

Original Research Article

Non-compliance with the operating program: Analyzing the causes and consequences: A case study

Abstract

Background

Surgical scheduling in hospitals is critical to optimize surgical activity and ensure quality of care. Surgical scheduling can be affected by a variety of factors leading to cancellation or delay of surgical procedures, which can result in financial and personal hardship for patients and their families. The study aimed to identify the incidence and causes of non-adherence to the surgical schedule in the operating room of the Mohammed V Military Teaching Hospital in Rabat, Morocco.

Methods

We analyzed the medical records of patients admitted for surgery over a 12-month period. Data collected included the number of scheduled, canceled, and added surgeries, epidemiological data of the patients, pathologies involved, reasons for cancellation and addition, and patient outcomes.

Results

We analyzed a total of 3023 scheduled surgeries, of which 215 (7.11%) were cancelled and 167 (5.6%) were added. Neurosurgery was the most frequently cancelled surgical specialty. The most common reasons for cancellation were infection, decompensation of a chronic pathology, and lack of availability of the operating room. Orthopedic surgery was also the most affected specialty in the added surgeries, mostly due to surgical emergencies. Our analysis of patient demographics revealed that the average age of cancelled surgery patients was 52.16 ± 14.6 years, with a male predominance of 63.25%. Based on ASA classification, 57.6% of patients were classified as ASA I, 33.48% as ASA II, and only 8.84% as ASA III. Medical and anesthesia-related causes accounted for 30 cancellations, with anesthesia contraindications (13.3%) and abnormal test results (40%) being the most common reasons. Surgery-related causes accounted for 22 cancellations, with non-availability of the surgeon (50%) being the most frequent reason. Patient-related causes accounted for 55 cancellations, with non-compliance with pre-anesthesia treatment (58.18%) being the most common reason. Organizational causes accounted for 108 cancellations, with equipment failure (40.7%) being the most frequent reason.

Conclusion

This review demonstrates that the main causes for surgery cancellation can be controlled by hospital managers, who can aim to improve areas such as patient flow and capacity management. Ultimately, this will improve the quality of health care delivered by hospitals.

Keywords : Non-compliance, Operating Program, cancellation, hospital management, patient outcomes, resource availability.

INTRODUCTION:

In today's healthcare environment, where demand for surgical procedures is increasing while resources remain limited, it is essential to ensure efficient use of available resources to meet patient needs. Adherence to the surgical program, which involves careful planning and execution of surgical procedures, plays a crucial role in achieving this goal. However, despite its importance, nonadherence to the surgical schedule is a common problem that causes difficulties for patients and their families as well as for the hospital and its caregivers (1,2).

The issue of non-compliance with the surgical program is a global concern, and the consequences of this problem are well documented in the literature (3). In Morocco, adherence to the surgical program remains critical, and understanding the causes and consequences of non adherence to the surgical program is critical to improving the quality of care provided to our patients and optimizing the use of resources.

Several factors contribute to non-compliance with the surgical program, including patient health status, surgeon-related factors, and anesthesiologist-related factors (4). In addition to the impact on patient well-being, nonadherence to the surgical schedule also has significant financial consequences for healthcare facilities (5).

Effective operating room management is essential to ensure patient safety and optimize resource utilization. It is therefore imperative to identify the causes of non-adherence to the surgical program and to take corrective action to improve adherence. The purpose of this study is to analyze the causes of non-adherence to the surgical program and to review the literature in order to compare the results with previous studies. Specifically, the study will be conducted at the Mohammed V Military Training Hospital in Rabat, Morocco.

By identifying the causes of surgical schedule non-compliance and their consequences, the study will provide valuable insights into how to optimize surgical activity, reduce cancellations and delays, and improve quality of care.

METHOD:

This is a prospective observational study conducted at Mohammed V Military Teaching Hospital in Rabat during a period from January 2, 2019, to June 30, 2019. A total of 3,023 surgical procedures were scheduled during this period.

