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Incidence and causes of cancellation of elective surgeries on the intended day of surgery in government medical college Srinagar: A prospective observational study

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Abstract
Background: The cancellation of elective surgeries on the intended day leads to inefficiencies in resource utilization, increased hospital costs, and emotional distress for patients. This study aims to evaluate the incidence and causes of elective surgical cancellations at Government Medical College Srinagar.
Methods: A prospective observational study was conducted over 18 months. Data were collected from two operation theatres of the Department of General Surgery. Reasons for cancellations were categorized as medical related, patient-related, administrative-related, or inadequate patient preparation.
Results: Out of 1600 scheduled surgeries, 145 surgeries (9%) were cancelled. The leading causes included medical factors (40.68%), administrative reasons (35.86%), patient-related factors (12.41%), and inadequate preparation (11.03%). High blood pressure (32.2%) was the most common medical reason, while overload scheduling (55.8%) was the predominant administrative reason.
Conclusion: A significant proportion of surgical cancellations were avoidable, emphasizing the need for enhanced preoperative screening, optimized scheduling strategies, and improved hospital resource allocation to minimize cancellations.

Keywords: Emergency or elective surgery, efficiency, administrative medicine, preoperative screening, cancellation elective surgical operations

Introduction

In a hospital, the operating theatre (OT) is considered the heart of the technical platform [1]. OT activities require significant material and human resources [2]. Hospital managers allocate 10-15% of the total hospital budget to the OT [3, 4]. A well-planned operating schedule is the cornerstone of hospital organisation and is therefore crucial to all hospital activities [5].

Cancellation of elective planned surgical cases is a recognised quality issue in healthcare. Cancellation of scheduled operations on the day of surgery leads to inefficient use of operating room (OR) time and wasted resources. It also causes inconvenience to patients and families. Determining the cancellation rate of scheduled surgeries is an important metric for care quality and management assessment. The incidence of postponed elective surgeries ranges from 10% to 40% [2, 6, 7].

Improving patient satisfaction through efficient healthcare delivery is a valid system objective. A high cancellation rate for elective surgical procedures hinders this goal. Cancellation reduces OR efficiency and increases costs. However, definitions of “cancellation” vary internationally. Some authors limit the term to procedures cancelled on the scheduled surgery day, while others include those cancelled the previous day. The NHS Modernization Agency Theatre Programme defines cancellations as those occurring after the patient has been notified of the operation date. Some studies classify reasons broadly, others list them ungrouped, and a few explore the decision-making process behind cancellations.

Day-of-surgery (DOS) cancellations are a global problem, ranging from 0.37% to 28% in developed countries [8, 9] and from 11% to 44% in developing nations [10, 11]. DOS cancellation results in logistical and financial burdens such as prolonged hospital stays, repeated pre-operative preparations, and opportunity costs in terms of lost time and income. Most surgeries in Government Medical College, Srinagar are low-cost, attracting a large number of patients from far-flung areas, often from lower socio-economic backgrounds. Inefficient resource use affects the general population, especially the underprivileged reliant on public healthcare [2].

Cancellation of surgical operations entails numerous adverse consequences. It induces stress and emotional distress for patients and their families. Work schedules and family arrangements are disrupted when planned procedures are cancelled [12].

Elective operation cancellations reduce OR efficiency, waste OR time and resources [13], and impose a significant economic burden on patients and hospitals due to extended stays and repeated pre-operative processes [4, 14-16].

Cancellation reasons vary by hospital [17]. They may be avoidable or non-avoidable [18], with avoidable causes being the most frequent [14, 19, 20]. While literature has explored delay causes, many questions remain. Most research is observational, retrospective, and limited to isolated facilities, making it difficult to control intrinsic and extrinsic factors. Assigning causality is challenging due to multiple interacting variables and the retrospective nature of most studies [7]. It is more accurate to refer to these as correlating factors.

Although correlating delay factors differ across studies, they typically fall into broad categories [4]. Various interventions have been studied to mitigate delays, including improved scheduling and optimised OR efficiency. Preoperative clinics assess patients prior to surgery and address patient-specific delays [16]. Anaesthesia-led clinics are becoming popular for optimising patients pre-surgery and have been shown to reduce DOS cancellations.

Most studies on surgical delays are single-site, retrospective, and rely on EHR data, which present challenges due to variations in definitions and site-specific dynamics. These factors complicate comparisons and interpretation. Surgical delays are a persistent issue with multifactorial causes related to the facility, providers, and patients. Further research is needed to understand these contributors and develop effective interventions that improve OR efficiency.

