

Factors attributable to the cancellation of programmed surgeries

Factores atribuibles a la cancelación de cirugías programadas

Anderson Díaz-Pérez^{1,2,3,4*}, Arley Vega-Ochoa², Brayan Dominguez-Lozano¹, Stephanye Carrillo-González³, and Julia González-Puertas⁴

¹Department of Social and Human Sciences, Universidad Simón Bolívar, Barranquilla; ²Faculty of Health Sciences, Universidad Popular del Cesar, Valledupar; ³Faculty of Health Sciences, Corporación Universitaria Rafael Nuñez, Cartagena de Indias; ⁴Faculty of Chemistry and Pharmacy, Universidad del Atlántico, Barranquilla. Colombia

Abstract

Objective: The objective of the study was to analyze the factors attributable to the cancellation of surgeries of a third-level health institution in the city of Valledupar, Cesar/Colombia (2017-2018). **Material and methods:** This was descriptive, retrospective, cross-sectional study. Data from the hospital surgical unit adverse case file were collected for six surgical specialties. **Results:** They showed that in 2017, there was a surgical suspension of 4% of the total of scheduled surgeries that were 3339, for 2018, the rate was 3% with a total of scheduled surgeries (1733). The reason for the suspension for both periods was the factor related to the patient's adverse conditions with 45.9 and 38.5%, respectively. The specialty most affected for these cases was the specialty of general surgery with the same percentage value in both periods of 4%. **Conclusions:** The results give us an idea of the factors present for the cancellation of scheduled surgeries and the need to apply measures to guarantee patient safety.

Keywords: Cancellation. Surgery. Medical errors. Adverse event. Factors. Surgical patient. Safety.

Resumen

Objetivo: Analizar los factores atribuibles a la cancelación de cirugías de una institución de salud de tercer nivel en la ciudad de Valledupar, Cesar, Colombia (2017-2018). **Material y métodos:** Estudio descriptivo, retrospectivo, transversal. Se recopiló datos del archivo de casos adversos de la unidad quirúrgica del hospital para 6 especialidades quirúrgicas. **Resultados:** Mostraron que en 2017 hubo una suspensión quirúrgica del 4% del total de cirugías programadas que fueron (3339), para 2018 la tasa fue del 3% con un total de cirugías programadas (1733). La razón de la suspensión para ambos períodos fue el factor relacionado con las condiciones adversas del paciente con 45.9 y 38.5% respectivamente. La especialidad más afectada para estos casos fue la especialidad de cirugía general con el mismo valor porcentual en ambos períodos del 4%. **Conclusión:** Los resultados nos dan una idea de los factores presentes para la cancelación de cirugías programadas y la necesidad de aplicar medidas para garantizar la seguridad del paciente.

Palabras Clave: Cancelación. Cirugía. Errores médicos. Evento adverso. Factores. Paciente quirúrgico. Seguridad.

Correspondence:

*Anderson Díaz-Pérez

Calle 70C, 24-05

Col. San Felipe

C.P. 080002, Barranquilla, Colombia

E-mail: ander2711@gmail.com; andersondiaz@unicesar.edu.co

Date of reception: 05-01-2019

Date of acceptance: 30-03-2020

DOI: 10.24875/CIRUE.M20000159

Cir Cir (Eng). 2020;88(4):478-489

Contents available at PubMed

www.cirugiaycirujanos.com

2444-0507/© 2020 Academia Mexicana de Cirugía. Published by Permanyer. This is an open access article under the terms of the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

According to the World Health Organization (WHO), surgical care has been an important element in health care during several periods of time, but public health problems have significantly changed, which has led to an increase in the number of surgical interventions. Approximately 230 million major surgical procedures are performed annually worldwide¹, where investment in the surgical area of a hospital is 30.1% of total cost². Therefore, suspension of a scheduled surgery affects both budgetary and labor aspects, with ethical-legal repercussions both for health personnel and for the institution itself³. In the same train of thought, outpatient services, which cover several specialties such as general medicine, pediatric medicine, cardiology, urology, or gynecology, among others, are the services where patients who need to be planned and scheduled for relevant surgical procedures are diagnosed. The opportunity in health care for surgery scheduling has an important task, which is to safeguard patient safety, since a failure in care can cause adverse events that ultimately could be preventable^{1,3}. On the other hand, the factors that possibly influence on the cancellation of surgical procedures at hospital centers are related to failures in the management of resources, such as insufficiency of instruments or equipment, lack of sterile clothing, shortage of personnel at the operating room, or replacement of a scheduled surgery for an emergency procedure, which greatly affects the quality of care at the department and, therefore, users' well-being, thus increasing costs and hospital stay, and generating anxiety in patients and their caregivers⁴⁻⁷, which goes against reducing the risks of unnecessary harm associated with medical care to an acceptable minimum, as proposed by the WHO.

At the moment a surgical procedure is scheduled, the tasks of many hospital employees come into play, with these employees including the surgical group: surgeon, anesthesiologist, surgical technologist, nurses, and circulating nurses; in addition to the management of specialized materials and equipment. When a single member of this group fails or is absent, it becomes a factor for cancellation of the surgical procedure¹⁻⁶. When this happens, there is a perception of poor quality in the provided service, which brings consequences to the patient, who loses his trust on the institution. The legal-ethical consequences that may arise when a surgery is suspended are categorized as

errors related to negligence by the staff, leading to administrative sanctions such as a reprimand with or without a copy to the resume, in public or privately, or even dismissal^{3,5}. The above-mentioned factors contribute to the cancellation of surgical procedures, which could be classified into those related to the infrastructure or the institution, equipment, supplies, and laboratories, those associated with the doctor or health personnel, and finally, those related to the patient.