The study was conducted in the department with three operating theaters: the aseptic pathology operating theater, the septic pathology operating theater, and the emergency operating theater. The aseptic pathology block, where the study was conducted, had 10 operating rooms out of the total 18 operating rooms in the department.

The inclusion criteria for the study were patients who had a change in their scheduled surgery, either cancellation or addition. Exclusion criteria included patients undergoing urology procedures in the urology block, patients admitted to the septic block, and patients admitted to the emergency block for unscheduled emergency surgery.

It is important to note that the exclusion criteria are not the opposite of the inclusion criteria. The inclusion criteria specify the types of patients eligible for the study, while the exclusion criteria specify which patients are not eligible.

Then we proceeded to a univariate analysis using chi-square tests to determine if there are significant associations between cancellation and the following variables. The multivariate analysis the logistic regression analysis was used to try to find out which factors were independently responsible for the non-compliance with the operating schedule in our study and are significant factors in predicting cancellations.

RESULTS:

We have analyzed 3023 scheduled surgeries, out of which 215 were canceled, resulting in a cancellation rate of 7.11%. Additionally, 167 unscheduled surgeries were performed, resulting in a total of 2975 cases, with an add-on rate of 5.6%. In addition, 167 surgical procedures were added to the surgical schedule, with an incidence rate of 5.5%. A total of 382 patients had their operative schedule changed, representing an incidence rate of 12.61%.[figure1]

The epidemiological data of the patients showed that the average age of patients whose surgeries were canceled was 52.16 ± 14.6 years, and there was a male predominance, with 63.25% men and 36.75% women. American Society of Anesthesiologists (ASA) classification revealed that 57.6% of patients were classified as ASA I, 33.48% as ASA II, and only 8.84% were ASA III.

The study found that the incidence of canceled surgeries varied by surgical specialty, with neurosurgery having the highest incidence at 25%, followed by the combined orthopedic and traumatology services at 10.81%, and the combined visceral surgery services at 9%.

The causes of surgery cancellation were classified into four groups

Medical and anesthesia-related causes: 30 surgeries were canceled due to medical or anesthesia-related reasons. 4 were canceled due to anesthesia contre-indications (13.3%), 12 due to abnormal test results (40%), 6 due to recent decompensation of a chronic illness (20%), 6 due to intercurrent illness preoperatively (20%), and 2 due to predicable difficult intubation (6.6%).

Surgery-related causes: 22 surgeries were canceled due to surgery-related reasons, including non-availability of the surgeon (50%), change in diagnosis (18.18%), and change in therapeutic protocol (31.81%).

Patient-related causes: 55 scheduled surgeries were canceled due to patient-related problems such as non-compliance with pre-anesthesia treatment (58.18%), non-compliance with preoperative fasting (18.18%), and patient refusal or absence on the day of surgery (23.63%).

Organizational causes: 108 surgeries were canceled due to organizational or administrative problems such as unavailability of operating rooms (12.03%), lack of personnel (4.6%), and equipment failure (40.7%). (Figure 2)

3023 surgical procedures scheduled

**215 interventions were
cancelled**

**167 unscheduled interventions
added**



Causes of cancellation :