Despite extensive literature on preoperative preparation and surgical performance, limited global attention is paid to the issue of elective surgery cancellations [21]. LMICs face a disproportionate burden of surgical disease and resource shortages. Cancellations in these areas affect a large number of patients. Given international disparities in healthcare management and resources, cancellation rates and causes likely vary, but literature addressing these differences is scarce. Without understanding cancellation causes in LMICs, effective strategies cannot be developed. This study aimed to describe the day-of-surgery cancellation rate and reasons at our tertiary hospital. Understanding these factors can inform appropriate interventions to reduce cancellations, optimise efficiency, and minimise resource wastage.

Need for this study

This study aimed to determine the incidence and causes of elective case cancellations at a major OR.

Research on this subject is limited, particularly in our country. Identifying the incidence and causes of elective surgical cancellations will help hospital management develop effective strategies for better utilisation of operating theatre resources. The findings may supplement limited existing literature and raise awareness among health professionals, administrators, and policymakers. Additionally, this study may encourage further detailed research.

Operating rooms (ORs) are critical contributors to hospital workload and revenue. Efficient OR management is essential for optimal patient outcomes and financial sustainability [22]. While exact figures vary by country, it is estimated that 50-80% of public health sector resources-including finances and trained personnel-are utilised within hospital settings [23].

Factors influencing OR efficiency include scheduling, staffing, equipment availability, anaesthetic induction time, and preparation time between cases. Poor OR management leads to cancellations and long patient waiting lists [22]. A well-managed OR results in higher surgical turnover, fewer complications, better patient outcomes, and greater satisfaction.

Several performance metrics relevant to OR utilization has been identified [22]:

- **Accurate case duration estimates:** Evaluates how closely actual time spent in the OR aligns with projections (within 15 minutes).
- **Percentage of on-time first case starts:** Measures punctuality of the first scheduled surgery.
- **Pre-admission screening:** Indicates percentage of cases with completed pre-anaesthetic checks before surgery.
- **Patient-in-to-incision time:** Time between patient arrival in OR and first surgical incision.
- **Average turnover time:** Time between one patient leaving and the next entering the OR.
- Cancellations or delayed starts often stem from inadequate pre-screening or inefficiencies in processes involving nursing, anaesthesia, housekeeping, and turnover teams.

Materials and Methods

Aims and Objectives

- To evaluate the incidence of cancellation of elective cases on the intended day of surgery.
- To evaluate the causes of cancellation of elective cases on the intended day of surgery.
- To suggest the measures that can be taken to minimize the cancellation of elective surgeries on the intended day of surgery.

Place of study

This prospective observational study was conducted over a period of 18 months at the Government Medical College, Srinagar, following approval from the Institutional Ethics Committee. Data collection was performed in two operating theatres of the Department of General Surgery. The pattern of data collection followed a systematic schedule: Monday/Tuesday during the first week of each month, Wednesday/Thursday in the second week, and Friday/Saturday in the third week. This rotation was consistently maintained throughout the study duration.

Inclusion Criteria

- All patients scheduled for various elective surgical procedures in the major OT during the study period.
- Cancellations of inpatient elective surgeries.
- Cancellations occurring on the intended day of surgery.

Exclusion Criteria

- Emergency surgical cases.
- Patients listed in the “definite schedule list” who developed medical complications overnight.
- Procedures not requiring an anaesthesiologist.
- Cancellations due to patient demise.
- All patients underwent pre-surgical anaesthetic assessments to evaluate their fitness for surgery. Upon receiving clearance, they were scheduled for elective procedures by the Department of General Surgery.

Scheduled elective surgery was defined as any procedure booked in advance and recorded on the Pre Anaesthetic Checkup (PAC) list before 4:00 PM on the preceding day of surgery.
The following parameters were recorded for all cases booked for surgery: Patient name, age, gender, ASA classification, MRD number, type of surgery, and reason for cancellation.
On the day of surgery, each case was reviewed to verify whether the procedure was conducted or cancelled.
If cancellation occurred, the number of cancelled cases and the specific reason were documented.
Cancellation was defined as any scheduled surgical operation not performed on the designated day. Data regarding cancelled procedures were extracted from the operating theatre list and documented in a dedicated form.

Categorization of Cancellation Reasons

- **Patient-related factors:** Refusal of consent, inadequate adherence to or delivery of preoperative instructions, patient "no show", lack of communication, financial constraints, changes in medical status.
- **Medical factors:** suboptimal patient condition for surgery, abnormal test results.
- **Facility/administrative factors:** Insufficient operating room time, unavailable or malfunctioning equipment, absence of ICU beds.
- **Inadequate preparation:** Lack of arranged medication, unavailability of required blood/blood products.

