

CANCELLATION OF SURGERIES: AN INTEGRATIVE LITERATURE REVIEW

Cancelamento de cirurgias: uma revisão integrativa da literatura

Cancelación de cirugías: una revisión integrativa de literatura

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ABSTRACT: Objective: To compile and analyze information available in the national and international literature about cancellation of surgeries. **Method:** Integrative literature review carried out from 2010 to June 2016, with search performed in indexed databases such as LILACS, SciELO, BVS, CINAHL, CAPES, and SCOPUS, for articles written in English, Portuguese and Spanish. **Results:** 61 articles were selected, which mentioned cancellation rates from 0.48 to 38%. Most frequent causes are similar among the studies, being the most common: patient's clinical conditions not favorable to surgery, problems related to the institution's structure and organization, and patient non-attendance. Interventions to reduce the number of cancellations are reported, several of them having effective results. **Conclusion:** The cancellation of surgeries is a worldwide theme that still requires investigations and interventions, as it harms people involved and the health system.

Keywords: Perioperative nursing. Perioperative care. Quality indicators, health care. Hospital administration.

RESUMO: Objetivo: Compilar e analisar informações disponíveis na literatura nacional e internacional sobre cancelamento de cirurgias. **Método:** Revisão integrativa da literatura de publicações do período de 2010 a junho de 2016, encontradas em periódicos indexados nas bases de dados LILACS, SciELO, BVS, CINAHL, CAPES e SCOPUS, nos idiomas inglês, português e espanhol. **Resultados:** Foram selecionados 61 artigos, que levantaram taxas de cancelamento de 0,48 até 38%. As causas mais frequentes são similares entre os estudos, sendo as mais comuns: condições clínicas do paciente não favoráveis à cirurgia, problemas relacionados à estrutura e à organização da instituição e o não comparecimento do paciente. Intervenções para reduzir o número de cancelamentos são relatadas, várias delas possuindo resultados eficazes. **Conclusão:** O cancelamento de cirurgias é uma temática em estudo mundial e que ainda requer investigações e intervenções, por ser prejudicial aos envolvidos e ao sistema de saúde.

Palavras-chave: Enfermagem perioperatória. Assistência perioperatória. Indicadores de qualidade em assistência à saúde. Administração hospitalar.

RESUMEN: Objetivo: Compilar y analizar informaciones disponibles en la literatura nacional e internacional sobre cancelación de cirugías. **Método:** Revisión integrativa de la literatura de publicaciones del período de 2010 a junio de 2016, encontradas en periódicos indexados en las bases de datos LILACS, SciELO, BVS, CINAHL, CAPES y SCOPUS, en los idiomas inglés, portugués y español. **Resultados:** Se seleccionaron 61 artículos, que levantaron tasas de cancelación de 0,48 hasta 38%. Las causas más frecuentes son similares entre los estudios, siendo las más comunes: condiciones clínicas del paciente no favorables a la cirugía, problemas relacionados a la estructura y la organización de la institución y la no ausencia del paciente. Las intervenciones para reducir el número de cancelaciones se reportan, varias de ellas con resultados eficaces. **Conclusión:** La cancelación de cirugías es una temática en estudio mundial y que aún requiere investigaciones e intervenciones, por ser perjudicial para los involucrados y para el sistema de salud.

Palabras clave: Enfermería perioperatoria. Atención perioperatoria. Indicadores de calidad de la atención de salud. Administración hospitalaria.

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INTRODUCTION

Institutions which currently deliver health services are aware that they have to seek for continuous improvement of care in all processes. Thus, constant surveillance has been performed in an attempt to eliminate sources of waste^{1,2}.

Performance should be assessed through quantitative indicators, which allow verifying productivity and quality of services. At the surgical center (SC), some of the indicators that could be used are:

- interval between surgeries;
- time spent in anesthetic recovery (AR) in the operating room (OR);
- percentage of room occupancy; and
- index of surgeries' cancellation².

The correct functioning of SC requires allocation of human, material, and financial resources; however, such resources are often used below their capacity³. The cancellation of surgeries is often seen by professionals as a natural phenomenon, part of the routine of an institution. It should be noted, however, that these occurrences must be minimized^{1,4}.

The most widespread methodology in scientific literature for the reduction of cancellation indexes suggests a survey of main causes for the suspension of a procedure and, from there, interventions can be implemented focusing on the solution for such causes⁵.

The later the cancellation, the greater the consequences for both patients and institutions^{5,6}. The patients who have their surgery canceled struggle when they learn that they will not undergo the planned intervention that would improve their clinical state, which also affects the image of the institution. Also, there is the possibility of longer hospitalization and higher risk of contamination⁴.

Nurses have an important role within the SC structure. Surgical procedures require prior preparation to receive the patient and, thus, this professional must be focused on ensuring that surgeries are dully planned and the conditions necessary for their execution are met, through adequate allocation of resources^{2-4,6}.

OBJECTIVE

Compile and analyze the information available in national and international scientific literature regarding cancellation of surgeries.

METHOD

This is an integrative literature review carried out in the following steps:

- definition of guiding research question;
- establishment of inclusion and exclusion criteria;
- definition of information to be extracted and categorization of studies;
- evaluation of studies included;
- interpretation of results and presentation of review and synthesized knowledge⁷.

The main question of this study was: what is the scientific production on surgery cancellation, including rates, causes, interventions, and other topics that could help to understand the scenario of the problem.

The research was carried out in June 2016 across the following databases: *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS); Scientific Electronic Library Online (SciELO); *Biblioteca Virtual em Saúde* (BVS/BIREME); Cumulative Index to Nursing and Allied Health Literature (CINAHL); *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES); SCOPUS. Initially, the Health Science Descriptors (*Descritores em Ciências da Saúde – DeCS*) related to the topic were used; however, due to the huge amount of results, we decided to redo the search using boolean operators with the terms: (*cancel** OR *suspen**) AND (*cirurg** OR *surger** OR *quirurg**).

