Anesthesiologist issue	23 (1.7)
13	Eye problems	Medical condition	23 (1.7)
14	Improperly estimated case time	Hospital-facility issue	15 (1.1)
15	Surgeon unavailable	Surgeon issue	14 (1.0)
OPD patients (n = 1,346)			
1	Improperly estimated case time	Hospital-facility issue	294 (20.8)
2	Changed line of management	Surgeon issue	243 (17.2)
3	Respiratory tract problems	Medical condition	113 (8.0)
4	Cardiovascular problems	Medical condition	93 (6.6)
5	Patient refusal	Patient issue	72 (5.1)
6	Intensive care unit unavailable	Hospital-facility issue	64 (4.5)
7	Scheduling problems	Surgeon issue	58 (4.1)
8	Have emergency case	Hospital-facility issue	53 (3.7)
9	Patient no-show	Patient issue	47 (3.3)
10	Fever-unspecified	Medical condition	34 (2.4)
11	Surgeon unavailable	Surgeon issue	31 (2.2)
12	Inadequate preparation	Surgeon issue	28 (2.0)
13	Gastrointestinal tract problems	Medical condition	28 (2.0)
14	Skin infection	Medical condition	28 (2.0)
15	Preoperative drug error	Anesthesiologist issue	25 (1.8)

The data are presented as n (%).
OPD = outpatient department; IPD = inpatient department

countries (6.6% in Hong Kong and 7.6% in Japan)[8]. In the developed countries, where good health care systems have been established, the incidence of case cancellations varies from 4.0% to 8.2% in European countries to 5.4% to 16.5% in North America and Australia; however the incidence is as high as 17% to 21% in some developing countries[5,7,10,11,19-21]. Case cancellations is one of the indicators used to assess the quality of the patient care and management systems at hospitals; therefore, it is not surprising that the incidence in many developing countries is higher than in developed countries[3]. The cancellation of scheduled procedures not only represents an underutilization of resources, but is also stressful and costly to patients in terms of lost working days and disruption to their daily life.

Regarding the results of this study, the most common category of reason for case cancellation among OPD patients was patient issue (54.1%), with patient no-show being the most common cause (41.5%). This was also the most common cause at King Chulalongkorn Memorial Hospital (26.3%) and Songklanagarind Hospital (25.1%)[17,18]. The reasons why our study had a markedly higher percentage than at those two hospitals are that, firstly, the present study included data on gastrointestinal endoscopy unit

cancellations and, secondly, separate analyses were performed for OPD and IPD patients. In contrast, the other two institutes did not include an endoscopic population, who are mostly OPD patients[17,18]. However, our percentage of 54.1% for patient issue was lower than the corresponding figures at an ambulatory surgical center in the USA (75.8%) and for a day case setting in the UK (51%), each of which was the most common cause of cancellations at those two centers[1,5].

The main reasons for patient no-shows may be the patients having forgotten the appointment, having changed their mind at the last moment, having personal reasons or other things to do, or simply not being able to get to the hospital due to traffic or the weather. A study at the Mayo Clinic showed that having a good scheduling system, shared medical records, and timely and effective communications can reduce the incidence of cancellations due to no-show to zero over a one-year period[6]. Many administrative strategies with effective action plans had been implemented to reduce this type of cancellation. They included the use of appointment reminders (automatic text, email or call reminders); developing strong relationships between patients and doctors to increase the former's commitment to attending and arriving on time; the immediate ascertaining of why each patient did not turn up and the suggesting of solutions for future use; having a clearly-written, no-show policy on display for patients to see; offering pre-paid packages; and charging for same-day cancellations[22-25].

Unlike the OPD setting, patient issue was not the most common category for case cancellations among IPD patients, accounting for only 8.9% of total cancellations. Instead, the three most common cancellation categories were hospital-facility issue, medical condition, and surgeon issue. Each had similar percentages, and when combined, they represented over 85% of the IPD case cancellations. The reason with the highest IPD cancellation rate in this study was an improperly estimated case time, resulting in schedules for surgical residents and junior surgeons being overbooked. This is a common cause of cancellations in major tertiary hospitals[3,21]. It may arise from surgical residents and junior surgeons not being familiar with the procedures and/or underestimating the time needed for operations. At a teaching hospital, some procedures performed by trainees under staff supervision may take longer to complete than had been estimated. The consequential over-run of surgeries affects the following scheduled cases in that there may be no, or inadequate, operating theatre [OT] time available. A properly estimated case time can be obtained from the statistical data available in OT case log books. Moreover, OT time can be wasted due to late starts, time lost between cases, delays in the preparation and cleaning of theaters, and/or the tardy transportation of patients[26]. Avoidance of wasted OT time can be achieved with a cooperative team approach by the personnel involved, such as the anesthesiologists, surgeons, scrub nurses, nurses in waiting areas, transporters and head of sterile processing[3,27].

