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Surgery at AIC Kijabe Hospital in Rural Kenya

In 2013, Mary Muchendu, a senior nurse, was the executive director of African Inland Church (AIC) Kijabe Hospital, a rural Christian mission hospital internationally renowned for its sophisticated surgery and anesthesia services. Muchendu became executive director in 2010, the same year that Kijabe Hospital opened three additional operating theaters (OTs) and an endoscopy suite.

Three years after assuming leadership of the hospital, Muchendu understood the challenges of surgical care delivery, which went far beyond ensuring adequate operating space. While the hospital remained committed to serving the poor and providing “health care to God’s glory” as it neared its 100th anniversary, Muchendu had to figure out how to generate revenue to match operating and infrastructure expenses. She knew the hospital was in need of utility infrastructure improvements and was considering the sustainability of its staffing model; out of its 17 surgeons and anesthesiologists, eight were expatriate missionaries. As she walked through the surgery clinic, Mary wondered if the OT expansion had been the right decision and what should come next.

Overview of Kenya

Kenya is located along the equator in East Africa (see **Exhibit 1** for map). The country gained independence from Great Britain in December 1963. Mwai Kibaki became Kenya’s third president in 2002, in what was widely considered a free and democratic election. From 2003 to 2007, Kenya successfully implemented the Economic Recovery Strategy for Wealth and Employment Creation, seeing annual GDP increase from 0.6% to 6.1%. In December 2007, Kibaki was re-elected for a second term. Though Kenya was

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historically one of the more politically stable countries in the region, riots broke out amid allegations of vote rigging and corruption, resulting in 1,300 deaths and over 600,000 internally displaced persons.

In June 2008, President Kibaki launched Kenya Vision 2030,¹ a campaign to advance Kenya to middle-income country status by 2030 and simultaneously achieve the UN Millennium Development Goals by 2015. Kenya adopted a new constitution in 2010, and the 2013 political elections passed with high turnout and little violence.

Of the 40 ethnic groups in Kenya, the three largest comprised nearly half of its total population of 41.6 million. The majority of people in Kenya lived in rural areas,² and most rural Kenyans derived their primary income from small-scale subsistence agriculture. Between 2008 and 2012, GDP grew 2–6% per year. Official unemployment rates hovered around 40%.³ Food insecurity was common in Kenyan households.

The vast majority (83%) of Kenyans practiced some form of Christianity, according to the 2009 national census. Specifically, 47.7% of Kenyans considered themselves Protestant; 23.5% identified as Roman Catholic. Others were Muslim (11.2%), were not religious (2.4%), or followed traditional beliefs (1.7%).⁴

Basic Socioeconomic and Demographic Indicators*

INDICATOR	MEASUREMENT	YEAR
UN Human Development Index ranking	143 out of 187	2011
Population (thousands)	41,610	2011
Urban population %	22	2010
Drinking water coverage (%)	52	2010
Poverty rate (% living under USD 1.25 per day)	43.4	2012
Gini index	42.5	2008
GDP per capita in PPP (constant 2000 USD)	647	2012
Literacy (total/female/male)	87/84/91	2009

Health in Kenya

Life expectancy for Kenyans fell from a peak of 60 years in 1989 to 55 years in 2009, largely due to AIDS-related mortality. In 2008, leading causes of adult mortality were HIV/AIDS, injuries, cancer, and cardiovascular disease. In 2009, water supply-, sanitation-, and hygiene-related diseases and associated conditions (anemia, dehydration, malnutrition) were the number-one cause of mortality and accounted for over 50% of hospital visits for those under five.⁵ Perinatal conditions also accounted for a significant number of pediatric deaths.⁶ The major causes of outpatient morbidity per 10,000 Kenyans in 2008 were malaria (11.9), diseases of the respiratory system (9.7), skin diseases and wounds (2.5), diarrheal diseases (1.7), and accidents (0.8).⁷

* Data compiled from: UNDP, WHO, World Bank, CIA, International Monetary Fund (IMF), Government of Kenya.

Health System and Epidemiologic Indicators[†]

INDICATOR		YEAR
Average life expectancy at birth (total/female/male)	63/62/65	2013
Maternal mortality (per 100,000 live births)	360	2010
Infant mortality (per 1,000 live births)	48	2011
Under-five mortality (per 1,000 live births)	73	2011
Vaccination rate (% of DTP3 coverage)	88	2011
Undernourished (%)	30	2012
Adult (15–49 years) HIV prevalence (per 100,000)	6,200	2011
HIV antiretroviral therapy coverage (%)	72	2011
Tuberculosis prevalence (per 100,000)	288	2011
DOTS coverage (%)	100	2012
Malaria cases (per 1,000)	303	2008
Government expenditure on health as % of total government expenditure	7.7	2010
Government expenditure on health per capita (current USD)	36	2010
Total health expenditure per capita (current USD)	37	2010
Physician density (per 10,000)	1.7	2008
Nursing and midwifery density (per 10,000)	1.9	2008
Number of hospital beds (per 10,000)	14	2012

Maternal morbidity and mortality in Kenya remained high, yet below average for sub-Saharan Africa, at 360 per 100,000 live births. Well over half of maternal deaths stemmed from surgically preventable or treatable conditions, including severe bleeding, obstructed labor, infection, complications of aborted pregnancy, and hypertensive emergencies (see **Exhibit 2** for diagram showing diseases often requiring surgical care).

Health System

The Ministry of Public Health and Sanitation and the Ministry of Medical Services functioned under the umbrella of the Kenyan Ministry of Health (MOH). The Ministry of Public Health and Sanitation was primarily responsible for preventive services, and the Ministry of Medical Services was primarily responsible for curative, hospital-based care. The MOH set regulations and monitored Kenya's public and private health systems.⁸

In an effort to better coordinate public health services, the Kenyan government introduced the Kenyan Essential Package for Health (KEPH) in 2005. The KEPH outlined six cohorts, each of which would receive a

[†] Data sources include: World Bank, UNICEF, WHO, Government of Kenya.

set of basic services: pregnancy and newborn, early childhood (2–5 years), late childhood (6–12 years), youth and adolescence (13–24 years), adult (25–59 years), and elderly (over 60 years).

To deliver these basic health services, the KEPH outlined six delivery levels (see **Exhibit 3** for diagram of the six levels). Level 1 comprised educators and community health workers and connected people to the health care system. Level 2 included dispensaries and public/private clinics, which interfaced with level 1. Level 2 and 3 institutions focused on preventive services in outpatient settings. Level 4, 5, and 6 institutions represented primary (i.e., district-level), secondary (i.e., region-level), and tertiary (i.e., referral) hospital care, respectively.

Level 3–6 facilities—health centers, district, provincial, and referral hospitals—all provided some level of surgical care. Level 3 health centers provided basic surgical services and referred more complex cases to level 4 district hospitals. All hospitals provided trauma care. Kenya’s two level 6 national referral hospitals were Kenyatta National Hospital and Moi Referral and Teaching Hospital. Kenyatta, a huge hospital with 1,800 beds and 6,000 staff members, had 24 OTs and treated 600,000 patients annually at 22 outpatient clinics.⁹ Moi had an 800-bed capacity, 125 of which were surgical. At these national referral hospitals, surgical residents were inadequately trained in an environment with less faculty supervision than appropriate; there was insufficient equipment and technology; and consultant surgeons often ran separate private practices. In addition, cases were often canceled for poorly documented but potentially preventable reasons, including the requirement of upfront payment. Delays in surgery were frustrating for staff and patients alike.

The KEPH framework integrated the public sector—roughly 48% of the 6,190 health facilities in the country in 2008—and private sector, which included faith-based organizations, for-profit companies, and not-for-profit entities. In 2008, there were 11 health facilities (of any type) every 1,000 km². Most private facilities were in urban areas and offered advanced, tertiary care services and few midlevel services. Private, for-profit facilities catered to high-income individuals, though a small group provided care to middle-income individuals. At many private hospitals, care was equivalent to that in developed countries. Local community organizations operated 3% of Kenya’s health facilities.

Financing

The Kenyan government created the National Hospital Insurance Fund (NHIF) in 1966 as an autonomous government entity to provide inpatient health insurance to wage-earning adults. Monthly premiums were based on income, ranging from USD 0.35 for individuals earning USD 12–17 per month, up to USD 4 for those earning USD 173 and above per month. Coverage was mandatory for formal-sector employees through monthly paycheck deductions. For informal-sector workers, the optional monthly premium was USD 1.84.

The NHIF classified hospitals into three coverage categories. The A category included Ministry of Medical Services hospitals, in which the NHIF provided 100% coverage. The B category included not-for-profit and faith-based organizations hospitals, and the C category included for-profit hospitals. The NHIF paid a set daily benefit for inpatient admissions and charged varying levels of copays.

As of 2008, 35.8% of national health care expenditures were paid out of pocket by individual patients, 31.0% by donor funds, 3.3% by private companies, and 0.1% by private foundations. The public sector covered 29.3% of costs. Private insurance and charity hospitals helped patients finance hospital care outside NHIF.

Medical Training

After completing medical school in Kenya, graduates could become medical officers by completing one year of a “classic” internship training in a government-approved hospital, which included district hospitals. Many interns graduated and worked as a medical officers in government facilities. They could continue training as residents in various specialties; few residency positions were sponsored, costing residents about USD 5,300 per year. Most surgical residency training in Kenya emphasized academic study, with minimal clinical practice. Surgeons who had completed their surgical residency and joined a hospital’s staff as responsible clinicians were known as consultant surgeons.

AIC Kijabe Hospital

In 1895 Christian missionaries first arrived in Kenya with the Africa Inland Mission (AIM). In the beginning, they brought their supplies in coffins, knowing they would die of malaria or other diseases in their quest to spread the word of God. AIM missionaries founded Kijabe Hospital in 1915 in a rural area 65 kilometers northwest of Nairobi in Kenya’s Rift Valley Province “to glorify God through compassionate health care provision, training and spiritual ministry in Jesus Christ.”

