

Same-day Cardiac Surgery Cancellations at a Large UK Centre and Patient Satisfaction Survey - Quality Improvement Study

Sara Jasionowska¹, Rory Hammond², and Wael Awad¹

¹St Bartholomew's Hospital

²St Bartholomew's Hospital

July 7, 2020

Abstract

Background Same-day cancellation of cardiac surgeries is a disheartening experience for patients. The primary aims of this study were to determine the frequency and reasons for same-day cancellations, and associated patients' outcomes. The secondary aims were to evaluate patients' reactions to cancellations and to propose measures to reduce cancellations. **Methods** We prospectively reviewed all elective and urgent in-patient adult cardiac surgeries performed from August 2017 to March 2018. Procedures were divided into cancelled (C) and not cancelled (NC) groups. A qualitative patient satisfaction survey was undertaken. **Results** Overall, 1388 patients were scheduled for cardiac surgery during this period. Elective surgeries constituted 70.7% (981/1388) and urgent 29.3% (407/1388). 231/1388 (16.7%) procedures were cancelled for the following reasons: 30.5% lack of ITU beds, 20.1% patient medically unfit, 8.2% ITU staff shortage, 6.9% emergency case intervention and 34.2% other. There was no significant difference in mortality between groups (2.6% in C vs 1.6% in NC, $p=0.62$). In group C, 36% (84/231) of patients underwent surgery within 72 hours of cancellation, 47% (110/231) of procedures were rescheduled, and 6.9% (16/231) were not performed. 30.7% (71/231) were potentially preventable. All cancelled patients were asked to complete the survey; 43.7% (101/231) responded, with 22.8% (23/101) describing feeling upset. However, 92.1% (93/101) felt the cancellation was justified. **Conclusion** This single institutional study suggests a relatively high number of planned same-day surgeries are being cancelled. A third of these may be preventable. Despite this, patients were understanding. Actions to decrease cancellations should be identified to improve efficiency.

ABSTRACT

Background

Same-day cancellation of cardiac surgeries is a disheartening experience for patients. The primary aims of this study were to determine the frequency and reasons for same-day cancellations, and associated patients' outcomes. The secondary aims were to evaluate patients' reactions to cancellations and to propose measures to reduce cancellations.

Methods

We prospectively reviewed all elective and urgent in-patient adult cardiac surgeries performed from August 2017 to March 2018. Procedures were divided into cancelled (C) and not cancelled (NC) groups. A qualitative patient satisfaction survey was undertaken.

Results

Overall, 1388 patients were scheduled for cardiac surgery during this period. Elective surgeries constituted 70.7% (981/1388) and urgent 29.3% (407/1388). 231/1388 (16.7%) procedures were cancelled for the following reasons: 30.5% lack of ITU beds, 20.1% patient medically unfit, 8.2% ITU staff shortage, 6.9% emergency case intervention and 34.2% other.

There was no significant difference in mortality between groups (2.6% in C vs 1.6% in NC, $p=0.62$). In group C, 36% (84/231) of patients underwent surgery within 72 hours of cancellation, 47% (110/231) of procedures were rescheduled, and 6.9% (16/231) were not performed. 30.7% (71/231) were potentially preventable. All cancelled patients were asked to complete the survey; 43.7% (101/231) responded, with 22.8% (23/101) describing feeling upset. However, 92.1% (93/101) felt the cancellation was justified.

Conclusion

This single institutional study suggests a relatively high number of planned same-day surgeries are being cancelled. A third of these may be preventable. Despite this, patients were understanding. Actions to decrease cancellations should be identified to improve efficiency.

Abstract word count: 249/250

Keywords : surgery cancelation, cardiac surgery, service improvement, patient satisfaction

Highlights

Cardiac surgery cancellations have an emotional and psychological toll on patients.

