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Mortality Pattern in Surgical Wards of a University Teaching Hospital in Southwest Nigeria: A Review

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Abstract

Background There are many reports from different parts of the world addressing different aspects of surgical mortality. There are few reports from our country, however, and most of them have dealt with mortality in the emergency room. The aim of this study was to determine the prevalence of mortality associated with surgical care and the trends in prevalence of surgical mortality. We used our results as benchmarks to identify areas of improvement.

Methods The records of all patients who died during admission for surgical care in Olabisi Onabanjo Teaching Hospital Sagamu between January 2006 and December 2010 were studied retrospectively. Relevant data were extracted, including demographics, surgical diagnosis, co-morbid conditions, length of hospital stay, surgical procedure performed, outcome of treatment, and date of death. Results were analyzed with Statistical Package for Social Sciences version 15.

Results The total admission in the surgical wards for 2005–2010 was 5,444, with a total of 2,217 surgical operations carried out during the same period. There were 277 (5.09 %) deaths (165 male and 112 female patients). Of 277 deaths, only 170 case notes (61 %) were available for review. Primary causes of death were classified as cancer (50 deaths, 29.4 %), trauma (66, 38.8 %), infection/inflammatory (16, 9.4 %), and other (38, 22.4 %). Surgical operations were performed in 60 (35.3 %) of the patients who died. No surgery was done in 110 (64.7 %) of those who died.

Conclusions The pattern of surgical mortality is not directly related to surgical procedures as most of the deaths occurred in the nonoperative care group. Trauma-associated deaths topped the list.

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Introduction

About 234 million surgical procedures are carried out annually worldwide with some mortality. Approximately 4,000 procedures per 100,000 population in many countries and up to 11,000 procedures per 100,000 population are carried out in high-volume countries [1].

Mortality during surgical care may result directly from the pathologic process necessitating surgical care, as a complication of a surgical procedure and anesthesia, or other co-morbid factors. Delay in diagnosis and treatment, medical and surgical errors, lack of expertise, and inadequate or limited health care facilities may contribute significantly to mortality during surgical care in the developing world. A study of the mortality pattern can help bridge knowledge gaps in a particular surgical setting and can identify areas of care that require more education, practice modification, and/or policy formulation.

In-hospital surgical mortality is traditionally defined as deaths occurring within 30 days of admission for surgical care [2]. This definition may give rise to both underestimation and overestimation of surgical death rates. Patients dying in hospital of causes not related to the surgical treatment during the period constitute overestimation, and those who die outside the hospital or after 30 days constitute underestimation.

Although there are numerous reports on various aspects of the issue of surgical mortality from many parts of the developed world, especially procedure-specific mortality rates. The results of these studies have been used as measures of hospital quality of service [3]. Few of the reports

have come from Nigeria. The reports emanating from our region address mostly mortality in the emergency room [4–6]. Ihegihu et al. [7] in Nnewi and Chukuezi and Nwosu [8] in Orlu (both in eastern Nigeria) studied mortality in surgical patients and reported crude mortality rates of 8.3 and 9.14 %, respectively. Biluts et al. [9] from Addis Ababa in Ethiopia reported a crude mortality rate of 7.0 %.

The present work is an attempt to provide some insight into the mortality pattern in surgical patients in general, as seen in our practice. It includes patients seen in the emergency room and those treated on an inpatient service. The objectives of this study were to determine the prevalence of deaths associated with surgical care in both operative and nonoperative surgical patients. We also compared our results with those of other published studies to identify areas of improvement in which surgical patient care could be improved.

Materials and methods

We conducted a retrospective study of the records of patients who died during surgical admissions at Olabisi Onabanjo University Teaching Hospital Sagamu, Nigeria between January 2005 and December 2010. The hospital is a tertiary care facility with 420 beds, 80 of which are dedicated for surgical patients. There are three functional operating rooms and a four-bed intensive care unit (ICU). The hospital has established units in general surgery, orthopedics and trauma, urology, otorhinolaryngology, ophthalmology, and pediatric surgery. Trauma patients requiring neurosurgical and/or plastic surgical evaluations are initially managed by the orthopedic and trauma unit before subsequent referral, if necessary. Relevant information was extracted from hospital admission and discharge registers in the medical records department, surgical theater, surgical wards, and ICU.