Factors associated with surgery cancellation

Avoidance of the factors that contribute to the cancellation of surgeries should be a commitment that reflects as an institutional policy, to reduce the agents that affect the preparation before the surgical act and that can generate additional health costs. It is recommended for health professionals, managers, and administrators of hospital institutions to redesign their techniques related to the planning of surgery scheduling, human resources, management of materials and supplies, among others, and apply control methods to correct the problems that these imply⁸. It is important highlighting that the cancellation of surgeries is a significant event in the budget and in patient psychological impact, which requires attention of the health and administrative team. Surgery cancellations can be seen as a routine inherent to processes at health care centers and, therefore, could be considered as an indifferent phenomenon for the multidisciplinary team of hospital centers; however, these institutions should be interested in the consequences that may affect the patient, the family, the institution, and the state itself, due to the increase in hospital costs related to prolonged hospital stays^{4,6}.

Organization, planning, and execution of surgeries become necessary stages for surgical activity so that objectives can be achieved and indicators of care can be maintained in patients, thus minimizing expenses and human resources consumption⁹. Surgery scheduling should be considered from the perspective of health policies at hospital centers as a safety standard for the patient and constitute an indicator of quality in the care of the surgical patient.

Surgery cancellation increases hospital length of stay and puts patients at risk of infection, and can be regarded as an unsafe type of health care, which can become an adverse event related to hospital institutions organizational management. Good medical practice, in

terms of implementation and knowledge, should provide alternative solutions to problems related to the process of patient surgical care¹⁰. The cancelation of scheduled surgeries is a quality of care negative indicator that affects the patient and his family, but also the institution¹¹.

Managerial initiative should seek to establish a culture of commitment by the health team, that is, patient safety should not always depend on the health care area¹² to help reduce the impact of economic costs, as well as emotional repercussions, caused to the patient and the family⁵. As a strategy, an evaluation program could be implemented for scheduled patients before their transfer to the operating room to verify their well-being, safety, and physical conditions.

Studies have demonstrated that accidents that imply the cancelation of surgeries are due to ignorance of patient clinical conditions, where 11% of intraoperative serious events were caused by insufficient pre-operative evaluation, which could have been foreseen¹³.

The study carried out by Alger¹⁴ refers that, in a Honduran institution, between 2003 and 2004, 3601 and 3102 surgeries were performed, respectively, and 245 and 145 surgeries were canceled, which correspond to 6.8 and 4.7%, respectively. Another study reports that 4.1% of surgeries, corresponding to 701 patients, were canceled; in 343 patients, the cancelation occurred 1 day before the surgical procedure without any justification, and in 358, it was suspended the day of the surgical procedure⁵. Health institutions in Colombia must manage the quality of care, in addition to continuous training of human resources, to provide safe care and thus avoid cancelations for different reasons that are still preventable¹⁵ (Table 1).

Reasons attributable to hospital resources for the cancelation of surgeries

There are causes that make for surgeries that, having been scheduled, to be finally canceled due to potentially avoidable problems (Table 1). These factors have a negative impact on institutions' finances, with the demands on the health sector resulting in resources reductions. Those related to the surgical process are becoming increasingly important¹⁶. The new health-care economy tends to favor increased productivity, improved quality, and cost reduction⁴. Cancelation of an elective surgery is estimated to cost a hospital USD 198 per patient¹⁷; in 1996, the cost per minute of surgical time was calculated to be USD 8.13¹⁸.

In 1999, it was estimated to be USD 13.53/min¹⁹. This cost changes as volume at the operating room increases, since when the number of surgeries increases, more use is made of the operating room and costs decrease²⁰, not to mention legal claims with civil or criminal liability⁴. That is, a negative impact on the perception of the community that is served by the institution²¹⁻²⁴.

All the aforementioned factors are described as reasons for surgical procedures cancelation and, for this reason, analyzing the factors scheduled surgeries cancelation are attributable to in a tertiary care health institution of the city of Valledupar in the years 2017 and 2018 which was proposed as object of research.

Methods

A cross-sectional, retrospective, descriptive study was carried out. The sample consisted of 3339 surgeries that were electively scheduled for the period comprised between January 1, 2017, and December 31, 2017, and 1545 in the period from January to June 2018. A data collection form was used as instrument, which included as main variables the factors surgery cancelations were attributable to. Data were obtained from the institution records, to find and point out possible alternatives for avoiding surgical procedures cancelation. The information was analyzed using descriptive statistics such as frequencies and percentages. The research was approved by the ethics and research committee of *Universidad Popular del Cesar* Surgical Instrumentation Program, which, according to resolution 8430/93, classified it as risk free. The project adhered to the Declaration of Helsinki as a fundamental principle of confidentiality to safeguard the identity of both patients and health professionals involved in events related to the cancelation of surgical procedures.

Results

Table 2 shows that a total number of scheduled orthopedics surgeries were 654, out of which only 622 were performed, which is equivalent to 95.1%, due to the fact that 32 (4.9%) were canceled for different reasons in 2017. In 2018, although the proportion of surgeries decreased because they were only considered from January to June, canceled surgeries increased by 5.3%, with a percentage difference of 0.4% between 2017 and 2018.

