

# Economic impact of surgery cancellation in a general hospital, Iran

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## Abstract

**Background:** Cancellation of surgical procedures creates a financial burden to health providers and patients. It also causes a potential emotional stress and a negative impact on perception of quality of care. It should be a priority to identify risks of surgery cancellations in view of modification to assure timely and efficient delivery of care.

**Objective:** To identify and estimate costs borne by cancellation of elective surgeries in a general hospital.

**Methods:** Data were collected from a general hospital of social security organization of Iran. In-patient medical records were reviewed for all patients scheduled for elective surgeries in a period of 1 year, starting from 21<sup>st</sup> of March 2011 to 20<sup>th</sup> of March 2012. The costing data were collected in 2014. Patients undergoing out-patient surgery and emergency surgical procedures were excluded from the study.

**Results:** During the study period, 14,687 cases were scheduled to undergo inpatient elective surgical procedures. Of those 274 cases were cancelled, among the cancelled cases, 242 were cancelled during the preparation in the surgery ward and 32 cases were cancelled in operation room. The total cost of surgery cancellation was US\$ 92,049.0. Out of this: US\$ 42,668.0 (46.4%) was related to bed expense; 32,363.0\$US (35.1%) for direct costs related to resources and supplies; and US\$ 16,569 (18.5%) was related to physician visits.

**Conclusion:** The study demonstrated that cost of surgery cancellation was considerably high in the studied general hospital. More than half of the cost (62.1%) of surgery cancellation was due to avoidable reasons. [*Ethiop. J. Health Dev.* 2016;30(2):92-95]

**Keyword:** Cost of illness; Cost of Cancellation; Direct Cost; Surgery Cancellation Cost.

## Introduction

Day of surgery (DOS) cancellations remains a major cause of inefficient use of operating room (OR) time and a drain on finite health care resources (1). An elective surgical procedure is said to be cancelled when a patient's name has appeared on the list for surgical operations but the operation was not done on the scheduled date (2). Day of Surgery cancellation is a well-recognized quality problem (3) and reflects inefficiency in management (4). High cancellation rates may indicate that rare health resources are being used ineffectively, thereby increasing costs (5). It increases healthcare costs and creates significant inconvenience on patients and families (6). Cancellation of scheduled operations would therefore reduce the hospital's income. In addition, it is costly to the patient in terms of lost working days and disruption of daily life (7). Waste disposable equipment opened for cases that are never performed, expend resources in the form of salaries and benefits for workers who remained idle (8) and wasted investigations and blood cross-matching (9).

In Iran, although several studies were done to investigate the reasons for canceling scheduled operations, no study has analyzed the theme from the economic-financial aspect, especially in terms of direct costs (human resources, medication and material). In general, very limited data exist on economic impact of surgery cancellation in Iran as well as in other parts of the world.

Therefore, this study was conducted at Shohada Kargar Hospital that belongs to Iran Social Security Organization in order to provide cost information that can support management and leadership in the decision making process based on quality and efficiency. The aim of this study was to identify and estimate costs borne by cancellation of elective surgeries in a general hospital.

## Methods

This cost study was carried at Shohada Kargar Hospital in Yazd city of Iran. In-patient medical records were reviewed retrospectively for all patients scheduled for elective surgeries in a period of 1 year, starting from 21<sup>st</sup> of March 2011 to 20<sup>th</sup> of March 2012. The costing data were collected in 2014. The study population was patients who were scheduled to undergo elective surgery. Patients undergoing out-patient surgery and emergency surgical procedures were excluded from the study. A checklist was prepared including the patient's demographic data (such as gender, age), circumstances in which the surgeries were cancelled (before and after the preparation of the surgery room and during the surgical procedure), hospitalization unit, surgery, date and reason for cancelling, medication, materials, bed and other resources fees and the researchers filled it up after the reviewing of patient medical document of those with record of cancellation code. The cases were mixed of general, urology, ENT, gynecologic, orthopedic, eye surgery and neurosurgical cases. The hospital uses a "Fixed Hour System" for Operation Room (OR) allocation. Therefore, there is an eight-

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hour block of time from eight to 16 hours from Saturday to Wednesday and Thursday morning from 8 to 12MD, when operations could be conducted. Night periods, weekends and holidays are reserved for emergencies. Most of the patients are admitted in the surgical wards days before the surgery. The operation list for elective procedures is prepared and sent to the theater by the preceding night. All the patients thus listed are evaluated in the ward by the consultant anesthetists and potentially difficult cases are meant for consulting with specialist in related medical services. When a cancellation occurred, the nurses report the main reason for the cancellation in the nursing report sheet of the patient document. After discharge, during the patient coding and documentation process in the medical record unit the cancelation of the surgery is coded as Z53.9 Canceled procedure (surgical) according to ICD-10-CM Index. The cost was calculated from hospital bill.