All patients who were admitted into the surgical wards with surgical conditions for management of their ailments, including investigations and nonoperative management, who subsequently died in the hospital were included in the study. Patients whose case notes were not available were excluded from further analysis.

The case notes of flagged or identified patients were retrieved. Data from these notes were extracted onto a proforma designed for the purpose. Such data include demographics, surgical diagnosis, co-morbid conditions, length of hospital stay (LOS), surgical procedure performed, outcome of treatment, and date of death. Patients who were less than 15 years of age were classified into the pediatric group. Those older than 15 years were considered adults. Patients who underwent a surgical procedure were classified as having operative care, whereas patients who were managed without surgery—investigations, resuscitative measures, medications, palliative care—were grouped as having nonoperative care. Results were analyzed by Statistical Package for Social Sciences version 15 (SPSS, Chicago, IL, USA). Descriptive statistics were done using frequency, percentages and tables. Categoric variables (cause of death, sex) were compared using the χ^2 test. The level of significance was set at 5 % (i.e., $p < 0.05$).

Results

The total admission in the surgical wards for the 6-year period (2005–2010) was 5,444. A total of 2,217 surgical operations were carried out during that period. There were 277 (5.09 %) total deaths (165 males, 112 females). The ages of these patients ranged from 1 day to 92 years (mean ± SD 40.5 ± 22.7 years, median 41 years). There were 45 children aged <15 years (16.2 %). Among them, there were 25 deaths (9 %) in infants, 12 of which occurred in neonates (4.3 %). There were 20 deaths of children aged >1 year (7.2 %).

Of 277 patients who died, only 170 case notes (61 %) were available for review. A comparison of the sex, age range, and etiology of death distribution in patients whose case notes were available for review and those whose were not is depicted in Table 1.

Table 1 Characteristics of patients with complete or incomplete records

Characteristic	Complete record	Incomplete record	Total	p (χ^2 test)
Sex				
Female	72	40	112	
Male	98	67	165	
Total	170	107	277	0.45
Cause of death				
Trauma	66	35	101	
Cancer	50	31	81	
Infections	16	14	30	
Others	38	27	65	
Total	170	107	277	0.63
Age range (years)				
<1	13	12	25	
1–20	12	12	24	
21–30	29	14	43	
31–40	27	17	44	
41–50	24	16	40	
51–60	26	17	43	
61–70	23	10	33	
>70	16	9	25	
Total	170	107	177	0.0781

Table 2 Primary cause of death/diagnosis in pediatric and adult cases

Cause of death	Pediatric	Adult	Total
Cancer (total no.)	1	50	
Lymphoma	1	1	2
Breast		15	15
Colon		6	6
Pancreas		5	5
Intraabdominal (unknown origin)		5	5
Stomach		2	2
Liver (PLCC)		2	2
Osteosarcoma		2	2
Multiple myeloma		2	2
Gallbladder		1	1
Melanoma		1	1
Prostate		1	1
Nasopharyngeal		1	1
Renal cell		1	1
Sarcoma		1	1
Retroperitoneal		1	1
Bronchus		1	1
Bladder		1	1
Trauma (total no.)	7	58	
Burns	4	21	25
Multiple injury		10	10
Head injury	3	9	12
Blunt abdominal injury		6	6
Penetrating abdominal injury		4	4
Femoral fracture		3	3
Pelvic fracture			1
Tibia and fibula fracture			1
Hip dislocation			1
Spinal injury			1
Traumatic amputation			1
Others (total no.)	13	25	
Intestinal obstruction	7	7	14
Enterocutaneous fistula	1	4	5
Gangrene		3	3
BPH		2	2
Leg ulcer		2	2
Hirschsprung disease	2		2
Inguinal hernia		1	1
Gastric perforation	1	1	1
Imperforate anus	1		1
Lumbar spondylosis		1	1
Mesenteric ischemia		1	1
Obstructive jaundice		1	1
Paralytic ileus		1	1
Uremia		1	1
Infection (total no.)	2	14	
Peritonitis	1	7	8
Typhoid perforation	1	1	2
Septicemia		1	1
Clostridium myonecrosis		1	1
Pulmonary tuberculosis		1	1
TB of the spine		1	1
Septic wound		1	1
Cervical lymphadenopathy		1	1

PLCC primary liver cell carcinoma, *BPH* benign prostatic hyperplasia, *TB* tuberculosis

The diagnosis/primary cause of death in the adults and children (<15 years) is shown in Table 2. Trauma accounted for 19 of 29 deaths in 21–30 year age group, and cancer accounted for 12 of 23 deaths in the 61–70 year age group (Table 3). Trauma deaths occurred in 15 females and 61 males, and cancer-associated deaths occurred in 30 females and 20 males (Table 4).