- Medical and anesthetic
- Patient related
- Organizational
- Surgeryrelated

Figure 1: Distribution of surgical procedures in our study

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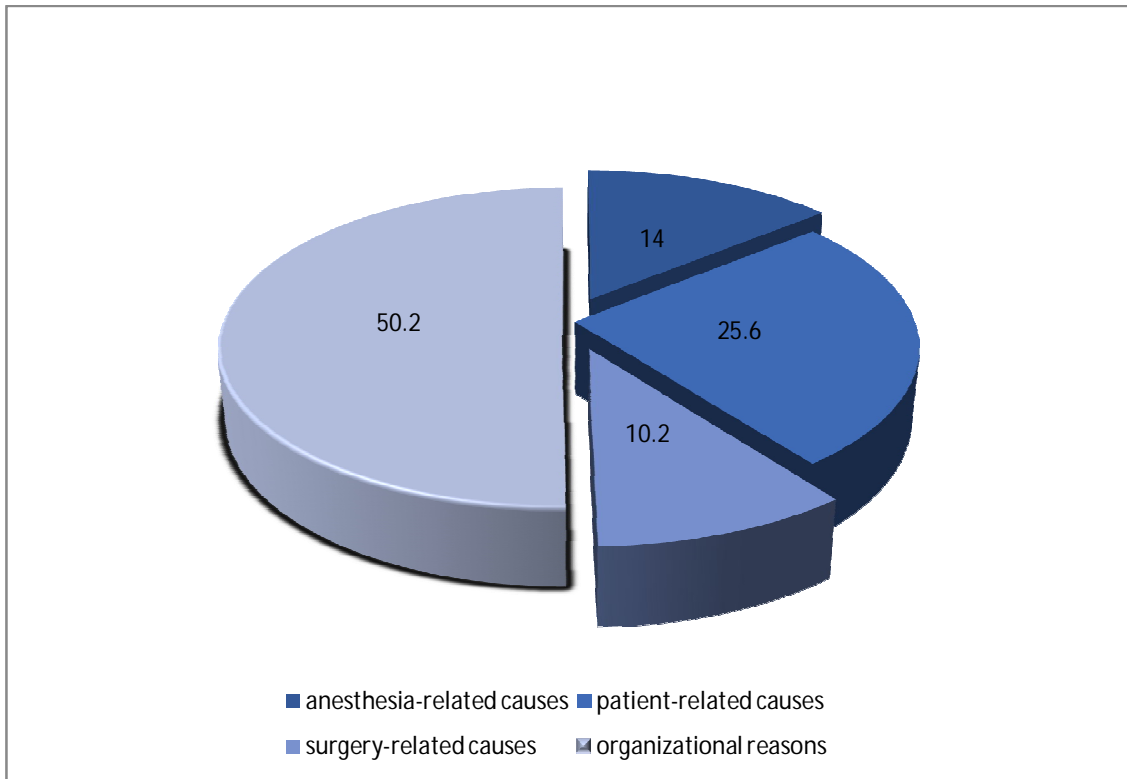


Figure 2: illustrates the different causes of cancellation in the study, with organizational reasons being the most prevalent at 50.2%, followed by patient-related causes at 25.6%, medical and anesthesia-related causes at 14%, and surgery-related causes at 10.2%.

statistical analysis:

Our study examined the factors associated with surgery cancellations using both univariate and multivariate analyses. In the univariate analysis, we found that patient age, ASA classification, medical-related cause, surgery type, and organizational causes were significantly associated with surgery cancellations, while sex had a p-value that was borderline significant. (table1)

Factor	Chi-square	df	p-value
Age	11.728	2	0.003
Sex	3.815	1	0.051
ASA classification	12.457	2	0.002
Medical-related cause	9.164	1	0.003
Surgery type	40.815	2	<0.001
Organizational cause	485.097	1	<0.001

Table 1: Univariate analysis using chi-square tests to determine if there are significant associations between cancellation and the following variables

In the multivariate analysis using logistic regression, we found that patient age, ASA classification, surgical specialty, and cause of cancellation were significant predictors of surgery cancellations. Specifically, older age, higher ASA classification, neurosurgery, and medical-related and organizational causes were associated with an increased likelihood of cancellations, while patient-related causes decreased the odds of cancellations. Sex and surgery-related causes did not emerge as significant factors in the multivariate analysis. (Table 2)