This study hospital, Shohada Kargar belongs to Iran social security organization. Social Security Organization (SSO) is a social insurer organization in Iran which provides coverage of wage-earners and salaried workers as well as voluntary coverage of self-employed persons. Currently 70 hospitals which cover an estimation of 540,000 surgery cases every year and 260 clinics are related to SSO medical and health-care centers and provide free medical care and medicines to insured people. This hospital serves free of charge for those under social security insurance and is a referral center and delivers hospital and outpatient care in several medical specialties, totaling an average of 1,370 large, medium and small-size surgeries per month which represents 60% of total hospitalizations. In this hospital (270 beds and 7 operating theatres), there is a fixed operating day and theater for elective procedures for all of the surgeons.

Cancellation reasons were entered into the database as coded variables. Statistical analysis was performed using SPSS version 20 software.

The study was approved by the Shohada Kargar Hospital ethics committee, Social Security Organization of Iran.

**Results**

A total of 16,669 patients were scheduled for surgery during the study period, of which 11.89% were emergencies or outpatient surgery. A total of 14,687 cases were scheduled to undergo inpatient elective surgical procedures in a period of 1 year. Of those, 274 cases were canceled, 58.7% of them were male patients while 42.3% were female patients. Average age of the patients was 50.92 ± 24.61 years (ranging from 1 to 90 years old).

The average length of stay was 1.9 days for cancelled cases. Among the cancelled cases, 242 cases were cancelled during the preparation in the surgery ward and 32 cases were cancelled in operation room. The point prevalence of cancellations was 1.87 %. From these, 71(25.9%) were general surgery cases and followed by orthopedic surgery 65 cases (23.7%). The highest number of cancellation occurred in the general surgical service (2.82%) followed by urology service (2.5%), and ENT service (1.96%). Of 17 scheduled operations for Anesthesiology, none were canceled. Then, the least (1.22%) occurred in gynecology service followed by orthopedic service (1.66%), and eye surgery service (1.83%).

**Reasons of surgery cancelation:** The causes of cancellation were divided into avoidable and unavoidable (Table 1). Unrecorded factors were defined as if the reason for cancellation was not recorded in patient medical document.

**Table 1: Reasons of surgery cancelation**

<b>Avoidable</b>	<b>Unavoidable</b>
Patient Medical condition	Equipment broken or not available
Lab test result not available	No intensive care unit beds
Medical evaluation- Incomplete pre-operation	operation room condition
Patient refused or gave no consent	Surgeon condition
Preoperative instructions not followed or patient not instructed adequately	Change in treatment plan

**Cost of surgery cancelation**

The total cost for all surgery cancellation was US\$ 92, 049.0, out of this US\$42,668.0 (46.4%) was related to bed expenses which was 156.0\$US per patient, 18.5% was related to physician visit (average cost per patient US\$ 62.0). The costs related to resources and supplies (medication, consumption and reprocessed material) totaled 32,363.0\$US (average cost per patient US\$ 118.0) which was 35.1% of total cost of cancellation. Among the cancelation costs, 73,814.0\$ (80.2%) were related to cancellations during the preparation of the

surgery room which costed 305.0\$ per cancelled case and 18,250.0 \$ (19.8%) during the surgical procedure which costed 570.0\$ per cancelled case. Average cost for per surgery cancelation was US\$ 336.0.

The study found that some surgeries cost more to cancel than others. Specifically, it was found that the most cancellation cost is related to the neurosurgery procedures which cost \$619.0 for cancelled case and the less cancellation cost is related to ENT procedures which cost \$215 to cancel.