Kijabe Station, the community surrounding the hospital, was home to 7,000 people in 2013, including a third of the hospital’s staff, all the doctors in training, and short-term missionaries. In addition to Kijabe Hospital, Kijabe Station included a church, Kijabe Boys’ School, Kijabe Girls’ School, Moffat Bible College, the AIC-CURE Hospital (pediatric orthopedics), and numerous small businesses such as restaurants, grocery stores, and vegetable and craft stands. It was also home to Rift Valley Academy (RVA), an international Christian boarding school established in the early 1900s with a fully accredited American-based curriculum that regularly sent students to prestigious American universities. “This isn’t insignificant; this makes it so that people can come ... They can work here for years,” said one Kijabe Hospital physician.

History and Overview

In the 1970s, ownership and management of Kijabe Hospital transitioned from AIM to African Inland Church (AIC; see **Exhibit 4** for AIC dispensaries and hospitals in Africa). The hospital relied on AIM’s extensive international medical mission network for volunteers and donated supplies and remained committed to advancing the reach of the Christian faith as it provided high-quality care.

Kijabe Hospital would communicate a personnel need—e.g., a surgeon—to sending agencies, which would recruit personnel via their websites, vet their credentials, arrange travel, and provide country-specific training at no cost to Kijabe Hospital. Some agencies were able to provide financial support. Samaritan’s Purse, for example, supported new physicians in a two-year post-residency program. Short-term missionaries (there for less than one year) paid for transport and room and board in staff housing.

The hospital preferred long-term missionaries. Dr. Mark Newton, an American long-term missionary who was department head of anaesthesia at Kijabe Hospital and associate professor of clinical anesthesiology at Vanderbilt University in Nashville, Tennessee (US), explained:

The strength of Kijabe is in the foundation (mission) and long history of the hospital having Western doctors committed to serving in Africa over long periods—over 10 years each. Our most senior surgeon, who stayed for decades, was a medical student here, and that was over 40 years ago. [There was a] focus on training African doctors in the mid-1990s and nurses in the mid-1970s, with a Scottish nursing educator who stayed in Kenya for over 40 years; again, long-term commitment to medical education. This is the key.

Spiritual ministry was important to care delivery. “We do not separate the medical and spiritual world in Kijabe Hospital. Both are together. Our vision is to glorify God in everything we do,” reported one of the hospital chaplains. Chaplains rounded with medical teams, provided consultations, and met with each patient during hospitalization. All visiting staff agreed to and signed an ethical code of conduct upon arrival. “A medical ministry is unique from other ministries. Ours is more of a ministry than health care. Health care is a medium to provide that ministry ... seeing lives changed, wholesomely, physically, and spiritually,” said Charles Thiongo, head of human resources at Kijabe Hospital.

One surgeon explained:

Being here is stressful, absolutely stressful. There’s disorganization, a lot of stresses, all the deaths. And yet, we have an inner sense of peace that we are where we ought to be, doing what we are supposed to be doing. And that inner sense of peace is invaluable. [Our Christian faith] affects [hospital culture] in many, many ways, mostly in the motivation for giving the care. Nobody in Kenya works like this otherwise.

Services

After its founding in 1915, Kijabe Hospital added inpatient wards, a maternity ward, and an operating theater. Training programs followed, including the establishment of a nursing school in the 1980s, medical internships in 1996, and family medicine and surgical residencies and fellowships thereafter. Health care provision and partnerships expanded with the establishment of dental services, anesthesia, pediatric general surgery, neurosurgery, services for disabled children, and HIV/AIDS care (see **Exhibit 5** for AIC Kijabe Hospital’s timeline and **Exhibit 6** for its organizational structure).

In 2010, Kijabe Hospital had a 50 km catchment area that covered three districts: Kiambu, Nakuru, and Nyandarua, whose combined population was over 2.8 million. The hospital served as the primary referral center for four AIC hospitals and over 50 rural clinics. Patients came from far away: “Kenya, Ethiopia, Sudan, Somalia, Tanzania, Burundi, Ghana, Central African Republic, Cameroon, Comoros Islands. They come from all over,” noted one surgeon. Somalis living in Kenyan refugee camps and Nairobi’s Mogadishu neighborhood due to a recent civil war (1991–2006) accounted for an estimated 20% of patients. The hospital employed Somali translators.

Kijabe Hospital’s reputation for high quality and low cost made it attractive to patients. In 2009, Kijabe admitted approximately 11,000 patients to the 265-bed hospital, with an average length of stay of 6.3 days. That same year, it performed 9,049 operations and almost 2,000 obstetric deliveries, saw more than 110,000 outpatients, and provided 4,655 patients with HIV care (73% of these were on antiretroviral therapy) at the hospital and satellite sites.¹⁰

Newton trained the Kenyan Registered Nurse Anesthetists (KRNAs) who provided anesthesia services for the surgical cases. Providing nurse anaesthetist training allowed for a fourfold increase in surgical caseload.¹¹ KRNAs were responsible for the entire spectrum of anesthesia care (inducing anesthesia, intubating patients, monitoring patients’ vital signs and urine output during the case, managing changes in hemodynamics, and reversing anesthesia at the end of the procedure).

The pediatric surgical department, working with a mission-based charity called BethanyKids since 2004, provided general surgery and neurosurgery services using two dedicated pediatric operating rooms. They treated spina bifida, hydrocephalus, gastrointestinal and urological disorders, burns, and cleft lip and palate, among other conditions. A separate institution on campus, AIC-CURE International Hospital, provided strictly pediatric orthopedic surgery. The majority (70–75%) of Kijabe Hospital’s orthopedic surgery cases were trauma-related, including many referrals from district hospitals for complications of old trauma.

Intensive Care Unit and High-Dependency Units

Kijabe Hospital opened its five-bed Intensive Care Unit (ICU) in 2005, including one isolation/pediatrics room. The ICU could provide continuous intravenous medications and fluids, ventilator-assisted respiratory support, constant monitoring of vital signs, and dedicated nursing and physician staff to respond to acute changes in status. The ICU reduced postoperative mortality and allowed the hospital to provide more surgically and medically advanced care.

Between 2005 and 2008, the ICU served 1,347 patients, a quarter of whom were children. Half of these patients underwent major surgery, of whom 77% of survived to discharge. Non-surgical ICU patients had a 66% rate of survival to discharge, compared with 97.6% for hospital inpatients overall.

Internal medicine, pediatric, family medicine, and anesthesia physicians staffed the unit, with consultation from specialty services upon request. Kenyan medical and nursing trainees also participated in clinical care. Nurse-to-patient ratios in the ICU were 3:5, compared with 1:12 in the wards.

A day in the ICU cost USD 52, or USD 87.50 if the patient was on a ventilator, almost two to three times as much as the NHIF reimbursed. Doctors learned to make trade-offs between optimal care and reasonable costs—a practice unfamiliar to most expatriates. “We cannot charge a lot for our patients, even though we give quality care. We have to consider and balance whatever things we do. We can’t check blood gases or do invasive blood pressure monitoring or dialysis. Those are things you would want to do if you had the option,” the ICU nurse-in-charge explained. Interventions such as rapid fluid resuscitation, early antibiotics, and patient monitoring were relatively inexpensive and could provide significant benefit.¹⁰ The ICU also used less expensive means of monitoring patients, such as pulse oximetry or non-invasive blood pressure monitoring.

ICU services, especially mechanical ventilation, were in heavy demand. Only three ventilators were available, and some patients were ventilator-dependent for protracted periods. Hospital leadership established a committee to investigate the best approach to determine indications for ventilation. They reviewed the literature and Kijabe Hospital’s ventilation outcome data over several years—including diagnoses, surgical procedures, ventilation time, ventilator settings at 24 hours, length of stay, and survival—to provide guidance for ventilator use.

High-dependency units were established in the men’s, women’s, and pediatrics wards to provide an intermediate level of patient care, with nurse-to-patient ratios (2:6) lower than the ICU but higher than the regular wards. Kijabe Hospital’s surgical capacity and tertiary care services were commensurate with the level six national referral centers (see **Exhibit 10** for patient demographics by ward).

Education and Training

Hospital leadership saw the development of competent, compassionate providers for rural Kenya and other remote areas as furthering the work of God. “The emphasis on education builds up a base of people that work here and extend Kijabe’s influence out there,” described one pediatrician. Kijabe Hospital developed a multilayered medical education program for Kenyans and others—undergraduate electives and internships, postgraduate medical training, nursing training, professional development, and research (see **Exhibit 7** for visiting medical student data). Leaders believed that exposing students to a high-functioning rural hospital in East Africa and helping them appreciate the contextual nuance of practice in this setting would encourage them serve in rural Africa. Many expatriates served as teachers.

The Kijabe School of Nursing, established in 1980, trained 50–60 registered nurses per year. It also offered advanced nursing training, such as the KRNA program, and internet-based continuing nursing

education credits. The KRNA training program, started in 2006, was the only one in Kenya and trained 15 students per year. The majority of KRNAs continued to work in rural areas of Kenya (see **Exhibit 8** for KRNA distribution throughout Kenya). The hospital offered other special certificate training programs for nurses as well, including its month-long ICU certificate program.

Kijabe Hospital experienced rapid turnover of its nursing graduates. Kijabe-trained ICU nurses were frequently recruited to private ICUs in Nairobi that paid more. Of the 30 nurses who participated in an intensive two-month course when the ICU first opened, only five remained at the hospital one year later. “Just finishing nursing school and working in our ICU is so attractive on nurses’ CVs that any of them applying for a job get it immediately,” said a surgical resident. “The turnover of nurses is catastrophic.” Others believed the turnover was a natural consequence of high-quality teaching.

Since the 1990s, Kijabe Hospital had offered one-year internships for new Kenyan medical school graduates through the Christian Health Association of Kenya and for clinical officers (similar to physician assistants). It also participated in a transitional internship training program for South Sudanese physicians, most of whom returned to South Sudan as the country became newly independent.

