

## Economic and psychological burden of scheduled surgery cancellation in a sub-Saharan country (Burkina Faso)

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**Background:** Cancellation of scheduled surgery creates a financial burden for hospitals, caregivers and patients. Cancellation causes emotional stress, which impacts on outcomes. In poor countries where the adequacy of healthcare is limited, the ethical dilemma created by scheduled surgery cancellation is particularly important.

**Objective:** To identify the incidence, cost and emotional impact of elective surgical cancellation in a teaching hospital in Burkina Faso.

**Methods:** A four month, prospective, observational study was undertaken in a teaching hospital (Yalgado Ouedraogo). All surgical patients were eligible. The causes of cancellation, financial cost and patients' emotional response were assessed. The cost was estimated using a tool adapted for the economic cost of African job types.

**Results:** During the study period, 1 088 cases were scheduled to undergo inpatient surgery. Of these, 239 cases (21.9%) were cancelled. Among the cancelled cases, 237 were cancelled during preparation in the surgical ward and two cases were cancelled in the operation room. A large number of the patients were housewives ( $n = 87$ ). The highest cancellation rate (35.9%) was found in general surgery. Cancellation was judged avoidable in 214 cases (89.5%). The total cost of surgery cancellation to the hospital was US\$ 19 147 (mean value US\$ 80 per patient). Patients lost a mean of US\$ 62.70, which represented 117.6% of the official average monthly income in Burkina Faso. ENT surgery was the costliest to the hospital (US\$ 4 989). Cancellation caused a negative emotional reaction in 205 patients (85.7%) and 'sadness' was the most frequent (54.8%;  $n = 131$ ). Cancellation resulted in 163 days of work lost.

**Conclusion:** Based on income, the cost of day of surgery cancellation was high in Burkina Faso.

**Keywords:** cost, emotional reaction, psychology, surgery cancellation

### Introduction

The operating theatre is a hospital's largest cost centre and source of income. It is a vital facility that uses a considerable portion of the hospital's budget. Day-of-surgery cancellation (DOSC) remains an indicator of quality of care and management.<sup>1</sup> DOSC causes an inefficient use of the operating theatre, and is a waste of time and resources for patients and their families.<sup>2</sup> It increases healthcare costs, and results in theatre inefficiency and financial loss, lost personal income<sup>3</sup> and emotional distress for patients. The DOSC rate ranges from 1.96% to 36.4% for numerous reasons.<sup>4,5</sup> As an indicator of quality of care, a surgical cancellation rate of less than 5% is recommended.<sup>6</sup> Surgical cancellations decrease hospital income, and are costly to patients in terms of lost productivity and emotional distress. DOSC is a well-recognised quality problem and reflects inefficiency in management. High cancellation rates may indicate that rare health resources are being used ineffectively, thereby increasing costs. There are many reasons for surgery cancellation including medical-related, administrative, financial and patient-related causes.<sup>7</sup> Studies have indicated a high frequency of cancelling, due to organisational problems in health institutions, including a lack of beds,<sup>8,9</sup> scheduling errors, communication errors<sup>8,10</sup> and other administrative problems. Some of these cancellations are

however avoidable. In Brasil, DOSC costs US\$ 3 466.70 over three months, at an average of US\$ 9.5 per patient.<sup>2</sup> In Iran, Maimaiti *et al.*<sup>11</sup> found that the total cost of surgery cancellation was US\$ 92 049.0. Cost was frequently evaluated using different tools according to the hospital concerned and the level of the country's development. DOSC has longer term negative emotional effects on the patient,<sup>12</sup> which include anxiety and depression after hospital discharge.<sup>13</sup> In Burkina Faso, Lankoandé *et al.*<sup>14</sup> (2016) reported that 36.9% of scheduled surgery was cancelled and most (68.5%) cancellations were avoidable. In developing countries, where healthcare resources are limited, good management of surgical cases needs to be implemented. The focus on the economic component of surgical cancellation is important to understand the impact on both the hospital and the patient. This study aimed to estimate costs, loss of working days and the patients' emotional responses after DOSC in Yalgado Ouedraogo Hospital (YOH).