- Prospective analysis of cardiac surgery cancellations is lacking in the literature.
- A considerable number (16.7%) of procedures were cancelled.
- A satisfaction questionnaire highlighted thoughts and concerns of our patients.
- One third of cancellations may be preventable.
- Replicable solutions to reduce cancellations were identified.

1.1 INTRODUCTION

Cancellations of scheduled surgeries are a major cause of inefficiency amongst healthcare organisations worldwide. This is an ineffective use of theatre time and poses an additional cost to already limited surgical budgets. Cancellations are a setback for patients and their families, carrying psychological, social, and financial implications.¹ In those suffering from life-threatening cardiac conditions, cancellations may have serious consequences.² They pose an additional emotional burden, with reports of anxiety and fear of worsening cardiovascular health.³

The NHS reported an average cancellation rate of 7.5% (range 2.6 - 18.2%) for same day elective and urgent cardiothoracic surgeries with no differentiation between cardiac and thoracic cancellations.² Previous international studies reported cardiothoracic cancellation rates of 1.96% - 24%.^{4, 5, 6, 7} The most common reasons for cancellations were reported to be patient-related factors, lack of available hospital beds, inadequate work-up, administrative shortfalls, and surgeon-related issues.^{6, 7, 8, 9, 10} A significant proportion of same-day cancellations were considered avoidable.^{7, 8}

The primary aims of this study were to establish the frequency of same-day elective and urgent cardiac surgical cancellations at our Centre, to determine the reasons for these cancellations and the outcomes of patients whose operations were cancelled. Patient-reported outcomes and satisfaction are of growing importance in the patient-centred approach to healthcare. Thus, the secondary aims were to evaluate the impact of cancellations on patients using a patient satisfaction questionnaire and to identify measures to decrease cancellation rates, if found to be higher than national averages.

1.2. MATERIALS METHODS

This prospective audit was performed between August 2017 and March 2018. The research is reported in line with the Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines.¹¹

Adult patients undergoing elective and urgent cardiac surgery were included in our study. Those who underwent emergency or non-cardiac procedures and patients under the age of 18 were excluded. Patients were identified on a weekly basis from theatre registers and printed operating lists. Same day surgery cancellations were defined as any postponement of patients' operation once listed for surgery.

Electronic hospital records were reviewed, and the following information was recorded for all patients: demographics; scheduled surgery date; EuroSCORE II and its components; admission type (elective/urgent in-house/transfer patient); date of pre-operative anaesthetic review. Additionally, reasons for cancellation, timing of cancellation (pre-operative/during anaesthesia/intraoperative) and outcomes including time from cancellation to performed operation; hospital stay post-cancellation and mortality were recorded. Procedures were divided into cancelled (C) and non-cancelled (NC) groups for analysis.

The reasons for cancellation were categorized into: lack of ITU beds and nurses; patient medically unfit; scheduling error; patient-related issues; emergency intervened; procedure no longer needed; lack of perfusionist; incomplete investigations; surgeon unavailable; transfer issue; theatre staff shortage. Patient-related issues included failure to stop medication and treatment refusal. Scheduling errors included overrunning cases, overbooking of the operating room, late operation start and IT errors.

We further assessed the impact of cancellations on patient satisfaction and wellbeing. Patients completed a questionnaire by telephone 3 months after discharge to allow time to reflect. Questionnaire data assessed adherence to Association of Anaesthetists of Great Britain and Ireland Theatre Efficiency guidance, including healthcare professionals informing patients; time offered for explanation; patient understanding and satisfaction as well as perception of being kept nil by mouth (NBM) longer than necessary (Figure 1). This questionnaire has previously been used by Wasim et al. to assess patient experience following cancelled orthopaedic surgery.¹² A pilot study was conducted to validate its content.

