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Delivery of operative pediatric surgical care by physicians and non-physician clinicians in Malawi



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ABSTRACT

Background: Specialized pediatric surgeons are unavailable in much of sub-Saharan Africa. Delegating some surgical tasks to non-physician clinical officers can mitigate the dependence of a health system on highly skilled clinicians for specific services.

Methods: We performed a case-control study examining pediatric surgical cases over a 12 month period. Operating surgeon was categorized as physician or clinical officer. Operative acuity, surgical subspecialty, and outcome were then compared between the two groups, using physicians as the control.

Results: A total of 1186 operations were performed on 1004 pediatric patients. Mean age was 6 years (± 5) and 64% of patients were male. Clinical officers performed 40% of the cases. Most general surgery, urology and congenital cases were performed by physicians, while most ENT, neurosurgery, and burn surgery cases were performed by clinical officers. Reoperation rate was higher for patients treated by clinical officers (17%) compared to physicians (7.1%), although this was attributable to multiple burn surgical procedures. Physician and clinical officer cohorts had similar complication rates (4.5% and 4.0%, respectively) and mortality rates (2.5% and 2.1%, respectively).

Discussion: Fundamental changes in health policy in Africa are imperative as a significant increase in the number of surgeons available in the near future is unlikely. Task-shifting from surgeons to clinical officers may be useful to provide coverage of basic surgical care.

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1. Introduction

Treatment of surgical diseases in low- and middle-income (LMICs) countries has largely been neglected by the public health community in the past, despite the fact that surgical diseases constitute 11% of the global burden of disease [1,2]. This is particularly true in the world's poorest countries, which contain 35% of the world's population but receive only 3.5% of all surgical procedures performed worldwide. [3]

On average, one in every six children in sub-Saharan Africa dies before age five as a result of infectious diseases, poverty, malnutrition, traumatic injuries, and lack of perinatal care [4–7]. Comprehensive data detailing the burden of pediatric surgical disease is lacking for many sub-Saharan African countries;

however, available studies suggest trauma, congenital anomalies, and surgical infections are common [8–12]. Even in countries with relatively robust general surgery practices, pediatric surgery has often received very little attention from both funding agencies and Ministries of Health [8,13]. The absence of appropriate surgical care in this environment results in many unnecessary pediatric deaths from curable surgical diseases and contributes to significant disability, ultimately compromising the quality of life of children in Africa. [14]

The number of pediatric surgeons serving in East, Central, and Southern Africa ranges from 1 in Malawi (population 13 million) to 25 in South Africa (population 48 million) [1,8,14,15]. A significant increase in the number of surgeons, surgical specialists, and anesthesiologists in these countries is unlikely to occur in the near future [16]. Therefore, national health systems must find other ways to offset the workforce shortage. One method involves mobilizing non-physician clinical officers to perform surgical and anesthetic tasks [1].

This approach, called surgical task-shifting, involves the delegation of tasks traditionally performed by surgeons and

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anesthesiologists to healthcare workers with lower qualifications [17]. The use of clinical officers or other mid-level health workers to provide specific health interventions has commonly been used throughout sub-Saharan Africa as a strategy for expanding healthcare delivery in settings with shortages of qualified health personnel [17]. Numerous studies have shown that task-shifting can be effective in the administration of ARTs [18], delivery of obstetric care [19,20], and in surgical subspecialty care, such as ENT, orthopedics, and anesthesia [17,21,22].

In 1976, the Malawian government introduced clinical officers in an attempt to meet the health demands of its population. Clinical officers undergo formal Diploma in Clinical Medicine training at the Malawi College of Medicine, which requires 3 years of didactic education followed by a yearlong rotating clinical internship at a central or district hospital. Following internship, clinical officers are licensed to practice independently [17,23]. Currently, clinical officers provide most of the medical, orthopedic, and obstetric care at district and regional hospitals, as well as administer anesthesia at district and central hospitals [17,23,24].

The use of clinical officers in pediatric surgical care delivery in Africa is neither widespread nor formally described. Our primary objective for this study is to examine the surgical case load, complexity, and outcome of cases performed by clinical officers compared to cases performed by physicians at our institution. We hypothesize that clinical officers can perform basic pediatric surgical procedures with similar outcomes compared to physicians.