Statistical Analysis

Recorded data were compiled using Microsoft Excel and subsequently imported into the SPSS Version 22.0 (SPSS Inc., Chicago, Illinois, USA) data editor for statistical analysis. Both SPSS and Excel were employed to perform descriptive statistics, including calculation of percentages and means. Continuous variables were expressed as mean ± standard deviation (SD), while categorical data were presented as proportions. Continuous variables with normal distribution were analyzed using the Student's t-test, whereas non-normally distributed variables were assessed via the Mann-Whitney U test. Categorical variables were examined using the Chi-square test. Logistic regression models were applied to identify potential predictors. Graphical representation of data was illustrated using bar diagrams. A P-value of <0.05 was considered statistically significant.

Results

This prospective observational study was undertaken for a period of 18 months. During this period, data was collected from the two operation theatres of the Department of General Surgery, Government Medical College Srinagar. Data was collected twice every week. Monday/Tuesday during the first week of the month, Wednesday/ Thursday during the second week and Friday /Saturday during the third week, and so on. A total of 1600 patients were scheduled for elective surgical procedures during the 18-month study period. The total number of surgical operations performed was 1455. The total number of patients cancelled was 145, resulting in an average cancellation rate of 9.0%. Gender Distribution: The distribution of the patients whose procedures were cancelled according to sex showed 75 (51.7%) males and 70 (48.3%) females with a male-to-female ratio of 1.1:1. The sex distribution of cancelled cases is shown in Table 1 and Graph 1.

Table 1: Gender Distribution

Gender	Frequency(n)	Percentage
Male	75	51.7
Female	70	48.3
Total	145	100

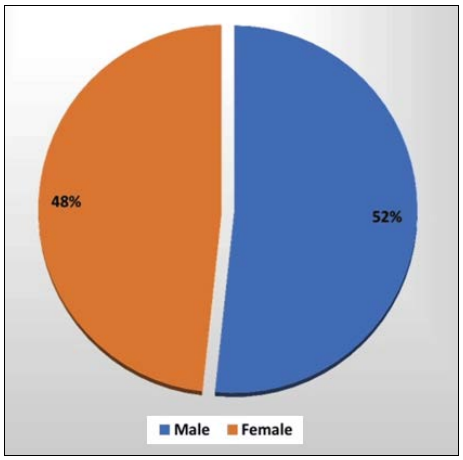

Fig 1: Gender distribution

Distribution based on age-group

The mean age (± SD) of the participants was 42.3 ± 15 years, with the range from 3 to 79 years. The majority of cases were seen between the age-group of 61-70 years (31 cases; 21.4%), followed by 51-60 years (30 cases; 20.7%) and 49-50 years (29 cases; 20%). Among the patients cancelled, there were 3 (2.1%) children aged ≤ 10 years, and 13 (8.9%) adolescents aged 11-20 years. Least number of cases cancelled were seen in children (3 cases; 2.1%) followed by the age group of 71-80 years (4 cases; 2.8%). The age distribution of cancelled cases is depicted in Table 2 and Graph 2.

Table 2: The age wise distribution of cancelled elective surgical operations

Age (in years)	Number(n)	Percentage (%)
≤ 10	3	2.1
11-20	13	8.9
21-30	17	11.7
31-40	18	12.4
41-50	29	20.0
51-60	30	20.7
61-70	31	21.4
71-80	4	2.8
Total	145	100