Studies published in full between January 2010 and June 2016, in Portuguese, English, and Spanish, addressing themes related to the objectives herein established were included in the survey.

Studies whose texts were not available in full in the databases selected or in the library collection of the Albert Einstein Israeli Institute for Teaching and Research (*Instituto Israelita de Ensino e Pesquisa Albert Einstein*) were excluded. Likewise, studies whose objectives were not compatible with the ones of this work were also eliminated.

The articles found were read and evaluated as to inclusion and exclusion criteria adequacy. When adequacy was proven, the information was registered in a proper form containing name of the journal, authors, year of publication, language, database, hospital/institution where the study was performed, country of the study, objectives, methods, results and conclusions. Several studies were found in more than one database.

After analysis and interpretation of data, the information collected was synthesized, which produced narrative results, describing common findings and differences between studies. Charts and graphics were also used to help analyze year of publication, language, database in which the article is available, and country of the study, as well as to compare results.

RESULTS

At the end of the analysis, 61 studies were included in the sample, summarized in Chart 1.

The analysis of number of publications per year indicates a regular yearly amount of publications, according to Figure 1. From 2010 to 2015, this number ranges from 8 to 12 publications. In 2016, six studies published until June were found.

As for languages, 76% of the studies found had been written in English (46 articles), 21% in Portuguese (13 articles), and only 3% (2 articles) in Spanish.

Of 61 articles included in the study, 51 were available in BVS, 40 in CAPES, and 36 in SCOPUS. LILACS, CINAHL and SciELO brought nine, eight and six articles, respectively (Figure 2).

Publications were found in 24 different countries. Brazil contributed with 13 publications and the USA with 12. Saudi Arabia, Norway, the United Kingdom, and India had three publications each. Taiwan, China, New Zealand, and Canada had two studies included. Two papers⁹⁻¹⁰ were not classified according to their countries due to their being bibliographical surveys. Such information is shown in Figure 3.

DISCUSSION AND CONTEXTUAL ANALYSIS

Cancellation index

The literature shows wide variation regarding values of surgery cancellation indexes and criteria defining occurrences in each study. Overall, cancellation is defined as a procedure in the map of surgeries created the day before its execution, but which was not performed^{14,28,39}. Bearing this in mind, rates ranged from low values such as 0.48⁴⁷, 1.98⁶⁰ and 2.00%⁵⁴, to high values such as 27.4¹⁵⁻⁵⁶ and 38.0%⁴⁸. Most studies showed rates between 5 and 20%. Another

literature review evaluating researches published from 1990 to 2010 found cancellation indexes ranging between 5.1 and 33.0%⁹.

In institutions where cancellations took place when the patient was already in the Operating Room (OR), indexes of 0.15⁴⁰, 0.21¹⁸ and 0.37%⁵⁸ were found. Another study evaluating the moment when cancellation occurred showed a total index of 26.8% when considering the suspension at any time before the procedure, or when considering cancellations only on the day of the surgery, 11.8%²⁶. This indicator is to be found in specific groups, as in the case of patients who had surgeries scheduled two years after percutaneous coronary intervention, whose rate was 13.3%³³.

Monitoring cancellation index in the institutions may be done with statistical tools, such as Process Statistical Control, which allows for the analysis of data in a short period of time, so that actions can be taken as soon as the number reaches an undesired value^{28,35,49}.

Considering the rescheduling of cancelled procedures, indexes of unperformed surgeries were 31.3⁴⁰, 32.9¹⁸ and 46.5%⁶. As for the interval between cancellation, rescheduling, and execution of the procedure, mean waiting time was 12.2 days⁵⁴.

Characteristics of cancellations

Determining the characteristics of cancellations in a given institution may help to direct the efforts of indicator improvement to groups in which this occurrence is more common. In the case of clinical specialties, the ones presenting higher indexes were: orthopedics^{6,17,23,39}, general surgery^{3,19,53}, otolaryngology^{20,32}, urology⁴¹, ophthalmology⁵⁸, and hand surgery⁵⁵. A higher number of cancellations was found among female patients⁵². Another study showed a positive correlation between number of cancellations and classification by the American Society of Anesthesiologists (ASA)⁵⁸; in other study, the dependency between factors was not considered significant¹⁸.

In a work evaluating the cancellation of cataract surgeries, the index was higher during winter⁴³. As for the day of the week, higher cancellation rates were on Mondays⁴⁴.

In regard to the type and size of hospitals, "teaching hospitals" had cancellation rates 2.23 times higher than medium and small-sized institutions⁵³.

A surgery may be postponed many times since its original schedule. In the study by Coady-Fariborzian et al.²¹, 53% of the cases took place less than 24 hours

Chart 1. Relation of studies included in the work.

