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A Cross-sectional (Both Qualitative and Quantitative) Study on Factors Impacting Surgical Patient Waiting Times and Cancellation of Theatre Lists in Malawi District and Rural Hospitals: A Case Study of Nkhotakota District Hospital

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ABSTRACT

Introduction: Surgical case cancellation is defined as canceling planned surgery after the patient has been notified of the operation date, on the day of or the day preceding surgery. Surgical patient waiting time is the time from when the patient is admitted to the hospital for a surgical procedure to the day of the operation. Cancellation of scheduled surgery specifically in Africa creates a financial burden for hospitals, caregivers, and patients. It causes emotional stress, which impacts outcomes. In poor countries where the adequacy of health care is limited, the ethical dilemma created by scheduled surgery cancellation is particularly important and worthy of investigation.

Objective of study: An investigation of the main factors that lead to surgical patients' waiting times and cancellation of theatre lists in the district and rural hospitals of Malawi. This study was conducted at Nkhotakota District Hospital in the central region of Malawi. The hospital serves a catchment area of 379,474 people with a bed capacity of 300.

Methods: This was a cross-sectional study in which both retrospective and prospective data were collected using theatre, ward, and surgical booking registers. Surgical staff, including nurses, clinicians, anesthetists, and administrative personnel, were interviewed.

Results: During the study period (6 months), 240 patients (93 females and 147 males) were booked for surgery. A total of 118 patients were operated on, representing 49%, and 122 patients were canceled, representing 51%. The cancellation rate was highest for general surgery (60%), gynecology (25%) and other cases (15%). There were no cancellations for orthopedic cases. Regarding the waiting time before the procedure, it was found that surgical patients on average waited for 2 days to be operated on or for a procedure to be cancelled.

Conclusion: The main reasons for theater cancellation found in this study were avoidable. Reasons such as inadequate surgical staff, lack of motivation for surgical staff by hospital management and patients not turning up on the day of surgery could be overcome with collective effort by both administration and surgical staff. In conclusion, patients who had a delayed surgical procedure waited on average for 5 days more than those who attended as requested (stayed for 1 day before the procedure was performed). Staff motivation and follow-up of patients booked for surgery two days before the day of the procedure and recruitment of more surgical staff can improve surgical case cancellation.

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KEYWORDS
Surgical cases; Reasons for cancellation; Patient waiting time

Introduction

Surgery is defined as a branch of medicine that involves the treatment of injuries or diseases by making an incision on the body and removing or repairing the damaged parts. Surgery as a health service in Africa, specifically Malawi, has been a great challenge due to a shortage of skilled surgical staff, lack of equipment, shortage of operating and ward space, and lack of motivation and supervision to ensure quality surgical

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services [1]. Surgical case cancellation is defined as canceling planned surgery after the patient has been notified of the operation date, on the day of or the day preceding surgery. In other ways, it can be defined as cases that appeared in the definitive schedule list that ultimately were not performed. This occurs worldwide because of system, provider, and patient-related factors [1], and it leads to economic inefficiencies and potentially patient harm.

The provision of safe and timely surgical care is essential to global health care. Low- and middle-income countries have a disproportionate share of the global surgical disease burden and struggle to provide care with the given resources [2]. Surgical case cancellation has the potential to affect a large number of patients in these areas, and it is likely that the incidence and reasons are different between high-income countries and Low or Middle-Income Countries (LMICs), but the literature describing these differences is scarce [3,4]. Without understanding the underlying reasons for case cancellation in LMICs, realistic strategies to decrease cancellations cannot be established [2,5].

Malawi is a small country in central sub-Saharan Africa with a population of 18 million, and it is the third poorest country in sub-Saharan Africa [6]. Malawi serves as a proxy for other low-resource countries in the region that fall on the path of more surgical case cancellations in its rural and district hospitals. Central hospital data indicate that out of 894 surgical patients booked for surgery in a month, 499 are operated on, leaving a large number of patients unoperated, and eventually, most of them die with the condition. If such is the case with central hospitals where most of the surgical specialists are, the district and rural hospitals should be worse, hence the conduct of this study. The goal of this study was to describe the day-of-surgery scheduled case cancellation rate, the corresponding reasons, and waiting time at a district and rural public hospital in Malawi. The majority of Malawi's population lives in the district and rural areas [7-11].