Factor	Odds Ratio	95% Confidence Interval	p-value
Age	1.019	[1.003, 1.036]	0.021
Sex	0.905	[0.683, 1.200]	0.488
ASA classification			
ASA II vs. ASA I	1.288	[0.916, 1.809]	0.146
ASA III vs. ASA I	2.791	[1.729, 4.502]	<0.001
Surgical specialty			
Neurosurgery vs. otherspecialties	5.427	[2.957, 9.953]	<0.001
Orthopedic and traumatology vs. other specialties	1.867	[1.227, 2.842]	0.003
Visceral surgery vs. other specialties	1.336	[0.863, 2.067]	0.196
Cause of cancellation			
CancellationMedical-related cause vs. no medical-related cause	2.479	[1.514, 4.057]	<0.001
Surgery-related cause vs. no surgery-related cause	0.722	[0.380, 1.372]	0.321
Patient-related cause vs. no patient-related cause	0.461	[0.301, 0.706]	0.001
Organizational cause vs. no organizational cause	2.474	[1.697, 3.608]	<0.001

Table 2: In the multivariate factors that influenced cancellations, we ve performed logistic regression analysis. Here, cancellation (1) or no cancellation (0) will be the dependent variable, while age, sex, ASA classification, surgical specialty, and cause of cancellation (medical-related, surgery-related, patient-related, or organizational) will be the independent variables.

Note: ASA I was used as the reference category for ASA classification in the logistic regression model.

DISCUSSION:

Our study investigated how different factors influenced surgical cancellations in various countries. The univariate analysis showed that age, ASA classification, medical-related cause, surgery type, and organizational causes were significantly associated with cancellations. In the multivariate analysis, older age, higher ASA classification, neurosurgery, medical-related causes, and organizational causes were significant factors increasing the odds of cancellations, while patient-related causes decreased the odds. Sex and surgery-related causes were not significant factors in the multivariate analysis.

Table 3 presented in the discussion showed the incidence of cancellations in different countries and studies. The highest incidence was observed in Burkina Faso (12), India (14), and Ethiopia (13), while the lowest incidence was observed in Germany (6), Finland (10), and the UK. (8)

This variation in incidence rates could be attributed to differences in socio-demographic factors, sample size, study location, study periods, and research methodologies. A meta-analysis conducted by Abate (17) in a metanalysis study, reported a high prevalence of case reversal in low- and middle-income countries, most of which were preventable through rigorous activities on operating room facilities, preoperative assessment and preparation, and effective communication between the patient and the healthcare provider. The incidence of cancellations varied by surgical specialty, with maxillofacial surgery having the lowest cancellation rate, followed by thoracic and oto laryngological surgery, and neurosurgery having the highest rate, followed by visceral and orthopedic surgery. The high rate of cancellations in orthopedic surgery may be due to the priority given to urgent trauma cases over scheduled surgeries. Medical and anesthetic causes accounted for 14% of cancellations in our study. Administrative reasons, such as lack of beds and scheduling conflicts, were responsible for the majority of cancellations (41.1%). The study also found that the most common reason for cancellation was administrative, such as lack of beds and scheduling conflicts. Other reasons for cancellation included medical and anesthetic causes and patient-related factors. The high rate of cancellations in neurosurgery could be due to organizational problems, such as lack of beds in intensive care units.

There have been several studies conducted on surgical cancellation rates and causes, with varying results depending on the population and setting. A review of literature on this topic suggests that cancellation rates can range from 1% to 50%, with the most common causes being organizational issues, patient-related factors, and surgeon-related issues (17).

The factors causing cancellations remain variable in the literature across countries. In his study, Ogwal (18) found that the prevalence of cancellation of elective surgery at Mulago Hospital in Uganda was 28.8%, with orthopedic surgery having the highest cancellation rate. Two-thirds of the cancellation factors were facility-related, and more than 50% of all cancellations were potentially preventable.

Our findings also highlight the lack of space in intensive care as the most important organizational cause of cancellations, which is consistent with other studies that have identified resource availability as a major contributing factor (19, 20).