All data was entered into a Microsoft Excel spreadsheet. Statistical analysis consisted of determination of the mean and range for continuous data and percentage quantification for the categorical data. Statistical significance was established using chi-squared test and two-sided unpaired student t-test with p values <0.05 considered significant. The study was approved by the on-site Trust Ethics and Quality Improvement Committee. As this was a quality improvement project and information collected did not include personal identifiers, individual consents were not required.

1.3. RESULTS

A total of 1388 patients were scheduled to undergo cardiac surgery during the study period, 981 (70.7%) elective and 407 (29.3%) urgent. Table 1 shows patients' characteristics. Myocardial Infarction (MI) status was the only significant difference between C and NC groups. Cancelled patients were more likely to have had a previous MI, with 40.2% (82/204) in C and 30.1% (338/1123) in NC affected (p=0.004). Operative procedures included isolated coronary artery bypass grafting (CAGB) in 47.9% (665/1388), isolated valve replacement and/or repair in 27.8% (386/1388), combined valve and CABG in 13.2% (183/1388), and other in 11.1% (154/1388). Overall, 16.6% (231/1388) of operations were cancelled on the day of surgery. The number of cancellations in the urgent group (21.6%, 88/231) was significantly higher than in the elective group (14.6%, 143/231) (p=0.001).

There was no difference in in-hospital mortality between the C and NC groups, with 2.6% (6/231) deaths in C group and 1.6% (19/1157) in NC group (p=0.62). Similarly, there was no difference in mortality between the C and NC patients within the urgent group (C urgent 4.5% (4/88) vs NC urgent 3.3% (14/343), p = 0.85), and no difference in mortality within the elective patient group (C elective 1.4% (2/143) vs NC elective 0.6% (5/814) (p=0.85).

Figure 2 shows the reasons for cancellation of surgery. The most common reasons for cancellations included: no ITU beds in 30.7% (71/231), patient medically unfit in 21.6% (50/231), scheduling error in 9.5% (22/231), no ITU nurses in 8.2% (19/231), patient related issues in 7.8% (18/231), emergency intervening in 6.9% (16/231). Patients were declared as medically unfit for the following reasons: evidence of infection (54%, 27/50); further investigations necessary (16%, 8/50), diarrhoea (6%, 3/50); deranged blood results (6%, 3/50), new angiography/TOE findings (6%, 3/50), gastric bleed (4%, 2/50), rash (4%, 2/50); haematuria (2%, 1/50), allergic reaction to pre-operative antibiotics (2%, 1/50).

'Scheduling errors' included overrunning first case in 61.9% (14/22), operating room overbooking in 22.7%

(5/22), late start to the operation in 14.3% (3/22). Patient-related issues included patient not attending for surgery in 27.8% (5/18), warfarin not stopped in 22.2% (4/18), treatment refusal in 16.7% (3/18), self-cancellation in 16.7% (3/18), late Jehovah witness declaration in 5.6% (1/18), incorrectly completed consent form in 5.6% (1/18), and private treatment preferred in 5.6% (1/18).

Our analysis revealed that at least 30.7% (71/231) of cancellations were potentially preventable. The main reasons identified included ITU staff shortage in 27% (19/231), surgery no longer needed in 10% (7/231), lack of perfusionist in 10% (7/231), inadequate work up in 7% (5/231), and patient not turning up for surgery in 7% (5/231). Additionally, cancellation rates varied from one consultant to the other (range 5.9% to 31.7%).

Cancellations occurred whilst still on the ward for 96.1% (222/227) of patients, intraoperatively for 1.3% (3/227; 2 electrical system failures and one new declaration of Jehovah Witness) and in the anaesthetic room for 0.9% (2/227; failed intubation and a new TOE finding). A different surgeon undertook the cancelled procedure in 26.4% (61/231) of cases; of these, 31.2% (19/61) were cancelled twice, and 78.9% (15/19) were operated on by a third surgeon.

In-hospital transfer patient cancellations were not higher for patients scheduled for surgery within 24 hours from admission compared to those scheduled for surgery beyond 24 hours of admission (25% (5/20) vs 15.3% (22/144), $p=0.27$).