Title	Authors	Year	Language	Database	Country	Objective
Tasas y causas de suspensión de cirugías en un hospital público durante el año 2014 ⁸	Abeldaño and Coca	2016	Spanish	CAPEL	Argentina	To analyze surgery cancellation in 2014.
A suspensão de cirurgia e o processo de comunicação ⁹	Aquino et al.	2012	Portuguese	BVS	not applicable	To identify, in national scientific literature, the reasons of cancellation of surgeries and to discuss their causes through the process of communication between professionals.
Cancelamento de cirurgias: uma revisão integrativa da literatura ¹⁰	Ávila et al.	2012	Portuguese	BVS, LILACS	Not applicable	To verify the knowledge produced about the cancellation of surgeries, in an attempt to identify actions to minimize these occurrences, according to the recommendations in the literature.
Reducing elective general surgery cancellations at a Canadian hospital ¹¹	Azari-Rad et al.	2013	English	SCOPUS, CAPEL, CINAHL, BVS	Canada	To identify potential improvements in the flow of patients through the surgical process to reduce the number of cancellations.
Why is cataract surgery canceled? A retrospective evaluation ¹²	Bamashmus et al.	2010	English	SCOPUS, CAPEL, BVS	Kuwait	To evaluate cancellation rates and the reasons why they occur.
Análise da suspensão de cirurgias em um hospital de ensino ²	Barbosa et al.	2012	Portuguese	SCOPUS, SCIELO	Brazil	To identify surgical cancellation rate and the reasons to carry out this procedure in a public teaching hospital.
Report into “on the day cancellations” for plastic surgery in patients who failed to stop their medication ¹³	Bass e Gill	2014	English	CAPEL, BVS	The United Kingdom	To evaluate the cancellation rate of procedures and to implement changes to reduce their impact on the confidence on the hospital
Cancellation of elective cases in pediatric surgery: An audit ¹⁴	Bathla et al.	2010	English	CAPEL, BVS	India	To determine the main reasons for the cancellation of elective surgeries of pediatric patients.
Cirurgias eletivas: cancelamentos e causas ¹⁵	Botazini et al.	2015	Portuguese	BVS, LILACS	Brazil	To investigate the number of elective surgeries cancelled and to identify their causes.
Surgical cancellations: a review of elective surgery cancellations in a tertiary care pediatric institution ¹⁶	Boudreau and Gibson	2011	English	SCOPUS, CAPEL, CINAHL, BVS	USA	To analyze the cancellation of elective surgeries and to identify and recommend changes related to nursing practices in the preoperative clinical evaluation to reduce cancellation rates.
Incidence, causes and pattern of cancellation of elective surgical operations in a university teaching hospital in the Lake Zone, Tanzania ¹⁷	Chalya et al.	2011	English	BVS	Tanzania	To evaluate the incidence, causes and cancellation pattern of elective surgeries and to find appropriate solutions for better patient management.

Continue...

Chart 1. Continuation.

Title	Authors	Year	Language	Database	Country	Objective
Case review analysis of operating room decisions to cancel surgery ¹⁸	Chang et al.	2014	English	SCOPUS, CAPES, BVS	China	To examine and categorize the number of cancellations after the patients were prepared for the operation room, determining the ways to reduce such cancellations
Cancellation of elective operations on the day of intended surgery in a Hong Kong hospital: Point prevalence and reasons ¹⁹	Chiu et al.	2012	English	SCOPUS, CAPES, BVS	Hong Kong	To determine points of prevalence of cancellation of elective surgeries and their motives.
The analysis for the causes of surgical cancellations in a Brazilian university hospital ²⁰	Cihoda et al.	2015	English	CINAHL	Brazil	To quantify the occurrence of cancellation of scheduled surgeries, to identify causes and specialties which contribute to this rate
An investigation of plastic surgery operative cancellations in a VA population ²¹	Coady-Fariborzian et al.	2016	English	SCOPUS	USA	To evaluate cancellation rates and their causes.
Descriptive study of case scheduling and cancellations within 1 week of the day of surgery ²²	Dexter et al.	2012	English	SCOPUS, CAPES, BVS	USA	To evaluate in a descriptive way the cases of cancellation less than one week before surgery.
Cancellation of operations in Saudi Arabian hospitals: Frequency, reasons and suggestions for improvements ²³	Dhafar et al.	2015	English	BVS	Saudi Arabia	To identify the frequency and reasons for surgery cancellation.
The challenge of cancellations on the day of surgery ²⁴	Dimitriadis et al.	2013	English	SCOPUS, CAPES, BVS	The United Kingdom	To investigate the reasons for cancellation on the day of the surgery and to propose strategies to reduce their incidence.
Preoperative screening and case cancellation in cocaine-abusing veterans scheduled for elective surgery ²⁵	Elkassabany et al.	2013	English	SCOPUS, CAPES, BVS	USA	Primary objective: to identify practices, procedures and policies on the screening of cocaine use and surgery cancellation. Secondary objective: to determine the cancellation rate on the day of the surgery related to the positive urine cocaine test.
Management implications for the perioperative surgical home related to inpatient case cancellations and add-on case scheduling on the day of surgery ²⁶	Epstein and Dexter	2015	English	SCOPUS, CAPES, BVS	USA	To explore the potential benefits of perioperative evaluation regarding the cancellation of interim patients and addition of surgeries.
Reasons for elective surgery cancellation in a referral hospital ²⁷	Ezike et al.	2011	English	CAPE, BVS	Nigeria	To detect the causes for cancellation on the day of the surgery in a hospital which carries out both elective and emergency surgeries.

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Chart 1. Continuation.