### Patients and methods

#### Study design and setting

A prospective, observational, hospital-based study was conducted in the teaching hospital Yalgado Ouedraogo (YOH)

between March 1 and June 30, 2016. YOH is a tertiary care, governmental hospital, with a capacity of 800 beds for inpatients. There are 13 operating theatres, allocated as followed: four operating theatres in general and urologic surgery (G&US), two in trauma and orthopaedic surgery (T&OS), one in ear, nose and throat surgery (ENT), three in gynaecology and obstetrics surgery (GOS), one in ophthalmology (OS), one in maxillofacial surgery (MFS) and one in neurosurgery (NS).

### Patients

The study included all surgical patients, of all ages, scheduled for surgical procedures at YOH. Patients who refused to be part of the study were excluded. Consent for participation in the study was obtained prior to the patient entering an operating theatre. A scheduled surgical procedure was considered cancelled when a patient's name had appeared on the list for surgical operations but the operation was not performed on the scheduled date.<sup>15</sup> Cancellations were further classified as avoidable or unavoidable. 'Avoidable' was defined as a cancellation due to circumstances or information that existed prior to the day of surgery and could have been avoided with adequate review or communication by the medical staff before the DOS. 'Unavoidable' cancellations were defined as those cancellations that could not have been avoided even with adequate review of the patients' medical records or communication before the DOS.

Patients were scheduled by the surgeon after confirming diagnosis, indication and pre-anaesthetic evaluation. Each patient was informed orally about the diagnosis, and type and date of operation. The operating list was agreed upon and approved by surgeons in each service before being sent to the operating theatre manager a week before surgery. If necessary, booked patients are requested to come in two days before the scheduled surgery date for preoperative blood-work up preparation. Most patients are usually admitted to the surgical wards one day before surgery. The list of scheduled patients, their phone number by specialty and operating theatre were available on the day before surgery.

### Study process, tools and data

Demographic data, type of surgery, number and reasons for cancellation, generated cost, loss of working days and emotional reaction were assessed. Patients who had their surgery cancelled were requested to express their emotional response regarding surgical cancellation and to state the number of surgeries that had been previously cancelled. When possible, the investigator was present at the time the patient was informed of the surgical cancellation, to assess the patient's immediate emotional response. When the investigator could not be present at the time of the announcement of the cancellation, the patient's emotional response was assessed as soon as possible prior to discharge. The emotional response was assessed by; (i) the patient's spontaneous reaction and oral response to the cancellation when notified, and then (ii) the investigator asked the patient to express orally her/his mood regarding the cancellation. The investigator was guided by a psychiatrist working in this hospital for the definition of an emotional state. A particular emotional state tool was not used for evaluation. The question 'How do you feel about your surgery cancellation?' was addressed to all patients. The verbal responses were recorded and then qualified as a negative, positive or indifferent reaction. An emotional reaction was defined as 'negative' when the mood expressed was 'disagreeable' or 'disliked'. The reaction was judged 'positive'

when expressing 'good' or 'useful' and 'optimistic'. An indifferent reaction was a reaction expressing 'neither good nor bad'. Patients were asked to assess the costs incurred by cancellation (drugs, consultations, laboratory investigations, travel, communication, personal or family loss of income). After the patient's discharge from hospital they were contacted by phone (if a 'definitive' cancellation) or during an appointment (if a 'postponed case') to evaluate costs related to cancellation. A 'definitive' cancellation is when surgery was cancelled and would not be scheduled for another day. A cancellation was defined as 'postponed' when surgery was to be rescheduled.

In Africa many people work in the informal sector. In order to adapt costs according to the type of job we used the economic cost estimation method of Guiguemdé *et al*<sup>16</sup> This method was adapted and validated considering African job types. The method was first used to evaluate the financial cost (direct and indirect costs) borne by patients and their caregivers due to malaria in a medico-economic study. In this study, the indirect cost to patients and their caregivers was evaluated considering the type of job, age and the period of activity.

