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Scaling up essential surgery in rural Africa: outcomes of a novel regional initiative

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Introduction: South Sudan, like most of rural Africa, has a high surgical disease burden and profound unmet surgical needs. This is against a background of weak surgical service delivery systems, especially in the harder-to-reach areas. Here it is further fueled by armed conflict and poverty. The surgical service delivery models applied so far have not adequately improved surgical care. Through the Intergovernmental Authority on Development Regional Initiative for Capacity Building, a surgical team was deployed to Kuajok Hospital in Warrap state. The team mentored South Sudanese health workers for 2 years while working together with other agencies operating in the locality to improve surgical services. This paper is an account of the capacity building process for surgical service improvement at this site, from 2015 to 2017.

Methods: A descriptive study of activities and patients seen over a 2-year period at this centre. Quantitatively, statistics were extracted and compiled from all areas of surgical care, including profiles of the various surgical conditions. Qualitatively, information was gathered through unstructured interviews.

Results: There was a drastic increase in surgical outpatient consultations, admissions, and operations. There was an improvement in the level of surgical care and patient care systems. New facilities like operating theaters, emergency rooms, surgical consultation rooms, and surgical wards were established. Community attitude and health-seeking behavior improved, leading to improved access to care. An indirect financial benefit was experienced due to improved patient care outcomes and reduced expenditure on referrals.

Conclusion: Improvement of surgical services in Africa's hard-to-reach areas is readily attainable through partnerships and mentoring of native medical workers by personnel from fellow African countries.

Key Words: essential surgery, rural, Africa

Introduction

In rural Africa, modern surgical services are extremely scarce, manifesting in the lack of adequate surgical facilities, poor access, and a severe shortage of surgical workforce, leaving a huge unmet need for surgical care[1–3]. This is attributable to factors like weak economies, poor management, and neglected priorities[4]. In South Sudan, the world's youngest nation, the situation is worsened by the prevalent state of war. Located in eastern sub-Saharan Africa with a population of about 12 million[5] (http://www.ssnbss.org/, https://www.citypopulation.de/en/southsudan/cities/) it is largely rural.(http://www.ssnbss.org/, https://ssnbs.org/). The surgical disease burden is high, against a background of weak surgical service delivery systems, and thus a huge unmet surgical need[1,6]. The number of surgical procedures per 100,000 population in South Sudan is estimated at only 268, and the specialist surgical workforce is extremely low at 0.32 per 100,000 population (www.lancetglobalsurgery.org/data.worldbank.org/indicator/SH.SGR.PROC.P5?locations=SS). Only 8 indigenous active surgeons have been recorded by 2010[7]. The high poverty levels, deficient infrastructure, and poor health-seeking behavior associated with low literacy levels have further contributed to the low access to health services, precipitating a health crisis, especially in the harder-to-reach areas (https://ssnbs.org/,[6] https://knoema.com/atlas/South-Sudan, http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/SSD.pdf, http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/SSD.pdf, https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/emis_2016_-_statistics_booklet_-_2017-02.pdf, [www.goss.org.],[8] https://www.ghdonline.org/uploads/LMICs_with_NSP_GS2030.pdf/https://www.

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iccpportal.org/sites/default/files/resources/Policy%20Brief_Global%20Surgery%202030.pdf, https://www.futurelearn.com/courses/geohealth/0/steps/19307).