Title	Authors	Year	Language	Database	Country	Objective
Elective surgery cancelation on day of surgery: an endless dilemma ²⁸	Fayed et al.	2016	English	SCOPUS, CAPES, BVS	Saudi Arabia	To investigate the rates and reasons for cancellation while evaluating the effect of new ORs about this rate.
Analysis of 43 Intraoperative cardiac surgery case cancellations ²⁹	Fitzsimons et al.	2016	English	SCOPUS, CAPES, BVS	USA	To determine the reasons for cancellation, predictability, total time in the operation room and destination of the patient.
Assessment of a standardized pre-operative telephone checklist designed to avoid late cancellation of ambulatory surgery: the AMBUPROG multicenter randomized controlled trial ³⁰	Gaucher et al.	2016	English	SCOPUS, CAPES, BVS	France	To evaluate the impact of application by telephone of a standardized checklist during preoperative period in the cancellation rates of outpatient surgeries
Causas que inciden en cancelación de cirugías desde la percepción del personal de salud ³¹	Gaviria-García et al.	2014	Spanish	CAPEP, SCIELO	Colombia	To identify from the perception of health professionals the factors which affect the cancellation of surgeries in a high-complexity hospital.
Effect of six sigma program on the number of surgeries cancellation ³²	Gheysari et al.	2016	English	CAPEP, BVS	Iran	To determine the number of causes for surgery cancellation, and areas to be improved.
Frequency of Surgery Cancellations Associated With Myocardial Infarction or Death 6 Months After Coronary Stent Placement ³³	Graham et al.	2015	English	CAPEP	USA	To identify the relation between coronary stent placement and the cancellation of surgeries after six months.
Using nurse-to-patient telephone calls to reduce day-of-surgery cancellations ³⁴	Haufler and Harrington	2011	English	SCOPUS, CAPES, CINAHL, BVS	USA	To describe the results of the impact of implementation of a telephone call system on the cancellation index
A new pathway for elective surgery to reduce cancellation rates ³⁵	Hovlid et al.	2012	English	SCOPUS, CAPES, BVS	Norway	To evaluate the result of a new process for elective surgeries and to study which factors may affect them.
Patient experiences with interventions to reduce surgery cancellations: A qualitative study ³⁶	Hovlid et al.	2013	English	SCOPUS, CAPES, BVS	Norway	To explore the experience of patients with interventions to reduce the cancellation of surgeries.
A qualitative study of contextual factors' impact on measures to reduce surgery cancellations ³⁷	Hovlid and Bukve	2014	English	SCOPUS, CAPES, BVS	Norway	To contribute for the understanding of how contextual factors affect the effort to reduce the cancellation of surgeries.
Causes of elective surgery cancellation and theatre throughput efficiency in an Australian urology unit ³⁸	Keller et al.	2014	English	SCOPUS, CAPES, BVS	Australia	To evaluate the efficiency of the units and to identify opportunities for improvement; to identify causes for cancellation on the day of surgery and how to avoid them.

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Chart 1. Continuation.

Title	Authors	Year	Language	Database	Country	Objective
Reasons for cancellation of operation on the day of intended surgery in a multidisciplinary 500 bedded hospital ³	Kumar and Gandhi	2012	English	SCOPUS, CAPES, BVS	India	To evaluate the reasons for the cancellation of elective surgeries in a government hospital of 500 beds.
Surgery cancelation on the day of surgery in same-day admission in a Finnish hospital ³⁹	Laisi et al.	2013	English	SCOPUS, CAPES, BVS	Finland	To determine the cancellation rate and the index by specialty. To identify the reasons for cancellation and to detect weaknesses in the system.
Retrospective analysis of surgery postponed or cancelled in the operating room ⁴⁰	Lau et al.	2010	English	SCOPUS, CAPES, BVS	Taiwan	To analyze the reasons for postponement or cancellation of surgeries in the operation room (OR) and to determine this effects on patients.
Day of surgery cancellation rates in urology: identification of modifiable factors ⁴¹	Leslie et al.	2013	English	SCOPUS, CAPES, BVS	Canada	To identify the cancellation rate and their reasons to explore the capacity of administrative data available to categorize potentially modifiable factors.
The reasons for cancellation of urological surgery: a retrospective analysis ⁴²	Lopez et al.	2012	English	SCOPUS, CAPES, BVS	New Zealand	To identify predictable reasons for surgery cancellation and actions which could minimize their occurrence.
Cancelamento de cirurgias em um hospital universitário: causas e tempo de espera para novo procedimento ⁶	Macedo et al.	2013	Portuguese	BVS, LILACS	Brazil	To identify the occurrence of surgery cancellations in the surgical center of a teaching hospital, identifying surgical specialties, the people responsible, the causes, patients' age range, as well as the period between cancellation and the performing of the new procedure.
Cancelamento de cirurgias de catarata em um hospital público de referência ⁴³	Magri et al.	2012	Portuguese	SCOPUS, CAPES, BVS, SCIELO, LILACS	Brazil	To analyze the incidence and reasons for the cancellation of cataract surgeries in a reference public hospital.
Cancelled surgeries and payment by results in the English National Health Service ⁴⁴	McIntosh et al.	2012	English	SCOPUS, CINAHL, BVS	The United Kingdom	To model the frequency of "last minute" cancellation of planned elective surgeries regarding patients and to provide factors leading to such cancellations.
Reasons for cancellation of elective operations at a major teaching referral hospital in Jordan ⁴⁵	Mesmar et al.	2011	English	CINAHL, BVS	Jordan	To determine the cancellation rate and the reasons for cancellation of scheduled elective surgeries.
Implicações do cancelamento de cirurgias em centro cirúrgico: estudo descritivo-exploratório ⁴	Morgan et al.	2010	Portuguese	SCOPUS, BVS	Brazil	To identify the implications of surgery cancellation in the work process of nurses in the surgical center of a teaching hospital.

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Chart 1. Continuation.