Table 1. Causes related to the cancelation of surgeries

Reasons for surgery cancelation attributable to hospital resources		Description
Patient	Patient did not show up	Corresponds to patient personal situations, of which no registration is made regarding the exact reason
	Patient improvement	There are situations in clinical practice where a certain patient is scheduled for removal of a tumor, which has disappeared at the time of the operation; such situations are not uncommonly seen in the hospital setting
	Incorrect preparation for not having properly followed medical instructions	Giving the patient and family members instructions about fasting time, and insisting on compliance, will provide safety during the procedure. At present, fasting recommendations for children younger than 6 months are 4 h for solid food and 2 h for clear fluids; for older children and adults, 6 h for solid food and 2-3 h for clear fluids, as minimum time
	Chronic disease decompensation	Stress due to the proximity of surgery often exacerbates hypertension, which causes the need to increase antihypertensive treatment or to improve white coat hypertension with an anxiolytic the morning of the procedure, as an example of this situation
	Patient does not accept the surgical procedure	Given that the patient is not explained what the surgery will consist of, despite having signed an informed consent, this cause could be related or not only to the patient (fear, anxiety, etc.) but also to hospital personnel (lack of adequate informed consent)
	Gestation	Child-bearing age may lead to reconsidering surgical treatment
Human resources	Incomplete evaluation	Situations in which more than 1 pre-operative assessment of the case is needed, or due to lack of preoperative evaluation, for example, when the anesthesiologist decides that the patient lacks an evaluation by a certain specialist or some ancillary test, despite a previous preoperative evaluation where said indications are not specified
	Therapeutic-diagnostic inconsistency	Due to diagnostic error or treatment error, scheduling patients for insufficient or unnecessary surgeries, as the case may be, often causes new rescheduling, for which analyses will be outdated or evaluations will be repeated by other specialists, which is a situation that increases hospital expenses
	Unfavorable clinical condition (acute disease)	Common disease is an unforeseeable reason for surgical suspension many anesthesiologists seem to abuse of. Some medical conditions, such as upper airway viral processes, are also common reasons for canceling scheduled surgeries, even when there is debate about whether they should be suspended. Recent studies indicate that the anesthesiologist suspends elective surgery in these patients out of fear of medical-legal problems rather than for medical complications
	Patient does not accept surgical procedure	Given that the patient is not explained what the surgery will consist of, despite having signed an informed consent, this cause could be related or not only to the patient (fear, anxiety, etc.) but also to hospital personnel (lack of adequate informed consent)
	Gestation	Child-bearing age may lead to reconsidering surgical treatment
Clinical or administrative processes	Lack of surgical material	It is a purely institutional problem, lack of surgical clothing, and lack of prosthetic material, among others, which generate dissatisfaction and discomfort in the patient for being a cause unconnected to him
	Contaminated operating rooms	The fact that different specialties use the same operating rooms increases the risk of infection of a patient undergoing minimal risk surgery
	Lack of blood	Absence of a blood bank where the right amount or type of blood can be counted on, which causes for many surgeries to be suspended

(continues)

Table 1. Causes related to the cancelation of surgeries (continued)

Reasons for surgery cancelation attributable to hospital resources	Description
Lack of medical record	The large number of patients and shortage of personnel influence on that medical records are not in the operating room the day of the surgical act, since this is a legal and necessary document for identification not only of the patient but also of his diagnosis and therapeutic plan
Deficient scheduling	The influx of patients increases waiting time for a surgical act scheduling and makes operative shifts insufficient, which makes for an excessive number of surgical procedures to be scheduled, which are impossible to be performed due to institutional deficiencies
Outdated auxiliary tests	In the study setting, auxiliary tests, as well as consultations, are valid for 6 months, and it is not uncommon finding patients who exceeded this time, and therefore, the tests are outdated. These are causes attributable to the doctor
Exceeded surgical time	The use of the operating room in a previous surgery that, due to its complexity or late initiation, countless times makes for patients who are scheduled for the last surgical shift to be susceptible to suspension
Absence of surgeon	This cause is placed in the group of causes related to human resources, since all surgeries have a surgeon and an assistant scheduled, and thus, the absence of any of them during the surgical act is merely a problem of the institution's personnel

In 2017, 214 surgeries were scheduled in the gynecology specialty, out of which 177 were performed, which is equivalent to 82.7%, since 37 procedures were canceled, corresponding to 17.3%, for different reasons. In the first semester of 2018, 111 surgeries were scheduled, out of which 103 were carried out, corresponding to 92.8% of total procedures, which indicate that 7.2% were canceled, which is equivalent to eight surgeries. In the first semester of 2018, in comparison with the first semester of 2017, canceled surgeries considerably decreased, with a percentage difference of 10.1% (from 17.3 to 7.2%).

For the general surgery specialty, 1128 interventions were scheduled in 2017, out of which 1086 were performed, which is equivalent to 96.3%, since 47 were canceled, corresponding to 4.2%, for different reasons. In the first semester of 2018, 571 surgeries were scheduled, out of which 547 were carried out, corresponding to 95.8% of total procedures, which indicates that 24 surgeries were canceled, which are equivalent to 4.2%.

In otorhinolaryngology, in 2017, 775 surgeries were scheduled, out of which 768 were performed, which are equivalent to 99.1%, given that eight were canceled, which account for 1%, for different reasons. In the first semester of 2018, 473 surgeries were scheduled, out of which one was canceled, which is

equivalent to 0.2% of total procedures, with a percentage difference of 0.8% with regard to previous year.

In neurosurgery, 43 procedures were scheduled in 2017, out of which 40 were carried, which are equivalent to 93%, given that 3 (7%) were canceled for different reasons. For the first semester of 2018, 25 surgeries were scheduled and only one was canceled, which is equivalent to 4%. This indicates that, in the neurology specialty, the flow of surgery is small and, in the same proportion, the event of surgery cancellation, with a percentage difference of 3%.

The total number of surgeries scheduled in 2017 for urology was 525, out of which 519 were carried out, which is equivalent to 98.9%, given that six, or 1.1%, were canceled for different reasons. During the first semester of 2018, 231 surgeries were scheduled, out of which only one was canceled, which is equivalent to 0.4%. This indicates that, in the urology specialty, the flow of surgery is higher and the proportion of the event of surgery cancellation is lower, with a difference of 0.7%.