Figure 3 shows cancellation to operation time. The NHS recommends that patients requiring any surgery are operated on within 28 days of cancellation. Operations were performed within this time frame in 99.1% (221/223) of cases. Patients were operated on within 24 hours in 19.9% (46/223) and 70.7% (163/223) within 7 days of cancellation. Twenty of the 223 (8.7%) cancelled patients were not operated on after the cancellation and instead underwent Percutaneous Coronary Intervention, Transcatheter Aortic Valve Implantation or medical treatment.

Patients' pathway post-cancellation outcomes are shown in Figure 4. Ninety-two patients (39.8%; 92/231) left the hospital within 24 hours to be re-dated and 33.8% (78/231) stayed for more than 7 days. One patient remained in hospital for 90 days after the cancellation due to a cardiac arrest. There was no increase in the total post-operative length of stay between the two groups with 76.2% (866/1137) of NC patients and 76.2% (173/227) of C patients staying in the hospital longer than 7 days ($p=0.988$).

Our centre aims to hold pre-admission clinics 2-4 weeks prior to scheduled surgery. This was achieved for 51.5% (431/837) of patients. Four hundred and six (48.5%; 406/837) patients were seen beyond 28 days of the scheduled surgery. Data on the timing of pre-op clinic was missing in 39.7% (551/1388) cases. Patients who were assessed within 28 days of surgery were less likely to have their procedures cancelled, 12.3% (53/431) of patients seen within 28 days were cancelled compared to 20.9% (85/406) in those seen beyond 28 days ($p=0.001$).

All cancelled patients were contacted on at least two different days but only 101/231 (43.7%) completed our survey; 23.8% refused for the following reasons: poor English language skills, not willing to answer, hard of hearing, poor memory of the event and 32.5% did not answer the phone.

The level of information received about the cancellation was reported as clear and comprehensible by 13.9% (14/101), acceptable by 67.3% (68/100) and inadequate by 18.8% (19/101). Cancellation was deemed justified in 92.1% (93/101) and 90.1% (91/101) denied there was a party to blame. Of the 10 patients who believed that there was a party to blame for the cancellation, 30% (3/10) blamed inadequate government funding, 30% (3/10) the hospital administration, 30% (3/10) the healthcare system, and 10% (1/10) put it down to miscommunication between hospitals.

At the time of cancellation 22.8% (23/101) reported feeling upset, 17.8% (18/101) anxious, 12.90% (13/101) confused, 10.9% (11/101) fine, 8.9% (9/101) disappointed, 6.9% (7/101) happy, and 19.8% (10/101) other. The majority (72/98 (73.5%)) of patients whose surgery was rescheduled admitted that they would have preferred to have been operated on by the same surgeon as originally planned. The waiting time for the rescheduled surgery was too long according to 19.4% (19/98) of patients. 26.7% (27/101) of patients reported

that the cancellation negatively impacted their sense of wellbeing, 64.4% (65/101) said it made no change and 8.9% (9/101) said that it made them feel better because they had more time to prepare.

1.4. DISCUSSION

Cancellations of cardiac operations have a lasting impact on patients and the hospitals at which they are treated. There is a lack of national data on the rates of same-day cardiac surgery cancellations in the UK. The available data is limited to the GIRFT (Getting It Right First Time) Specialty Report 2018, which reports the mean cancellation rate of cardiothoracic surgery cancellation as 7.5% (range 2.6%-18.2%) across 31 UK centres.² This study aimed to establish the rate of cancellation in our centre, its' impact on patient outcomes and to formulate possible solutions to decrease cancellation rates, if deemed high. This is the first prospective study on same-day cancellations of elective and urgent cardiac surgeries in Europe and North America.