The economic cost (EC) = direct cost (DC) + indirect cost (IC). Direct cost includes medical consultation (MC), examination cost (EC), medicines cost (DC), hospitalisation cost (CH) and travelling cost (TC).  $DC = (MC + EC + DC + TC + CH) \times M$  (M = number of patients). The indirect cost includes loss of productivity by the patient and/or everyone who needs to attend to the patient's recovery. For the indirect cost (IC), the age, profession, professional activity period, professional activity level, cancellation time, professional invalidity time, income, and percentage of income lost by the patient were assessed. Farmers' activity period corresponds to the rainy season accounting for six months and for others (storekeeper, artisan) the activity period is permanent with an economic income over 12 months. In rural areas, professional activities are familial and members of the family are of differing ages, thus do not have the same ability to work, which allows one to define a 'Potent Equivalent' (PE) according to Guiguemdé. The PE measures the capability of a person to undertake agricultural activity (AA) on a scale of 0 to 1, with 0 PE for those less than 6 years old (0% of AA), 0.5 PE for those from 6 to 15 years old (50% AA) and 1 PE for those 15 to 50 years old (100% of AA). When surgery cancellation was outside the rainy season there was no economic loss for farmers. In Burkina Faso, the mean annual income was \$440 for farmers, \$480 for artisans and \$560 for stockbreeder<sup>17</sup> for 1 PE. The percentage of income lost is the percentage of lost activity during the productive period.  $PEL = (MLD/DPAP) \times 100$  (PEL: percentage of economic loss; MLDP: mean length of disability period; DPAP: duration of professional activity period). Duration of the DPAP was 180 days for farmers and 365 days for other professions. Indirect cost (IC) =  $EPL \times Mi \times Ni / 100$  ( $Mi$  = mean income for 1 PE; EPL: economic percentage loss;  $Ni$  = Patient's PE professional estimate). Job absenteeism (n) was defined as the number of work days lost in a week due to organisation for surgery.  $N = 5 \text{ days/week} \times N \times P_1 \times P_2$  ( $n$  = number of work days lost,  $N$  = number of patients cancelled,  $P_1$  = number of patients who have a job among patients cancelled,  $P_2$  = percentage of absenteeism due to cancellation).

On the day before surgery, inpatients were met in their ward and were informed about the goal of the study. They received a consent form to complete and sign. Outpatients were met on the

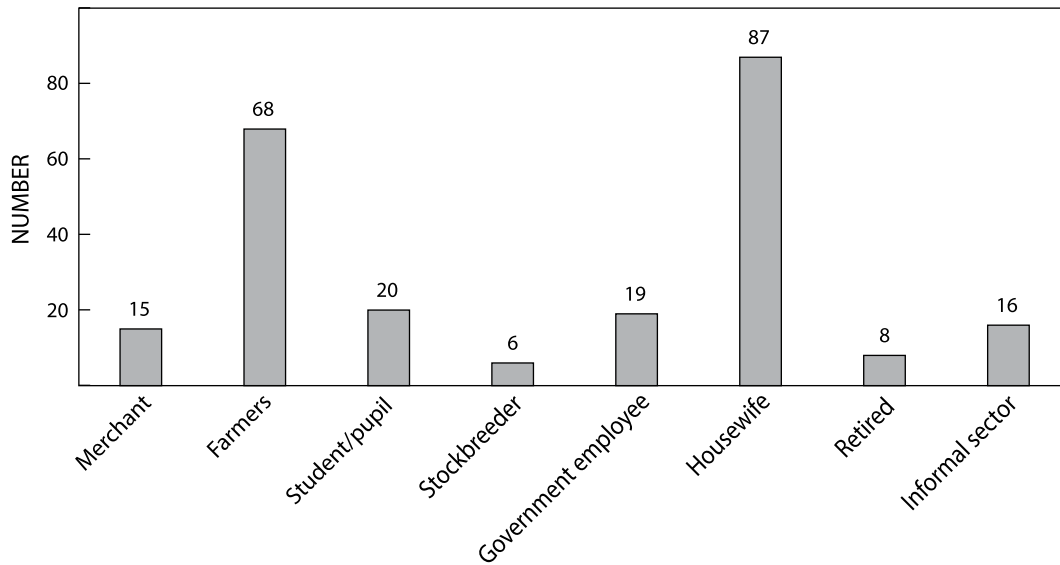


Figure 1: Professional status of patients ( $n = 239$ ).

day of surgery before entry into the operating theatre and completed the consent form at that point. Data were kept confidential and patient anonymity respected. Ethical approval to conduct the study was obtained from National Center of Scientific Research and Technology (NCSRT BFA 000223/16) committee.

#### Data analysis

Data were analysed with EpiInfo® version 7.5.1 (CDC, Atlanta, GA, USA) by a statistician. Nominal, non-continuous data were reported as frequency and percentages. Financial cost and other quantitative variables were expressed as mean values. The emotional state was expressed in frequency and percentage. A relationship analysis between variables was not performed in our study.