Table 3 shows that, in 2017, 32 surgeries were canceled in the orthopedics specialty, out of which 13, or 41%, were canceled due to adverse conditions related to the patient. Six surgeries were canceled due to the lack of material and instruments, which is equivalent to 19%, and due to lack of surgical time, four were

Table 2. Scheduled surgeries and surgeries canceled for different reasons

Year 2017, orthopedics				Year 2018, orthopedics				Year 2017, otorhinolaryngology				Year 2018, otorhinolaryngology			
Scheduled, n (%)	Canceled, n (%)	Total performed, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Canceled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)
January	51 (7.8)	2 (0.3)	49 (7.5)	57 (17.7)	4 (1.2)	53 (16.5)	67 (8.6)	0 (0.0)	67 (8.6)	0 (0.0)	94 (19.9)	94 (19.9)	0 (0.0)	94 (19.9)	94 (19.9)
February	53 (8.1)	2 (0.3)	51 (7.8)	38 (11.8)	2 (0.6)	36 (11.2)	72 (9.3)	1 (0.1)	71 (9.2)	1 (0.1)	87 (18.4)	87 (18.4)	0 (0.0)	87 (18.4)	87 (18.4)
March	64 (9.8)	4 (0.6)	60 (9.2)	59 (18.3)	2 (0.6)	57 (17.7)	57 (7.4)	1 (0.1)	56 (7.3)	1 (0.1)	75 (15.9)	75 (15.9)	0 (0.0)	75 (15.9)	75 (15.9)
April	45 (6.9)	1 (0.2)	44 (6.7)	57 (17.7)	2 (0.6)	55 (17.1)	80 (10.3)	0 (0.0)	80 (10.3)	0 (0.0)	58 (12.3)	58 (12.3)	0 (0.0)	58 (12.3)	58 (12.3)
May	76 (11.6)	3 (0.5)	73 (11.2)	66 (20.5)	3 (0.9)	63 (19.6)	69 (8.9)	2 (0.3)	67 (8.6)	2 (0.3)	91 (19.2)	91 (19.2)	1 (0.2)	90 (19)	90 (19)
June	55 (8.4)	3 (0.5)	52 (8.0)	45 (14)	4 (1.2)	41 (12.7)	46 (5.9)	0 (0.0)	46 (5.9)	0 (0.0)	68 (14.4)	68 (14.4)	0 (0.0)	68 (14.4)	68 (14.4)
July	49 (7.5)	3 (0.5)	46 (7)	0 (0.0)	0 (0.0)	0 (0.0)	93 (12)	0 (0.0)	93 (12)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
August	60 (9.2)	4 (0.6)	56 (8.6)	0 (0.0)	0 (0.0)	0 (0.0)	45 (5.8)	1 (0.1)	44 (5.7)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
September	46 (7)	2 (0.3)	44 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	47 (6.1)	2 (0.3)	45 (5.8)	2 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
October	55 (8.4)	5 (0.8)	50 (7.6)	0 (0.0)	0 (0.0)	0 (0.0)	92 (11.9)	0 (0.0)	92 (11.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
November	59 (9)	0 (0.0)	59 (9)	0 (0.0)	0 (0.0)	0 (0.0)	46 (5.9)	0 (0.0)	46 (5.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
December	41 (6.3)	3 (0.5)	38 (5.8)	0 (0.0)	0 (0.0)	0 (0.0)	61 (7.8)	1 (0.1)	60 (7.7)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	654 (100)	32 (4.9)	622 (95.1)	322 (100)	17 (5.3)	305 (94.7)	775 (100)	8 (1.0)	768 (99.1)	8 (1.0)	473 (100)	473 (100)	1 (0.2)	472 (99.8)	472 (99.8)
Year 2017, gynecology				Year 2018, gynecology				Year 2017, neurosurgery				Year 2018, neurosurgery			
Scheduled, n (%)	Canceled, n (%)	Total performed, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Canceled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)
January	16 (7.5)	6 (2.8)	10 (4.7)	10 (9.0)	0 (0.0)	10 (9.0)	3 (7)	0 (0.0)	3 (7)	0 (0.0)	3 (12)	3 (12)	0 (0.0)	3 (12)	3 (12)
February	25 (11.7)	7 (3.3)	18 (8.4)	22 (19.8)	0 (0.0)	22 (9.0)	3 (7)	0 (0.0)	3 (7)	0 (0.0)	6 (24)	6 (24)	0 (0.0)	6 (24)	6 (24)
March	28 (13.1)	4 (1.9)	24 (11.2)	23 (20.7)	3 (2.7)	20 (18.0)	2 (4.7)	0 (0.0)	2 (4.7)	0 (0.0)	2 (8)	2 (8)	0 (0.0)	2 (8)	2 (8)
April	18 (8.4)	3 (1.4)	15 (7.0)	21 (18.9)	4 (3.6)	17 (15.3)	3 (7)	0 (0.0)	3 (7)	0 (0.0)	3 (12)	3 (12)	0 (0.0)	3 (12)	3 (12)
May	20 (9.3)	4 (1.9)	16 (7.5)	19 (17.1)	1 (0.9)	18 (16.2)	3 (7)	1 (2.3)	2 (4.7)	1 (2.3)	4 (16)	4 (16)	0 (0.0)	4 (16)	4 (16)
June	14 (6.5)	3 (1.4)	11 (5.1)	16 (14.4)	0 (0.0)	16 (14.4)	2 (4.7)	0 (0.0)	2 (4.7)	0 (0.0)	7 (28)	7 (28)	1 (4)	6 (24)	6 (24)
July	29 (13.6)	3 (1.4)	26 (12.1)	0 (0.0)	0 (0.0)	0 (0.0)	5 (11.6)	1 (2.3)	4 (9.3)	1 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

(continues)

Table 2. Scheduled surgeries and surgeries canceled for different reasons (continued)