The cancellation rate at our centre during the study period was 16.6% (9.1% higher than that reported by GIRFT). In part, this could be related to the definitions of a *cancellation*. In this study all patients cancelled on the day of surgery, including those cancelled and operated within 24 hours, were considered cancelled. Our results showed that patients undergoing urgent cardiac surgery were more likely to have their procedures cancelled compared to those undergoing elective procedures. Additionally, this study revealed the five major reasons for cancellations to be in line with those previously reported.

ITU bed unavailability was the most common reason for cancellations at our centre. This may be improved by ring-fencing ITU beds for elective and urgent cases, whereby any same-day emergency case cannot take a scheduled case's space.^{13, 14} ITU bed security may facilitate same day of surgery admission, reducing pre-surgery ward bed occupancy and patient flow, and limit cancellations due to ITU bed unavailability. However, ring-fencing of beds can result in a waste of resources as it is dependent on the stable flow of elective and urgent procedures and a predictable length of post-operative stay.

Patients being unfit for surgery and patient-related issues were other major reasons for cancellations at our centre. Previous studies by Whiteley et al.¹⁵ and Hines et al.¹⁶ reported that specialist-nurse led pre-admission clinics or nurse-led clinics with anaesthetist's supervision resulted in better patient optimisation and reduced surgery cancellation rates. The pre-admission clinics at our centre are carried out by advanced nurse practitioners who assess patients and escalate abnormal clinical findings to the appropriate teams. Various timings of the pre-admission clinic have been described in the literature and its' optimal timing is disputed. A study by Pollard et al.¹⁷ found no difference in cancellation rates between patients pre-assessed 30 days compared to those assessed 24 hours before the surgery in a cohort of patients undergoing upper abdominal and intra-thoracic surgeries. However, Kaddoum et al.⁴ reported that the clinic should be held days before the surgery to achieve the best results. It is critical that the assessment is not carried out too early as the patient's health status may change, yet if performed too close to the surgery date there may not be enough time to carry out necessary investigations. At our centre pre-admission clinic and surgery slots are allocated by the Single Point of Contact (SPOC) office, dedicated to cardiac surgery planning. The goal set by the Trust to see patients in the pre-admission clinics between 2-4 weeks prior to surgery date was achieved for 51.5% of patients.

We found that patients who had their pre-operative clinic within 28 days prior to the scheduled surgery were significantly less likely to be cancelled. This critical finding reflects our centre's policy for pre-operative review timing. Measures that focus on ensuring patients are assessed within this timeframe will be important to reducing cancellations associated with poor preoperative health and significant preoperative findings. A 28-day period enables appropriate time for outstanding investigations to be performed and optimising patients prior to surgery.

The length of the waiting list may impact overall cancellation rates. Long-waiters may develop new problems resulting in their procedures being cancelled when they eventually come to surgery. They may become urgent, leading to cancellation of elective procedures. A further mechanism in place to optimise efficiency at our centre is the 'short notice waiting list'. In this analysis, the majority of patients were waiting for over two

months.

A solution to decreasing cancellations linked to patients being unfit and patient-related reasons may be pre-operative telephone reminders.¹⁸ Calling patients is an opportunity to ensure the medications have been stopped, that the patient is willing to continue with the operation, that the patient remains fit for surgery and is an opportunity for any patient concerns to be addressed. Current practice in our hospital involves a letter to patients with their surgery date.

Scheduling errors were another common reason for cancellations at our centre. Seventy-seven percent were due to overrunning cases and operating room overbooking. At our centre, the scheduling of operating lists is arranged by the SPOC office and individual surgeons. Pandit et al.¹⁹ reported that the surgical forecasting of the length of the operation was more adequate than the scheduled duration. Additionally, monitoring and auditing of theatre time according to operation type and individual surgeons could help improve surgery planning in the future.

We found that 30.7% of cancellations were potentially preventable, with the top five reasons accounting for over 60% of cancellations at our centre. Although the lack of ITU staffing may be a complex and difficult problem to solve, we believe that addressing these issues would result in a significant decrease in cancellation rates.