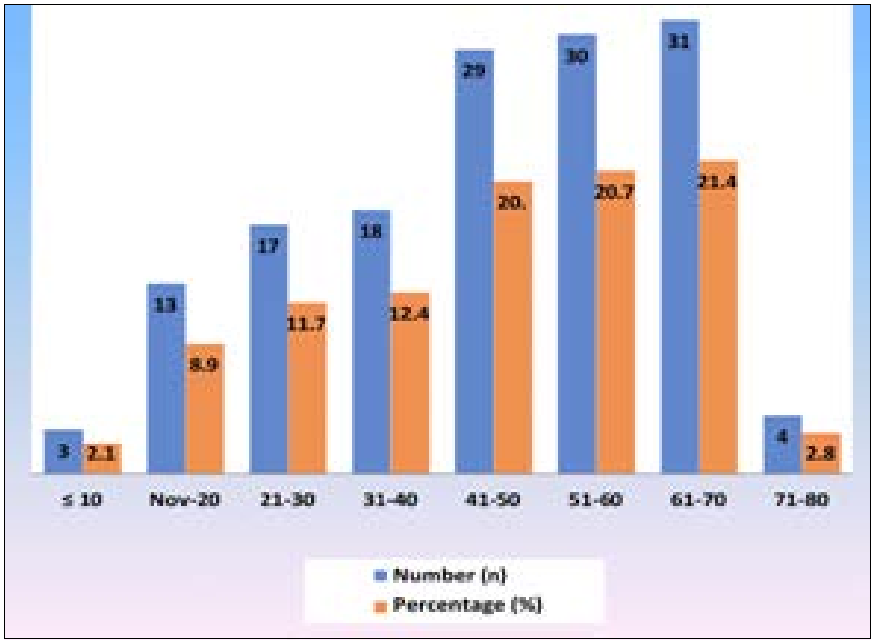

Fig 2: Distribution based on age

The majority of cases that were cancelled on the intended of surgery belonged to ASA Class II (75 cases; 51.7%) followed by ASA Class I (50 cases; 34.5%), and ASA Class III and above (20 cases; 13.8%).

Table 3: Distribution based on ASA classification

ASA Class	Number(n)	Percentage (%)
ASA I	50	34.5
ASA II	75	51.7
ASA III and Above	20	13.8

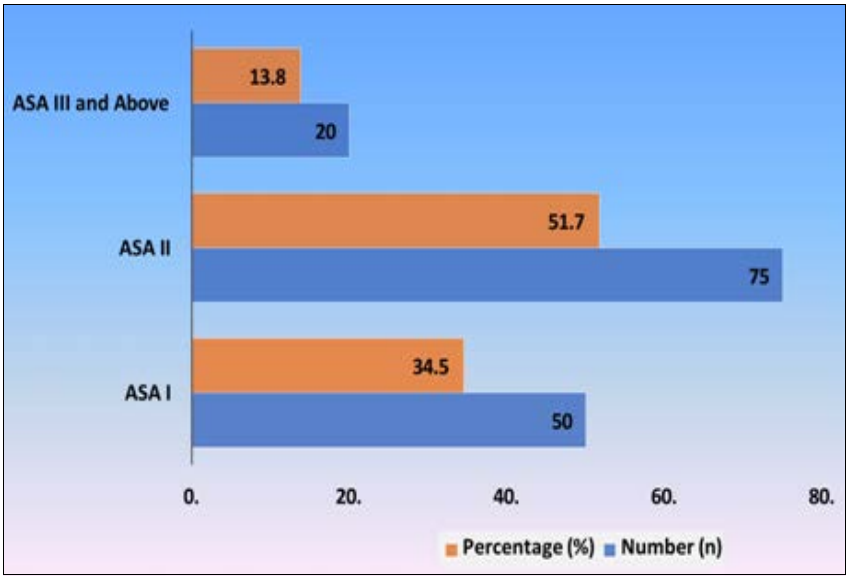

Fig 3: ASA Classification

According to cancelation distribution among the residency, from the cancelled cases, most were from the rural area (80 cases; 55.2%), Table 4.

Table 4: Distribution of cancelled cases on the basis of residence

Residence	Number(n)	Percentage (%)
Urban	65	44.8
Rural	80	55.2

For those cases cancelled, the decision was made after entering into the OR in 52% (75/145). The decision to cancel was made in 48% (70/145) cases only, after entering into the OR [Table 5].

Table 5: Distribution of cancelled cases based on Timing

Timing	Number(n)	Percentage (%)
Before entering OR	70	48
After entering OR	75	52

Cases booked as last on the list ranked significantly high among those cancelled, Table 6.

Table 6: Distribution of cases cancelled by number on the list

Number on list	Number of patients	Percentage
1	2	1.4
2	6	4.1
3	9	6.2
4	18	12.4
5	35	24.1
6	75	51.7
Total	145	100

Categories of cancellation: There were many reasons for postponement of surgery and were categorized into medical related, patient related, administrative and inadequate preparations of patients. Medical and administrative related reasons were the commonest and accounted for 40.7%, 35.9% respectively (Table 7). Medical related reasons for cancellation: The most common medical related reasons for cancellation were; high blood pressure (32.2%), abnormal lab results (13.6%) were other causes of cancellations within this category. Other causes included; uncontrolled Diabetes Mellitus, upper respiratory tract infection, ischemic heart disease.