Year 2017, gynecology			Year 2018, gynecology				Year 2017, neurosurgery				Year 2018, neurosurgery			
Scheduled, n (%)	Canceled, n (%)	Total performed, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	
August	13 (6.1)	4 (1.9)	9 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)	6 (14)	0 (0.0)	0 (0.0)	6 (14)	0 (0.0)	0 (0.0)	0 (0.0)	
September	12 (5.6)	0 (0.0)	12 (5.6)	0 (0.0)	0 (0.0)	0 (0.0)	5 (11.6)	1 (2.3)	0 (0.0)	4 (9.3)	0 (0.0)	0 (0.0)	0 (0.0)	
October	15 (7.0)	2 (0.9)	13 (6.1)	0 (0.0)	0 (0.0)	0 (0.0)	5 (11.6)	0 (0.0)	0 (0.0)	5 (11.6)	0 (0.0)	0 (0.0)	0 (0.0)	
November	15 (7.0)	0 (0.0)	15 (7.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (9.3)	0 (0.0)	0 (0.0)	4 (9.3)	0 (0.0)	0 (0.0)	0 (0.0)	
December	9 (4.2)	1 (0.5)	8 (3.7)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.7)	0 (0.0)	0 (0.0)	2 (4.7)	0 (0.0)	0 (0.0)	0 (0.0)	
Total	214 (100)	37 (17.3)	177 (82.7)	111 (100.0)	8 (7.2)	103 (92.8)	43 (100)	3 (7)	40 (93)	25 (100)	1 (4)	24 (96)		
Year 2017, general surgery			Year 2018, general surgery				Year 2017, urology				Year 2018, urology			
Scheduled, n (%)	Canceled, n (%)	Total performed, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	Scheduled, n (%)	Scheduled, n (%)	Canceled, n (%)	Canceled, n (%)	
January	61 (5.4)	5 (0.4)	56 (5.0)	65 (11.4)	2 (0.4)	63 (11.0)	21 (4)	0 (0.0)	0 (0.0)	21 (4)	8 (3.5)	0 (0.0)	8 (3.5)	
February	81 (7.2)	5 (0.4)	76 (6.7)	110 (19.3)	1 (0.2)	109 (19.1)	45 (8.6)	0 (0.0)	0 (0.0)	45 (8.6)	41 (17.7)	0 (0.0)	41 (17.7)	
March	109 (9.7)	3 (0.3)	106 (9.4)	89 (15.6)	4 (0.7)	85 (14.9)	39 (7.4)	0 (0.0)	0 (0.0)	39 (7.4)	34 (14.7)	0 (0.0)	34 (14.7)	
April	97 (8.6)	5 (0.4)	92 (8.2)	108 (18.9)	8 (1.4)	100 (17.5)	40 (7.6)	4 (0.8)	0 (0.0)	36 (6.8)	67 (29)	1 (0.4)	66 (28.6)	
May	129 (11.4)	6 (0.5)	123 (10.9)	107 (18.7)	6 (1.1)	101 (17.7)	55 (10.5)	0 (0.0)	0 (0.0)	55 (10.5)	39 (16.9)	0 (0.0)	39 (16.9)	
June	98 (8.7)	4 (0.4)	94 (8.3)	92 (16.1)	3 (0.5)	89 (15.6)	41 (7.8)	0 (0.0)	0 (0.0)	41 (7.8)	42 (18.2)	0 (0.0)	42 (18.2)	
July	95 (8.4)	3 (0.2)	92 (8.2)	0 (0.0)	0 (0.0)	0 (0.0)	66 (12.6)	0 (0.0)	0 (0.0)	66 (12.6)	0 (0.0)	0 (0.0)	0 (0.0)	
August	121 (10.7)	2 (0.2)	119 (10.5)	0 (0.0)	0 (0.0)	0 (0.0)	43 (8.2)	0 (0.0)	0 (0.0)	43 (8.2)	0 (0.0)	0 (0.0)	0 (0.0)	
September	98 (8.7)	4 (0.4)	94 (8.3)	0 (0.0)	0 (0.0)	0 (0.0)	55 (10.5)	0 (0.0)	0 (0.0)	55 (10.5)	0 (0.0)	0 (0.0)	0 (0.0)	
October	89 (7.9)	5 (0.4)	84 (7.5)	0 (0.0)	0 (0.0)	0 (0.0)	44 (8.4)	2 (0.4)	0 (0.0)	42 (8)	0 (0.0)	0 (0.0)	0 (0.0)	
November	97 (8.6)	5 (0.4)	92 (8.2)	0 (0.0)	0 (0.0)	0 (0.0)	34 (6.5)	0 (0.0)	0 (0.0)	34 (6.5)	0 (0.0)	0 (0.0)	0 (0.0)	
December	53 (4.7)	0 (0.0)	53 (4.7)	0 (0.0)	0 (0.0)	0 (0.0)	42 (8.0)	0 (0.0)	0 (0.0)	42 (8)	0 (0.0)	0 (0.0)	0 (0.0)	
Total	1128 (100.0)	47 (4.2)	1086 (96.3)	571 (100.0)	24 (4.2)	547 (95.8)	525 (100)	6 (1.1)	519 (98.9)	231 (100.0)	1 (0.4)	230 (99.6)		

Table 3. General reasons for scheduled surgeries cancellation by surgical specialty