Auteur	Pays	Année	Nombre	Incidence
Rakesh Garg (14)	India	2009	1590	30.3%
Schuster M (6)	Germany	2011	6009	6.5%
Chalaya (16)	Tanzania	2011	3064	21.0%
Dimitrias (8)	UK	2013	19368	5.19 %
Laisi J (10)	Finland	2013	12205	4.5%
McKendrick (7)	UK	2014	28928	9.7%
Cihoda JH (5)	Brazil	2015	29518	16.1%
Lankoande (12)	Burkina Faso	2016	103	36.8%
Kaddoum (4)	Libanon	2016	5929	4.4%
Desta (13)	Ethiopia	2018	462	31.6%
Huyn Sun Cho (9)	Hong Kong	2019	60330	8%
Solak (11)	Bosnia (50)	2019	8201	4.58%
Notre étude	Morocco	2019	3023	7,11%

Table 3 : Different incidences of cancellation of scheduled surgery in the literature

Our study found a cancellation rate of 7.11% for scheduled surgeries, which is consistent with rates reported in previous studies. However, cancellations can have significant consequences for both patients and healthcare providers. Cancellations can lead to increased costs, delays in treatment, increased anxiety for patients, and a waste of resources such as operating room time, anesthesia, and staff time. Additionally, cancellations can have a negative impact on the morale and job satisfaction of healthcare providers (21).

Several solutions have been proposed to reduce the incidence of surgical cancellations. First, improvements in preoperative assessment can help identify patients who are at higher risk of cancellation due to medical or anesthesia-related causes. For example, more thorough preoperative testing and evaluation may help identify patients with abnormal test results or recent decompensation of chronic illnesses. This can help healthcare providers take appropriate steps to optimize patient health before surgery and reduce the risk of cancellations (22).

Second, improved communication between healthcare providers and patients can help address patient-related causes of cancellations, such as non-compliance with pre-anesthesia treatment or preoperative fasting. Education and counseling for patients before surgery can help ensure that they understand the importance of adhering to preoperative instructions (23).

Third, addressing organizational causes of cancellations requires a more systemic approach. Solutions may include better management of operating room schedules, improving equipment maintenance, and increasing staffing levels to reduce the risk of staff shortages.

Fourth, the use of predictive analytics and machine learning can help identify patients who are at higher risk of cancellations and allow for more proactive interventions. For example, predictive models can be used to identify patients who are at higher risk of postoperative complications or who are more likely to require add-on surgeries. This can help healthcare providers take appropriate steps to optimize patient care and reduce the risk of cancellations (24).

Finally, the use of virtual consultations and telemedicine can help improve communication and coordination between healthcare providers and patients, particularly in the context of the COVID-19 pandemic. Virtual consultations can help identify patients who are at higher risk of cancellations and allow for more proactive interventions, such as optimizing preoperative care or rescheduling surgery to a later date.

CONCLUSION

Overall, the results of our study align with previous research on surgical cancellations and provide valuable insights for improving surgical scheduling and reducing cancellations in our institution. The non-compliance with the operating program may have negative consequences on patients, increasing hospital costs and affecting the quality of care. The causes of cancellation and addition could be prevented by rigorous planning, better communication between the different factors, and anticipation of emergency situations. Possible solutions, such as implementing waiting lists for operating rooms or more efficient communication systems, should be considered to reduce non-compliance rates.

Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Consent

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

REFERENCES:

1. Tan AL, Chiew CJ, Wang S, Abdullah HR, Lam SS, Ong ME, Tan HK, Wong TH. Risk factors and reasons for cancellation within 24 h of scheduled elective surgery in an academic medical centre: A cohort study. *Int J Surg*. 2019 Jun;66:72-78. doi: 10.1016/j.ijso.2019.04.009. Epub 2019 Apr 26. PMID: 31029875.
2. Koushan M, Wood LC, Greatbanks R. Evaluating factors associated with the cancellation and delay of elective surgical procedures: a systematic review. *Int J Qual Health Care*. 2021 Jun 26;33(2):mzab092. doi: 10.1093/intqhc/mzab092. PMID: 34100548.
3. Armoeyan M, Aarabi A, Akbari L. The Effects of Surgery Cancellation on Patients, Families, and Staff: A Prospective Cross-Sectional Study. *J Perianesth Nurs*. 2021 Dec;36(6):695-701.e2. doi: 10.1016/j.jopan.2021.02.009. Epub 2021 Sep 24. PMID: 34565663.
4. Kaddoum R, Fadlallah R, Hitti E, El-Jardali F, El Eid G. Causes of cancellations on the day of surgery at a Tertiary Teaching Hospital. *BMC Health Serv Res*. 2016 Jul 13;16:259. doi: 10.1186/s12913-016-1475-6. PMID: 27412041; PMCID: PMC4944432
5. Schofield WN, Rubin GL, Piza M, Lai YY, Sindhusake D, Fearnside MR, Klineberg PL. Cancellation of operations on the day of intended surgery at a major Australian referral hospital. *Med J Aust*. 2005 Jun 20;182(12):612-5. doi: 10.5694/j.1326-5377.2005.tb06846.x. PMID: 15963016.
6. Schuster M, Neumann C, Neumann K, Braun J, Geldner G, Martin J, Spies C, Bauer M; CASCAES Study Group. The effect of hospital size and surgical service on case cancellation in elective surgery: results from a prospective multicenter study. *Anesth Analg*. 2011 Sep;113(3):578-85. doi: 10.1213/ANE.0b013e318222be4d. Epub 2011 Jun 16. PMID: 21680860.

7. Kim KO, Lee J. Reasons for cancellation of elective surgery in a 500-bed teaching hospital: a prospective study. *Korean J Anesthesiol.* 2014 Jul;67(1):66-7. doi: 10.4097/kjae.2014.67.1.66. PMID: 25097743; PMCID: PMC4121499.
8. Dimitriadis PA, Iyer S, Evgeniou E. The challenge of cancellations on the day of surgery. *Int J Surg.* 2013;11(10):1126-30. doi: 10.1016/j.ijssu.2013.09.002. Epub 2013 Sep 12. PMID: 24035905. Solak AK, Pandza H, Beciragic E, Husic A, Tursunovic I, Djozic H. Elective Case Cancellation on the Day of Surgery at a General Hospital in Sarajevo: Causes and Possible Solutions. *Mater Sociomed.* 2019 Mar;31(1):49-52. doi: 10.5455/msm.2019.31.49-52. PMID: 31213956; PMCID: PMC6511384.
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 Feb;18(1):5-10. PMID: 22302904.
10. Laisi J, Tohmo H, Keränen U. Surgery cancelation on the day of surgery in same-day admission in a Finnish hospital. *Scand J Surg.* 2013;102(3):204-8. doi: 10.1177/1457496913492626. PMID: 23963036. Cihoda JH, Alves JR, Fernandes LA, de Souza Neto EP. The analysis for the causes of surgical cancellations in a Brazilian university hospital. *Care Manag J.* 2015;16(1):41-7. doi: 10.1891/1521-0987.16.1.41. PMID: 25918776.
11. Solak AK, Pandza H, Beciragic E, Husic A, Tursunovic I, Djozic H. Elective Case Cancellation on the Day of Surgery at a General Hospital in Sarajevo: Causes and Possible Solutions. *Mater Sociomed.* 2019 Mar;31(1):49-52. doi: 10.5455/msm.2019.31.49-52. PMID: 31213956; PMCID: PMC6511384.
12. Lankoande M, Bonkougou P, Traore S, Kabore R, Ouangre E, Pendeville P. Cancellation of elective surgical procedures in the university teaching hospital center Yalgado Ouedraogo in Burkina Faso: Incidence, reasons and proposals for improvement. *South African J Anaesth Analg* 2016;22:140-4.
13. Desta M, Manaye A, Tefera A, Worku A, Wale A, Mebrat A, Gobena N. Incidence and causes of cancellations of elective operation on the intended day of surgery at a tertiary referral academic medical center in Ethiopia. *Patient Saf Surg.* 2018 Aug 27;12:25. doi: 10.1186/s13037-018-0171-3. PMID: 30154916; PMCID: PMC6109985.
14. Garg R, Bhalotra AR, Bhadoria P, Gupta N, Anand R. Reasons for cancellation of cases on the day of surgery-a prospective study. *Indian J Anaesth.* 2009 Feb;53(1):35-9. PMID: 20640075; PMCID: PMC2900031.
15. McKendrick DR, Cumming GP, Lee AJ. A 5-year observational study of cancellations in the operating room: Does the introduction of preoperative preparation have an impact? *Saudi J Anaesth.* 2014 Nov;8(Suppl 1):S8-S14. doi: 10.4103/1658-354X.144053. PMID: 25538529; PMCID: PMC4268536.