Since July 1, 2008, Kijabe Hospital had offered a surgery residency accredited through the College of Surgeons of Eastern, Central, and Southern Africa (COSECSA), funded by the Pan-African Academy of Christian Surgeons (PAACS), a Christian organization training general surgeons at eight hospitals in Africa since 2003. Dr. Rich Davis, surgery residency program director at Kijabe Hospital, explained:

PAACS’s goal is to choose people who would be missionaries to their own countries and voluntarily not go open a boutique plastic surgery practice in Nairobi. Probably the best way to get people like that is to ... look for people who are committed to their faith and committed to serving people who don’t have access to care otherwise.

The PAACS training model emphasized clinical skills with an apprenticeship model similar to Western countries. Residents were given free housing, books, an internet allowance, and a USD 15,000 stipend that covered basic living expenses for their families. Kenya was the first PAACS program to train women. Previously, two of about 300 practicing surgeons in Kenya were women.

Depending on PAACS funding and housing availability, Davis aimed to take one resident per year. He added basic orthopedic and urologic surgical care to the US surgical residency curriculum to train highly competent “African surgeons,” who would be well equipped to deliver essential surgical care anywhere. “The first thing that attracted me to this residency is that it’s sponsored,” one third-year surgical resident said. “Secondly, it sounded really good in terms of the type of training. That’s what I was looking for—really good training.” Many PAACS graduates were working in remote areas that would not otherwise have access to a surgeon, which made leadership feel it was a successful program.

Surgery and neurosurgery residents from domestic and international programs rotated at Kijabe Hospital. Fourth-year general surgery residents from the US and UK went to “gain perspectives on global surgery” and learn about the provision of surgical care in a low-income environment with limited resources.¹² Dr. Erik Hansen, program director of Kijabe Hospital’s pediatric surgery fellowship and associate general surgery program director at Vanderbilt explained, “Vanderbilt Surgery Department was the first general surgery program [to have an] accredited extramural international rotation ... How do we get mutual benefit? You’re never going to have a relationship that’s apples for apples.”

Kijabe Hospital launched East Africa’s first fellowship program in pediatric surgery in 2007 through PAACS and COSECSA, as well as East Africa’s only pediatric neurosurgery sub-specialization training, through BethanyKids in conjunction with the University of Nairobi with support from private foundations.

Dr. Leland Albright, a renowned pediatric neurosurgeon who had written the seminal textbook in the field and worked full-time at Kijabe Hospital, said:

I think even after we leave, there will be neurosurgery residents, fellows, and some staff that will continue to come. It's a phenomenal opportunity. You see things you would never see in the US. In 25 years in the US, I saw three children with frontonasal encephaloceles, which is a hole in the skull with brain coming out through the face. Here, we do probably 15 a year.

An orthopaedic surgery residency had also been developed with three to five residents at any given time (see **Exhibit 9** for the complete list of postgraduate training programs at AIC Kijabe Hospital).

Kijabe Hospital welcomed visiting residents of other specialties from national and international hospitals. For example, the Anesthesia Department trained people at both Kijabe Hospital and the University of Nairobi in neonatal, pediatric, and adult care, offering one-month elective rotations. The hospital produced regular reports on its performance; conducted weekly morbidity and mortality conferences; and organized grand rounds and other education conferences. The hospital had the capacity to perform research and ran its own ethics committee (i.e., Institutional Review Board [IRB]), a medical library, and could serve as a site for clinical trials.

Expanding

Newton, along with Dr. Peter Bird, a surgeon from Australia, had been advocating for OT expansion since the mid-2000s. Total OT load had grown annually, from 4,099 in 2003 to 9,150 in 2009 (see **Exhibit 11** for OT load by year and **Exhibit 12** for surgical services). They convinced the hospital leadership that surgery should be prioritized and then approached large organizations, the Australian Government, and individual donors to raise the money needed. The hospital's surgeons and anesthesiologists envisioned a surgical practice that would continue to grow and accommodate the unmet demand with quality care.

At the same time, hospital leadership, including 10 management directors and the board of directors, wanted to develop a long-term plan to meet "the needs within the organization." Expanding the OTs would be the first stage of a 10-year plan—"a milestone on an otherwise long race ... to achieving the broader ministry"—that also included expansion of training programs, more disciplined management of finances, and several major improvements, such as utilities infrastructure expansion, that would secure Kijabe's longevity.

Kijabe Hospital Under Muchendu

In 2010, Mary Muchendu, who had been the principal of the nursing school for 10 years, was appointed the hospital's executive director. Being "a local person with a lot of experience in the local area made her particularly well suited [to navigate the politics]." Muchendu replaced a more traditionally trained administrator who had shepherded the dramatic growth of the hospital. Before Muchendu assumed the executive director role, "the doctors made up the bulk of the highest-trained people," one manager explained. "The natural progression of us getting a higher- and higher-caliber team at the management level was more centralized decision making."

Muchendu realized broader organizational changes were necessary to support the hospital's sustainability. She explained:

Mission hospitals are not really known to be business-minded. We say, in Kiswahili, "*Shauri ya Mungu*," meaning, "It's God's will." You don't want to push further, you want to leave it to God, and then you find

you lose supplies and you lose equipment. You're not maximizing resources. I found it quite a challenge to turn *Shauri ya Mungu* into, "You're responsible for supplies; you have to use it well and have strict financial management so that you minimize financial risks."

Operating Theater Expansion

The new operating theaters opened in 2010. Mary Njenga was appointed OT manager. She enforced strict sterile practices and implemented a system of accurate inventory accounting. With the input of surgeons, she rearranged the OT space, forcing everyone to pass through a changing room. Njenga noted:

This theater had run for 30 years without any control measures, even the charging system. [There was] no accountability. They used to just let everything go. I thought, "It's time for the team to take up the duty and own up the department" ... I lead the way, and they follow. It's better that way for the group, because in [the operating] theater, you have to make it as a team ... Share with another, educate them, and then they can follow. They can do what you teach even when you are no longer there.

Each item was documented in a proprietary electronic inventory tracking software and in a patient's record, used for billing. Initially, almost everyone complained about the system, but Bird and Newton supported Njenga. "I would explain the vision, and they would back me up," Njenga noted. The new system was estimated to increase the theater profitability from USD 35,000 to USD 117,000 per month by reducing waste and inefficiency.

Standard procedures and required documentation, including informed consent, ensured safety. In addition, a modified WHO Surgical Safety Checklist confirmed patient identity, vital signs, allergies, lab values, and proper preparation for surgery (patient had not eaten, etc.) before each procedure. Inventory of surgical supplies such as gauzes, sponges, and needles were performed at pre- and post-surgery "time-outs." Anesthesia records were kept meticulously during surgery for each patient, including trends in vital signs, medications given, and documenting fluid status (urine output, blood transfusions, etc.). In the immediate postoperative period, a nurse monitored patients, including vital signs and examinations, every 15 minutes until patients were deemed stable enough to move to the surgical ward.

The efficiency of case scheduling improved as well. The OT staff maximized patient flow and rearranged cases if operations were canceled. Non-emergent cases were typically scheduled within one week, and emergent cases were addressed after the OT nurse manager, emergency department, and surgeons coordinated.

Referral patterns to Kijabe also changed as surgeons received more complex cases that took more time. In addition, Bird commented, "Increased theaters gave us more time to teach. The expansion of theaters coincides with the expansion of training programs. Having more theaters means much less pressure to get cases done, and now trainees get to do cases, and they take twice as long."

After the expansion, slow bed turnover was still a problem. More detailed cost accounting led to rising fees. Patients medically ready for discharge remained on the floor because they lacked funds to pay. These occupied beds made it difficult for the operating room to complete the daily cases, and admission wait times could span two days. Existing space had already been optimized in terms of bed capacity by rearranging some office space and hallways.

The number of surgical procedures performed annually decreased dramatically in 2010. The total caseload increased in 2011 and then decreased again thereafter annually (see **Exhibit 10** for total theater caseload over time).

By 2011, Kijabe Hospital surgical services included general surgery, pediatric surgery, pediatric neurosurgery, ENT surgery, obstetrics and gynecology, plastic surgery, and anesthesia (see **Exhibit 13** for

the surgical facilities at AIC Kijabe Hospital). The caseload increased that year to approximately 9,500 operations. Postoperative care took place in all of the seven wards: male adult, female adult, pediatrics, maternity, nursery, private, and ICU.

Workforce and Services

The growth in OT space accommodated more surgical faculty. Total staff costs were USD 3.4 million in 2011 (see **Exhibit 14** for staff costs by year). A total of 634 personnel—including 194 nurses, 32 fully trained foreign and national physicians with expertise in a wide range of medical and surgical sub-specialties, and 21 doctors in training—staffed the hospital and outpatient clinics in 2013 (see **Exhibit 15** for hospital staff data).

Expanded training programs included the general surgery program, the orthopedics program, and the nurse anesthetist program, which was doubling every 12–18 months. The Department of Anesthesiology at Kijabe Hospital expanded to include anesthesia resident training and a Pediatric Anesthesia Fellowship for East Africa, and the nurse anesthesia training programs was opened to candidates from South Sudan. Volunteer anesthesiologists, primarily from private practice in the US, taught blocks of materials. In addition, Vanderbilt's Department of Anesthesiology would send 4–10 residents and fellows per year to help train, provide service, and transport educational supplies.

In July 2011, Kijabe Hospital became the first international site approved by the Residency Review Committee (RRC) of the American Council for Graduate Medical Education (ACGME) for American surgical residents. Kijabe Hospital agreed that a surgeon certified by the American Board of Surgery would supervise and evaluate these senior American residents during their two-month visiting rotation and that it would fulfill a host of other, primarily administrative, requirements. Visiting residents could not ethically provide unsupervised clinical care, especially for diseases that they were not accustomed to treating in the US.