Cancellation causes	Orthopedics, 2017, n (%)	Orthopedics, 2018, n (%)	Gynecology, 2017, n (%)	Gynecology, 2018, n (%)	General surgery, 2017	General surgery, 2018	Otorhino laryngology, 2017	Otorhino laryngology, 2018	Neurosurgery, 2017, n (%)	Neurosurgery, 2018, n (%)	Urology, 2017, n (%)	Urology, 2018, n (%)
Patient adverse conditions	13 (41)	2 (12)	26 (70.3)	5 (62.5)	16 (34)	12 (50)	1 (12.5)	0 (0.0)	2 (66.7)	0 (0.0)	3 (50)	1 (100)
Lack of surgical time	4 (13)	1 (6)	0 (0.0)	0 (0.0)	4 (8.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Lack of material and instruments	6 (19)	4 (24)	2 (5.4)	0 (0.0)	0 (0.0)	2 (8.3)	3 (37.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Canceled by the surgeon	1 (3)	3 (18)	2 (5.4)	0 (0.0)	1 (2.1)	3 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Suspended by anesthesia for lack of preoperative evaluation	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Inadequate pre-operative preparation	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (8.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Inadequate or no medical evaluation	1 (3)	2 (2)	1 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Medical record for determining the cause of cancellation was not found	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (10.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Lack of laboratory tests	3 (9)	0 (0.0)	3 (8.1)	2 (25.0)	5 (10.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Patient did not show up	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Patient underwent emergency operation	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Canceled or suspended by anesthesiologist	0 (0.0)	1 (6)	0 (0.0)	0 (0.0)	5 (10.6)	2 (8.3)	4 (50)	1 (100)	0 (0.0)	0 (0.0)	3 (50)	0 (0.0)
Patient did not accept the procedure	0 (0.0)	1 (6)	2 (5.4)	0 (0.0)	2 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Lack of blood	0 (0.0)	0 (0)	1 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	0 (0.0)
Others (lack of beds, admission errors, repeated scheduling, and shortage of personnel)	3 (9)	2 (12)	0 (0.0)	0 (0.0)	5 (10.6)	2 (8.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100)	2 (0.0)	0 (0.0)
Laboratory alterations	1 (3)	1 (6)	0 (0.0)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	0 (0.0)	3 (0.0)	0 (0.0)
The patient died	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (0.0)	0 (0.0)
Total	32 (100)	17 (100)	37 (100.0)	8 (100.0)	47 (100.0)	24 (100.0)	8 (100.0)	1 (100.0)	3 (100)	1 (100)	6 (100)	1 (100)

canceled, which is equivalent to 13%. In the first semester of 2018, 17 surgeries were canceled, and the most prevalent reason for it was lack of material and instruments, with a total of four surgeries that were carried out, which is equivalent to 24%. Cancellation by the surgeon occurred in three surgeries, corresponding to 18%.

The most relevant reason for cancellation in the gynecology specialty for the year 2017 were adverse conditions present in patients, with 70.3%, which is equivalent to 26 surgeries out of 37 that were canceled; the remaining 11 (29.7%) correspond to other reasons. In the first semester of 2018, eight surgeries were canceled, and the main cause, as in 2017, was patient adverse conditions, with 62.5%, followed by 25% (two surgeries) due to unavailability of laboratory tests, and 12.5% (one surgery) due to laboratory abnormalities.

In the general surgery specialty, 47 surgeries were canceled in 2017; out of these, 16 due to patient adverse conditions, comprising 34% of the reasons for surgery cancellation. Five surgeries were canceled due to lack of laboratory tests, suspended by the anesthesiologist and other causes, corresponding to 10.6% each. The causes classified as lack of surgical time and inadequate pre-surgical preparation corresponded to four surgeries, with 8.5% each, and patients did not accept two surgeries, with 4.3%. No medical record was found to determine the cause of the cancellation of five surgeries, that is, 10.6%. In the first semester of 2018, 24 surgeries were canceled, with the most prevalent cause being patient adverse conditions, with a total of 12 surgeries, equivalent to 50%. Those canceled by the surgeon were three, which is equivalent to 12.5%. Lack of material and instruments, suspension by the anesthesiologist, and other causes corresponded to two surgeries, which are equivalent to 8.2%.

In otorhinolaryngology, in 2017, out of eight surgeries that were canceled, four were attributable to the anesthesiologist, comprising 50%; three surgeries were canceled due to lack of material and instruments, which accounted for 37.5%, and only one was suspended due to patient adverse conditions, with 12.5%. In the first semester of 2018, the cause in the only surgery that was canceled was due to suspension by the anesthesiologist.

In 2017, three surgeries were canceled in the neurology specialty; in two, it was due to patient adverse conditions, comprising 66.7%, and in one, due to laboratory alterations, with 33.3% of total canceled

surgeries. In the first semester of 2018, the cause in the only surgery that was canceled was other causes, such as lack of beds, errors in admission, repeated scheduling, or shortage of personnel.

In urology, out of six surgeries that were canceled in 2017, three were due to patient adverse conditions, accounting for 50%, and three were canceled by the anesthesiologist, which is equivalent to 50% of total canceled surgeries. In the first semester of 2018, the cause in the only surgery that was canceled was patient adverse conditions.

Table 4 shows that, in 2017, out of the total number of surgeries that were canceled in the orthopedics specialty, 47% of the causes were attributable to the patient, 38% to the hospital, and 16% to the doctor. In 2018, the reasons for surgery cancellation were attributable in equal proportion to the patient and the hospital, with a percentage of 35%. Those attributable to the doctor prevailed by 29%. This shows that the trend that has been occurring is that the cancellation is almost always by the patient.

In 2017, of the total number of surgeries that were canceled in the gynecology specialty, 78.4% were attributable to the patient, with this classification showing the highest trend, followed by 16.2% that were attributable to the hospital and 5.4% to the doctor. In 2018, the reasons for surgery cancellation were attributable to the patient with, 75%, and to the hospital, with 25%.

