



## Review

# A profile of surgical burden and anaesthesia services at Mozambique's Central Hospital: A review<sup>☆</sup>



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## ABSTRACT

**Background:** Surgical and anaesthesia data, including outcomes, remain limited in low-income countries (LIC). This study reviews the surgical burden and anaesthesia services at a tertiary care hospital in Mozambique.

**Methods:** Information on activities within the department of anaesthesia at Maputo Central Hospital for 2014–15 was collected from its annual report and verified by the Chairman of Anaesthesia. Personnel information and health care metrics for the hospital in 2015 were collected and verified by hospital leadership.

**Results:** Maputo Central Hospital has 1423 beds with 50.1% allocated to primary surgical services. 39.7% of total admissions were to surgical services, and in 2015 the hospital performed 10,049 major operations requiring anaesthesia. The OB/GYN service had the most operations with 2894 (28.8%), followed by general surgery (1665, 16.6%). Inpatient surgical mortality was 4.1% and surgical-related diagnoses comprised two of the top 9 causes of death, with malignant neoplasms and hemorrhage from trauma causing the highest mortality.

In 2014–15, Maputo Central Hospital employed 15 anesthesiologists, with 4 advanced and 23 basic mid-level anaesthesia providers. Of 10,897 total anaesthesia cases in 2014, 6954 were general anaesthesia and 3925 were neuraxial anaesthesia. Other anaesthesia services included chronic pain and intensive care consultation.

Anaesthesia department leadership noted a strong desire to improve data collection and analysis for anaesthesia outcomes and complications, requested an additional administrator for statistical analysis.

**Discussion:** This profile of anaesthesia services at a large tertiary hospital in Mozambique highlights several features of anaesthesia care and surgical burden in LICs, including challenges of resource limitations, patient comorbidity, and social dynamics present in Mozambique that contribute to prolonged hospital stays. As noted, enhanced data collection and analysis within the department and the hospital may be useful in identifying strategies to improve outcomes and patient safety.

## 1. Introduction

An estimated 5 billion people lack access to safe surgical care, and an additional 143 million operations are needed annually in low and middle-income countries (LMICs) to meet their burden of surgical disease [1]. Access limitations in many countries are driven by a lack of trained personnel, equipment, monitoring supplies, and medications. For example, an estimated 30% of hospital facilities in LMICs do not have a full or part-time anaesthesia provider [2]. These deficiencies limit GDP growth in countries that greatly need it, and the vast economic and social implications worldwide may be mitigated by cost-effective interventions to improve access to basic surgical services [1]. A deeper understanding of these deficiencies and their effect on health-care delivery is necessary for thoughtful and effective intervention.

Despite increased attention to these issues, outcomes data for surgery and anaesthesia remain limited in many LMICs. Mozambique is located in sub-Saharan Africa and has a population of 26 million people with 45.3% younger than 14 years old [3]. The 2015 United Nations Human Development Index (HDI) ranked Mozambique 180 of 188 countries with a maternal mortality ratio of 489 of 100,000 live births and a life expectancy of 53.3 years [4]. Health care expenditure is below global benchmarks at 6.6% of GDP [3]. There are only 0.3 physicians per 10,000 population, with only an estimated 116 surgical specialists [5] and 33 anesthesiologists [6], which has led to a high number of technicians providing advanced medical care including anaesthesia and surgical services [6]. Physicians are concentrated in highly populated areas, and in 2015 an estimated 63 surgical technicians [5] and 257 anaesthesia technicians [6] provided much of the

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operative care in rural parts of the country.

The capital city of Mozambique, Maputo, has 4.5% of the population and 77% of the anaesthesiologists [6]. Eduardo Mondlane Central Hospital is a government-funded 1500-bed quaternary care center that serves as a referral center for the rest of the country. In conjunction with Eduardo Mondlane University, the country's primary medical school, it conducts the majority of the advanced medical training in Mozambique and contains the country's only anaesthesia residency program.

In an effort to provide a broader understanding of the surgical demand and anaesthesia services at MCH and in low-income settings we retrospectively evaluated total surgical caseload and anaesthesia care over respective one-year periods. By combining total surgical burden and surgical outcome data with anaesthesia workforce and clinical data for this hospital we sought to provide a comprehensive view of perioperative services in this setting.

## 2. Methods

Following hospital approval, a retrospective review of personnel information and health care metrics for the hospital in 2015–16 collected by logbook assessment and department reports and verified by hospital leadership. Data collected included hospital bed distribution and utilization, distribution of operations, length of stay, and in-hospital mortality following surgery. In-hospital deaths were categorized by cause as specified in the patient chart. For comparison, admission, length-of-stay and mortality for non-surgical services were also assessed. Reasons for case cancellation were included and divided by surgical service. No patient-specific information was collected in this process.