#### Results

In total 1 088 surgeries were scheduled during the period, of which 239 (21.9%) were cancelled on the day of surgery. These included 125 males and 114 females. The mean age of the patients was  $37.1 \pm 20.6$  years. The professions were predominantly housewives ( $n = 87$ ) or farmers ( $n = 68$ ) (Figure 1).

Among cancelled surgeries, 42 (17.6%) were inpatients and 197 (82.4%) outpatients. According to surgery specialty, the highest rate of cancellation was general surgery (35.9%), followed by ENT surgery (30.5%) (Table 1).

DOS cancellation was avoidable in 89.5% ( $n = 214$ ). No-shows ( $n = 57$ ; 23.8%) and operating theatre dysfunction ( $n = 45$ ; 18.8%) were the main avoidable causes. The main reasons ( $n = 77$ ; 35.9%) were patient related or due to administrative reasons ( $n = 60$ ; 28%). The reasons for cancellation are summarised in Table 2.

Patients reported surgery been cancelled once (90.4%), twice (7.5%) or three times (2.1%). Cancellation was a postponement in 140 cases (58.6%) and a definitive cancellation in 99 cases (41.4%). The mean duration between cancellation and the next operation was 18.8 days. DOS cancellation cost the hospital US\$ 19 147 with a mean value of US\$  $80 \pm 48.3$  per patient. This cost was related to surgery cancelled and not rebooked. Patients lost in total US\$ 14 999.90 with a mean value of US\$  $62.70 \pm 71.1$  per patient. It was found ENT surgery to be the most expensive, which cost US\$ 4 990 for all cancelled cases; followed by T&OS (US\$ 3 039). The least costly cancellation was in ophthalmologic surgery (US\$ 757). Table 3 describes the costs of surgical cancellations.

Table 1: Number of performed and cancelled surgeries ( $n = 239$ )

Specialty	Scheduled, $n$	Performed, $n$ (%)	Cancelled operations		
			Specialty, $n$ (%)	Percentage of scheduled	Overall rate
G&DS <sup>a</sup>	128	82 (64.06)	46 (35.9)	4.2	19.2
MFS <sup>b</sup>	82	65 (79.3)	17 (20.7)	1.56	7.11
OB/GYN <sup>c</sup>	234	199 (85.04)	35 (14.9)	3.21	14.6
NS <sup>d</sup>	92	82 (89.1)	10 (10.8)	1	0.4
OS <sup>e</sup>	105	85 (80.9)	20 (19.05)	1.83	8.36
ENTS <sup>f</sup>	187	130 (69.5)	57 (30.5)	5.23	23.8
T&OS <sup>g</sup>	172	140 (81.4)	32 (18.6)	2.94	13.4
US <sup>h</sup>	88	66 (75)	22 (25)	2.02	9.2
Total	1088	849 (78.0)	239 (21.9)	21.97	100

<sup>a</sup>G&DS = General and Digestive Surgery; <sup>b</sup>MFS = Maxillo Facial Surgery; <sup>c</sup>OB/GYN = Obstetrics/Gynaecology; <sup>d</sup>NS = Neurosurgery; <sup>e</sup>OS = Ophthalmology; <sup>f</sup>ENTS = Ear, Nose, and Throat; <sup>g</sup>T&OS = Trauma and Orthopaedic Surgery; <sup>h</sup>US = Urologic Surgery.

Table 2: Reasons for surgery cancellation (n = 239)

Factor	Characteristics	Nature	Number	Percentage	
Reasons	Avoidable, n = 214	Patient no-shows	57	23.8	
		Operating room dysfunction	45	18.8	
		Surgeon not available (travel)	38	15.9	
		Lack of anaesthetic staff	20	8.4	
		Patient not pay surgery fees	12	5.0	
		Patient did not follow instructions	7	3.5	
		Lack of surgery materials	7	2.9	
		Patient refused surgery	4	1.7	
		Pre-anaesthetic evaluation not done	4	1.7	
		Lack of blood	4	1.6	
		No beds available	3	1.3	
		Change in treatment plan	3	1.3	
		Error of blood cross-matching	1	0.4	
		Intravenous access failure	1	0.4	
		Lack of paediatric anaesthetic equipment	1	0.4	
		Intubation failure	1	0.4	
		Improved patient condition	1	0.4	
		Unavoidable, n = 25	Medical cause (sepsis)	23	9.6
			Long turnover time from previous surgery	1	0.4
			Patient deceased	1	0.4
Total			239	100	
Responsibility		Administration related	60	28	
		Patient related	77	35.9	
		Acute medical conditions related	65	30.3	
		Caregiver related	12	5.6	
Total			214	100	

Cancellation caused negative emotional reactions in 205 patients (85.7%) and the main negative reaction was ‘sadness’ (54.8%) (Figure 2).