Previous studies reported that patients whose surgeries are cancelled at short notice experience disappointment and anxiety. From our Patient Satisfaction Questionnaire, only a small percentage of patients reported feeling upset, anxious, and confused. In keeping with previous literature reports, cancellations negatively affected patient well-being in 27% cases.³ Sixty-four percent of patients admitted that it had no significant impact on well-being and 9% reported that the cancellation improved their well-being because it allowed more time to mentally prepare.

Association of Anaesthetists of Great Britain and Ireland Theatre Efficiency guidance suggest that patients whose operations have been cancelled should undergo their procedures within 28 days, provided there are no reasons not to proceed. Nearly all (99.1%) cancelled patients at our centre subsequently underwent surgery within the 28-day period as suggested. In addition, over 70% of cancelled patients were operated within 24 hours of the cancellation. This is reflected in patients' feedback with 80% reporting the waiting time for rescheduled surgery as 'adequate'.

Our study revealed multiple reasons for surgical cancellations, some of which are potentially avoidable. In order to succeed in reducing the rate of same-day cancellations each problem must be addressed individually and systematically. Every stage of the patient journey from the decision to operate, the pre-admission clinic, the booking and organisation of the surgery slot, the consent process and even the surgery itself must be optimised. During the data collection period we found that there were gaps in the online medical records especially with regards to timing of pre-operative assessment, follow-up care, transfer status of patients and EuroSCORE II components. An additional limitation is the number of patients completing the questionnaire. Although the questionnaire's content validity and internal consistency was tested in a pilot study and an attempt to avoid acquiescence bias was made by avoiding an agree/disagree choice, only 43.7% patients completed the survey. Non-responses to our survey may have led to an underestimation of negative responses, potentially introduced bias, impacting the representativeness of the sample and skewing results.

1.5. CONCLUSIONS

The cancellation rates at our centre are relatively high and a third of cancellations are considered preventable. Cancellations have a negative impact on patients' wellbeing, but the majority of patients accepted that cancellations were justified. Actions to reduce the cancellations were identified and will be implemented at our centre. Future work will be to ascertain whether these actions are effective in reducing cancellation rates.

1.6. ACKNOWLEDGEMENTS

The Audit team, Miles Curtis, the SPOC Office for the help with data collection.

1.7. DISCLOSURES: None

1.8. FUNDING: None

1.9. DECLARATION OF INTEREST : None

1.10. ETHICAL APPROVAL : The study has been approved by the on-site Ethics board and has been registered on the Clinicaltrials.gov. (ID: NCT04386733)

1.11. AUTHORS' CONTRIBUTION

Sara Jasionowska – concept/design, data analysis/interpretation, drafting article, critical revision of the article, approval of article, statistics, data collection

Rory F L Hammond - concept/design, data analysis/interpretation, drafting article, critical revision of the article, approval of article, statistics, data collection

Wael I Awad - concept/design, drafting article, critical revision of the article, approval of article, senior supervision