Several surgical service delivery models have been applied by various interest groups but the deficiency is still pronounced. Some non-governmental organizations have used brief humanitarian models—flying in personnel and equipment for short-term surgical camps[6], others have established more permanent, usually faith-based health facilities—which run purely on donor budgets with specific priorities (https://www.mediciconlafrica.org/en/wp-content/uploads/sites/2/2016/10/cuamm_annualreport2015_inglese_ok_ interobassadistillato.pdf), whereas others focus only on emergencies like war casualties (https://www.msf.org/south-sudan). Presently, the health sector in South Sudan is largely funded by external donors who have coalesced their contributions into a health-pooled fund (https://hpfsouthsudan.org/). This disburses funds through implementing partners who directly manage the health centres. Under the Intergovernmental Authority on Development Regional Initiative for Capacity Building, several agencies concerted their efforts to support South Sudan in public service improvement, including the health care sector (https://www.undp.org/south-sudan/projects/support-public-administration-igad-rss-regional-initiative). A surgical team comprising of personnel from Uganda and Ethiopia was constituted and deployed to Kuajok Hospital in Warrap state, one of the poorest states in South Sudan (https://reliefweb.int/sites/reliefweb.int/files/resources/County%20Level%20Poverty%20Estimates.pdf, https://www.undp.org/south-sudan/projects/support-public-administration-igad-rss-regional-initiative). The team was majorly mandated to mentor South Sudanese health workers. For 2 years (September 2015–July 2017), the team worked together with other agencies operating in the locality to improve surgical services. This paper reports the activities and impact of this initiative.

Methods

Design

This was a descriptive study that assessed qualitatively and quantitatively project activities and patient statistics recorded over the 2-year period from September 2015 to July 2017.

Kuajok Hospital in Warrap State of South Sudan is located about 700 km northwest of the capital Juba. The hospital catchment area is over 45,000 km^2 (https://www.citypopulation.de/en/southsudan/cities/, https://www.citypopulation.de/php/southsudan-admin.php?adm1id=81) with a population estimated at 1.3 million in 2015 (https://www.citypopulation.de/en/southsudan/cities/, https://www.citypopulation.de/php/southsudan-admin.php?adm1id=81). The study was conducted in line with the revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) criteria and the findings were described accordingly (http://www.squire-statement.org/index.cfm?fuseaction=Page.ViewPage&PageID=471).

Data collection

The preproject surgical services were assessed by tracing and reviewing hospital and patient records, and from interviews of selected staff and service beneficiaries. The study also assessed the mentoring process, formal administrative activities, and infrastructural changes. Quantitative data were extracted and compiled from multiple areas of surgical care covering major and minor theater operations, ward procedures, in-patient admissions, outpatient consultations, and referrals, as well as profiling the prevailing diseases and conditions. Qualitative information was gathered through unstructured interviews and commentaries from patients, other service beneficiaries, and community and opinion leaders.

Preproject status

Whereas the hospital had been upgraded from a primary health centre in 2009, by the start of the project, it still lacked facilities commensurate with the status of a hospital. There was a severe shortage of personnel and facilities—with only 2 admission wards; maternity and a general ward for all the other cases. There was no dedicated surgical ward. The hospital and the entire state had no surgeon, and most surgical cases were referred to other distant hospitals. The operating theater was desolate, underequipped, and underutilized, with only 1 anesthetist. Most personnel lacked essential medical and surgical skills and could not diagnose or manage many conditions including cancers. The poor health-seeking behavior where most patients present late with advanced disease made it even harder for them to benefit from the underresourced hospital. All these contributed to the low patient numbers.

Interventions

Five pronged strategies were used to improve surgical services: (1) training and mentorship, (2) offering advanced clinical care, (3) improvement and expansion of infrastructure and equipment, (4) increase in human resources, and (5) adoption of favorable policy changes.

Training and mentorship

- Training and mentoring of health workers, including medical officers, clinical officers, theater assistants, nurses, and nurse aides, in managing various surgical and medical conditions.
- Formal training through workshops in acute trauma care for both hospital staff and those from outlying health centres.

Provision of advanced clinical care

- Provision of critical surgical human resources, including a surgeon, trauma nurse, and 2 anesthetists.
- Establishment of regular surgical outpatient clinics and efficient handling of internal surgical consultations and referrals.
- Support supervision through outreaches to satellite health facilities within the catchment area, including acute trauma support for mass casualty incidents during armed conflict.

Provision of equipment and infrastructure development

- Renovation and construction of key new infrastructure, including a dedicated surgical ward, operating theater, surgical consultation room, and an emergency room.
- Establishment of diagnostic imaging services; x-ray and ultrasound scans and recruitment of attendant personnel (radiographer).
- Participation in the establishment of a health training institute.