Table 7: Different categories and reasons for cancellation of elective general surgery

Reasons	Number of patients (N=145)	Percentage (%) Within Total	Percentage (%) Within Category
I. Medical Reasons	59	40.68	—
High blood pressure	19	13.1	22.2
Diabetes mellitus	8	5.5	13.6
Upper RT infection	6	4.1	10.2
Anaemia	5	3.4	8.5
IHD	1	0.7	1.7
COVID-19+	6	4.1	10.2
Patient not euthyroid	5	3.4	8.5
Abnormal lab results	8	5.5	13.6
Patient taking anticoagulant	1	0.7	1.7
II. Administrative Related Reasons	62	36.06	—
Over load schedule	29	20	55.8
Lack of anaesthetists	5	3.4	9.8
Equipment failure/not available	4	2.8	7.7
ICU beds not available	5	3.4	9.6
Lack of surgical staff	5	3.4	9.6
OR renovation	4	2.8	7.7
III. Patient Related Reasons	18	12.41	—
Patient failed to attend	10	6.9	55.6
Patient refusal	3	2.1	16.7
Financial/personal problems	3	2.1	16.7
Change in surgical plan	2	1.3	11.1
IV. Inadequate Patient Preparation Reasons	16	11.03	—
Medicine not arranged	1	0.7	6.2
Poor gut preparation	2	1.4	12.4
Anaesthesia work-up needed/assessment not complete	6	4.1	37.5
Some investigation not done	6	4.1	37.5
Blood/blood products not available	1	0.7	6.2

Patient related reasons: Failure of patients to attend or no show, was commonest patient related reason which accounted for 6.9% of all cancellations. Administrative related reasons: The most common administrative reason for cancellation was shortage of time to cover the whole list of operations, which accounted for 35.86% of all cancellations and more than half the reasons within this category. Inadequate patient preparation reasons: Some investigations not done were the major contributing factors for surgery cancellation in this group. However, drugs not arranged or poor gut preparation for colonic surgery were the reasons for few eliminations.

The reasons for the cancellation of the procedures were regarded as avoidable (preoperative preparation related, facility related, and personnel related problems) among 109 (75.2%) cases. On

the other hand, non-avoidable reasons (patients who refused to consent) were recorded among 36 (24.8%) cases.

Discussion

Case cancellation has been defined as cancelling a planned surgery after the patient has been notified of the operation date, on the day of or the day preceding surgery, or cases that appeared in the definitive schedule list that ultimately were not performed. Cancellation of elective surgeries occurs worldwide because of system-, provider- and patient-related factors. This leads to economic inefficiencies and potential patient harm. The case cancellation rate may serve as a useful proxy for a hospital's capacity to provide surgical care.

Current metrics include the number of available personnel and/or surgical volume, but the cancellation rate is a more direct measurement of the demand for care at a given hospital and its ability to meet that demand with the available resources.

The primary purpose of managing surgery cancellation rates is to reduce cancellation rates and improve the efficiency of operating room management, through analyzing factors associated with surgery cancellations and taking preventive measures. This prospective observational study was undertaken for a period of 18 months. During this period, data was collected from the two operation theatres of the Department of

General Surgery, Government Medical College Srinagar. A total of 1600 patients were scheduled for elective surgical procedures during the 18-month study period. The total number of surgical operations performed was 1455. The total number of patients cancelled was 145, resulting in an average cancellation rate of 9.0%, which is similar to an Indian study by Kumar R *et al*. In a study by Anarfi N *et al*. at Komfo Anokye Teaching Hospital (KATH), 1078 surgical interventions were booked and 25.78% (N=278) were cancelled. The cancellation rate conducted in some other African countries, such as Ojo E.O and Ihezue C.H (2008) [8] in Nigeria, Kingham T.P *et al*., (2009) [9] in Sierra Leone, Lavy C *et al*., in tropical countries in Africa, Notrica MR *et al*. in Rwanda and Lankoande M *et al*. in Burkina reported 28.5%, 28.6%, 30% to 55%, 35% and 36.9% respectively, while in developed countries the rate is much lower. In Saudi Arabia 7.6% (Dhafar KO *et al*., 2015) [4], the United Kingdom 8% of scheduled interventions were cancelled compared to 11.8% in the U.S.A (Schuster, M. *et al*.). Likewise, the rate of elective surgery cancellation in our study was lower than the rate reported in another study by

Timmers T K *et al*., who observed a cancellation rate of 32%. The high cancellation rate was possibly be due to insufficient organisation and the role of the studied facility, as it was not a referral and teaching hospital.