Title	Authors	Year	Language	Database	Country	Objective
Suspensão cirúrgica: perspectiva do residente de medicina em clínicas cirúrgicas ⁴⁶	Nascimento et al.	2014	Portuguese	BVS, SCIELO, LILACS	Brazil	To understand the perception of the resident on clinical surgery about postponing surgical procedures, the repercussions and consequences of this event in their work.
Day of surgery cancellation rate after preoperative telephone nurse screening or comprehensive optimization visit ⁴⁷	Olson and Dhakal	2015	English	CAPEL, BVS	USA	To verify whether the rates of cancellation on the day of the surgery vary according to the different patient evaluation processes.
Improving the process to reduce ophthalmologic surgery cancellation and patient complaints ⁴⁸	Padoveze et al.	2010	English	BVS, LILACS	Brazil	To describe a quality intervention program to reduce cancellation rates of ophthalmic surgeries and patient complaints.
Reducing cancellations on the day of scheduled surgery at a children's hospital ⁴⁹	Pratap et al.	2015	English	SCOPUS, CAPEL, BVS	USA	To describe a quality improvement Project to reduce the time lost due to cancellation of surgeries on the scheduled day.
A comunicação da suspensão de cirurgias pediátricas: sentimentos dos familiares envolvidos no processo ⁵⁰	Risso and Braga	2010	Portuguese	SCOPUS, CAPEL, BVS, SCIELO, LILACS	Brazil	To identify and describe the perception of 15 mother and/or legal guardians of children between 0 and 18 years of age, hospitalized, after receiving the News that the surgery of their children had been postponed.
A retrospective observational study of patient cancellations on the day of surgery in the general surgical directorate ⁵¹	Rymaruk	2011	English	SCOPUS, CAPEL, CINAHL, BVS	England	To verify the proportion of avoidable cancellation and to suggest measures to circumvent or identify them in advance.
Avaliando o indicador de desempenho suspensão cirúrgica, como fator de qualidade na assistência ao paciente cirúrgico ¹	Sá et al.	2011	Portuguese	SCIELO	Brazil	To identify the number of cardiac surgeries carried out and postponed in 2008, describing the causes of such cancellations.
Bed crisis and elective surgery late cancellations: an approach using the theory of constraints ⁵	Sahraoui and Elarref	2014	English	SCOPUS, CAPEL, BVS	Qatar	To study the main cause for late cancellation of surgical procedures.
Perfil cirúrgico e fatores determinantes das suspensões de cirurgias gerais ambulatoriais: contribuições para assistência de enfermagem ⁵²	Sampaio and Ribeiro	2012	Portuguese	BVS	Brazil	To identify the profile of outpatient users of general surgery; to determine general surgical procedures carried out; to analyze the determining factors of general surgery postponement.
The effect of hospital size and surgical service on case cancellation in elective surgery: Results from a prospective multicenter study ⁵³	Schuster et al.	2011	English	SCOPUS, CAPEL	Germany	To understand how the type of hospital (teaching, large or small/medium sized ones) and the clinical specialties provided influences the surgeries cancellation rate.

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Chart 1. Continuation.

Title	Authors	Year	Language	Database	Country	Objective
Same-day cancellation of cardiac surgery: A retrospective review at a large academic tertiary referral center ⁵⁴	Smith et al.	2014	English	SCOPUS, CAPES, BVS	USA	To retrospectively analyze cardiac surgeries on the day they would be performed, determining the cancellation rate; to identify the incidence and predictable cancellation reasons; to quantify operatory delay.
Cancelamento de cirurgias em um hospital público na cidade de São Paulo ⁵⁵	Sodré and El Fahl	2014	Portuguese	BVS, LILACS	Brazil	To establish the incidence of elective procedures cancellations in the surgical centers, to identify the surgical specialties more involves and the most frequent reasons for the suspension of scheduled surgeries.
Determinantes para suspensões cirúrgicas em um hospital universitário ⁵⁶	Souza et al.	2010	Portuguese	CINAHL, BVS, LILACS	Brazil	To identify the quantitative of elective surgeries postponed in a nine-month timeframe, considering and analyzing determinants on the emotional, physical and social implications for patients, Family and institution.
Reasons for cancellation of elective cardiac surgery at Prince Sultan Cardiac Centre, Saudi Arabia ⁵⁷	Sultan et al.	2012	English	SCOPUS, CAPES, BVS	Saudi Arabia	To evaluate the reasons for cancellation of specific cardiac procedures.
Operation cancellation at Chang Gung Memorial Hospital ⁵⁸	Sung et al.	2010	English	BVS	Taiwan	To analyze the reasons for cancellations and to propose strategies to reduce the cancellation rate in operation rooms.
An analysis of time utilization and cancellations of scheduled cases in the main operation theater complex of a tertiary care teaching institute of North India ⁵⁹	Talati et al.	2015	English	BVS	India	To analyze the time of use and the cancellation of cases scheduled in the operation rooms.
Day of surgery cancellations in a tertiary care hospital: A one year review ⁶⁰	Trentman et al.	2010	English	SCOPUS	USA	To determine the cancellation rate and to classify avoidable/unavoidable cancellations and the ones related to patient/hospital.
Cancellations on the day of elective gynaecological surgery: the Counties Manukau experience ⁶¹	Wang et al.	2013	English	CAPE, BVS	New Zealand	To verify rates and reasons for cancellation on the day of elective surgeries.
A column-generation-based heuristic algorithm for solving operating theater planning problem under stochastic demand and surgery cancellation risk ⁶²	Wang et al.	2014	English	SCOPUS, CAPES	China	To develop a highly-efficient robust model to solve the problem of cancellation to be used on the scheduling of surgeries, considering uncertain durations and the arrival of emergencies.

from the procedure. Dexter et al.²² recommended that the planning of resources related to use of the OR should be made with maximum advance of two days,

for they found that, from this period on, 51.5% of the rooms did not suffer further alterations in the program. Leslie et al.⁴¹, in interviews with patients who had their