In most Malawian district and mission hospitals, the reasons for surgical case cancellation are workforce, infrastructure, supplies, equipment, and service delivery. These factors are vital to ensure the proper functioning of the theatre [12]. There are measurable inadequacies and disparities in the number and distribution of surgical care specialists in the country [12,13]. Most district hospitals have unreliable running water, electricity, or a functioning backup generator. The availability of functioning essential equipment and supplies relies on a planning and procurement process inherent in a functioning healthcare system. However, there are other reasons that still need to be considered apart from the mentioned few, e.g., insufficient staff, patient commitment for surgery, and patient condition on the day or a day before surgery, so that they are addressed and improve surgical patient care. The purpose of this study was to examine such reasons for surgical case cancellation and propose ways of improving patient care.

An evaluation study was performed at Kamuzu Central Hospital, one of the tertiary hospitals in Malawi, of the proportion of elective surgeries that were canceled and the associated reasons [13]. Of 10,730 scheduled surgeries, 4,740 (44.2%) were canceled for different reasons ranging from patient-to hospital-related reasons. In this study, they found that high case cancellation at a tertiary hospital in Malawi was primarily due to infrastructural limitations [6,14]. This study did not include information on district and rural hospital case cancellations, which was necessary in this case. Most cases that are performed at the central hospital are referred from district hospitals. This study needed to determine in detail why surgical cases are canceled at the district hospital and compare the reasons for surgical case cancellation at the district hospital with those at the tertiary hospital. This study, surgical case cancellation at the district and rural hospital, now provides information that can be compared to those reasons for tertiary hospital case cancellation and helps in decision-making by the Malawi Ministry of Health.

The surgical burden and CC in rural and district hospitals of Malawi are large, but no study has been conducted to obtain in detail the reasons for such cancellations. In most of the studies conducted in other countries, similar reasons for case cancellations,e.g., unavailability of committed surgical staff, lack of surgical equipment, and lack of hospital space, were observed apart from a few that had unique reasons, such as cancellation of public patients rather than private patients and non patient turnover. In Malawi, only at the central hospital was a similar study conducted. Conducting this study at the district and rural hospitals of Malawi, where the most underprivileged and majority of the country's population lives, makes it a better way of understanding such reasons, and suggestions can be made for better surgical service delivery at such facilities [15-17].

Materials and Methods

This cross-sectional study involved both quantitative and qualitative data collection methods on factors impacting surgical patient waiting times and surgical case cancellations in Malawi district and rural hospitals. Data were collected using theatre, ward, and surgical booking registers. Surgical staff, including

nurses, clinicians, anesthetists, and administrative personnel, were interviewed. The primary objective was to obtain an in-depth understanding of why the booked surgeries were canceled out and not carried out as planned. This study was conducted at Nkhotakota District Hospital, one of the hospitals that serves the rural population in the central region of Malawi. The hospital serves a catchment area of 379,474 people with a bed capacity of 300. All cases/patients booked for surgery during the period of study (6 months), both males and females, were included. The study was carried out from 1 February 2019 to 31 July 2019 (6-month period) after obtaining ethical approval from COMREC (ref. P.01/19/2585). One site (Nkhotakota District Hospital) was selected and used as a source of data collection for the period of study. All cases booked for surgery during the period of study (6 months) were sampled, representing a 100% sample size. This was done using a purposive sampling method.

Retrospective data were collected from the theatre (anesthetist and clinical) and ward registers. A semi-structured questionnaire was used to interview administrative staff, surgical staff, ward nurses, and clinicians who were on duty the day prospective data were collected. Four questions were used to determine whether the theatre cancellation was due to administration, resources, surgical staff, facilities, or patients. The interview took at least 10 minutes for each staff member, and the consent was in English. No incentive was given for the interview conducted.