The most recent information on workforce data and clinical activities within the department of anaesthesia was available for 2014–15 and was collected from logbook assessment and provider surveys, and verified by the Chairman Director of Anaesthesia. Anaesthesia clinical activities included overall case volume, services performed in the chronic pain clinic, and operating room anaesthesia techniques such as airway management and utilization of neuraxial anaesthesia. For services where records were not available, a narrative review of anaesthesia involvement was provided by anaesthesia department leaders. A survey of providers within the department was also conducted to assess perceived clinical and research challenges and suggestions for improvement.

Institutional research board approval was obtained and a data use agreement was completed between investigators allowing for review of MCH hospital data. This work has been reported in line with the STROCSS criteria [7].

## 3. Results

### 3.1. Surgical volume and outcomes

In 2015–16, MCH had 1423 beds with 337 dedicated to general surgery, 176 to obstetrics/gynecology, and 200 to orthopedic services. During the year of data collection, the hospital performed 10,049 major operations requiring anaesthesia services. The obstetrical service had the greatest number of operations with 2894, followed by general surgery (1665), ophthalmology (1644), and orthopedics (1254) (Fig. 1). In-hospital surgical mortality was 4.1% with malignant neoplasms contributing to the greatest number of deaths (18%) (Table 1), while total hospital mortality was 9.16%. HIV/AIDS contributed to the highest proportion of all deaths in the hospital (26.3%) as well as the third highest proportion of surgical deaths (12.6%) (Table 2). Trauma hemorrhage and motor vehicle accidents accounted for 26.3% of deaths for surgical admissions. The average length of stay for general surgery was 9.6 days and for orthopedic surgery was 21.7 days (Table 2).

Data for case cancellations revealed a total cancellation rate of

8.6%. The highest number of cancellations occurred for orthopedic surgeries, with OR time limitations cited as the most common reason for case cancellation (Table 3). The urology service had the highest rate of cancellations with 27% cancelled among 676 scheduled. Patient or patient family choice was the most common cause of cancellation for general and pediatric surgery cases.

### 3.2. Anaesthesia services

In 2014–15, the anaesthesia department at MCH employed 11 Mozambican and 4 foreign anaesthesiologists, with 4 advanced and 23 basic mid-level anaesthesia providers (referred to as 'superior anaesthesia technicians' and 'medium anaesthesia technicians' locally). Provider services included primary anaesthesia care for general, cardiac, orthopedic, ophthalmologic, GI, ENT, pediatric, plastic, urologic, maxillofacial, neurosurgical, OB and gynecologic procedures as well as emergency consultations, preoperative and postoperative visits, and partial ICU coverage (Fig. 2). Of 10,897 total anaesthesia cases in 2014–15, 6954 were general anaesthesia with 1279 by LMA, 1619 by facemask, and 4012 by ETT (44 unknown). Neuraxial anaesthesia was performed for 3925 cases, with the majority done by spinal injection (3913). The highest volume of cases in one month was 1056 in October, 2014.

Services also include staffing of the only chronic pain clinic in Mozambique which treated 1438 patients with primary diagnoses including back pain (503), cancer pain (237), neuropathic pain (168) and chest pain (115). Epidural injections were used for 143 patients, and trigger point injections for 30.

In survey responses, anaesthesia department leadership noted a strong desire to improve data collection and analysis for anaesthesia outcomes and complications. They requested an additional administrator for statistical analysis, and noted difficulties collecting data from providers administering anaesthesia but employed by other clinical departments.

## 4. Discussion

This profile of surgical caseload and anaesthesia services at a large referral hospital in Mozambique provides a large-scale view of perioperative care in a low-resource setting. Allocation of hospital clinical and educational resources should reflect the distribution of case types reflected in this data with services directed toward obstetrical care, general surgery, ophthalmology and orthopedic surgery most likely to reach the highest numbers of patients. As in many LMICs [8–12], trauma remains a significant cause of mortality, with two of the top five causes of death for surgical patients related to injuries. As the largest urban center in the country, Maputo accounts for 75.0% of the nation's motor vehicles [13] and improvement in trauma prevention and care are critical to public health in the area. The development of a public pre-hospital emergency response system in Mozambique will be an important step toward this improvement, as has been recommended elsewhere [14].

In addition to acute care, this study sheds light on the interplay between chronic disease and surgical mortality in this setting. Complications related to HIV and diabetes, both diseases that can be successfully managed medically, account for a large proportion of deaths in surgical patients and overall deaths. Despite significant progress in expanding antiretroviral treatment to nearly one million people, a reduction in AIDS-related deaths by 46% since 2010 and over USD \$3 billion in PEPFAR (US President's Emergency Plan for AIDS Relief) funding since 2004 [15], the HIV/AIDS epidemic continues to have a significant impact on general medical and surgical care in Mozambique. In addition to HIV, maternal mortality is an area of chief concern in Mozambique which has a maternal mortality ratio (MMR) of 489/100,000 live births [16]. While the outcomes for obstetric and gynecology admissions include non-maternal cases, the mortality of

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