Surgical operations were carried out in only 60 (35.3 %) of the patients who died. Among the operations, 40 (66 %) were done on an emergency basis. The surgical procedures performed are shown in Table 5. There were four intra-operative deaths during the 6-year period. Three were

Table 3 Age range and etiology of death

Age (years)	Etiology of death				
	Cancer	Trauma	Infection	Others	Total
0–20	1	9	2	13	25
21–30	5	19	4	1	29
31–40	7	13	3	4	27
41–50	8	11	3	2	24
51–60	12	8	2	4	26
61–70	12	3	0	8	23
>70	5	3	2	6	16
Total	50	66	16	38	170

Table 4 Etiology of death and sex

Etiology of death	Sex		
	Female	Male	Total
Cancer	30	20	50
Infection	8	8	16
Others	19	19	38
Trauma	15	51	66
Total	72	98	170

χ^2 test: $p = 0.000$

Table 5 Frequency of surgical procedures performed in patient who died

Procedure	Number	%
Ex-Lap	34	56.7
Ex-Lap, bowel resection	2	3.3
Ex-Lap, ileostomy	1	1.7
Ex-Lap, colostomy	1	1.7
Ex-Lap, gastrojejunostomy	1	1.7
Left hemicolectomy	1	1.7
Sigmoidectomy	1	1.7
Biopsy	3	5.0
Colostomy	2	3.3
Débridement	2	3.3
Open reduction and internal fixation	2	3.3
Tube thoracostomy	2	3.3
Tube thoracostomy, biopsy	1	1.7
Bilateral tube thoracostomy	1	1.7
Mastectomy	1	1.7
Prostatectomy (retropubic)	1	1.7
Orchidectomy	1	1.7
Amputation	1	1.7
Anoplasty	1	1.7
Suturing	1	1.7
Total	60	100

Ex-Lap exploratory laparotomy

associated with laparotomy. No surgical procedures were undertaken in 50 of 66 patients who experienced trauma-associated death. There was also no surgery performed in 34 of 50 patients with cancer-associated death (Table 6).

The primary causes of death/diagnosis in the group with no surgical intervention were as follows: burns 25, breast cancer 11, head injury secondary to a road traffic accident (RTA) 11, multiple injury secondary to RTA 5, peritonitis 5, abdominal malignancy 5, others 48. Co-morbidity factors present in the patients were as follows: none in 133 of the 170 patients who died (78.2 %), diabetes 5, hypertension 4, anemia 7, neonatal period 4, previous exploratory laparotomy 3, renal failure 3, others 11.

Table 6 Etiology of death in operated and non operated cases

Etiology of death	Surgical procedure		
	No	Yes	Total
Cancer	34	16	50
Infection	10	6	16
Others	16	22	38
Trauma	50	16	66
Total	110	60	170

Discussion

The subject of surgical mortality has not been as well researched and discussed for the sub-Saharan region as has been done for the developed world. Two studies emanating from the region discussed mortality in patients under surgical care including patients who were managed without surgery [7, 8]. Surgical care in our circumstances includes admission for both operative and nonoperative care. We believed that a study of the trend of mortality in patients under surgical care in these circumstances was necessary. The results are reported in this article.

The surgical mortality rate over the 6-year period of this study was 5.08 %, which is relatively low compared to other reports from Africa, although values of crude surgical mortality rates are not a true reflection of hospital quality of service [10]. Similar studies done in Nnewi by Ihegihu et al. [7] and Chukuezi and Nwosu [8] in Orlu (both in Eastern Nigeria) showed a crude mortality rate of 8.3 and 9.14 %, respectively. Biluts et al. [9] from Addis Ababa in Ethiopia reported a crude mortality rate of 7.0 %.