The second most common reason for IPD case cancellations was changed line of surgical management (17.2%). This percentage was higher than the corresponding figures reported by other studies, which were less than 5%[3]. Cancellations may occur due to reasons such as inadequate preoperative preparation, preoperative drug errors, scheduling errors, or staff unavailability. This is considered to be the result of a lack of coordination between departments; however, these cancellations can be avoided through means such as effective communication between scheduling coordinators and management via preoperative anesthesia assessment clinics[5,9,27-30]. Nevertheless, some cancellation reasons are unavoidable, such as unexpected changes in patients' medical condition. Interestingly, the greatest problem associated with the medical issue category for both OPD and IPD patients was respiratory problems, which was followed by cardiovascular problems (such as uncontrolled hypertension or a hypertensive crisis).

One limitation of this study is related to it being retrospective. This led to a recall bias in the data collection: some patients were reported more than once for the one cancellation, but with different reasons given; that caused difficulty in determining, and hence classifying, the primary reason for each cancellation. Moreover, the reasons for case cancellations were reported with a variety of formats and information by nurses in individual units in each department. Nevertheless, the hospital can use this study's categorization system for the recording of the primary reason for elective case cancellations in future.

Conclusion

In summary, case cancellations occurred for 5.7% of the total number of elective surgical cases at Siriraj Hospital. Although the cancellations were associated with multiple factors, they were mainly due to patient and hospital-facility factors, with the specific causes being primarily in the form of patient no-shows

and improperly estimated case times, respectively. Strategies to improve hospital management and information sharing between medical units are needed to reduce both the overall incidence of elective surgical case cancellations, as well as cancellations due to the two specific causes that were identified.

What is already known on this topic?

The incidence of elective case cancellations is one of the measures used to determine the quality of a hospital's patient care and resource management. Case cancellations decrease the level of patient satisfaction and undermine staff morale. Additionally, they result in wasted investigations, lead to delayed patient care, and can potentially affect the clinical outcomes.

What this study adds?

The current incidence of case cancellations at Siriraj Hospital has been established, and the causes have been defined and categorized. The results of this study will be presented to the Surgery Unit and other involved divisions as the first step in improving the hospital's future resource management.

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Trial registration

Clinical Trials.gov registration as NCT 02816281.

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Potential conflicts of interest

The authors declare no conflict of interest.

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Appendix 1. Categorization of reasons for patient cancellations

Category	Reason
Patient issue	Patient no-show
	Patient refusal
	Patient dead
Hospital-facility issue	Case bumps
	Improperly-estimated case time
	ICU unavailable
	Blood products unavailable
	Equipment unavailable
	Hospital bed unavailable
Surgeon issue	Changed line of surgical management
	Inadequate preparation (e.g., inadequate bowel preparation)
	Scheduling error
	Surgeon unavailable
Anesthesiologist issue	Inadequate NPO
	Anesthesiologist refusal
	Preoperative drug error
Medical condition	Cardiovascular problems (e.g., hypertension, shock, acute coronary syndrome)
	Electrolyte imbalance
	Endocrine problems (e.g., hyperglycemic crisis, uncontrolled hyperthyroid
	Eye problems (e.g., hordeolum, conjunctivitis)
	Fever - unspecified (body temperature more than 38□C)
	Gastrointestinal tract problems (e.g., diarrhea)
	Gynecological problems (e.g., menstruation)
	Hematologic problems (e.g., anemia, thrombocytopenia, coagulopathy)
	Neurologic problems (e.g., recent stroke, alteration of consciousness)
	Respiratory problems (e.g., pneumonia, respiratory tract infection)
	Skin infection (e.g., dermatophyte infection, lice infection)
	Urogenital problems (e.g., urinary tract infection)
Miscellaneous	Health insurance problems
	Reason could not be determined from medical records
	Data unavailable or missing data