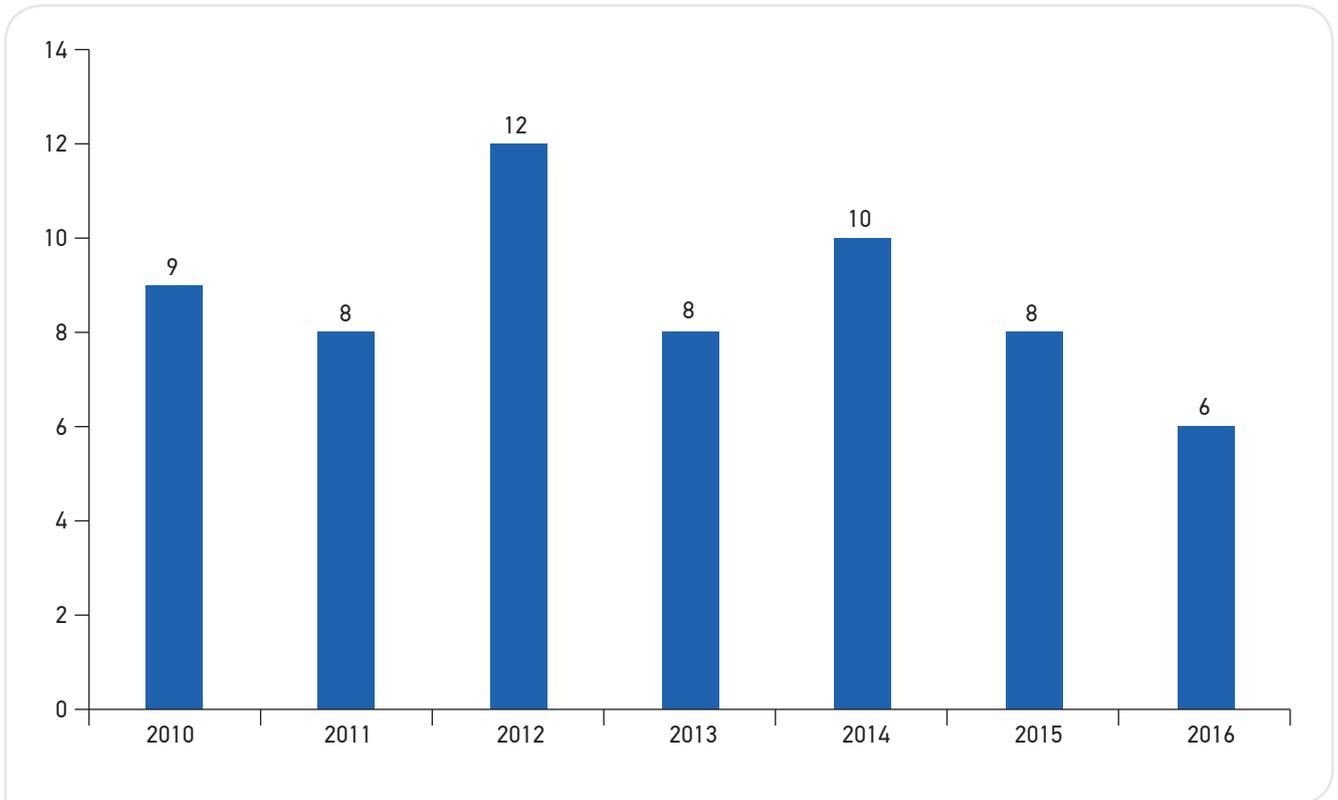


Figure 1. Number of articles included in the sample, according to year of publication.

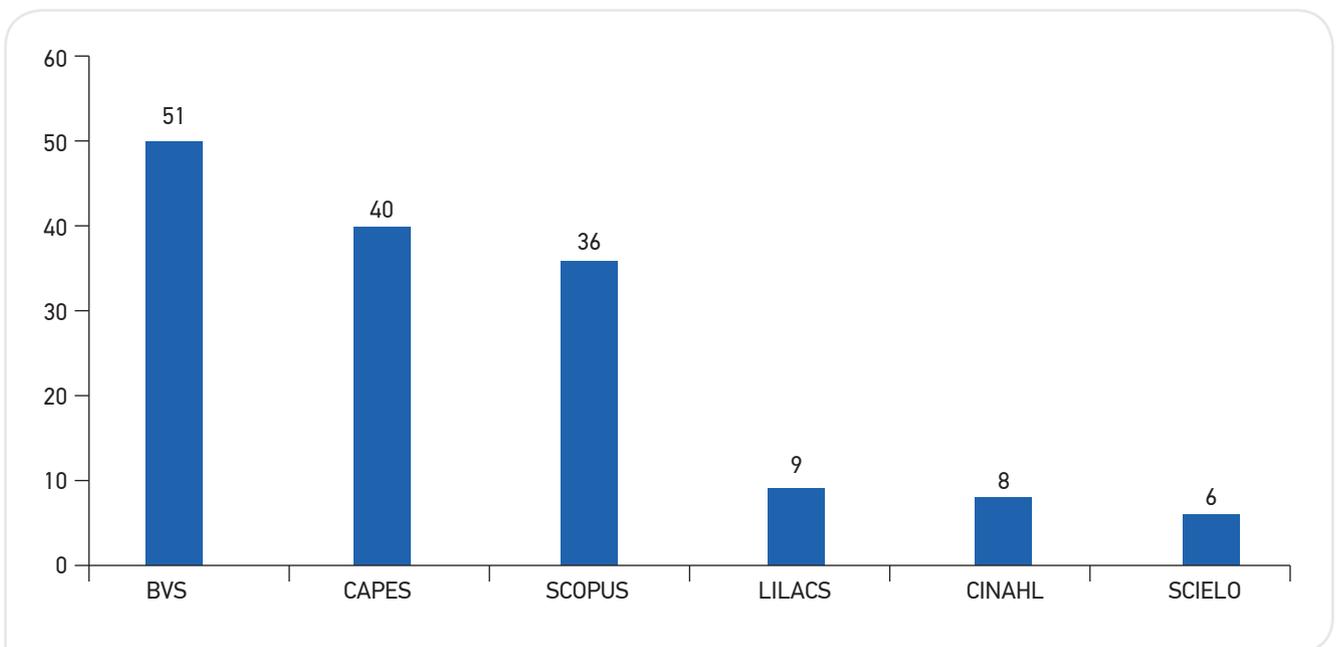


Figure 2. Number of articles included in the sample, according to database.

surgeries cancelled, identified that almost half of them were notified about it less than 60 minutes before the time scheduled for the procedure.