2. Methods

We conducted a case–control study of pediatric surgery procedures at Kamuzu Central Hospital (KCH) over one calendar year (January to December 2012). KCH is a 1000-bed tertiary hospital in Lilongwe and serves as a referral central for approximately 6 million people in the central region of Malawi. The surgical staff available at KCH during the study period included four full-time general surgery consultants, one urologist, five visiting general surgery and subspecialty consultants, and sixteen full-time clinical officers. Also operating during the study period were eleven Malawian general and orthopedic surgical residents and two American general surgery residents. The main operating theatre at KCH has four fully functional operating rooms with six clinical officer anesthetists.

All pediatric patients (≤ 17 years old) who underwent an operative procedure during the study period were identified in the operating theatre log book. Age, sex, preoperative diagnosis, procedure performed, operative acuity, and date of operation were recorded. Criteria for major case designation included; 1) entrance into a body cavity (cranium, thorax, abdomen), 2) need for general anesthesia, 3) soft tissue operations requiring more complex technical procedures (skin autograft, contracture release, or amputation). Criteria for minor case designation included; 1) skin, mucus membrane, or connective tissue resection only, without entrance into major body cavity, 2) local or regional anesthesia, 3) minimal degree of complexity. Patients undergoing orthopedic procedures were excluded. Patients identified in the operative log were matched to their respective entries in our pediatric outcomes database to obtain primary outcome measures including length of stay, complications requiring reoperation, and survival to discharge.

The non-physician healthcare worker in our context may be called non-physician clinicians, mid-level providers, or clinical officers. We use the term clinical officer, as this is the designation commonly used in Malawi. Cadre of operative surgeon was determined from the operative log. Procedures performed by clinical officers, with or without a surgical resident, were listed as

clinical officer (CO) cases. Procedures performed by consultant–surgeons, with or without a clinical officer and/or surgical resident, or by surgical residents alone were listed as physician (MD) cases. Procedures performed by physicians were used as the control group.

Univariate and bivariate analysis was conducted to describe the pediatric surgical population and compare the outcome and operative intervention of procedures performed by physicians and clinical officers. All statistical analysis was performed using StataSE 12, Stata Corp LP, College Station, TX. Both the University of North Carolina Institutional Review Board and the National Health Sciences Research Committee of Malawi (NHSRC) approved this study.

3. Results

A total of 1186 operative procedures were performed on 1004 pediatric patients during the study period. Clinical officers performed 40% of all cases. The majority of cases were completed under general anesthesia (87%). Fifty-seven percent of pediatric surgical operations were major cases and approximately one-third were performed as emergencies (Table 1). The average age of the children was 5.7 years (± 5.2), and 64% were male (Table 2).

General and congenital surgeries were the most common procedures (Fig. 1). Congenital pathology resulted in 23% of all cases. Gastrointestinal general surgery, soft tissue excision, trauma and burns, urology, neurosurgery, and ENT surgery made up roughly equal proportions (between 10 and 14% each), while surgery for neoplastic disorders was relatively rare (Fig. 2). The most common procedures were hernia repair, general surgery laparotomy, and biopsy or excision of tissue masses. These procedures were more commonly performed by physicians (Fig. 3). Burn surgery, neurosurgery, and ENT procedures were more commonly performed by clinical officers (Fig. 1). No full-time ENT surgeon was available at KCH during the study period, although visiting surgeons were available intermittently. One neurosurgical consultant was available for complex neurologic cases, although the majority of the ventriculoperitoneal (VP) shunt cases were performed by a clinical officer (Fig. 3). One urologist was available and performed the majority of the pediatric urology cases (Fig. 1).

Patients initially operated on by clinical officers were more likely to undergo multiple procedures and have a longer hospital length of stay; however, many of these patients were burn victims who underwent multiple procedures for excision and grafting (Tables 2 and 3). After excluding burn cases, the reoperation rate and hospital length of stay did not differ significantly between physician and clinical officer cohorts.

Table 1

Operative characteristics for all surgeries performed ($N = 1186$).

Total operative cases	N (%) ^a
Anesthesia type	
General	1029 (87%)
Local/Regional	12 (1%)
Case urgency	
Emergent	380 (32%)
Elective	787 (66%)
Case complexity	
Major	672 (57%)
Minor	368 (31%)
Operating surgeon	
MD	566 (48%)
CO	475 (40%)

^a Percent may not add up to 100% due to missing data.

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