The patient’s reactions are described in Table 4. Cancellation also caused absenteeism from the workplace. Seventeen patients (P<sub>1</sub> = 7.1%) were employed and these patients lost 163 days of work. These 163 days lost represented 68% of working patients.

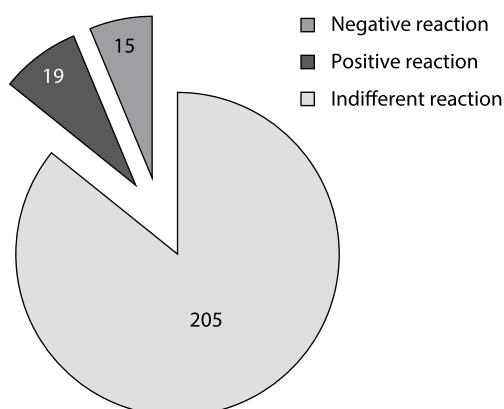


Figure 2: Patients' emotional reaction to cancellation (n = 239).

### Discussion

DOS cancellation is a worldwide problem. Optimisation of theatre throughput efficiency starts with careful booking of the operating list. Elective surgical operations require a major organisational effort between the surgical team, theatre staff and hospital administration. This prospective study investigated surgery cancellations in a Burkina Faso general hospital. The incidence of elective surgical cancellations has been reported in the literature to range from 1.87% to 40%.<sup>1,11,18</sup> The total cancellation rate was 21.9% in our study, comparable to the rate found by Chaylia *et al.*<sup>18</sup> in Tanzania, which was 21%. The high rate of cancellation in our study may be partly due to including all surgical specialties. In Australia, Hana *et al.* reported a DOS cancellation rate of around 7.2%.<sup>19</sup> In Oman, Sivasubramanian *et al.*<sup>20</sup> reported 26% and Ojo *et al.*<sup>21</sup> in Nigeria found 28.5%. In our study, patients did not have documentation containing information related to the scheduled surgery while in developed countries patients often do have one. The best possible organisation, availability of resources and healthcare assurances are reasons that make the management of scheduled surgery better in developed countries. The highest percentage of cancellation was in the G&D (general and digestive) surgery 35.9% followed by ENT surgery (30.5%). In Sudan, Mutwali *et al.*<sup>22</sup> found the highest percentage of cancellations in NS 27.5% followed by plastic surgery (27.4%). General surgery had the highest number of cases scheduled for operation at 2 196 (30.1%) followed by orthopaedics at 1 812 (25%) in India.<sup>23</sup> The DOS cancellation rate according to specialty varied in the literature.<sup>1, 5, 11, 22-24</sup>

Table 3: Cost incurred by surgery cancellation ( $n = 239$ )

Financial cost	Type of cost	Mean cost per patient (US\$)	Min/Max costs (US\$)	Overall cost (US\$)
General cost	Indirect cost	8.8 ± 47.8	0/680	2 102.4
	Drugs cost	18.4 ± 33.7	0/340	4 397.7
	Hospitalisation cost	2.02 ± 6.8	0/53.55	483.85
	Consultations cost	2.72 ± 8.4	0/85	649.4
	Examinations cost	23.4 ± 28.3	0/144.5	5 593.3
	Travel cost	7.4 ± 9.7	0/42.5	1 772.3
	Overall cost	62.7 ± 71.1		14 990.9
	Cost by job	Housewife	115.03 ± 68	3.4/318.7
Farmer		149.6 ± 80.2	34.8/390.1	10 177.3
Merchant		155.2 ± 190	8.11/796.5	2 328.5
Student/pupil		151.1 ± 73.6	40.5/291.1	3 022.7
Government employee		157.57 ± 100.6	39.7/474.5	2 836.3
Retired		113.17 ± 35.4	87.1/184.1	905.3
Other or informal job		141.56 ± 86.4	36.01/327.6	2 265.
Stockbreeder		153.6 ± 84.3	84.7/314.5	921.6
Cost by surgical speciality		G&DS	38.5 ± 39.6	3.1/213.6
	MFS	62.9 ± 54.5	1.3/132.7	1 069.3
	OB/GYN	36.3 ± 39.4	0.1/147.5	1 270.8
	NS	93.7 ± 119	2.4/97.6	937.4
	OS	30.3 ± 60.3	0.8/226.1	606.4
	ENTS	84.7 ± 41.1	5.1/173.4	4 829.5
	T&OS	94.9 ± 129.4	3.4/727.6	3 038.9
	US	66.7 ± 62	2/236.3	1 468