Data from the questionnaire and registers were kept in a lockable cabinet after entry into the Excel sheet. Data analysis was performed using Stata. We conducted a descriptive analysis of variables potentially associated with surgical case operations among the patients who were booked for surgery during the period of study. A multivariate analysis was performed using cox regression on the rate of operation by different categories, e.g., frequencies, rate ratios, proportions, Inter Quartile Ranges (IQRs), and 95% confidence intervals. This helped to determine the most common reason for surgical case cancellation, median waiting time, and age of the patients. The association between the variables (sex, age, specialty, and diagnosis) and outcome (operation) was assessed using rate ratios and 95% confidence intervals. A Kaplan–Meier survival estimate graph was used to estimate the time to case cancellation. Through Excel, graphs, tables, and pie charts were produced to present data for case cancellation by specialty and month and data on the reasons for case cancellation and their definitions. Through a generalized logit regression model, odds ratios were obtained to compare reasons for Nkhotakota District Hospital surgical list cancellation versus Kamuzu Central Hospital surgical list cancellation in Malawi [18-20].

Missing data were managed by the multiple imputation method, assuming that data were missing at random by imputing the missing number of procedures through the mean. For example, data for some gynecological cases were missing in the booking register for March, April, and May but were found in the theatre register. This was imputed by calculating the mean for the other months' surgical case data. We added up the data of booked cases for each month and divided by the total number of each surgical diagnosis (e.g., n=surgical cases+n=orthopedic cases+n=other cases divided by 3), and the answer was n=gynecological cases). n in this case was the total number of booked patients with that particular surgical specialty. This helped to avoid bias.

Results

Quantitative and qualitative data

During the period of data review (February to July 2019), 240 patients were booked for surgery (93 women and 147 men). Of these, approximately 49% (118/240) of patients were operated on. A total of 122 patients were canceled for reasons ranging from the administrative-surgical team and patient-related reasons, representing 51% (Figure 1).

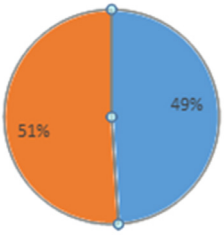

Figure 1. Proportion of surgical cases at Nkhotakota District Hospital during Feb-Jul 2019 (operated and canceled *vs.* total booked). **Note:** (■): Total cancelled; (■): Total operated.

The overall surgical case cancellation rate was highest for general surgery (60%), gynecology (25%), and other cases, e.g., small lipomas, abscesses, and infected wounds that required debridement and examination under anesthesia (15%). There were no cancellations for orthopedic cases because there were a few cases of such nature with 3 orthopedic clinicians available all the time (Figures 2 and 3). Data from booking, ward, and theatre registers indicated that many cancellations occurred in July 2019. During this month, most of the clinicians had gone on leave, and others were on circumcision campaigns. There were a few clinicians who performed elective procedures, explaining the reason for more case cancellations (Figure 4).

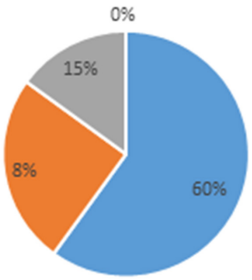

Figure 2. Surgical case cancellation rate by specialty at Nkhotakota District Hospital during Feb-Jul 2019. **Note:** (■): General surgery; (■): Gynacology; (■)-Other cases.

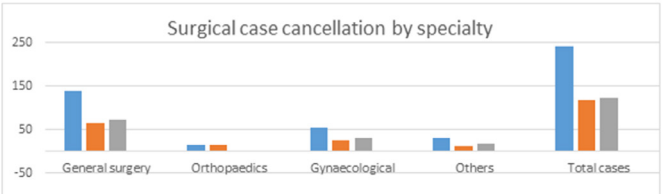

Figure 3. Surgical case booking, operation, and cancellation by specialty at Nkhotakota District Hospital. **Note:** (■): Total operated; (■): Total booked; (■)-Total cancelled.