The low cancellation rate of 21.9% in Lankoande *et al*.'s study (in 2017) might be related to the monitoring of cancellation as a quality indicator in the hospital quality improvement programme. Another source of variation in the reported rates of cancellations is the approach to data collection, whether it is prospective or retrospective as seen in the study by Mesmar M *et al*. In our study, data on cancellation were collected prospectively; therefore, under- reporting of cancellations is expected to be minimal. The discrepancy in cancellation might also be due to the sociodemographic characteristics, sample size, study area, and methodological difference.

The distribution of the cases in our study according to sex showed 75 (51.7%) males and 70 (48.3%) females with a male-to-female ratio of 1.1:1. There was no statistically significant difference in the rate of procedure cancellation between the sexes. In another study done in Tanzania by Chalya PL *et al*. male to female ratio of cancelation was 1.9:1 with 65.8% and 34.2%, respectively. The cancelation rate distribution among sex in a study by Demilew BC *et al*. was female 37 (52.1%) and male 34 (47.9%) with a ratio of 1.1:1, and Ogwal A *et al*. found male-to-female ratio of 2.1:1. Elrahman AA *et al*. in his study found females to be predominant 55.5%, with female: male ratio of 1.2:1, which was not statistically significant. A study by Sung WC *et al*. 43 reported that there was no significant difference in the surgery cancellation rate based on sex.

We could not establish the reasons for the gender differences. In the present study, the mean age (± SD) of the participants was 42.3 ± 15 years, with the range from 3 to 79 years. The majority of cases were seen between the age-group of 61-70 years (31 cases; 21.4%), followed by 51-60 years (30 cases; 20.7%) and 41-50 years (29 cases; 20%). Among the recruited patients, there were 3 (2.1%) children aged ≤ 10 years, and 13 (8.9%) adolescents aged 11-20 years. Least number of cancelled cases were seen in children (3 cases; 2.1%) followed by the age group of 71-80 years (4 cases; 2.8%). In Lankoande M *et al*. the average patient age was 41.1 years and maximum cancellations were seen between the age group of 30-49 years. Elrahman AA *et al*. findings were similar with the mean age of 41.2 ± 16 years and (range2 - 80 years) and most of the patients 180 (62.0%) were in the age group 21-50 years. In a study by Anarfi N *et al*. among the cancelled cases, 50% experienced their first-ever surgery cancellation between the ages of 20- 29 and 40-49 years. In a study by Desta M *et al*. 21-30 years old age group were the highest cancelled age groups (23.3%) followed by 31-40 years old group (19.9%) cancelled groups and less frequent cancellation were over the age of seventy (1.4%). In Arshad Z *et al*.'s study, cancellations were more common in patients aged 0-10 years (13%) followed by those aged 21-30 years (9%). Leslie RJ *et al*. found cancellations were less frequent in older age groups (5% among 71-80 years and 6% among 61-70 years) [14]. But in Sudan, Mutwali IM *et al*. found the highest cancelled group was 61-70 years old (31.1%), followed by 51-60 years old group (25.4%). Ogwal A *et al*. found among the recruited patients, there were 108 (27.0%) 71 (17.8%) adults aged ≥50 years.

The majority of cases that were cancelled on the intended day of surgery belonged to ASA Class II (75 cases; 51.7%) followed by ASA Class I (50 cases; 34.5%), and ASA Class III and above (20 cases; 13.8%), which was similar to Zulfikar M *et al*. and Olson RP *et al*. who also found majority of cancelled cases belonged to ASA II. Similar results were also found by De C *et al*. and Gammeri E *et al*. In our study, according to cancelation distribution among the residency, from the cancelled cases, most were from the rural area (80 cases; 55.2%). The difference among the rural and urban patients who were scheduled for surgery was significantly high for rural, which was similar to Demilew BC *et al*. who found the difference among the rural and urban patients who were cancelled for surgery was significantly high for rural.

Our data suggested that among our patient population, majority (93%) of cancelled patients were Muslims that is 135 out of 145 patients. This could be due to the reason that more than 80% in this region are Muslims.

Our data suggested that majority (58.6%) of patients in our study population were married. We found that majority (35.2%) of patient in our study population were having maximum academic qualification up to primary school education. These results are similar to Anarfi N *et al*. who reported in a study that most of the patients were having a primary education level.