1.12. REFERENCES

1. Dimitriadis P, Iyer S, Evgeniou E. The challenge of cancellations on the day of surgery. *International Journal of Surgery*. 2013;11(10):1126-1130.
- 2 Cardiothoracic Surgery - Getting It Right First Time - GIRFT [Internet]. Getting It Right First Time - GIRFT. 2020 [cited 16 June 2020]. Available from: <https://gettingitrightfirsttime.co.uk/surgical-specialty/cardiothoracic-surgery/>
3. Ivarsson B, Larsson S, Sjoberg T. Postponed or cancelled heart operations from the patient's perspective. *Journal of Nursing Management*. 2004;12(1):28-36.
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 Services Research*. 2016;16(1).
5. Smith M, Mauermann W, Cook D, Hyder J, Dearani J, Barbara D. Same-day cancellation of cardiac surgery: A retrospective review at a large academic tertiary referral center. *The Journal of Thoracic and Cardiovascular Surgery*. 2014;148(2):721-725.
6. Argo J, Vick C, Graham L, Itani K, Bishop M, Hawn M. Elective surgical case cancellation in the Veterans Health Administration system: identifying areas for improvement. *The American Journal of Surgery*. 2009;198(5):600-606.
7. Schofield W, Rubin G, Piza M, Lai Y, Sindhusake D, Fearnside M et al. Cancellation of operations on the day of intended surgery at a major Australian referral hospital. *Medical Journal of Australia*. 2005;182(12):612-615.
8. González-Arévalo A, Gómez-Arnau J, delaCruz F, Marzal J, Ramírez S, Corral E et al. Causes for cancellation of elective surgical procedures in a Spanish general hospital. *Anaesthesia*. 2009;64(5):487-493.
9. Kumar R, Gandhi R. Reasons for cancellation of operation on the day of intended surgery in a multidisciplinary 500 bedded hospital. *Journal of Anaesthesiology Clinical Pharmacology*. 2012;28(1):66.
10. Ezike H, Ajuzieogu V, Amucheazi A. Reasons for elective surgery cancellation in a referral hospital. *Ann Med Health Sci Res*. 2011;1(2):197-202.
11. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process: Table 1. *BMJ Quality & Safety*. 2015;25(12):986-992.

12. Wasim A, Shahban S, Goswami V. Hospital policy following cancelled orthopaedic surgery and the patient experience—making the best of a bad situation. *Journal of Hospital Management and Health Policy*. 2018;2:48-48.
13. O'Malley N, Sproule J, Nicholson P, Rice J, McElwain J. Ring-fencing — bed protection for the patient. *Irish Journal of Medical Science*. 2005;174(S1):49-49.
14. Coyle D, Lowery AJ, Khan W, Waldron R, Barry K. Successful introduction of ring-fenced inpatient surgical beds in a general hospital setting. *Ir Med J*. 2012;105(8):269-271.
15. Whiteley MS, Wilmott K, offland RB. A specialist nurse can replace pre-registration house officers in the surgical pre-admission clinic. *Ann R Coll Surg Engl*. 1997;79(6 Suppl):257-260.
16. Hines S, Munday J, Kynoch K. Effectiveness of nurse-led preoperative assessment services for elective surgery: a systematic review update protocol. *JBIC Database of Systematic Reviews and Implementation Reports*. 2013;11(9):73-83.
17. Pollard J, Olson L. Early Outpatient Preoperative Anesthesia Assessment. *Anesthesia & Analgesia*. 1999;89(2):502-505.
18. Turunen E, Miettinen M, Setälä L, Vehviläinen-Julkunen K. Elective Surgery Cancellations During the Time Between Scheduling and Operation. *Journal of PeriAnesthesia Nursing*. 2019;34(1):97-107.
19. Pandit J, Carey A. Estimating the duration of common elective operations: implications for operating list management. *Anaesthesia*. 2006;61(8):768-776.

FIGURE LEGENDS

Figure 1 : Patient satisfaction questionnaire.

Figure 2 : Reasons for cancellation of cardiac surgery (ITU – Intensive Therapy Unit; TOE – Transoesophageal Echo).

Figure 3 : Time from cancellation to operation.

Figure 4 : Duration of the hospital stay after cancelled surgery.

Hosted file

tables journal of cardiac surgery.docx available at <https://authorea.com/users/340072/articles/467190-same-day-cardiac-surgery-cancellations-at-a-large-uk-centre-and-patient-satisfaction-survey-quality-improvement-study>

Hosted file

figures journal of cardiac surgery.docx available at <https://authorea.com/users/340072/articles/467190-same-day-cardiac-surgery-cancellations-at-a-large-uk-centre-and-patient-satisfaction-survey-quality-improvement-study>