The age and sex distribution in our study is similar to those in the studies cited above, although there was relatively higher mortality rate observed in children and neonates than in the Nnewi study. The reason is that the pediatric surgical unit manages complex cases, including congenital abnormalities in neonates, which are very challenging to manage in a resource-limited environment such as ours. Only 61 % of case notes were available for review, similar to the findings in the Nnewi study. There is no significant difference in the characteristics of the patients whose case notes were available and those whose notes were not, as shown above. Poor record-keeping is the bane of retrospective studies in the Third World.

Burns as the primary cause of death accounted for the highest percentage of deaths, which is due to a variety of reasons. Burns caused by explosions of adulterated kerosene are rampant. Also common are explosions during the vandalization of petroleum products and in homes due to domestic storage of petroleum products occasioned by product scarcity [11]. There is a high incidence of burns over large surface areas, sometimes approaching 100 %. The proximity of our hospital to a major petroleum product storage depot that serves the whole country, with its associated large vehicular transport route, contributes to the high incidence of severe burns. Lastly, the absence of a burn unit to take care of these cases is a major contributory factor.

Breast cancer is the second commonest primary cause of death. It is the most common cause of all cancer deaths in our cohort of patients. This is not surprising as breast cancer is now the commonest cancer in women, ahead of cervical cancer, in our region [12]. Also, the hospital is a referral center for breast cancer care.

Various intestinal obstructions constitute another important cause of mortality. Many factors are responsible for this situation, including late presentation, refusal of operative treatment, inability to pay for treatment, inadequate preoperative and postoperative care consequent to resource limitations [13].

Head injury and multiple injuries secondary to RTAs constitute another major cause of death, as observed in other studies [7–9]. Shock from blood loss, head injury, and hypoxia from various causes including chest injuries are major causes of trauma-associated mortality [14]. Nearness to two major expressways that link Lagos, the commercial capital of Nigeria, to the rest of the country is a major factor. The initial management of the patients with head injury is done by the orthopedic and trauma unit. Patients requiring further care are then referred to another center, but timely transfers are often not possible as a result of infrastructural and logistical challenges.

Most of the trauma-associated deaths occurred in the 21–50 year age groups. This finding is in keeping with the well-known association of trauma with persons in their most active and productive period of life. Also, trauma-associated deaths were more common in males, as expected [14, 15].

Cancer-associated deaths were more common in the older age groups—not an unexpected finding as cancer incidence generally increases with age. Cancer-associated death was more common in females than males as the commonest cancer causing mortality in the study was breast cancer, a disease that primarily affects females.

There was no surgical intervention in 64.7 % of the patients in this study, similar to the findings of the Nnewi study [7]. Nonoperative care becomes the only viable option in the face of advanced surgical disease, refusal of operative treatment, inability to pay for treatment, infrastructural challenges, and sometimes the dearth of manpower [13, 16]. Late presentation in hospitals for treatment is the rule in our environment. Many reasons have been adduced for this practice, including ignorance, poverty, and inaccessible and poor medical facilities. The majority of the patients with trauma-associated death had had no surgical treatment for reasons similar to patients in the cancer-associated mortality group.

As it is known that emergency procedures are associated with higher mortality [17], it is not surprising that most of the deaths in the operated group were associated with emergency procedures. Mortality rates for emergency surgical procedures can be reduced by aggressive resuscitative methods, institution of specific prophylaxis, timely surgical intervention, and adequate postoperative care including the ready availability of intensive care when required.

Laparotomy was the most common surgical procedure performed in the operated group, a reflection of the level of development of surgical services in our hospital. Because only the general surgery service is sufficiently staffed and equipped, more abdominal conditions are treated.

Co-morbidity is known to contribute to surgical mortality [18]. However, the majority of patients in this study had no co-morbidities.

Conclusions

Based on our findings, the pattern of surgical mortality is not directly related to surgical procedures—most of the deaths occurred in the nonoperative care group. Trauma topped the list of primary causes of death. There is a need to upgrade the trauma service and provide reliable immediate access to neurosurgical care when needed. Breast cancer was the most common cause of cancer-related death in our patients.

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