Policy changes

- Formulation and adoption of progressive service policies and administrative activities through regular audits and improved planning.
- Improvement of logistics management to ensure efficient and prioritized procurement of supplies, drugs, and equipment.
- Improvement of documentation, record keeping, and introduction of workplace protocols.

Human resource mobilization

Advocacy and lobbying for expansion of the local human resource for health, through regular recruitment, improved remuneration, and retention of medical officers, nurses, and records assistants, among others.

Results

Outcomes of the project were assessed quantitatively in terms of statistics of patients, human resources, and structures/facilities, and qualitatively along the themes of level of surgical care, patient care systems, and community attitude.

Improvement of clinical care

Primary

Patient care outcomes improved, with a reduction in overall morbidity and mortality among patients seen at the centre.

Patient care statistics improved indicating better access to care, as shown by the increase in the number of patients receiving outpatient surgical consultations, number of admissions, ward procedures, and operations. This significant improvement in care translates into reduced morbidity, though a more objective analysis would be required to quantify the reduction in morbidity. An improved level of surgical care was attained, with the availability of specialist surgical care, advanced surgical operations, better anesthesia, and a significant reduction in perioperative mortality —only one case of perioperative mortality was recorded for the entire project time.

Surgical operations carried out included laparotomy, herniorrhaphies, excisions, STS, orthopedics, thyroidectomy, and mastectomy, supported by improved anesthesia techniques, especially intubation.

Patients' access to specialist surgical care enabled early and improved diagnosis and treatment.

Improved patient care systems involved prioritized and efficient logistics management, better and focused trauma care, and shortened turn-around time for laboratory services. Improved patient care systems also extended to emergency care, patient navigation, and coordination of internal referrals. The acquired efficiency is further evidenced by the high turnover of about 50 in-patients per month in the 8-bed surgical ward.

Emphasis and improvement of record keeping, which allowed detailed profiling of surgical diseases for the very first time in this Hospital.

Secondary

Better services at the hospital led to improved community confidence, attitude, and health-seeking behavior, leading to improved access and utilization of the hospital services. These outcomes together reduced the need for referral. The net savings from the overall cost reduction were used for further improvement of services at the hospital. Cost-cutting, from reduced expenditure on trauma care, reduced referrals, and early and accurate diagnosis. Reduction of disease burden through improved trauma care. Trauma being a major contributor to the hospital disease burden, improved care reduced the number of visits per affected patient to the hospital, saving time, man-hours, supplies, and direct costs spent on posttrauma care.

Training and mentorship

Training and mentoring of 22 health workers (9 medical officers, 1 clinical officer, 2 theater assistants, 5 nurses, and 5 nurse aides) in managing various surgical and medical conditions was attained. The training and support supervision to staff at satellite health centres led to improvement in surgical services at those health centres.

Infrastructure development

The structures or facilities acquired included an expanded and refurbished operating theater, the establishment of an emergency room, a surgical consultation room, and a dedicated surgical ward.

Policy changes

Efficient procurement and patient care pathways were realized, as well as effective record-keeping and profiling of the diseases at the hospital.

Resource mobilization

Expansion of the health workforce, resulting in up to 6 medical officers, 2 clinical officers, 4 nurses, and 2 records assistants being employed.

Secondary

Cost-cutting arose from reduced expenditure on trauma care, reduced referrals, and early and more accurate diagnoses.

Data analyses

Data were categorized and calculated as proportions, and displayed in tables, graphs, and pie charts. Table 1 demonstrates a significant increase in patient numbers across all areas of care right from the first year of the project, together with selected categories of service provision. This led to a significant reduction in morbidity and mortality in the hospital and the catchment area.

Table 1 further depicts a substantial increase in the number of patient care outcomes. A grand total of 365 theater operations were carried out over the 2-year period under study, 1217 surgical patients were admitted and managed as in-patients, and 2686 outpatient consultations were done. Unlike before the project, consultations and bedside procedures in the project years were surgeon-supervised(Figs. 1 – 4).