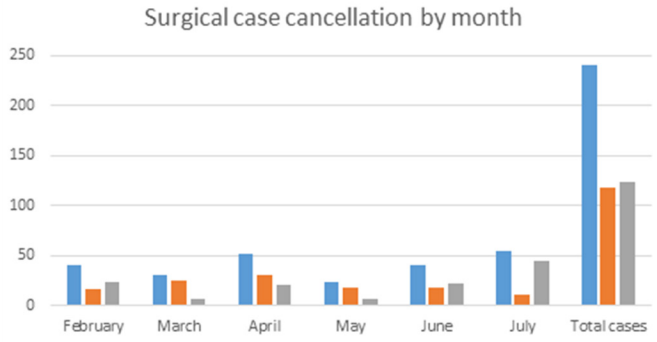

Figure 4. Surgical case booking, operation, and cancellation by month at Nkhotakota District Hospital. **Note:** (■): Total operated; (■): Total booked; (■)-Total cancelled.

In this study, there were 9 main reasons for cancellation of cases. Of these, hospital/administrative-related reasons accounted for 78% (7) of case cancellations, and patient-related causes accounted for 33% (3) of case cancellations. Hospital/administrative causes were as follows: Lack of motivation for surgical staff, inadequate surgical staff, lack of resources, e.g., anesthetic drugs, surgical sets, interrupted water supply, long theatre lists, interruption with emergency obstetric cases, and unplanned public holidays falling on a theatre day. Patient-related reasons were also found and included the following: Failure to turn up on the planned day of surgery and medical conditions such as hypertension, diabetes, and anemia requiring blood transfusion. Inadequate staff and patients not turning up for a scheduled procedure were the most common reasons for a canceled procedure. This was noted from the frequency table with a list of reasons for surgical case cancellation. Both occurred 35 times, with a 28.1% contribution to case cancellation (Table 1).

Table 1. Reasons for surgical case cancellation at Nkhotakota District Hospital.

Reason for case cancellation	Female	Male	Total
	N (%)	N (%)	N (%)
Absconded	2 (4.55)	5 (6.49)	7 (5.79)
Anemia	8 (18.18)	2 (2.6)	10 (8.26)
High Blood Pressure	1 (2.27)	5 (6.49)	6 (4.96)
Inadequate staff	1 1 (22.73)	24(31.17)	35 (28.1)
Interruption with emergency	3 (6.82)	2 (2.6)	5 (4.13)
Long theatre list	5 (11.36)	13(16.88)	18(14.88)
The patient did not show up	1 5 (33.09)	20(25.97)	35 (28.1)
Uncontrolled diabetes	0(0)	1(1.3)	1 (0.83)
referred to KCH	0(0)	5 (6.49)	5 (4.13)
Total	44 (100)	77(100)	122(100)

Regarding length of stay, 118 patients were operated on, with a total personal stay of 452 days. The minimum number of days of operation was one, and the maximum number was nine days. The median time from the scheduled day of admission to the operation was one day (IQR; 1-2 days) (Table 2). Using a Kaplan–Meier graph, it showed that patients stayed longer in the hospital after a canceled operation, but as days of hospital stay increased, the probability of being canceled from a surgical procedure decreased. At each drop of the graph, the chances of being canceled decreased (Figure 5). This provided an explanation for those patients with a medical condition requiring stabilization; as they improved, they were prioritized for the operation. Again, those that were canceled and remained in the hospital until the next theatre day were scheduled for operation. The median age for the patients was 34 years (IQR; 16.5-54 years) (Table 3).

Table 2. Analysis of time in days-Inter Quartile Ranges(IQR).