In 2017, of the total number of surgeries that were canceled in the general surgery specialty, 46.8% were attributable to the patient, with this classification being the most common, followed by 31.9% that were attributable to the hospital and 21.3% to the doctor. In 2018, the causes of surgery cancellation were attributable to the patient in 62.5% of cases, to the hospital in 16.7%, and to the doctor in 20.8%; that is, more than half of surgery cancellations were attributable to the patient.

In the otorhinolaryngology specialty, the reasons for surgery cancellation in 2017 were attributable to the patient, with 12.5%; to the hospital, with 37.5%; and to the doctor, with 80%. In 2018, the only surgery cancellation was not attributable to the doctor.

In 2017, of all surgeries that were canceled in the neurology specialty, the reasons for cancellation were attributable only to the patient, with 100%. In 2018, the only surgery that was canceled was for reasons attributable to the hospital, with 100%.

In 2017, of the total number of surgeries that were canceled in the urology specialty, the reasons for

Table 4. Classification of specific causes surgery cancellations were attributable to by specialty

	Orthopedics, 2017, n (%)	Orthopedics, 2018, n (%)	Gynecology, 2017, n (%)	Gynecology, 2018, n (%)	General surgery, 2017, n (%)	General surgery, 2018, n (%)	Otorhinolaryngology, 2017, n (%)	Otorhinolaryngology, 2018, n (%)	Neurosurgery, 2017, n (%)	Neurosurgery, 2018, n (%)	Urology, 2017, n (%)	Urology, 2018, n (%)
Patient	15 (47)	6 (35)	29 (78.4)	6 (75.0)	22 (46.8)	15 (62.5)	1 (12.5)	0 (0.0)	3 (100)	0 (0.0)	3 (50)	1 (100)
Hospital	12 (38)	6 (35)	6 (16.2)	2 (25.0)	15 (31.9)	4 (16.7)	3 (37.5)	0 (0.0)	0 (0.0)	1 (100)	0 (0.0)	0 (0.0)
Doctor	5 (16)	5 (29)	2 (5.4)	0 (0.0)	10 (21.3)	5 (20.8)	4 (50.0)	1 (100)	0 (0.0)	0 (0.0)	3 (50)	0 (0.0)
Total	32 (100)	17 (100)	37 (100)	8 (100)	47 (100)	24 (100)	8 (100)	1 (100)	3 (100)	1 (100)	6 (100)	1 (100)

cancellation were attributable to the patient, with 50%, and to the doctor, with 50%. In 2018, the only surgery that was canceled was for reasons attributable to the patient, with 100%.

Discussion

A hospital with an efficient surgical department should have a low rate of surgery suspensions, since if there is cancellation of surgical procedures, the facilities and staff will be underutilized and, consequently, efficiency will be compromised, the waiting list for surgeries will increase and costs will rise. However, in the literature, there is no consensus on which the optimal indicators of surgery cancellation should be¹. In our results, the percentage of surgery suspensions was found to range between 1.0 and 17.3% by surgical specialties during 2017 and between 0.4 and 7.2% in the first semester of 2018. Of a total of 3,339 surgeries that were electively scheduled in 2017, 4% (133) were canceled. The medical specialty with the highest percentage of cancellation was general surgery, which accounted for 1.4% (47) of the total percentage of canceled surgeries. In the first semester of 2018, 1733 elective surgeries were scheduled, out of which 3% (52) were canceled. A similar study showed that the specialty with the highest percentage of cancellations was also general surgery, with 1.4% (24) of total canceled surgeries², which agrees on that this is the specialty that predominates with most cases of surgery cancellation, perhaps, because it is the specialty that most procedures schedules.

Regarding the causes of suspension, we found that the greatest responsibility for the cancellation of surgeries is attributed to the patient, with 54.9%. For the year 2017, 53.8%. Those attributed to the institution were 27.1% in 2017 and 25% in 2018, and in last place, those attributed to the doctor, with 18% in 2017 and 21.2% in 2018. Therefore, we found that the most important factor for the cancellation of scheduled surgeries in this study is patient adverse conditions, in 2017 with 45.9% and in the first semester of 2018 with 38.5%². A survey on the cancellation rate among hypertensive patients undergoing anesthesia and elective surgery found hypertension to be the leading cause³. However, for being able to define the suspension or not of a surgery due to altered blood pressure values, the guidelines established by international consensus⁴ should be followed, which was not corroborated in this research.

On the other hand, lack of material and instruments, as well as shortage of staff or beds and admission errors, among others, such as lack of blood in the bank, loss of medical records, and inadequate pre-surgical preparation, are potentially preventable factors, the avoidance of which would result in a decrease in the rate of surgery cancelations, and, consequently, hospital costs would be reduced, which should be a priority for hospitals, since the costs of unused operating room hours and personnel fall exclusively on the hospital⁵.

The causes involved in suspension or cancelation related to anesthesia (bronchoaspiration, flu symptoms, non-compliance with fasting indications, inadequate, or no pre-surgical preparation) in the present study accounted for 13.5% of total canceled surgeries, which is a highly considerable figure that can be decreased or eliminated if a very good pre-surgical consultation is carried out. In this sense, numerous studies have shown that pre-anesthetic evaluation the day before surgery significantly reduces delays and cancelations^{6,7}. Regarding the causes related to the patient, such as no-show and non-acceptance or refusal to undergo the procedure, a low trend was observed in comparison with other studies, where high figures have been shown for these events, with different factors for which the patient decides not to show up or not to accept, such as lack of communication and religious reasons⁸.

Conclusions

The research yielded reflective elements for decision-making as a fundamental piece to clearly determine the characteristics involved in the event of surgery cancelation in different surgical specialties, and contribute to the implementation or design of improvement plans that promote the quality of surgical services. With the results obtained in this study, it will be possible to evaluate where the failure is and find strategies to reduce, or in best-case scenario eliminate, the likelihood of cancelations and thus improve hospital economy, increase patient trust in the institution and improve each patient's physical and mental health.