16. Chalya PL, Gilyoma JM, Mabula JB, Simbila S, Ngayomela IH, Chandika AB, Mahalu W. Incidence, causes and pattern of cancellation of elective surgical operations in a university teaching hospital in the Lake Zone, Tanzania. *Afr Health Sci.* 2011 Sep;11(3):438-43. PMID: 22275936; PMCID: PMC3261008.
17. Abate SM, Chekole YA, Minaye SY, Basu B. Global prevalence and reasons for case cancellation on the intended day of surgery: A systematic review and meta-analysis. *Int J Surg Open.* 2020;26:55-63. doi: 10.1016/j.ijso.2020.08.006. Epub 2020 Aug 20. PMID: 34568611; PMCID: PMC7440086.
18. Ogwal A, Oyania F, Nkongwe E, Makumbi T, Galukande M. Prevalence and Predictors of Cancellation of Elective Surgical Procedures at a Tertiary Hospital in Uganda: A Cross-Sectional Study. *Surg Res Pract.* 2020 Mar 19;2020:1464098. doi: 10.1155/2020/1464098. PMID: 32258365; PMCID: PMC7115171.
19. Hänninen-Khoda L, Koljonen V, Ylä-Kotola T. Patient-related reasons for late surgery cancellations in a plastic and reconstructive surgery department. *JPRAS Open.* 2018 Sep 5;18:38-48. doi: 10.1016/j.jpra.2018.08.002. Erratum in: *JPRAS Open.* 2021 Sep 24;30:174-175. PMID: 32158836; PMCID: PMC7061671.
20. Chung F, Mezei G. Factors contributing to a prolonged stay after ambulatory surgery. *Anesth Analg.* 1999 Dec;89(6):1352-9. doi: 10.1097/00000539-199912000-00004. PMID: 10589607.
21. Dexter F, Epstein RH. Typical savings from each minute reduction in tardy first case of the day starts. *Anesth Analg.* 2009 Apr;108(4):1262-7. doi: 10.1213/ane.0b013e31819775cd. PMID: 19299798.
22. Epstein RH, Dexter F. Management implications for the perioperative surgical home related to inpatient case cancellations and add-on case scheduling on the day of surgery. *Anesth Analg.* 2015 Jul;121(1):206-218. doi: 10.1213/ANE.0000000000000789. PMID: 26086516.
23. Madani A, Watanabe Y, Bilgic E, Pucher PH, Vassiliou MC, Aggarwal R, Fried GM, Mitmaker EJ, Feldman LS. Measuring intra-operative decision-making during laparoscopic cholecystectomy: validity evidence for a novel interactive Web-based assessment tool. *Surg Endosc.* 2017 Mar;31(3):1203-1212. doi: 10.1007/s00464-016-5091-7. Epub 2016 Jul 13. PMID: 27412125.
24. van der Meijden OA, Schijven MP. The value of haptic feedback in conventional and robot-assisted minimal invasive surgery and virtual reality training: a current review. *Surg Endosc.* 2009 Jun;23(6):1180-90. doi: 10.1007/s00464-008-0298-x. Epub 2009 Jan 1. PMID: 19118414; PMCID: PMC2686803.

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