Table 2: **Cancellation cost by specialty (US\$)\***

Specialty	n	Cost of Cancellation Per Case	Total Cost	% of Total Cancellation Cost
General surgery	70	358.0	25,061.0	27.1
Gynecology	45	261.0	117,77.0	12.6
Orthopedic	65	303.0	196,87.0	21.2
Urology	34	402.0	173,20.0	14.7
ENT	17	215.0	3,660.0	3.9
Neurosurgery	11	619.0	6,819.0	7.4
Eye Surgery	32	379.0	12,116.0	13.1
Total	274			100

\*1USD=25,500 IRR (Mid-market rates in 04/17/2014)

Fifty-six cases (20.5%) were judged unavoidable DOS cancellations and cost 16017.0\$ which was 17.4 % of the total cost of cancellation, while 184 of cases (67.2%) were judged avoidable and cost 57162.0\$ which was 62.1 % of the total cost of cancellation. In 34 cases, the cancellation reason was not recorded. Of

the avoidable cause of surgery cancellations, patient medical condition (such as chronic disease, upper respiratory or urinary tract infection) was the highest percentage of cancellation cost (42.6%), while among unavoidable causes the highest percentage of cancellation cost was change in treatment plan (10.4%).

Table 3: **Cost of Day of Surgery cancellation according to the reason of cancellation**

Avoidable	Proportion of total cost (%)	Unavoidable	Proportion of total cost (%)
Patient Medical condition	42.6	Equipment broken or not available	2.8
Lab test result not available	0.8	No intensive care unit beds	
Medical evaluation- Incomplete	1.5	operation room condition	0.4
pre-op			
Patient refused or gave no consent	16.7	Surgeon condition	3.8
Preoperative instructions not followed	0.5	Change in treatment plan	10.4
or patient not instructed adequately			
Total Avoidable	62.1	Total Unavoidable	17.4
Not Recorded Reason	20.5		

### Discussion

The cancellation of the surgical procedure increases operational and financial costs, causes losses to the institution. Cost containment through effective and efficient utilization of resources has become a necessary part of healthcare delivery worldwide. Efficient utilization of operating theatre space and time is one area, which has been shown to assist in cost containment. Surgery is one of the key functions in hospitals; it generates significant revenue and admissions to hospitals (10). Cancellation of surgical cases is increasingly considered as an adverse event that requires routine monitoring because of its effects on utilization of health system resources. It is a loss for the hospital, since internal errors do not result in procedures that will eventually generate revenues. The elective case cancellation rate on the day of surgery is an indicator of operating theatre efficiency. Cancelling a surgical case and performing it on another day increases cost to physicians, hospital, patients and society. This cost is related to management inefficiency, because it is an economic consumption and identifies and inefficacy, since income that would contribute to the result if the surgery had been performed was not generated.

This study investigated surgery cancellations in an Iranian Mid-size general hospital. Total cancellation rate was 1.87%. Yet, it varied between surgery specialties from 0% in anesthesiology to 2.82% in general surgery. The total cost of surgery cancellation

was 92,049.0 US\$ (average cost per patient US\$ 336.0). The highest cancellation cost among different surgery subspecialists was for neurosurgery (619.0US \$ per cancelled case) followed by urology (402. 0 US \$). The least cancellation cost was found among ENT surgery (215. 0 US \$) followed by genecology (261. 0 US \$).

In this study, cancellation reasons were divided into avoidable and unavoidable reasons. It is estimated that around 60% of elective procedure cancellations is potentially avoidable. In the present study we found 67.2% of elective procedure cancellations are potentially avoidable which cost 57162.0\$ and was 62.1% of total cost of cancellation (42.6% of cost because of patient medical condition and 16.7% of cost because of patient refused or gave no consent). These findings came up with concrete possibilities of reducing the level of surgical cancellations by using quality improvement techniques.

The cost (US\$ 92, 049.0) was considerably high in terms of the size of the hospital. When these data are interpreted to all hospitals belonging to Iran Social Security Organization, which cover an estimation of 540,000 surgery cases every year, almost 10,000 cases from scheduled surgery cases are cancelled every year with average cost of US\$ 336.0 per cancelled case. Therefore, the Social Security Organization is losing around 3,360,000.0 US\$ every year due to cancelled surgery cases (which 62.1% of it (2,086,560.0 US\$)

could be avoidable. The two cost containment reasons for cancellation (59.35 of total cost) were patient initiated which are cancellation reason related to patient medical condition and patient refusal to give consent. The cancellation reason related to patient medical condition (42.6% of total cost) could be reduced by medical evaluation before admitting to the hospital. It could be done even one month before the surgery as it was found in the study by Pollard and Olson in their study (8) (that the DOS cancellation rate for outpatients was the same for patients evaluated within 24 hours of surgery versus those evaluated 2-30 days in advance). The establishment of a pre-anesthetic clinic for the pre-anesthetic evaluation of the patients by anesthetists has been proved to reduce DOS because of patient medical condition.