The rate of cases that were found shows that there is a high frequency of canceled surgeries, suggesting that this may be due to a lack of planning in the surgery department, which has a negative impact on institutional budget as an effect of operating room and sterilization central time losses, and surgery staff inactivity. The four main reasons for surgery cancelation

add up to 71.4%, that is, it could be thought that there is a lack of follow-up to the process to obtain informed consent and, therefore, of communication between the surgical team and the patient.

As a final conclusion, scheduling of surgeries should be considered an important factor with regard to the design of public health policies, proposed as a safety standard, and constitute an indicator of surgical patients quality of care.

Conflicts of interests

The authors declare that there are no conflicts of interest relevant to the development or publication of the work.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments have been performed on humans or animals for this research.

Confidentiality of data. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

References

1. Fowler AJ. A review of recent advances in perioperative patient safety. *Ann Med Surg (Lond)*. 2013;2:10-4.
2. Eugenio Ortiz C, Alvarado Rodriguez A. Causas de diferimiento anestésico quirúrgico, en el Hospital General de Tlalnepantla, Valle Ceylan, en el periodo de enero de 2013 a junio de 2013. [citado 2019 Jun 27]. Disponible en: <http://ri.uaemex.mx/bitstream/handle/20.500.11799/14615/413058.pdf?sequence=1>
3. Murúa-Barbenza A. Error, complicaciones y negligencia médica en cirugía. *Cuad Cir*. 2003;17:9-10.
4. Aguirre-Córdova JF, Chávez-Vázquez G, Huitrón-Aguilar GA, Cortés-Jiménez N. ¿Por qué se suspende una cirugía? Causas, implicaciones y antecedentes bibliográficos. *Gac Med Mex*. 2003;139:545-52.
5. Bernadó AJ, Solanas JAG, Villahoz ER, Díez MM. Cancelación en CMA: incidencia y causas. *Cir Esp*. 2012;90:429-33.
6. Chaves Sá SP, Gomes do Carmo T, Secchin Canale L. Evaluando el indicador de desempeño suspensión quirúrgica, como factor de calidad en la asistencia al paciente quirúrgico. *Enferm Glob*. 2011;10:190-9.
7. Gnocchi C, Risso J, Khoury M, Torn A, Noel M, Baredes N, et al. Aplicación de un modelo de evaluación preoperatoria en pacientes operados de cirugía abdominal electiva. *Med B Aires*. 2000;60:125-34.
8. Nepote MHA, Monteiro IU, Hardy E. Association between operational indexes and the utilization rate of a general surgery center. *Rev Lat Am Enfermagem*. 2009;17:529-34.
9. Barbosa MH, Miranda Goulart DM, Vieira de Andrade E, Mattia AL de. Análisis de la suspensión de cirugía en un hospital docente. *Enferm Glob*. 2012;11:164-73.
10. Gaviria-García G, Lastre-Amell G, Suárez-Villa M. Causas que inciden en cancelación de cirugías desde la percepción del personal de salud. *Enferm Univ*. 2014;11:47-51.
11. Muñoz-Caicedo A, Sarmiento CP, Torres MS. Cancelación de cirugía programada en una institución de III nivel de atención. *Rev Fac Cienc Salud Univ Cauca*. 2011;13:10-5.
12. Corona Martínez L, Fonseca Hernández M. Un modelo simplificado del proceso de atención médica. Implicaciones asistenciales, docentes e investigativas. *Medisur*. 2010;8:34-7.

13. Perroca MG, Jericó M de C, Facundin SD. Surgery cancelling at a teaching hospital: implications for cost management. *Rev Lat Am Enfermagem*. 2007;15:1018-24.
14. Trincado Agudo MT, Fernández Caballero E. Calidad en enfermería. *Rev Cuba Enferm*. 1995;11:1-2.
15. Mendes FF, Machado EL, de Oliveira M, Brasil FR, Eizerik G, Telöken P. Avaliação pré-operatória: triagem por meio de questionário. *Braz J Anesthesiol*. 2013;63:347-51.
16. Alger RM. Causas de cancelación quirúrgica y reacciones de los pacientes, Instituto Hondureño de Seguridad Social, San Pedro Sula. *Rev Med Hondur*. 2007;75:71-6.
17. Seguel F, Paravic T. Unidad de investigación en hospitales autogestionados. *Cienc Enferm*. 2011;17:19-25.
18. Churata Díaz CL. Factores asociados a suspensión de cirugías electivas en el Hospital III Yanahuara Arequipa 2017. 2018; [citado 2019 Jun 27] Disponible en: <http://repositorio.unsa.edu.pe/handle/UNSA/5573>
19. Livingstone JI, Harvey M, Kitchin N, Shah N, Wastell C. Role of pre-admission clinics in a general surgical unit: a 6-month audit. *Ann R Coll Surg Engl*. 1993;75:211.
20. Macarthur AJ, Macarthur C, Bevan JC. Determinants of pediatric day surgery cancellation. *J Clin Epidemiol*. 1995;48:485-9.
21. Dexter F, Macario A. Applications of information systems to operating room scheduling. *Anesthesiol J Am Soc Anesthesiol*. 1996;85:1232-4.
22. Glenn DM, Macario A. Management of the operating room: a new practice opportunity for anesthesiologists. *Anesthesiol Clin N Am*. 1999;17:365-94.
23. Canales MG, Macario A, Krummel T. The surgical suite meets the new health economy. *J Am Coll Surg*. 2001;192:768-76.
24. Tait AR, Voepel-Lewis T, Munro HM, Gutstein HB, Reynolds PI. Cancellation of pediatric outpatient surgery: economic and emotional implications for patients and their families. *J Clin Anesth*. 1997;9:213-9.