Percentage	Percentiles	Smallest	Largest
1%	1	1	-
5%	1	1	-
10%	1	1	-
25%	1	1	-
50%	1	-	-
75%	2	-	8
90%	4	-	9
95%	7	-	9
99%	9	-	9
Note: Obs-240; Sum of weight-240; Mean-1.883333; Standard deviation-1.71229; Variance-2.931939; Skewness-2.506887; Kurtosis-8.742893			

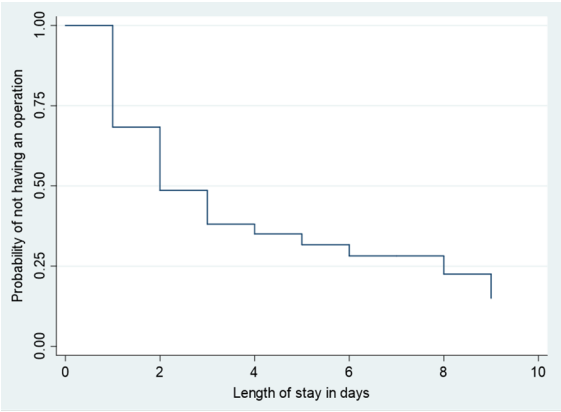

Figure 5. Length of hospital stay *vs.* probability of surgical case cancellation.

Table 3. Analysis of age for surgical patients-Inter Quartile Ranges(IQR).

Percentage	Percentiles	Smallest	Largest
1%	2	2	-
5%	4	2	-
10%	6	2	-
25%	16.5	2	-
50%	34	-	-
75%	54	-	79
90%	66.5	-	79
95%	70	-	86
99%	79	-	88
Note: Obs-240; Sum of weight-240; Mean-34.92917; Standard deviation-22.09506; Variance-488.1916; Skewness-2.606205; Kurtosis-1.976			

On determining factors associated with the operation, the sex and condition of the patient were significantly associated with undergoing the operation, (Risk Ration) RR>1 and P value <0.05. Regarding sex, males were less likely to be operated on than females (RR<0.54, 95% (Confidence Interval) CI (0.33-0.89) and p-value 0.02). Patients aged >30 years had a reduced rate of surgical case operations based on personal days (240.16, RR 0.94, 95% CI (0.62-1.42) and P value 0.76), which explains the higher number of cancellations in older patients than in younger patients. The main reason for fewer cancellations in those younger than 30 years was that most of this age group did not miss an appointment, unlike the older group. Again, priorities for surgery were given to the below-30 age group. Another reason was that most of those patients older than 30 years had other medical conditions that were a contraindication to a surgical procedure.

We observed confounding in sex, specialty, and some diagnoses, with the rate ratio changing by greater than 10%. On comparing reasons for district and central hospital surgical case cancellation based on infrastructural, staffing, and patient reasons, we found that district hospitals were less likely to experience case cancellation due to infrastructural reasons than central hospital (Table 4), (odds of case cancellation due to infrastructure compared to patient reasons), P value 0.01, 95% CI (0.002-0.040). There was no significant difference between staffing and patient reasons at the district and central hospitals (p-value 1.425, 95% CI 0.985-2.060).

Table 4. Comparing reasons for surgical case cancellation at KK Hospital and KCH.

Reasons for cancellation	Nkhotakota district Hospital	Kamuzu central hospital
Infrastructure	2	3746
staffing-(surgeons, nurses and anesthetists)	57	727
Patient factors	64	1163

Qualitative data were collected through a questionnaire administered to surgical, ward, and administrative staff as follows.

a. The most commonly performed procedures at the district and rural hospitals and estimated the average waiting time taken to procedure or cancel.
b. Detailed definitions of patient-related reasons for scheduled surgical case cancellation at Nkhotakota District Hospital
c. Detailed definition of hospital-related (surgical staff, administrative, resources, facilities) reasons for scheduled surgical case cancellation at Nkhotakota District Hospital

During the period of data collection, 10 surgical staff were interviewed (4 nurses, 3 clinicians, 1 anesthetist, 1 orthopedic clinician, and 1 administrative staff) on reasons for theatre list cancellation and longer patient waiting time. The most commonly mentioned reasons among the interviewed staff were a shortage of staff and a lack of motivation for the surgical team by management. There were a few patient-related reasons, such as patients with conditions such as high blood pressure, diabetes, and anemia, not showing up on a surgical day, and absconding.