From 2007–12, Kijabe Hospital hosted 131 foreign medical students, including 66 from the US. By 2012, the hospital was training nine medical officers and eight clinical officers, up from two medical officer interns in 1995 and five medical officer interns and two clinical officer interns in 2007. The first surgical resident to graduate from Kijabe Hospital's program earned the highest graduating test scores in all of COSECESA and joined Kijabe Hospital Department of Surgery as a consultant in 2012.

Obstetric and gynecologic surgeons, focused on maternal morbidity, worked in the hospital and various satellite clinics. The Obstetrics-Gynecology Department received complex and high-risk referrals as one of few hospitals outside Nairobi with a Newborn Intensive Care Unit that could ventilate babies and give surfactant to assist with the lung function in premature infants, with access to the operating theaters. Kijabe Hospital also had the capacity to do non-stress tests on fetuses and deliver them within 15 minutes if needed. "Of all the places I have been in this country, I would rate us above the national referral hospitals in outcomes," said Dr. Alfred Osoi, the Ob/Gyn Department chair. "It makes you feel as an obstetrician you are making a difference."

Pediatric neurosurgeon Albright and his wife "felt God leading us to come here to do and teach pediatric neurosurgery full time. So we did. We arrived September 1, 2010." Kijabe Hospital soon became one of the highest-volume pediatric neurosurgical centers in the world. "We did 1,326 cases in 2011, and about the same in 2012—and this is two of us, me and a fellow. Nobody that I know of does anything like that. We probably see more spina bifida than any place in the world, about one a day. And most large children's hospitals in the States may see 20–25 cases per year. We do that in a month," said Albright.

In 2013, MOUs (memorandums of understanding) were developed with a number of US institutions, including Ohio State University's Plastic Surgery Department and University of Tennessee Chattanooga Plastic Surgery Department, which had approved rotations at Kijabe Hospital. Some fellowships in development included pediatric anesthesia, plastic and reconstructive surgery, and ENT surgery. A scrub tech training program was also started to formally train the OT staff.

Between 2009 and 2013, the number of surgeons grew from 9 to 17 and specialities from 5 to 8 (see **Exhibit 10** for permanent surgeons and specialities).

Staff Benefits and Development

The hospital held an all-staff chapel every Wednesday morning and worship services every Sunday. On those days, the OTs opened later. The chaplaincy organized an evangelism course for staff, as well as small-group Bible studies. Many employees held their own Bible studies. Each medical training program included biblical training and offered counseling to trainees during times of stress.

Special efforts were made to find jobs within Kijabe Hospital for spouses of hired staff. "Because it's a ministry, we encourage family togetherness," said HR Director Thiongo.

Hospital leadership emphasized continuing education. Thiongo explained:

Professional growth [is] number one. We invest a lot in the growth of professionals, both internally and externally. Mostly, we ensure here you keep growing and continuous improvement. There's a rigorous attempt that every department keeps growing and learning, and it's expected of consultants to attend conferences or continuing education. For key people, we [provide] support.

When pediatric surgeon Dr. Erik Hansen, who had run the surgical residency program at Vanderbilt, joined the staff in 2010, it strengthened the academic partnership between Kijabe Hospital and Vanderbilt University. Visiting academics provided unique resources, such as continuing medical education opportunities, and advanced training for residents, as well as assistance with complex surgical cases.

Both Muchendu and the nursing school director received scholarships to fund their Vanderbilt University online master's degree programs in health services management. They each hoped to develop broader visions for Kijabe Hospital and improve their management abilities. Kenyan faculty member Osofi explained, "Having the executive director of the hospital still undergoing continuing education spurs on the learning culture that is in Kijabe." Osofi was able to take a leave of absence to pursue a masters in public health at University of Washington in Seattle (US) under a Fogarty grant. While there were no formal training of trainers programs at Kijabe, everyone was expected to share what they learned abroad. Osofi observed, "In Kenya, there's not real mentorship; you have bosses that lord over you. But in this place, you have good mentorship, people showing you the ropes, helping you to learn."

Local staff salaries were not competitive with the private or government sectors. In 2010, when the Kenyan Constitution guaranteed government salaries would match those of the private sector, Kijabe Hospital did not change its scale. A diploma-level nurse and an advanced-degree nurse just starting at Kijabe Hospital earned USD 325 per month. The same positions earned USD 470 per month and USD 584–701 per month, respectively, outside Kijabe Hospital. Kijabe Hospital paid medical officers about USD 1,750 per month, while government hospitals offered USD 2,340. Consultants made a third of what they would make outside Kijabe Hospital. "That's why our consultants represent the highest level of commitment. Compared to what they would make out there, they have the highest level of sacrifice," said Thiongo.

"If money is the driving factor, you just have to get out of this place. [But] I would still rather work here," claimed Osofi. "This is a community and not just a workplace," explained another physician. "Mary

Muchendu could be making a lot more money elsewhere—a lot more. She is here because she has a heart for people, for her God. Others are also here by choice.”

The human resources department organized free hot tea delivery to every department twice daily, extracurricular sports teams, and team-building retreats for every department. Surgical department retreats included everyone from surgeons to nurses to ancillary staff. The increased staff welfare initiatives were thought to be responsible for the large reduction in staff turnover, from over 14% in 2008 to less than 8% in 2012 (see **Exhibit 16** for graph of staff turnover over time).

Financing and Donations

From 2010 to 2011, Kijabe Hospital’s operational expenses grew 18% from USD 7.4 million to USD 8.7 million, and its revenue rose from USD 7.5 million to USD 8.8 million (see **Exhibit 14** for 2009-2011 hospital finance statements.) Muchendu explained they were able to save USD 620,000 in operations by “just tightening the way we did our bills and expenditures and procurement.” Bird explained, “We’ve brought on more administration staff, and we’re doing more cost accounting. The charges to patients have gone up as well. The simpler cases don’t necessarily come to Kijabe anymore because our prices are higher. It’s been a double-edged sword, because we can’t manage the poorer patients but we can keep the hospital afloat.”

Of Kijabe Hospital’s revenue in 2011, 82% came from patient care, including USD 8.8 million from the department of surgery. Records since 2010 showed that unpaid debt and direct bill write-offs cost the hospital USD 60,000–80,000 annually. Missionary staff charged reduced prices. “Here, the hospital might charge USD 600, and the doctor’s fee may be less than USD 50. If you go to a private hospital in Nairobi, doctors’ fees might be equivalent to or higher than what they pay the hospital,” described one physician.

Some patients had NHIF coverage that provided USD 29 per day of inpatient ward hospitalization, which helped defray costs. Patients often spent several weeks raising money for their medical needs through Kenyan community self-help events called *harambees*.

Each patient was billed for the specific procedure, anesthesia, and surgical consumables. The hospital kept meticulous track of supplies so that patients were charged for exactly what was used. Emergent surgical procedures were performed without pre-payment, while urgent or elective procedures required a deposit, typically around USD 950, depending on the estimated bill. Upon discharge, patients would receive the balance of unused funds or be charged the amount in excess of their deposit.

The poorest patients received free care. The hospital discharge planner made the determination of inability to pay on a case-by-case basis, based on interviews with the family and the chief of the patient’s community. A handful of externally supported programs (BethanyKids, AIDS-Relief, etc.) also provided free care for specific diseases.

Significant funding came from churches and individuals who believed in Kijabe’s mission. “When we needed an ICU built, a Christian church was contacted in the US where some of the long-term missionaries had contacts, and we informed them of our needs. They decided as a church that they would raise these funds, USD 30,000+ for the ICU at their Christmas offering weekend,” said Newton.

With the rise in social media, the hospital also began posting patients’—particularly children’s— stories and pictures to a website called Watsi.org. Donors could sponsor individual patients, and their gifts were deducted from the patient’s bill.

Supplies

The hospital relied on medical equipment donations for everything from operating-room beds to anesthesia machines and ventilators. “There are some things we can source in Kenya, like chest tubes, Pleur-evacs, suture, closed suction drains. Some things we can rely on people to bring are throwaway in America but we use them over and over again, like pulse [oximeter] strips ... masks for Ambu-bags ... cautery pencils... biopsy forceps... the suction tubing we reuse all the time until it’s a little piece of spaghetti,” one surgeon explained. Items that could not be sterilized often had to be thrown away if they arrived in an open package.

Because donated equipment was frequently used, it often broke or stopped working. Local repairs and technicians were not available. Donations that were incompatible with Kijabe Hospital’s devices or for a specialty service that Kijabe Hospital did not offer were passed on to others. Sometimes, the supplies themselves were not affordable. For example, when newer ventilators were donated to the hospital, the ICU director realized that the new equipment was too expensive to maintain and opted for older ventilators whose maintenance was easier and more affordable in the Kijabe Hospital setting. The newer ventilators were swapped for the more familiar older models at a large private ICU in Nairobi.

Infrastructure Expansion

Kijabe Hospital’s basic facilities, including water, electricity, and waste management systems, were last upgraded in 1978 (see **Exhibit 17** for further details about existing buildings and the 10-year construction plan). The strain on utilities was beginning to show: sewage breakdown ponds overflowed into surrounding communities, hospital-wide blackouts occurred sporadically, water shortages were common, and human waste was burned in open areas. “Clinical expansions were outstripping other systems,” said Bird. “Muchendu was given a ship growing so quickly it could implode.”

Collins Muiruri, who had trained in mechanical engineering and business in the US, was appointed head of hospital engineering and facilities in 2010. “In mission hospitals, sometimes the doctors are doing everything from finance to projects to HR. That just creates a nightmare foundation,” he said. “We had to change that.”

To assist in the early stages of assembling a master plan, a missionary group from Engineering Ministries International visited Kijabe Hospital in February 2010. The 24 civil and mechanical engineers worked with Muiruri and the hospital’s engineering team to identify areas of need. This entailed surveying the entire property, taking aerial photos, and performing structural assessments. The engineers studied water quality, demands, water sources, water concerns, and water storage. They looked at wastewater conditions, including quantity, septic tanks, and possible means of improvement, and presented their report at a second visit that June.

