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## Perioperative Deaths in a Nigerian Tertiary Teaching Hospital\*

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**Aim:** Perioperative deaths may be categorized into avoidable and non-avoidable. An audit of such deaths should be carried out periodically with a view to improving the standard of clinical practice.

**Materials and Methods:** The master registry of the main theater of the hospital was examined to identify all deaths that occurred within the main theater environment (reception, operating room, and recovery room) over a five-year period (January 2000- December 2004). Patients' ages, sex and timing of surgery (elective or emergency), American Society of Anesthesiologists (ASA) status and the diagnosis were noted. The diagnosis was further categorized in relation to the underlying pathology.

**Results:** There were 30 (0.42%) perioperative deaths out of a total of 7158 surgical operations performed within the period under review. Only 23 case notes of the patients were available for analysis. The deaths involved 12 elective and 11 emergency procedures. ASA grades I-III accounted for 52% (n = 12) of the deaths and 48% (n = 11) were assessed as ASA IV-V. Bleeding (n = 7) and sepsis (n = 5) were the commonest underlying causes of death

**Conclusions:** Early presentation of patients to hospital, adequate preoperative care and improvement in hospital facilities will reduce the rate of perioperative deaths.

**Key Words:** Perioperative, death, bleeding, sepsis

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### Nijeryada Bir Eğitim Hastanesinde Perioperatif Ölümler

**Amaç:** Perioperatif ölümler önlenemeyenler ve önlenemeyenler olarak iki grupta ele alınabilir. Klinik pratiğin kalitesini artırmak için bu ölümler düzenli aralarla gözden geçirilmelidir. Bizim amacımız Nijerya Benin Üniversitesi Hastanesinin büyük ameliyathanesinde ameliyat sırasındaki ölümleri araştırmaktır.

**Yöntem ve Gereç:** Hastanenin Büyük ameliyathanesinin resepsiyon, ameliyat odaları ve uyanma odasındaki tüm kayıtlar incelenerek Ocak 2000 ve Aralık 2004 arasındaki beş yıllık sürede burada oluşan ölümler araştırıldı. Hastaların yaş, cins, Cerrahi zamanlaması (elektif veya acil), ASA skoru ve tanıları kaydedildi. Tanılar altta yatan patolojilere göre tekrar gruplandı.

**Bulgular:** Toplam 7158 ameliyat arasında 30 (%0.42) perioperatif ölüm saptandı. Değerlendirme için sadece 23 hastanın kayıtlarına ve dosyasına ulaşılabildi. Olguların 12 si elektif 11'i ise acil girişim yapılan hastalardı. ASA skorları olguların %52'sinde (n = 12) 1-3 arasında, %48'inde ise (n = 11) 4-5 idi. Kanama (n = 7) ve sepsis (n = 5) en sık görülen ölüm nedenleri idi.

**Sonuç:** Hastaların hastaneye erken başvurusu, uygun perioperatif bakım ve hastane koşullarındaki iyileştirmeler perioperatif ölüm oranlarını azaltacaktır.

**Anahtar Sözcükler:** Operasyon, kanama, sepsis, ölüm

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## Introduction

The perioperative care of the surgical patient is a team effort of the surgeons, anesthetists and others. However, outcome of the surgical care is critically dependent on the lead surgeon and the anesthetist. This notwithstanding, morbidity and mortality may occur in the perioperative period. A perioperative death, which literally amounts to a failure of treatment, is an unfortunate situation for any surgeon or anesthetist to encounter. The psychological trauma experienced by one under such a circumstance can be so immense that a defense association has advised that the surgeons involved in any case of intraoperative death should not operate for the next 24 hours (1,2). Similar advice may not be out of place for his anesthetist as well.

Perioperative deaths have been categorized as avoidable and non-avoidable (3,4). The former includes those in which better and more appropriate intervention could have made a difference in outcome. The factors involved in avoidable deaths have been further categorized into surgical, anesthetic and administrative, depending on the area(s) where an error of omission or commission could have contributed to the patient's death. Furthermore, the value of a combined anesthetic and surgical audit has been stressed (5). Periodic audit of intraoperative deaths in an establishment will help to identify these contributory factors with a view to taking appropriate steps to forestall a recurrence. These ultimately improve the standard of medical treatment of the institution.

This paper retrospectively studied the patients that died within the operating theater environment (reception, operating room, and recovery room) in the University of Benin Teaching Hospital, Benin City, Nigeria over a five-year period. It is hoped that this report will help to highlight avoidable factors with a view to reducing mortality within the operating theater environment.

## Materials and Methods

The operating theater facilities in the main theater of the University of Benin Teaching Hospital are shared by the following teams: General Surgery, Pediatric Surgery, Urology, Orthopedics and Trauma, and Cardiothoracic Surgery. Others are Maxillofacial Surgery, Ear, Nose and Throat (ENT), and Gynecology. Obstetric surgery is normally carried out in the labor ward theater. This study was restricted to cases operated in the main theater.

All the deaths that occurred within the theater environment (reception, operating room and recovery room) over a period of five years (January 2000-December 2004) were identified from the master register of the main theater. Their case notes were acquired from the Medical Records Department in accordance with institutional guidelines. The case notes were scrutinized in terms of age, sex, timing of surgery (elective or emergency) and diagnosis. The latter was further categorized in relation to the preoperative underlying pathology. An analysis was made of the assessment of risk grading as carried out by the anesthetist before surgery in accordance with departmental protocol.