Discussion

There is global momentum toward recognizing and addressing the challenges faced by surgical care providers in LMICs [21,22]. This research is in line with these global initiatives, and it provides a new perspective on perceived barriers to surgery at rural district hospitals by eliciting the views of the cadre directly responsible for clinical services. In doing so, this paper complements and enriches the evidence provided by other studies on surgical case cancellation and longer waiting times.

Elective surgical operations require a multidisciplinary approach between the surgical team, hospital staff, and hospital administration. Case cancellations on the day of surgery lead to underuse of operating theatres, increased waiting period for the patients, frustration and mental stress to the patients and their families, and increases in the cost and wastage of hospital consumables [9,19,23]. The incidence has been reported in literature ranging from 20% to 40% [8,19,24]. In our study, we had a case cancellation rate of 51%, which is very high compared to other studies reported from most developing countries [8]. More effort is needed to improve surgical case performance at the district hospital. Nkhotakota District Hospital, which serves a catchment area of 379,474 with a 300-bed capacity, has 3 anesthetists out of the required 8 for the district hospital and two theatre nurses to assist with both elective and emergency procedures. Most of the surgeries at the hospital are performed by general clinical officers, and only 6 are dedicated to work on different theatre days depending on their work schedule. Once in a while, the hospital is visited by Kamuzu Central Hospital surgical team with a specialist, but this does not solve the issue of case cancellations because most of the time, the team stays 2-3 days and leaves the hospital with an insufficient surgical team. Frequent visits by surgical specialists to the district hospital would have at least helped in motivating the district team, leading to more surgeries performed on a particular scheduled day [25-27].

Hospital administration plays a crucial role in supporting surgical service provision in all health facilities in Malawi. Cancellations of elective operations due to lack of motivation to surgical staff, inadequate surgical staff, lack of resources (e.g., essential anesthetic drugs and surgical sets), unpaid bills that lead to interrupted water supply, and limited theater space were purely administrative [8]. A lack of prioritization of needs for the hospital leads to fewer resources (supplies and equipment) for surgical use. The hospital administration needs to prioritize resources essential for theatre use and the recruitment of specialized clinical officers and nurses to support surgical service delivery. In a study conducted at Kamuzu Central Hospital, a tertiary hospital in Malawi, the main reason for surgical cases was primarily due to infrastructural limitations (84.8%), including equipment shortages (50.9%) and time constraints (33.3%). Provider limitations accounted for 16.5% of cancellations, most often due to shortages of anesthesia providers. Preoperative medical conditions contributed to 26.3% of cancellations [6]. In our study, there were 9 main reasons for the cancellation of surgical cases. Of these, hospital/administrative-related reasons accounted for 78% (7) of case cancellations, and patient-related causes accounted for 33% (3) of case cancellations. Hospital/administrative causes were as follows: Lof motivation for surgical staff, inadequate surgical staff, lack of resources, e.g., anesthetic drugs, surgical sets, interrupted water supply, long theatre lists, interruption with emergency obstetric cases, and unplanned public holidays falling on a theatre day. Patient-related reasons were also detected and included: Failure to turn up on the planned day of surgery and medical conditions such as hypertension, diabetes, and anemia requiring blood transfusion [28-31]. On comparing infrastructural and patient reasons at Nkhotakota Hospital and Kamuzu Central Hospital, Nkhotakota Hospital was less likely to be affected by infrastructure than Kamuzu Central Hospital. There was no significant difference in staffing to patient reasons

between Nkhotakota and Kamuzu Central Hospital. This provided evidence that investments in medical infrastructure, surgical staff, supplies, and equipment are critical at all levels of surgical service delivery in Malawi.