In our study, for those cases cancelled, the decision was made

before entering into the OR in 48% (70/145). The decision to cancel was made in 75 cases only, after entering into the OR. The probable reasons for this were as follows: all patients receiving general anaesthesia should undergo a medical examination and evaluation by the anaesthesiologist on the day before the operation. Our study suggested that some of the cancellations could have been prevented or that the surgery could have been delayed before the patient entered the operating room. In particular, the preoperative examinations planned by the attending surgeon should be checked, and vital signs at the ward should be confirmed by ward staff. A double-checking system could also be implemented, involving a nurse checking the essential preoperative examinations before the anaesthesiologist does.

In our study, cases booked as last on our list ranked significantly high among those cancelled. This was apparently because of lack of time. Also it is of course the major cases that indeed need more meticulous workup and preparations, including arrangement like placing central venous line and intubation for general anaesthesia.

In our study, out of 1600, all cases belonged to General Surgery specialty. The rate of cancellation varied depending on the type of surgery. Out of the total 1600 surgical procedures, the proportions of cancelled surgical procedures were 7.6% (84 out of 1100), 9.0% (27 out of 300) and 17% (34 out of 200) for major, intermediate and minor procedures respectively. These findings resonated with the reports from other studies, Lacqua MJ *et al*., Hussain AM *et al*., Jonnalagodda R *et al*., Parsa P *et al*.

However, due to the significant differences in healthcare systems and populations on an international level, not to mention the differences in local characteristics of the centres included, and study design, there are limitations to the conclusions which can be made by drawing direct comparisons. None-the-less, there remains a number of common reasons and were categorized into medical related, patient related, administrative, inadequate preparations of patients and other reasons in our study. A number of studies have used similar means of categorising cancellation reasons into broader groups, and then dividing these further into avoidable and unavoidable reasons for cancellation. In our study, medical and administrative related reasons were the commonest and accounted for 40.7% and 35.9%, respectively.

Among Medical Related Reasons (MRR), uncontrolled high blood pressure (HBP) was commonest reason and accounted for 19 (13.11%) cancellation. Hypertension is certainly associated with an increased risk of perioperative morbidity and mortality and a diastolic blood pressure of 110-115 mmHg was considered as a cut off for postponing anaesthesia. El-Bushra AD *et al*. in El Obied teaching hospital in Western Sudan also found that HBP is commonest MRR accounted for 22.2%, as well as reported in similar study by Morrissey S *et al*. in London.

Majority of elective patients were seen by the anaesthetist only on the day prior to surgery. So, the preoperative optimization is done over a short period of time. Studies like Miller GG *et al*. have shown that preoperative anaesthesia assessment of patients in anaesthetic assessment clinics significantly reduces operative room delays and cancellations. The uncertainty of the highest safe blood pressure for anaesthesia results in variations in practice.

Among patient related reasons, failure of patient to attend (or patient no-show) was the commonest cause in this category and accounted for 10 (6.9%). One of the causes could be attributed to fear of operation due to inadequate psychological preparation. A similar significant number found in a study done in Nigeria by Oguntol AS *et al*. and a study by Mazzei WJ *et al*.

Considering administrative related reasons (ARR), shortage of time accounted for 29 (20%) of the operation cancelled. El-Bushra AD *et al*. found, 5.6% in Western Sudan, Oguntol AS *et al*. found 1.2% in Nigeria, and Mazzei WJ *et al*. found 18.7% in San Diego. Lack of anaesthesia staff or surgical staff were the other ARR.

When analysed these reasons were due to failure of the hospital administration to recognize the needs of the operative theatre and the indifferent attitudes among the theatre staff. A lot of precious time was lost inpatient transport in or out of the Operative Theatres (OT), in induction of anesthesia, in surgical preparation and draping. The room turn over time may be also reduced if more recovery room beds were made available.

In a recent study, Hariharan S *et al*. found that only 7% of the surgical procedures were started on time. Training and delegation of responsibilities to young motivated qualified nurses to take over the administrative responsibility of the operating theatre might help to overcome the problem.

The most common inadequate patient preparation reasons (IPPR) were some investigations not done which accounted for 4.1% of all cancellations in our study. This reflects the reluctance of surgical staff and lack of collaboration with anaesthetic staff. Although this is comparable with 7.1%-27.2% in other different studies,

El-Bushra AD *et al*. Oguntol AS *et al*. Incomplete investigations also could be secondary to lack of funds to pay for the tests rather than inefficiency of the laboratories, though occasionally lack of reagents, poor electricity supply are common causes in the developing countries. Blood and blood products not arranged and not available is one reason in IPPR, which is comparable to Oguntol AS *et al*.'s study. Phobia for blood donation by patient relatives and the public at large, prevent adequate stocking of our blood banks, thus blood not easily made available for surgical procedures. There is a need to reawaken the usual mass donation by groups of students, civil servants, societies and associations. Auditing of blood usage during surgical procedures should be carried out in various centres in order to really determine what should be the minimum number of units to be requested for procedures.