The master plan was divided into phases, giving the finance team time to raise funds for each project while moving forward with pressing issues. Between 2010 and 2012, Muiruri’s team replaced the main incoming transformer and generator and installed voltage stabilizers and automatic switchgears. In-country wholesalers familiar with Kijabe Hospital’s outstanding reputation offered flexible financing to make the upgrades possible. With these, power supply was steady and backed up. Kijabe Hospital went from losing power 7–10 times per day to having a world-class electric system to support its critical units, including the OTs and intensive care units. “We did this to send a message that we can be a mission hospital but still have the best. Right now, we have one of the best power systems in East Africa. We are comparable to Aga Khan Hospital or Nairobi Hospital [the two biggest private hospitals in Kenya,] or banks, which need very good power systems,” said Muiruri.

The next projects were the sewer/waste management system and the water supply. The electrical and waste management systems would be designed to manage the resources of the hospital, whereas the water system, which was supplying only two-thirds of the required water for the town, would be revamped by adding fresh water sources. The hospital installed a diesel generator for backup power, a water purification system, oxygen concentrating systems (adequate for even very sick patients), a vacuum plant that allowed wall suction units in the wards and OTs, a medical gas storage building, a stable electric current, and a human waste incinerator. Future plans included an overhaul of the storm water drainage system, which would prevent flooding in certain areas of the hospital complex and reduce rainwater inflow into sanitary sewers, which caused them to overflow.

A 70–80 bed expansion of the BethanyKids inpatient pediatrics wards was a high priority, given the rise in pediatric surgical and neurosurgical cases. Plans were under way to create a neonatal ICU, which would free all five beds for adult and older pediatric ICU patients. The adult men's and women's wards would also be expanded, and isolation rooms would be added. In addition, private wards; radiology, pathology, and lab facilities; the outpatient and emergency departments; space for records and administrative offices; and clinics for ENT, HIV and tuberculosis patients would also be expanded. New staff kitchen and dining facilities were planned, in addition to a café for patient families and visitors. There were plans to increase space for the engineering, facilities, and security departments, including plans to improve traffic flow. A funeral chapel, parking lot, and morgue were also planned. Lastly, there were plans for an addition to the OTs, which would increase locker and storage space, add three more OTs (for a total of 12), add two neonatal resuscitation rooms, expand the central sterilizing department, add office space, and connect the OTs to labs and pathology. Several outdoor improvement projects around the Kijabe Hospital complex were slated to provide seated waiting areas, parks, and recreational areas for patients and families.

Decisions

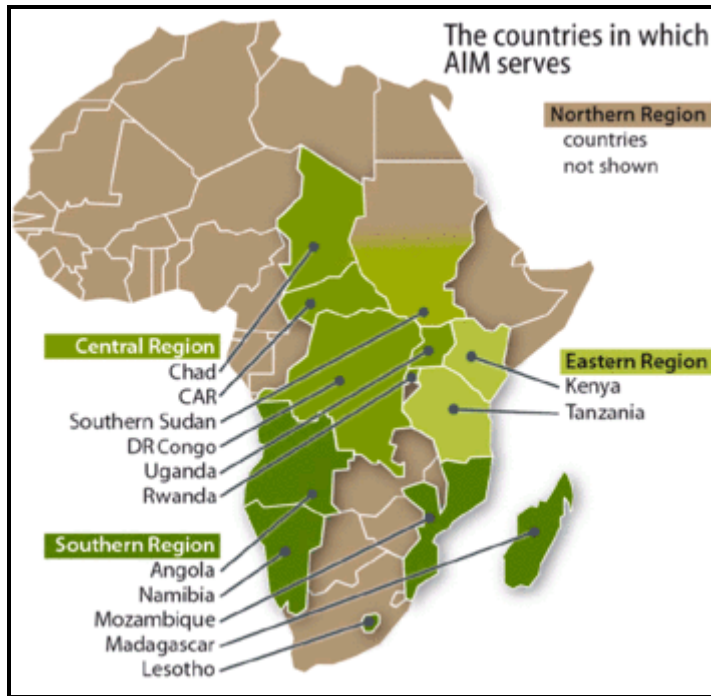
Mary Muchendu and the rest of the hospital leadership were aware of the funding limitations they faced. The amount of unpaid patient debt was expected to rise relative to revenue. In 2013, Muchendu considered developing a hybrid payment model whereby outpatients could pay a premium for greater convenience such as shorter wait times, improved amenities such as private rooms, and improved customer service. Revenue generated from these premiums could then be funneled back to the hospital. Some medical staff were concerned about the temptation to pursue sustainability over care for the poor or education. "Often the progression of faith-based organizations designed for the poor is that if they stay in business, they become centers of excellence for the rich," said the medical director.

The leadership considered how to balance the professional staff of expat missionaries working for free with Kenyan doctors trained locally. They also considered how their mission should play into these decisions. What would truly allow them to maximize their potential as surgeons, as Christians and as expats and Kenyans? How did their focus on expensive surgical care, training, and OT expansion align with their mission to serve the vulnerable? Could a hospital in Africa serve the poor and provide high-quality service and education without Western volunteers, supplies, and equipment?

Appendix *List of Abbreviations*

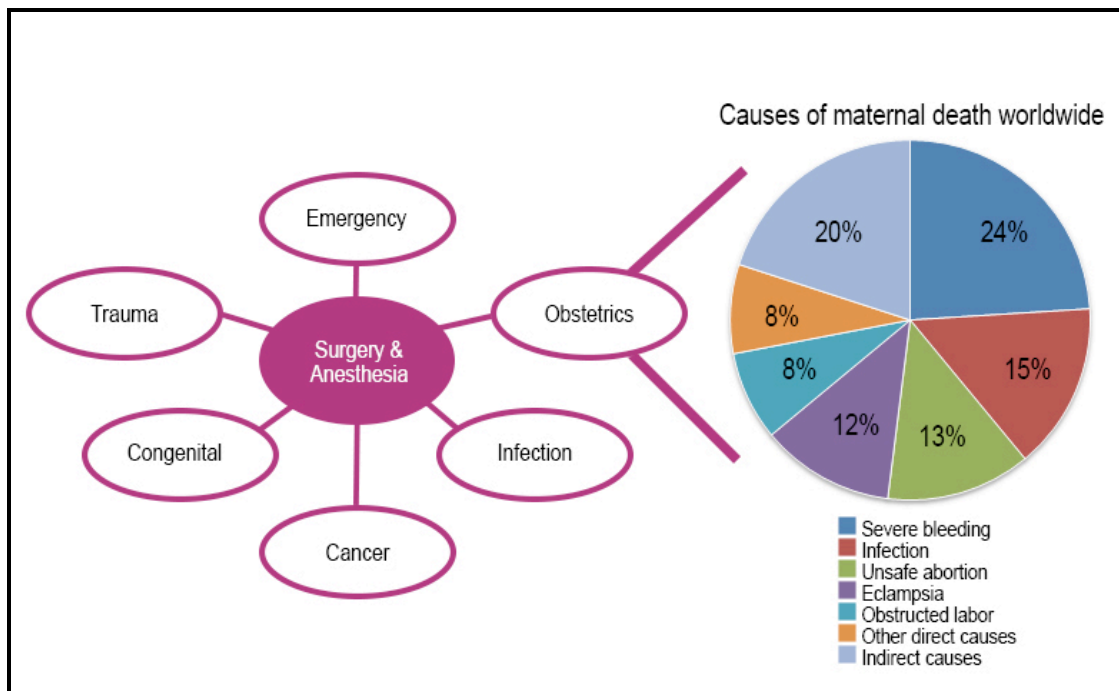
AIC	African Inland Church
AIDS	acquired immune deficiency syndrome
AIM	Africa Inland Mission
ACGME	American Council for Graduate Medical Education
CIA	Central Intelligence Agency
COSECSA	College of Surgeons of Eastern, Central, and Southern Africa
DOTS	directly observed therapy, short course
DPT3	third dose of diphtheria toxoid, tetanus toxoid, and pertussis vaccine
EMI	Engineering Ministries International
FPNS	Fellowship in Pediatric Neurosurgery
GDP	gross domestic product
HIV	human immunodeficiency virus
ICU	Intensive Care Unit
IMF	International Monetary Fund
KRNA	Kenya Registered Nurse Anesthetist
KEPH	Kenyan Essential Package for Health
MOH	Ministry of Health
MOU	memorandum of understanding
NHIF	National Hospital Insurance Fund
OT	operating theater
PAACS	Pan-African Academy of Christian Surgeons
PPP	purchasing power parity
RRC	Residency Review Committee
RVA	Rift Valley Academy
UN	United Nations
UNDP	United Nations Development Programme
USD	United States dollars
WHO	World Health Organization