Conclusion

The main reasons for theater cancellation that were found in this study were avoidable. Reasons such as inadequate surgical staff, lack of motivation for surgical staff by hospital management and patients not turning up on the day of surgery could be overcome with collective effort by both the administration and surgical staff. In conclusion, patients who had a delayed surgical procedure waited on average for 5 days more than those who attended as requested (stayed for 2 days on average before the procedure was performed). This study highlights that most causes of cancellation of operations at the district and rural hospitals of Malawi are avoidable. As such, efforts should be made to prevent the cancellation of surgery by careful planning, bearing in mind the local constraints on human and material resources. The Operation Theatre (OT) list should be made judiciously to avoid under or overutilization of OT facilities. Staff motivation by hospital management's concern or interest in surgical activities is of paramount importance. Most of the interviewed hospital staff testified that very long ago when the hospital was newly built, the theatre staff were provided with nice meals as lunch for that particular theatre day so that the theatre services were not interrupted. Staff were taking meals right in the theatre such that after taking lunch, services were continued until the knocking-off time. Unlike these days when they are not provided with food or at times given food which is not all that appetizing, they prefer breaking at lunch and coming back for continuation of the services which truly interrupted the whole theatre list/day resulting in cancellation of the theatre list due to time wasted in trying to get lunch in their different homes.

Again, when theatre equipment, e.g., theatre clothes and sets, were worn out or in case of malfunctioning theatre equipment, the management would never take serious action to deal with the challenge that needed immediate intervention. Another theatre staff explained that he would truly be happy to have the management team conduct monthly meetings with the theatre staff to get to the real in-depth of the challenges being faced in their day-to-day operations and discuss possible solutions. None of the theatre staff demanded money for an operation done within the normal working days but explained that for the theatre days that fall on a public holiday, they wished they were working despite having the holiday but being considered as overtime that could be paid for. Mostly during public holidays, elective surgical procedures were canceled until the next normal working day.

The requirement of the instruments/drugs/other equipment necessary for the scheduled surgical list must be discussed among the surgeon, staff nurse, and anesthetist a day before the planned OT list. Both anesthetic and surgical preoperative assessments should be performed promptly, on admission to the outpatient department and a day before the operation. In this case, medical problems can be identified in time, and the number of cancellations on medical grounds can be avoided by establishing a formal liaison with the clinicians and by improving communication between patients, clinicians, and nurses.

Limitations

This study had some limitations that might have altered the results. Most of the respondents for the questionnaire were health workers involved in conducting surgeries, unlike administrative workers, who had only one respondent, which could give biased information. Poor documentation was seen as a major limitation in this study. There was no proper documentation of the date of the procedure in the register, and some surgical cases that were not found in the booking register were found to have been operated on in the theatre register. However, this was managed by the imputation method through mean calculation. Again, it was very difficult to administer the questionnaire to administrative staff, and they continued to refer the interviewer from one person to another, which made it very difficult to determine the real person positioned to respond to the questionnaire. In the end, the interviewer managed to interview an officer who had both administrative and medical roles.

Recommendations

District and rural hospital management need to realize that surgical staff motivation is of paramount importance and another long-lasting solution for prioritizing the recruitment of more surgical staff depending on the availability of funding. To prevent cases of missing data, the Malawi Ministry of Health needs to incorporate a section in the theatre register that will track data for surgical cases that have been canceled for that particular day and state the reasons for cancellation. Again, the booking register should be properly kept and followed on the day of the procedure so that the surgical team tracks the total number of patients booked against the number operated on that particular day. The hospital management should

provide airtime for surgical staff to follow up on patients who did not turn up for a scheduled day of operation.

The Ministry of Health should also introduce an electronic data-capturing system that will track data for booked surgical patients, operated cases, canceled cases, and the reasons for cancellations. With this, decisions will be made accordingly, e.g., if the reasons for many cancellations were inadequate surgical staff, the MOH will be able to prioritize employing skilled surgical staff to support surgical services or institute a strong central surgical team to visit the district and rural hospitals frequently every two weeks to track surgical data and support accordingly.

Declarations

Ethics approval and consent to participate

In this study, the informed consent documents, patient information sheets, and hospital staff questionnaires were reviewed and approved by the College of Medicine Research Ethics Committee (COMREC, Malawi, ref. P.01/19/2585). All participants voluntarily participated in the study after signing an informed consent form.

Consent for publication

Not applicable.

Availability of data materials

Available in a supplementary file.

Competing interests

The authors declare that they have no competing interests.

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