Lack of surgical staff, accounted for 3.4%, this was another reason for cancellations. It is similar to study by El-Bushra AD *et al*. who found 1.6% for absence surgeon and 1.2% for admission error in his study. This occurred in units where team leaders were involved in hospital administration or reporting late due to long distance travels. Adequate staffing of surgical teams and theatre workers including porters shall reduce the time wastage thus enhancing efficiency. Unplanned admissions and lengthy OT lists prepared by junior surgeons, who were not familiar with the procedures, was also a reason for operation cancellation. Many patients did not need surgery or required further work up before surgery. Ensuring that only consultants book patients for surgery would reduce the number of cancellation due to incorrect indication of surgery with significant impact on operating time available.

Influence of surgeon experience was observed in this study and found inexperienced surgeons add significantly to the operation time. Consultants were quicker and their presence reduced the likelihood of complications, thus reduced operative time. Moreover, it was observed that if a consultant surgeon and consultant anaesthetist were present in OT, the list is likely to proceed with fewer delays.

Avoidable causes of cancellation Schofield, *et al*. (2005)

classified the causes of cancellation of operations as avoidable and non-avoidable. In our study, non-avoidable causes were patients who didn't show up or were not able to pay for investigations, and cancellation by the patient accounted for 3.4%. Accordingly, the majority of our cancellations 75.2% were potentially avoidable. At another study performed at ambulatory surgery practice in the United Kingdom by Jime´nez A *et al*. reasons for cancellation were: acute medical conditions in 23.3% of cases, personal decision of the patient to refuse programming in 22.2%, nonattendance in 2.1%, failure to follow pre-operative guidance in 23.3% and unavailability of resources in 29%.

These causes were preventable or possibly preventable in 57.1% of cases, difficult to prevent in 29% and not preventable in 13.9%.

Reasons for surgery cancellations are specific for every institute. Even a low cancellation rate necessitates further investigations and improvement in the quality of care. The cancellation rate in the present study leaves significant room for improvement with appropriate interventions to circumvent cancellations on the day of surgery. Future prospective studies should be conducted to validate categorization and define cancellation causes in more depth.

Conclusions

It was obvious that most of the reasons of postponement surgical operation were avoidable and can be prevented by simple steps. Cancellations can be minimized if the patients with medical problems were detected early and referred for an anaesthetic assessment soon after they are scheduled for surgery. In order to enhance cost - effectiveness and efficiency; efforts should be made to prevent unnecessary postponement through careful planning aimed at increasing operation theatre spaces and efficient utilization of few available hospital resources including that of the operating room, theatre facilities and valuable man power improving the scheduling and admission procedure is required for better use of hospital resources. These steps are;

1. Proper assurance of the patients before surgery and improving informed consent.
2. Improving medical staff performance and enhancing preoperative judgment of the patients before booking.
3. Improving availability of hospital resources as necessary instruments, equipment, prosthesis, and cross matched blood for transfusion.
4. Improving communication channels at all hospital levels including OR and registration office to ensure availability of postoperative beds; OR and ICU to ensure availability of beds. As well as improving communication with surgeons, and reminding patients about time of the operation. This may be conducted through SMS, or e- mails.
5. Improving defining booking list through proper estimation of time of each surgical procedure putting into consideration many factors such as the surgical team members; knowledge, skill and speed of the surgeon; nursing staff attending operation; and anesthetists. Overbooking could also be prevented through conducting most predictable operations first.

Additional Information

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Ethical Comittee Govt Medical College Srinagar issued approval IRBGMC-SGR/Anes /1204. IRBGMC-SGR/Anes /1204 01/07/2025 Sub: Ethical Committee Meeting. A meeting of the institutional ethical committee of Government Medical College, Srinagar was held on 22nd May 2019 in the Auditorium of GMC Srinagar, with Professor Khurshid Iqbal (Chairman Ethical Committee) in chair to discuss the ethical clearance of the project, "Incidence and Causes of Cance lation of Elective Surgeries in Government Medical Colege Srinagar.". The meeting discussed threadbare ethical issues involved in the study and the committee unanimously decided to clear the research project with the request that before publishing the data all researchers should approve the research documents (Paper/Thesis/Presentation). Copy to: 1. Principal/Dean, Govt. Medical College, Srinagar. 2. Members 3. Principal Investigators 4. Office Member Secretary. Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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