Exhibit 1 *Africa Inland Mission Presence in Africa, 2011*



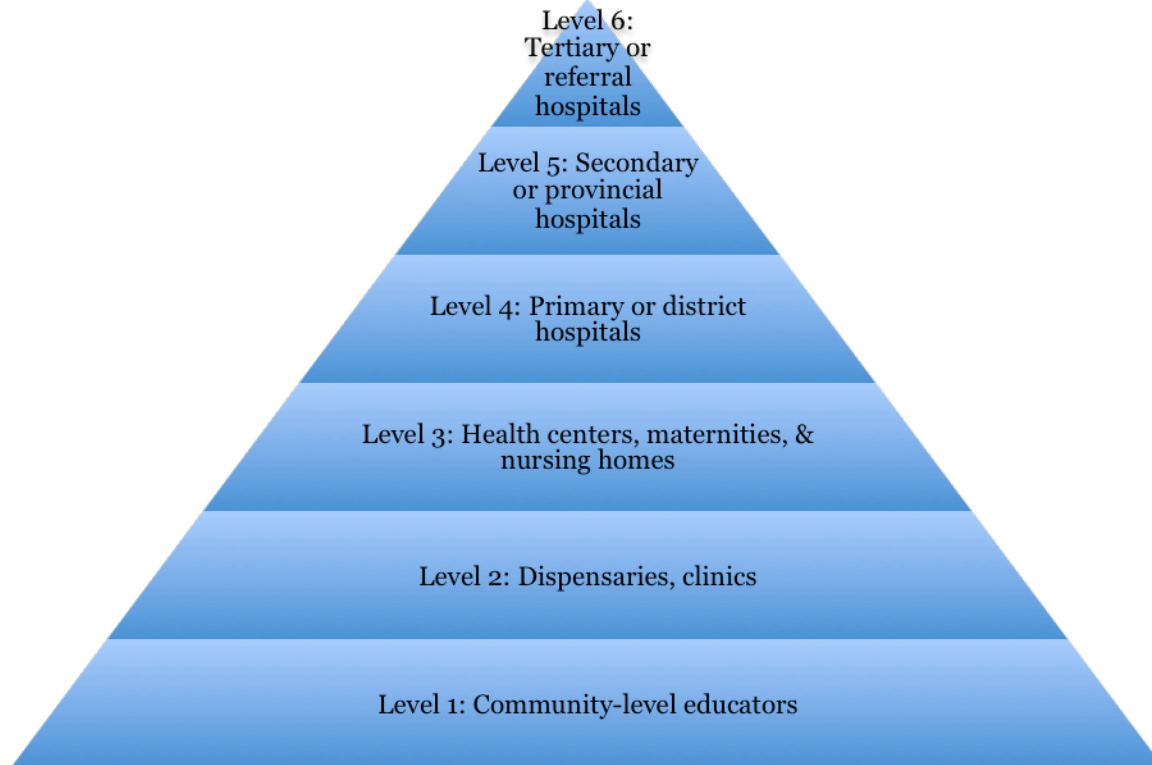
Source: Africa Inland Mission.

Exhibit 2 *Diseases Often Requiring Access to Essential Surgical Care*



Source: Compiled using data from the World Health Organization.

Exhibit 3 *Delivery Levels of the Kenyan Essential Package of Health*



Source: Kenya National Health Sector Strategic Plan II, 2005–10.

Exhibit 4 African Inland Church Dispensaries (black) and Hospitals (red), 2011



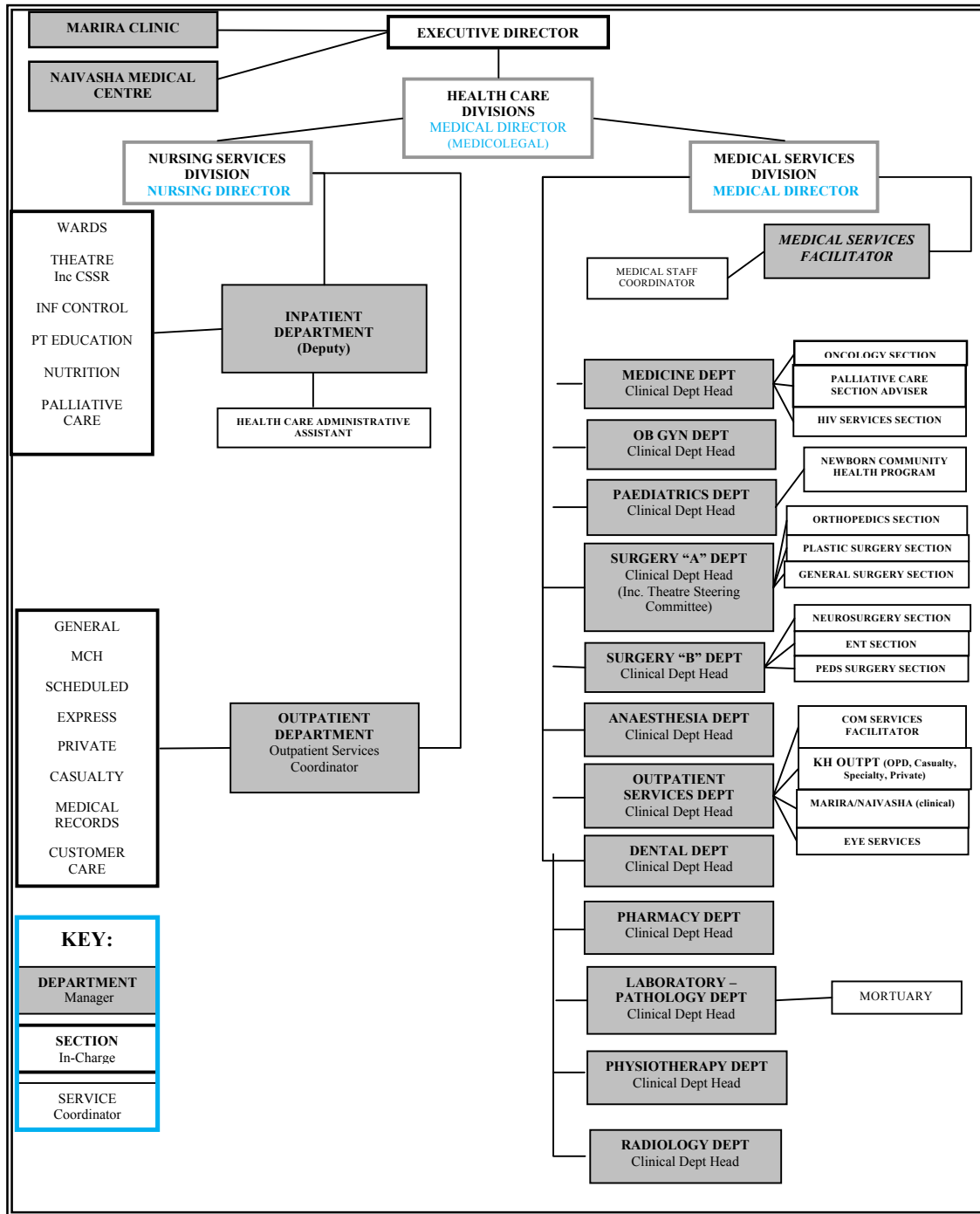
Source: African Inland Church.

Exhibit 5 *AIC Kijabe Hospital Timeline*

YEAR(S)	EVENT(s)
1895	Africa Inland Mission (AIM) arrives in Kenya with a group of missionaries from Philadelphia (Pennsylvania Bible Institute).
1915	“Theodora Hospital” (later renamed Kijabe Hospital) opened at Kijabe Mission Station.
1961	Initial buildings of current campus constructed, 65-bed capacity and small, basic surgery capacity.
1968–1970	Creation of a nursing school, dormitory for 48 nursing students constructed.
1969	Expansion: second building with a 30-bed maternity unit, three private rooms, and one operating theater with increased capacity.
1970s	African Inland Church becomes independent of AIM.
1972	Establishment of a board of governors, which made Christian medical ministry central to hospital’s mission.
1977–1980	German National Church doubles bed capacity of Kijabe Hospital (65 beds to 130 beds).
1980	Three-to-five-year community nurse training program begins. New outpatient building opened by former president Moi.
1991	Two-year dental training program for Kenyan dentists begins in Dental Department.
1995	Christian Kenyan doctor creates new intern training program, physician training with the University of Nairobi.
1998	Kenya Registered Nurse Anesthetist (KRNA) training started.
2004	BethanyKids at Kijabe Hospital opens specialized pediatric surgical center.
2007	Kenyan Nursing Council formally recognizes KRNA training.
2010	Major Operating Theater (OT) expansion. Engineering Ministries International (EMI) creates master plan. Electric and waste water systems upgraded.
2012	EMI finalizes master plan.

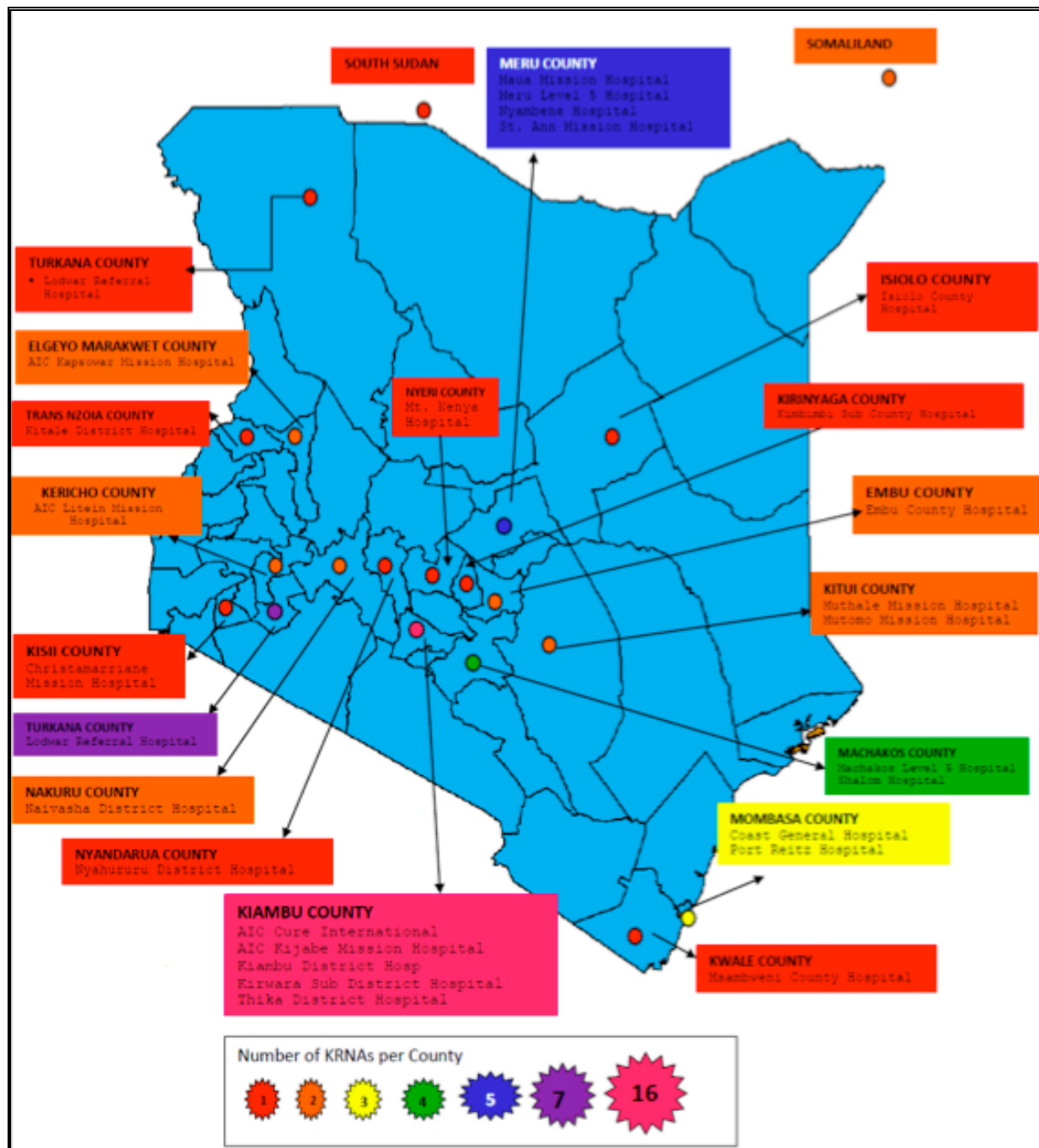
Source: Compiled by case writers using sources from Kijabe Hospital.