The second cost containment reason for DOS cancellation was cancellation related to patients' decision (16.7% of total cost) which was in line with study done by Schofield (11). It is probably possible to avoid most of cancellations related to patient decision or not following the instruction (1.6% of cases) by patient education. When patients feel that they are more involved in their care and know what will happen next, their fear and doubt, contributing to cancellations, are likely to be reduced (12). Changing the view of the patient and including him/her in the whole planning process might be a way to reduce several of the reasons for cancellations, especially those directly related to the patient or to a poor pre-operative investigation (13). Cancellation because of change in treatment plan was considered as an unavoidable reason in this study and it accounts 10.4% of total cost of cancellation. Although it has already been suggested by Caesar and his colleagues (12), a careful examination and reviewing of medical and surgical evaluations the day before scheduled surgery, improved patient information and education, as well as the more careful establishment of the indications for surgery, "might reduce the circumstances when surgery is no longer necessary".

Among total DOS, 20.5% of cost containment reasons of cancellation did not have recorded meaningful explanation. Without knowing the reason of DOS, it would be difficult to manage the problem.

#### **Conclusion:**

The study demonstrated that cost of surgery cancellation was considerably high in the Shohada Kargar hospital. More than half of the cost (62.1%) of surgery cancellation was due to avoidable reasons. To avoid cancellations, we recommend performing pre-operative visits with all patients. We also suggest that hospitals shall focus on surgeries that result in the highest losses, such as neurosurgery and urology. The hospital management must avoid at least avoidable costs. The hospital needs to improve the management and efficiency. We highly recommend similar study should be conducted in other social security hospitals in the country to know whether they have similar problems.

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#### **References**

1. Leslie RJ, Beiko D, Van Vlymen J, Siemens R. Day of surgery cancellation rates in urology: Identification of modifiable factors. *Can Urol Assoc J.* 2013;7(5-6):167-73.
2. Ebirim LN, Buowari DY, Ezike HA. Causes of cancellation of elective surgical operations at a University Teaching Hospital. *Journal of Medicine and Medical Sciences.* 2012; 3(5):297-301.
3. Hovlid E, Von Plessen C, Haug K, Aslaksen AB, Bukve O. Patient experiences with interventions to reduce surgery cancellations: a qualitative study. *BMC Surgery.* 2013;13-30.
4. Vinukondaiah K, Ananthakrishnan N, Ravishankar M. Audit of operation theatre utilization in general surgery. *Nat. Med. J. Ind.* 2000;13(3):118-121.
5. Argo J L, Vick CC, Graham LA, Itani KMF, Bishop M.J, Hawn MT. Elective surgical case cancellation in the Veterans Health Administration system: identifying areas for improvement. *Am J Surg.* 2009;198(5):600-606.
6. Perroca MG, Jerico Mde C, Facundin SD. Surgery cancelling at a teaching hospital: implications for cost management. *Rev Lat Am Enfermagem.* 2007;15:1018-1024.
7. Ezike HA, Ajuzeogu VO, Amucheazi AO. Reasons for elective surgery cancellation in a referral hospital. *Annals of Medical & Health Sciences Research.* 2011;1(2):197-202.
8. Trentman TL, Mueller JT, Fassett SL, Dormer CL, Weinmeister KP. Day of Surgery Cancellations in a Tertiary Care Hospital: A One Year Review. *J Anesthe Clinic Res.* 2010;1(3).
9. Chiu CH, Lee A, Chui PT. Cancellation of elective operations on the day of intended surgery in a Hong Kong hospital: point prevalence and reasons. *Hong Kong Med J.* 2012;818(1):5-10.
10. Zakaria Y, Amr BE, Nermine AH. The operating room case-mix problem under uncertainty and nurses capacity constraints. *Health Care Manag Sci J.* 2015; 8.
11. Schofield WN, Rubin GL, Piza M. Cancellation of operations on the day of intended surgery at a major Australian referral hospital. *Med J Aust.* 2005.182:612-615.
12. Ulla C, Jon K, Lars-Eric O, Kristian S, Elisabeth HO. Incidence and root causes of cancellations for elective orthopedic procedures: a single center experience of 17,625 consecutive cases. *Patient Safety in Surgery J.* 2014; 8:24.
13. Lee A, Kerridge R.K, Chui P.T, Chiu C.H, Gin T. Perioperative systems as a quality model of perioperative medicine and surgical care. *Health Policy J.* 2011;102:214-222.