Notes: G&DS = General and Digestive Surgery; US = Urologic Surgery; OB/GYN = Obstetrics/Gynaecology; OS = Ophthalmologic Surgery; MFS = Maxillo Facial Surgery; NS = Neurosurgery; ENT = Ear, Nose, and Throat Surgery.

In our study, the majority (89.5%) of cancelled surgeries were avoidable. This rate is comparable to the literature findings in Karddoun<sup>1</sup> (71.6%). The majority of cancellations were preventable (93.8%) in Tanzania<sup>18</sup> and (62.1%) Iran.<sup>11</sup> In a high-income environment, studies have shown that more cancellations were unavoidable.<sup>25</sup> The reasons that contribute to the majority of the avoidable DOS cancellations are no financial clearance, incomplete medical evaluation, patients not presenting for surgery, operating theatre behind schedule and bed unavailability. In our study patient-related causes accounted for 35.9% followed by medical causes (30.3%). Mutwali *et al.*<sup>22</sup> found that 68.3% were patient-related and then anaesthesia decisions (33.3%). Other authors<sup>1,26,27</sup> found that work-up and/or medical issues were the most common causes for DOS cancellation.

There are many tools and process to evaluate healthcare costs. Tools or methods may include direct and indirect costs. There are four approaches to measure the cost of illness: the Human Capital Method (HCM), the Willingness to Pay Model (WPM), the Production Function (PF) approach and the Friction Cost Method (FCM).<sup>28</sup> These tools are validated and can be used worldwide.

Table 4: Patient response to the question 'How do you feel regarding your surgery cancellation?' ( $n = 239$ )

Patient responses and emotional state	Number	Percentage
<i>Patient oral response to question:</i>		
I am sad	118	49.4
I am angry	40	16.7
I understand and tolerate physicians	19	7.9
I am indifferent; physicians know their job	15	6.3
I am angry and sad	11	4.6
I am discouraged	9	3.8
I understand but I am stressed	8	3.4
I am disappointed	7	2.9
I am stressed	3	1.3
I am angry and stressed	3	1.3
I am angry and have chagrin	2	0.8
I am angry and feel frustrated	2	0.8
I am discouraged and stressed	1	0.4
<i>Physical signs observed in patient</i>		
Patient was weeping	1	0.4
Total	239	100

The first two are the classic methods deriving from the 1960s. With the exception of the last tool, they all assess the cost of illness to an individual as well as to society. The following summary will focus specifically on the aspects related to patient costs and disregard some of the aspects mentioned in the literature regarding macroeconomic measurements of the cost to society. These tools have limitations; HCM does not capture labour substitution by family members, foregone household activities and leisure time. WPM is subject to personal interpretations of questions and social desirability bias in answering, and FCM and PF do not take consider objective data. In developed countries, technology allows a clear, easy and quick evaluation of cost. In our study, we used a tool developed by Guiguemdé *et al.*<sup>16</sup> This tool takes into account the nature of the job, the subject's age and the period of activities. It is not a validated tool with internal consistency and reliability. In Iran, Maimaini *et al.*<sup>11</sup> calculated costs from hospital bills. In the literature some authors<sup>29</sup> estimated cost by using financial prediction. In Brasil, Perroca *et al.*<sup>2</sup> used bills, factory prices, salaries, vacation salary and taxes to estimate cost. Due to the limited technology in Burkina Faso, we used the tool created by Guiguemdé *et al.*<sup>16</sup>

Cost containment through effective and efficient utilisation of resources has become a necessary part of healthcare delivery worldwide. During our study, cancellations cost the hospital US\$ 19 147 with a mean value of US\$ 80 ± 48.30 per patient. This cost was very high in terms of the size of the hospital. Maimaiti *et al.*<sup>11</sup> found a total cost for all surgery cancellations to be around US\$ 92 049 with an average cost of US\$ 336 per cancelled surgery. In Brasil Perroca *et al.*<sup>2</sup> found a total cost of US\$ 3 466.70 with an average cost of US\$ 9.50 per patient. Our results showed that the most expensive cancellation to the hospital was ENT procedures (US\$ 4 830) for all cancelled cases followed by T&OS (US\$ 3 039). Some surgeries therefore cost more than others to cancel. Specifically, Maimaiti *et al.*<sup>11</sup> found that the costliest was neurosurgery procedures (US\$ 619) and the least costly was ENT procedures (US\$ 215).