Exhibit 6 Administrative Organisational Structure, 2012



Source: Medical Director's Office, AIC Kijabe Hospital.

Exhibit 7 KRNA Distribution Throughout Kenya



Source: Mark Newton’s teaching files, 2014.

Exhibit 8 *Visiting Medical Student Data*

COUNTRY	YEAR					
	2007	2008	2009	2010	2011	2012
Kenya	5	5	5	5	5	8
Uganda	0	0	0	0	3	4
USA	12	6	8	16	16	8
UK	4	7	2	4	2	4
Nigeria	0	1	0	0	0	0
South Africa	0	1	0	0	0	0
Total	21	20	15	25	26	24

Source: AIC Kijabe Hospital Department of Medical Education, 2013.

Exhibit 9 *Postgraduate Training at AIC Kijabe Hospital*

- ◆ General Surgery
 - A five-year residency program accredited by the PanAfrican Association of Christian Surgeons, Loma Linda University (USA), and the College of Surgeons of East, Central and Southern Africa (COSECSA).
 - A one-month resident rotation site under MOU with Vanderbilt University Medical Center (USA).
 - Orthopedic surgery: Five-year registrar training (in partnership with AIC Cure Hospital) accredited by the College of Surgeons of East, Central, and Southern Africa (COSECSA)
- ◆ Family Medicine
 - The Family Medicine program will be administered by the Kaburak University, with new students set to enroll for the 2014–15 academic year.
 - One-month resident-level internal medicine training rotation site under MOU with Swedish Hospital Family Practice training program (USA).
- ◆ Pediatric Surgery
 - Three-year fellowship level training Programme in Pediatric Surgery (PAACS and COSECSA accredited).
 - Accredited three-month rotation site in Pediatric Surgery for the PAACS General Surgery Registrar Programme (for PAACS trainees from outside Kenya).
- ◆ Pediatric Neurosurgery
 - One-year fellowship level training Programme in Pediatric Neurosurgery. The fellowship is being accredited by the University of Nairobi (FPNS (UoN)).
 - One-month resident-level training rotation site under MOU with University of Nairobi.
- ◆ ENT Surgery
 - One-month resident-level training rotation site under MOU with University of Nairobi.
- ◆ Anesthesia
 - One-month rotation for anesthesia registrars under MOU with University of Nairobi.
 - One-month resident-level anesthesia training rotation site under MOU with Vanderbilt University Medical School (USA).
 - Founding partner in the East Africa Pediatric Anesthesia Fellowship with Kenyatta National Hospital and Gertrudes Children's Hospital (Nairobi).
- ◆ Internal Medicine
 - One-month resident-level internal medicine training rotation site under MOU with University of Texas Medical Branch (USA).

Source: AIC Kijabe Hospital Grant Proposal, 2013.

Exhibit 10 Patient Demographic and Surgical Specialties (2011)**Inpatient Wards**

	ADMISSIONS	DISCHARGES	DEATHS
ICU	160	111	111
Maternity	3,333	3,428	4
Nursery	833	1,049	29
Pediatric	2,686	2,719	66
Private	349	352	8
Salome (Women's)	1,569	1,649	135
Wairegi (Men's)	2,109	2,160	104
Total	11,039	11,468	457

Outpatient / Clinic

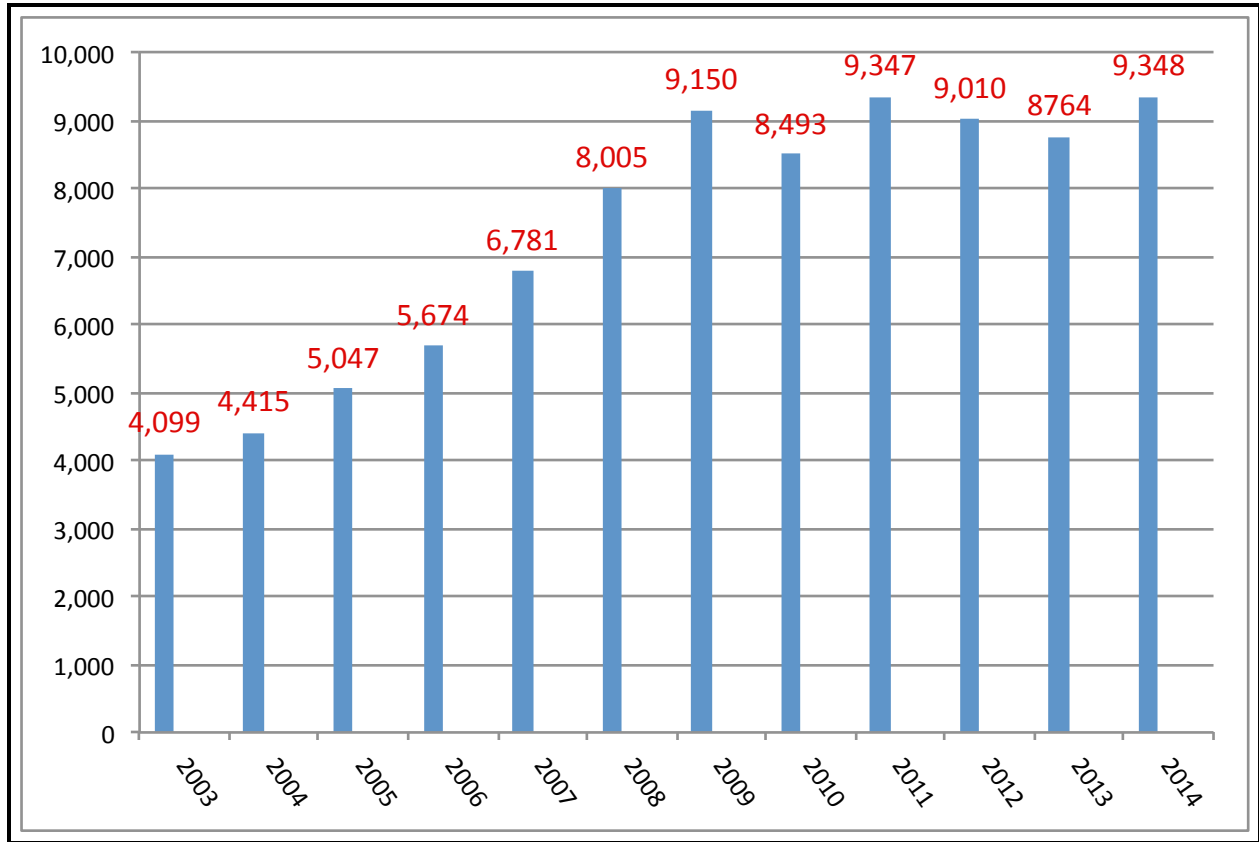
	Number of Patients
General Outpatient	61,527
Private Outpatient	3,058
Surgical	8,784
Orthopedic	6,284
Diabetic	1,798
Gynecology	3,136
Casualty	7,262
AIDS Relief	5,154
BethanyKids	4,458

Permanent Surgeons and Specialties 2009, 2013

	2009	2013
General	3	5
Orthopedic*	2	3
Obstetrics-Gynecology*	1	3
Pediatric	2	1
Pediatric Rehabilitative*	1	
Pediatric Neurology*		1
Plastic*		1
Ophthalmology (Clinical Officer)*		1
Dentistry		1
Anesthesiology		1
Total Permanent Surgeons	9	17
Total Specialities*	4	9

Source: AIC Kijabe Hospital Grant Proposal, 2013.

Exhibit 11 *Total Theater Case Load at Kijabe Hospital, 2003–14*



Source: Peter Bird, Kijabe Hospital.

Exhibit 12 *Surgical Services at Kijabe Hospital, 2013***General Surgery**

Hernia repair
 Conditions of the thyroid gland
 Problems of the urinary tract
 General abdominal surgery
 Cancer of the skin
 Cancer of abdominal organs
 Cancer of genitourinary tract
 Cancer of the head and neck
 Leg circulation
 Leg wound management
 Breast conditions and breast cancer
 Abdominal aortic aneurysm repair
 Vascular condition repair
 Multidisciplinary management of complex trauma

Neurosurgery and Pediatric Neurosurgery

Hydrocephalus
 Spina bifida
 Brain tumors
 Head injuries
 Spasticity
 Movement disorders
 Encephaloceles
 Tethered spinal cords
 Spinal cord injuries

Ophthalmology

Screening of all eye problems
 Diabetic retinopathy
 Refraction services
 Provision of spectacles

Cataract surgery
 Trachoma surgery
 Corneal repair
 Conjunctiva mass excision
 AC washout
 Other anterior segment surgeries
 Congenital cataract screening
 Retinoblastoma screening
 Strabismus screening

Orthopedic Surgery

Severe injuries
 Birth defects
 Advanced arthritis
 Spine disorders
 Infections
 Tumors

Pediatric General Surgery

Tumors
 Anorectal malformations
 Hirschprung disease
 Intestinal atresias
 Hypospadias
 Bladder exstrophy
 Chest and lung anomalies
 Undescended testes
 Intraabdominal conditions
 Intrathoracic conditions
 Intestinal endoscopy
 Urinary endoscopy

Plastic and Reconstructive Surgery

Source: Kijabe Hospital website.