The costs of cancellation may vary between institutions — but all professionals recognize the existence of these expenses⁴. In the United Kingdom, 23 cancellations in a single institution generated an estimated cost of £ 20,000¹³. Wang et al.⁶², through an algorithm, suggested that, if the institutions choose to work with a high risk of cancellation due to excessive scheduling of surgeries, there could be a reduction in operational costs; however, this causes patient dissatisfaction. Thus, each institution should evaluate their options, since, even though improvements have a cost in

order to be implemented, such expenses may overlap with those resulting from cancellations²⁴.

Cancellation causes

In many studies analyzed, the most frequent causes of cancellation are similar. Different expressions are used to classify them, but they may be grouped into three main categories:

- clinical conditions unfavorable to surgery: changes in patient’s clinical status often happen, making it impossible to carry out procedures as planned. In such cases, the risks of surgeries surpass the benefits, thus cancellation is chosen^{12,18,21,24,29,38,40,43,45,48,51,54,56,61};

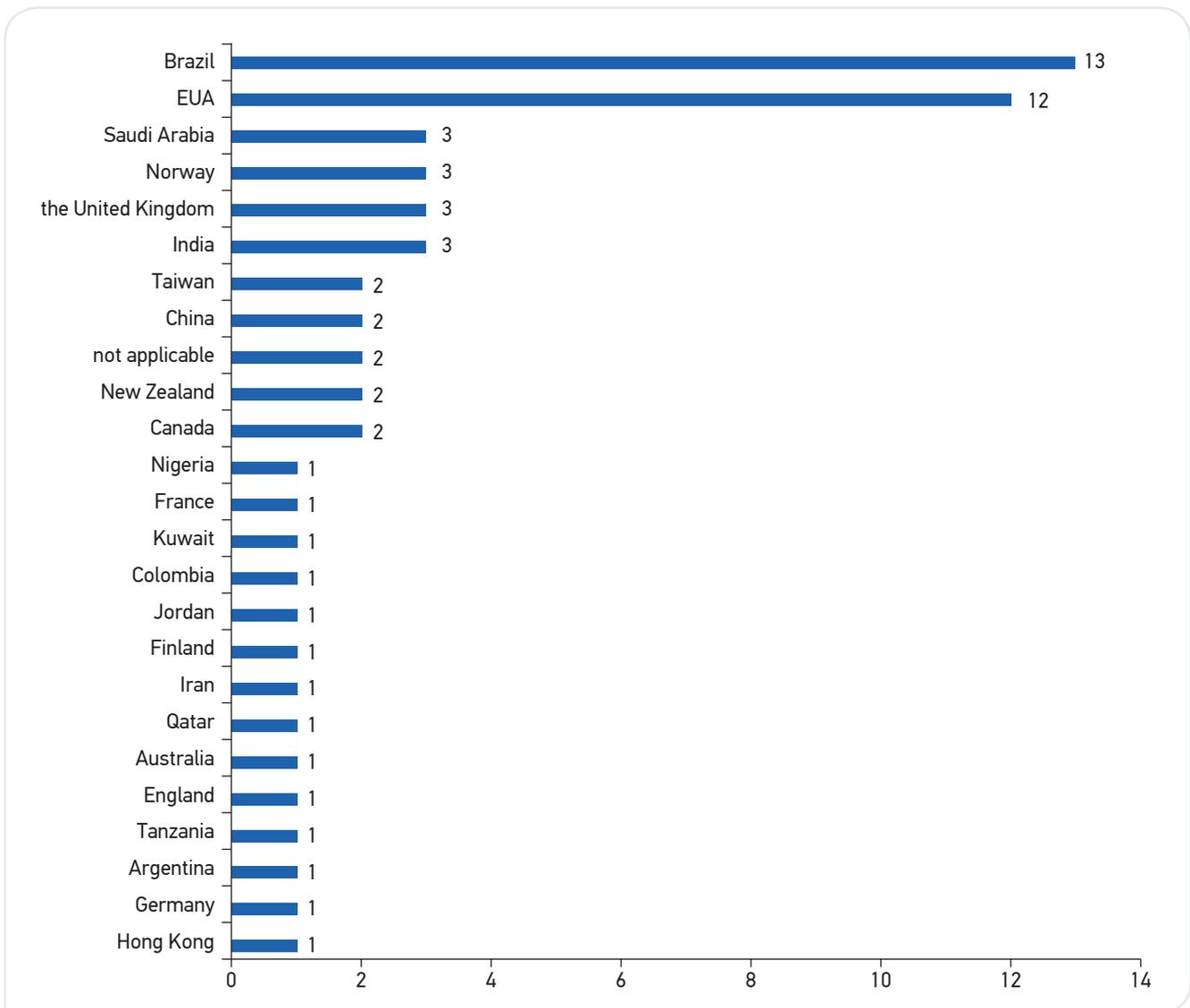


Figure 3. Number of articles included in the sample, according to the country of the study.