In total, patients lost US\$ 14 991 (mean US\$ 62.70 ± 71.10 per patient) in our study. Maimaiti *et al.*<sup>11</sup> found an average cost per surgery cancellation of approximately US\$ 336. This study found that farmers had the highest financial loss with a mean value of US\$ 1 150 ± 80.20 per patient followed by government employees (US\$ 158 ± 100.60). There is a lack of data on surgery cancellation costs in the literature. In many studies, cost was evaluated by using the hospital financial or insurance data. In Burkina Faso, technology is still undeveloped and health insurance measures are performed only in private hospitals. In fact, the real impact of cancellation must consider income according to the job. Surgery cancellation would then cost farmers US\$ 149.60, accounting for 34% of their annual income, and stockbreeders US\$ 153.60, accounting for 27.4% of their annual income. In Burkina Faso, the mean monthly income is US\$ 53.30.<sup>30</sup> In our study patients lost a mean of US\$ 62.70, which represented 117.6% of an official monthly income in Burkina Faso.

In our study, total direct costs were US\$ 12 889 with a mean value of US\$ 53.90 per patient. The total indirect cost was US\$ 2 102 with a mean value of US\$ 8.80 ± 47.80 per patient. In Iran<sup>11</sup> the direct cost was about US\$ 75 301 with an average cost of US\$ 274 per patient. Direct cost was cost related to lab tests, medicines, communication and travel while indirect costs were related to loss of income. In our study, avoidable cancellation represented 89.5% costing US\$7 425 or 49.5% of total cost. In the study of Maimaiti *et al.*<sup>11</sup> 20.5% was judged unavoidable at a cost of US\$ 16 017. The majority of causes were avoidable according to the literature, and good planning can reduce costs.

In our study 205 (85.7%) reacted negatively to cancellation. Ivarsson *et al.*<sup>31</sup> found that 71 (61%) patients reacted negatively and organisational reasons were the most stressful. Sadness (49.4%) and anger (16.7%) were the main emotions stated in relation to cancellation. Acharya *et al.*<sup>32</sup> found anger in 19.5%, frustration in 56.1%, and anxiety in 51.2%. In a prospective control study, cancelled patients felt their clinical condition was negatively influenced by cancellation.<sup>27</sup> Negative reaction influences outcome and causes depression.<sup>27</sup> Importantly, the position of the person announcing cancellation and the process with which this occurs has an influence on resulting negative reactions. DOS cancellation has been associated with depression, urinary tract infection, wound infection and myocardial infarction.<sup>33</sup> These risks secondary to an otherwise avoidable cancellation in many cases is an ethical dilemma. Sometimes cancelling elective surgery can have benefit for the patient but in most cases it is inconvenient.

This study has limitations. The method to evaluate costs met many difficulties. The financial cost and mood assessment of the patients' caregivers were insufficient. The results regarding patients' reactions were self-reported and no objective tool was used. The process of announcing cancellation, the position of the person who did this, information regarding further operation planning and emotional state after discharge from hospital were not studied.

## Conclusion

This prospective study demonstrated that the DOS cancellation rate was high. Cancellation causes were mainly patient related. Most causes were avoidable and cancelling surgery caused considerable cost to both the patient and the hospital. More than half of the cost of surgery cancellation was avoidable. In terms of income, the cancellation cost was very high for Burkinabe. There were many negative reactions, dominated by sadness. To avoid cancellation, we recommend performing

preoperative visits with all patients and ideally admitting the patient a day before surgery. The hospital management must at least deal with avoidable costs by improving both management and efficiency. In the context of under-development, prioritisations have to be made and healthcare givers must pay attention to management issues. A prospective study is necessary to evaluate the medical impact of DOS cancellation on the outcomes of scheduled surgeries.

**Conflicts of interest** – The authors declare that they have no competing interests.

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