Exhibit 13 *Surgical Facilities at AIC Kijabe Hospital*



Clockwise from top left: Hand-wash sinks outside operating theater; endoscopy/minor procedure suite; operating theater mini-storeroom with attendant; postoperative recovery area with wall oxygen, suction, and vital sign monitoring.

Source: Case writers.

Exhibit 14 *AIC Kijabe Hospital Financial Statements 2009–11 (USD)*

		2009	2010	2011
Income	Patient revenue		5,919,858	7,166,118
	Donated staff services income		1,171,968	1,190,363
	Other income		319,790	383,324
	Total income	6,286,434	7,411,616	8,739,804
Expenditure	Staff costs		(2,691,816)	(3,390,861)
	Supplies		(1,833,678)	(1,959,306)
	Donated staff services costs		(1,171,968)	(1,190,363)
	Administrative expenses		(533,867)	(785,129)
	Establishment expenses		(429,008)	(624,297)
	Other operating expenses		(648,785)	(671,304)
	Total expenditure	(6,267,404)	(7,309,123)	(8,621,260)
Surplus/ Deficit		19,030	102,493	118,545

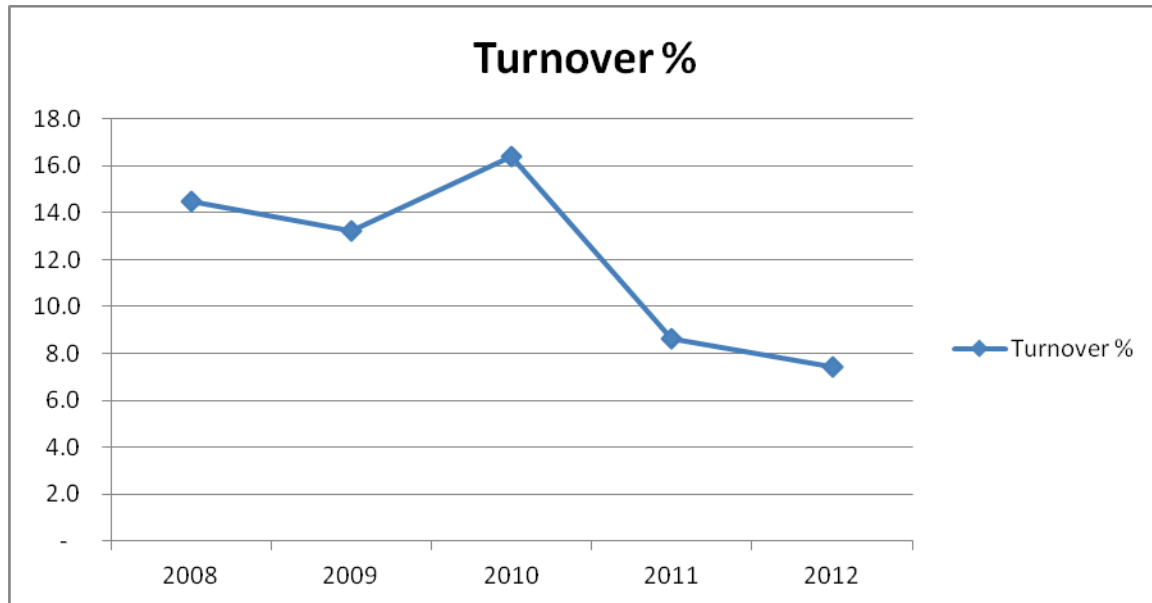
Source: AIC Kijabe Hospital Office of the Finance Director, 2011.

Exhibit 15 *AIC Kijabe Hospital Staff, Skills, and Training*

STAFF	NUMBER	%
Administrative staff	90	13.6
Health care professionals	378	55.0
Support staff	215	31.4
Total	683	100
NON-PHYSICIAN HEALTH CARE PROVIDER STAFF TRAINING LEVEL	NUMBER	%
Master's	20	3
Bachelor's	30	4
Advanced / Higher Diploma	17	2
Diploma / CPA	308	45
Certificate	60	9
Other	248	36
Total	683	100

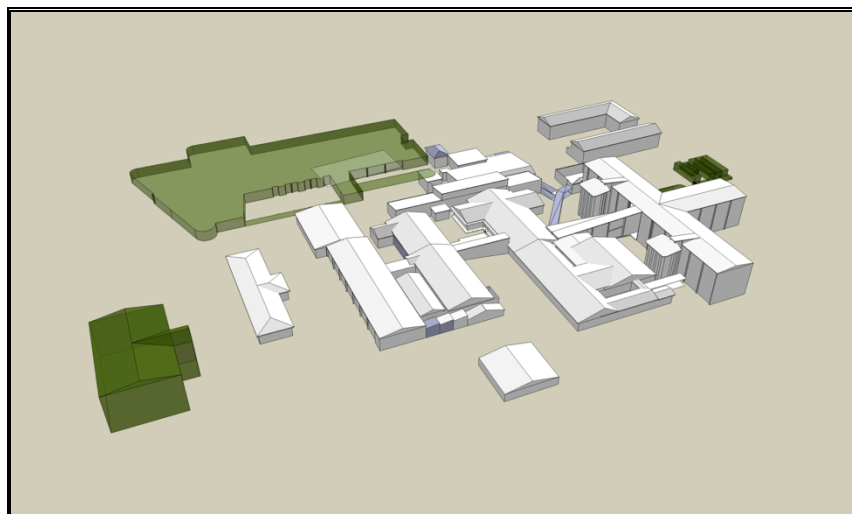
Source: AIC Kijabe Hospital Office of the Finance Director, 2013.

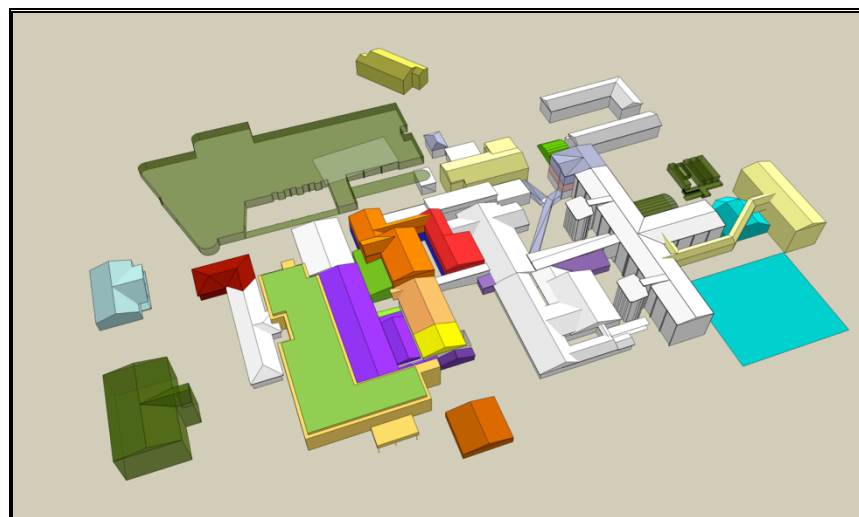
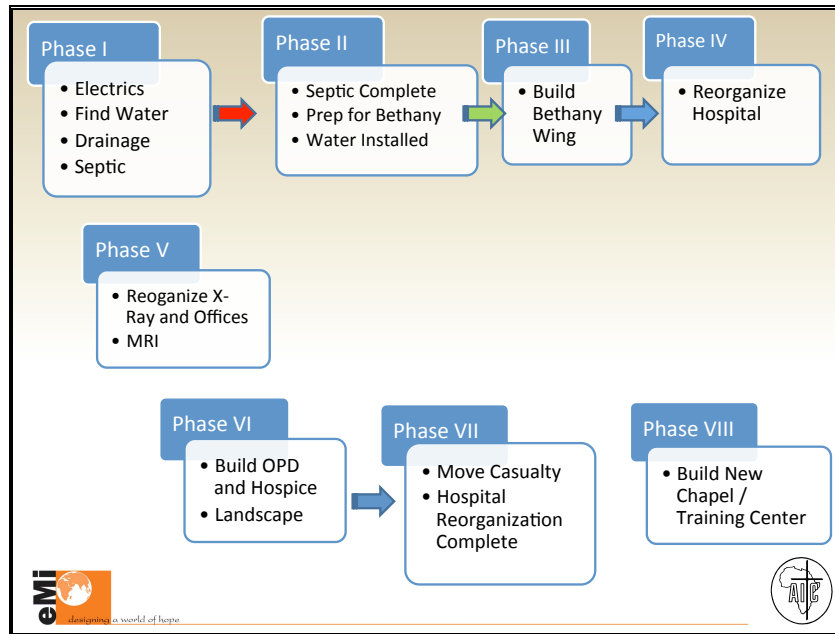
Exhibit 16 *Staff Turnover at AIC Kijabe Hospital*



Source: AIC Kijabe Hospital Office of the Finance Director, 2013.

Exhibit 17 *Existing Buildings and 10-Year Plan*





- ◆ Surgery expansion
- ◆ Radiology, pathology, lab expansion
- ◆ OPD, ER addition, including Records and Admin
- ◆ Ears, Nose, & Throat (ENT)
- ◆ Morgue update
- ◆ Engineering and Facility Dept
- ◆ New staff kitchen and dining
- ◆ Car parking / traffic flow / security
- ◆ TB & HIV building
- ◆ Storm water
- ◆ Medical gas
- ◆ Café

Source: Engineering Ministries International “10-Year Master Plan Part 2” Presentation, Oct 29, 2012.

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