- problems related to institution's structure and organization: such as availability of beds for patients, lack of surgeons, lack of material, and other issues; these factors are responsible for most cancellations in some institutions^{1,8,17,19,27,31,42,57,60}. In other cases, the procedure must be cancelled due to lack of appropriate time for its performance on the scheduled day, both due to delays and to excessive scheduled surgeries^{3,5,59};
- patient's absenteeism: the biggest problem in some institutions is patient non-attendance. This event may be the consequence of a feeling of improvement in their clinical state, withdrawal in cases of aesthetic surgeries, or even neglect^{6,28,34,55}.

In some cases, researchers found difficulties in obtaining an accurate classification of cancellation causes, whether because they were confusing or did not allow a clear understanding of the main reason^{2,4,15}.

It is common for other authors to classify cancellation causes as avoidable and unavoidable, so that there is a better perception of the volume of occurrences and interventions with potentially more effective results can be attempted. In most cases, there is a consensus that a considerable share of such events could be prevented with improvements in processes^{3,27,42}. When quantified, mean values of avoidable cancellations range from 17.0%⁵⁴, 22.0%⁵⁷ and 24.4%⁶¹ to 80.0%^{12,51} and 93.8%¹⁷.

Interventions to reduce the number of cancellations

Bass and Gill¹³ report the result of implementation of a more effective communication system between professionals and patients, aiming to reduce the number of cancellations resulting from anticoagulant or antiplatelet medication use before the surgery. Although decrease in occurrences was not observed, there was a 41% reduction in costs associated to them.

Boudreau and Gibson¹⁶ evaluated the impact of distribution of guideline material for legal guardians of children who would undergo surgeries, and a reduction of 6.0 to 3.6% in cancellation rates was observed.

Epstein and Dexter²⁶ verified that 62.3% of cancellations in the period analyzed had been evaluated by a professional up to 6 p.m. the day before the surgery, meaning that, in these cases, the test could not avoid the cancellation. Olson and Dhakal⁴⁷ found an influence of preoperative evaluations

according to two approaches: a more specific one for cases more susceptible to cancellation; and a broader one for cases with lower risk. Cancellation indexes with those approaches were 0.48 and 0.60%, respectively, inferior to the 1.23% index observed in a total group of schedules.

Fayed et al.²⁸ followed up the variation of cancellations along with the implementation of new OR, when the index went from 11.11 to 9.00%.

Gaucher et al.³⁰ compared the cancellation indexes in a group through a telephone checklist with questions related to preoperative care. There was no reduction of occurrences in this group, suggesting that a customized checklist would be necessary for each situation. In the study of Haufler and Harrington³⁴, telephone follow-ups suggested a reduction of 53% in cancellation numbers.

Gheysari et al.³² followed up the implementation of a six-sigma program to determine cancellation causes and improvements to be implemented based on the analysis. The methodology caused a reduction in cancellation rates from 3.6% to 1.4%.

Hovlid et al.³⁵ found a reduction in cancellation rates from 8.5 to 4.9%, after the implementation of measures such as: greater involvement of doctors in surgery scheduling, introduction of an electronic scheduling system, and greater commitment from the hospital's management.

Padoveze et al.⁴⁸ described a method to evaluate cancellation causes and the development of such actions to minimize their occurrence. Improvements in the communication between teams and changes in the acquisition of essential surgical products were implemented. Total cancellation rate did not drop, but there was a reduction in relation to improvement targeted causes.

Among studies addressing mathematical modeling and statistical evaluations, Azari-Rad et al.¹¹ determined that the sequencing of surgeries in increasing order of duration and variability may reduce the number of cancellations. Wang et al.⁶² developed a model from which it was possible to determine that scheduling with high risk of cancellation helps to increase the efficiency in the use of SC resources and to reduce costs, though it may lead to greater patient dissatisfaction.

Perception of professionals and patients regarding cancellations

Cancellations bring several consequences to patients. Complications in their health conditions and changes in their social agenda are only two of them. In the study by Leslie et al.⁴¹, about 80% of interviewed patients who had

their surgeries postponed stated believing that there was no impairment to their health status.

Interviews show that the communication between health professionals and family members is often inadequate, making the role of nurses as mediators rather important⁵⁰. Patients wish to be involved in the scheduling process of their surgeries (which may result in lower cancellation rates), as well as to receive individualized treatment and to have a good relationship with the professional they will be in touch with at the institution³⁶.

From the professionals' point of view, through analysis of studies, both nurses and medical residents are aware of the numerous consequences of a cancellation^{4,46}. Many report that administrative management of the institution is poor, causing the scheduled procedures to not be carried out³¹. Leadership engagement and the clear definition of a cancellation reduction policy are seen by professionals as actions that contribute with the improvement of this indicator^{35,37}. Some professionals also reported the need for a well-defined policy to deal with specific cases such as the detection of medication used by the patient before a surgery²⁵.

CONCLUSIONS

The analysis of the 61 articles demonstrates that the cancellation of surgeries is a theme commonly studied

worldwide, providing data that allow various institutions to comparatively evaluate the managerial situation of their SC.

The authors agree that there is always a way to improve the service provided by reducing cancellation rates, once some cases could be avoided with the implementation of improvements. These improvements are of utmost importance for institutions, considering the impact cancellations pose to the lives of patients and their relatives and to the management of the institution's resources (material and personnel), in addition to damaging the reputation of the institution and costs to the health system.

The main reasons and characteristics of cancellations vary widely between studies due to different criteria used to sort data and the characteristics of each organization, which may assist different audiences, work with one or multiple clinical specialties, or even due to sample size.

Data about the implementation of processes' improvements to reduce cancellations are available. Each organization is able to evaluate which may suit their reality in order to obtain better results.

In summary, the indicator of surgery cancellations is important for the SC management and should be the focus of a multidisciplinary team trained and committed to better results for the institution and better-quality services for patients.

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