## Results

A total of 7158 surgical operations were carried out during the period under review. There were 30 perioperative deaths (0.42%). Only 23 case notes were available for analysis. The deaths involved 13 males and 10 females with an age range of 6 weeks to 72 years (mean 32.5). Of these, 12 were elective and 11 were emergency procedures. Table 1 shows the unit distribution. The general surgical conditions and trauma were the leading causes of perioperative deaths. Table 2 shows the American Society of Anesthesiologists (ASA) grading of the patients, while Table 3 is a pathological classification of the cases. Hemorrhage (n = 7), sepsis (n = 5) and head injury (n = 3) were the major underlying pathological conditions in patients who died in the perioperative period.

Table 1. Unit analysis.

Unit	Number	Percentage (%)
General surgery	8	34.8
Trauma	6	26.2
Pediatric surgery	3	13.0
Urology	2	8.7
Gynecology	2	8.7
Maxillofacial	1	4.3
ENT	1	4.3
Total	23	100

Table 2. ASA status of intraoperative deaths.

ASA grade	Elective	Emergency	Total
I	2	1	3
II	4	2	6
III	2	1	3
IV	3	1	4
V	1	6	7
Total	12	11	23

Table 3. Classification of clinical pathology.

Pathology	Number	Percentage (%)
Hemorrhage	7	30.4
Sepsis	5	21.7
Head injury	3	13.1
Wilms tumor	2	8.8
Abdominal gunshot	1	4.3
Toxic goiter	1	4.3
Aspiration during intubation	2	8.8
Burns	1	4.3
Obstructed hernia*	1	4.3
Total	23	100

\* This patient had a combination of infected obstructed paraumbilical hernia and severe hypertension (220/130 mmHg).

## Discussion

The results show that 0.42% of all surgical procedures during the study period resulted in perioperative death, and hemorrhage and sepsis were the leading associated factors. Hemorrhage as a factor in perioperative death is lower than results from a study by McDonald and colleagues (4), who reported 71% of perioperative deaths as due to hemorrhage versus 30% in our study. This difference may be related to the case mix in the different hospitals. For instance, there is no cardiac surgery service in our hospital. Indeed, some of the deaths in our series were due to challenges of inadequate blood bank services. However, improved surgical techniques and improved banking services will

help in reducing perioperative deaths due to excessive blood loss. In addition, a similar study in Malawi showed sepsis as a major cause of perioperative death (6).

Some of the recorded perioperative deaths may have been avoided. One of the patients in this series illustrates the place of communication skills in the management of the surgical patient. Preoperative anesthetic review of a 66-year-old man with toxic goiter raised issues regarding his suitability for surgery and anesthesia due to an intercurrent valvular heart disease. However, the surgeon did not see the heart condition as a threat to patient safety and insisted on operating. The patient developed cardiac arrest at induction. Kluger and colleagues (7) showed the relationship between preoperative preparation and morbidity/mortality. Effective communication between the anesthetic and surgical teams towards a preoperative optimization of the valvular heart disease could have resulted in a better outcome. It is imperative, therefore, that issues generated from consults to other clinical services should be respected and addressed.

Unexpected regurgitation, vomiting and aspiration of gastric content is not uncommon during general anesthesia (8). Indeed, regurgitation/aspiration ranked fifth and comprised over 5% of a large collection of incidents occurring during general anesthesia (9). One of the deaths from aspiration of gastric contents illustrates substandard clinical care. This involved a 40-year-old female scheduled for laparotomy for postcholecystectomy biliary peritonitis. Neither the resident surgeon nor the resident anesthetist passed a nasogastric tube prior to anesthesia and surgery as institutional protocol would suggest. Furthermore, there was no application of cricoid pressure at induction of general anesthesia. The patient vomited at induction and aspirated gastric contents. The poor supervision of the resident was further accentuated as the management of the complication was inadequate. This further illustrates the place of the human failure component of critical incidents (10,11). The risk of regurgitation and aspiration in this population of patients is enormous and the outcome is poor, particularly in developing countries. It is important that appropriate consultations with the supervising consultants are made for every patient no matter the presumed simplicity of the surgery or anesthesia. This will improve training and supervision of trainees and facilitate a better outcome for patients.

The outcome of surgical treatment is determined to a large extent by the preoperative condition of the patient. About half of our patients ( $n = 11$ ) were in the ASA classification of physical status class IV or V, showing that they were high-risk patients at the outset. In addition, about half of the cases were emergency procedures with their particular associated risks. In one series, 70% of perioperative deaths were related to emergency procedures (3). This brings to the fore the importance of proper preoperative management, as it helps to optimize the patient's condition and improve outcome. It has been shown that most deaths occur among the gravely ill, in inadequately prepared patients and in those operations done in the late hours of the night (12).

A limitation to the interpretation of our results is the retrospective nature of the study. An extraction of information from a critical incident monitoring would

have been more informative. In addition, the inability to retrieve all case notes of the patients that died perioperatively limits the desired information on the possible factors in such deaths. This is, however, not uncommon in developing countries (13). Nevertheless, this report highlights some of the factors associated with perioperative death in a hospital in a developing country.

## Conclusion

Multiple factors contribute to perioperative deaths in our environment. Hemorrhage, sepsis, regurgitation/aspiration and human factors were the leading reasons for perioperative deaths. Improved blood banking services, training and re-tooling of the trainees, and enhanced communication skills would lead to better outcomes.

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