Figure 5 shows trauma ranks highest, followed by soft tissue infections, burns, and cutaneous anthrax. Notably, very few cases of malignancy are recorded.

Trauma, though second to soft tissue infections still ranks high even in outpatients, cumulatively causing the largest burden of

Table 1

Outputs.

Parameter	(2014/15) Preproject	No. Per Year (2015/2016) Project year 1	(2016/2017) Project year 2
Outpatient consultations	225	1491	1195
In-patient admissions	21	479	738
Operations			
Major	1	68	46
Minor	38	101	150
Total	37	169	196
Ward procedures	50	534	378
Medical officers present	2	3	5
Wards available	2	3	4
Operating theater status	1 bed, limited space, and inadequately equipped	1 bed, improvised/expanded space, and better equipped	2 beds, refurbished and expanded space, and fully equipped
Structures	—	—	—
Established	—	—	—
Operating theater	1	1	1
Surgical ward	—	1	1
Emergency room	—	1	1
Surgical consultation room	—	1	1
Personnel mentored directly	—	14	22
Personnel recruited	—	6	6
Formal training workshops held	—	1, on acute trauma care	1, trauma care

disease among patients attending the hospital. Hemorrhoids and keloids follow closely in causing a significant burden of disease to the community, raising questions about the possible contributing environmental and genetic factors. Hernias, which are ranked fourth (5%), cover all anatomic and pathologic variations. Animal bites were also quite prevalent reflecting a community that still interfaces closely with the wild. A small number of patients attending the surgical clinics presented with some medical comorbidities, whereas a few purely medical cases also reported are under others. Notably, in both pie charts, the "others" constitute large proportions reflecting the diversity of surgical conditions in this community.

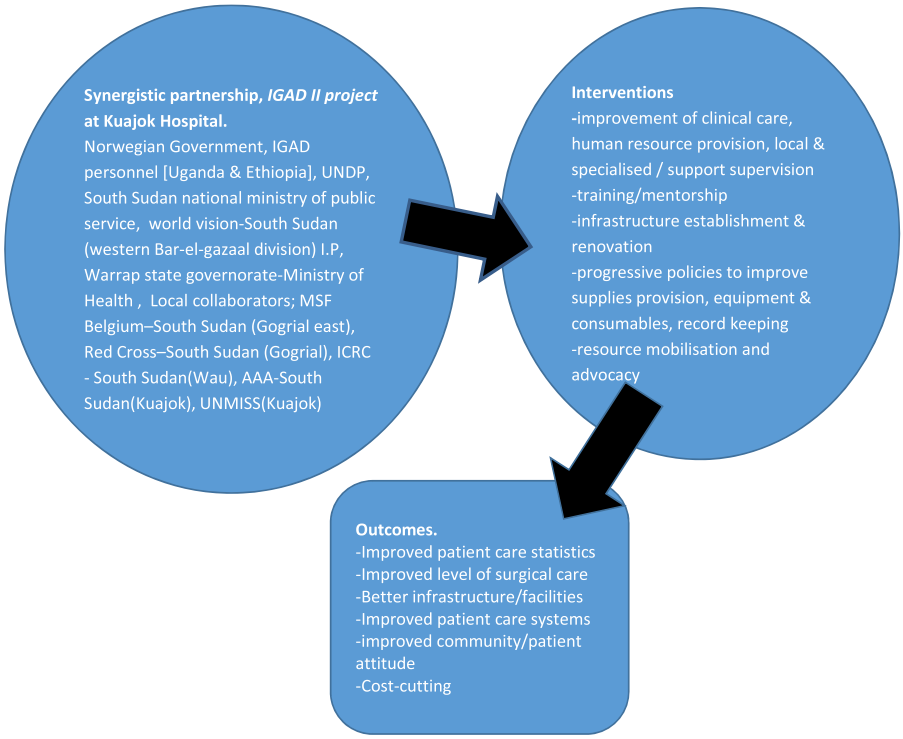

Figure 1. Operational framework for improved surgical service delivery.

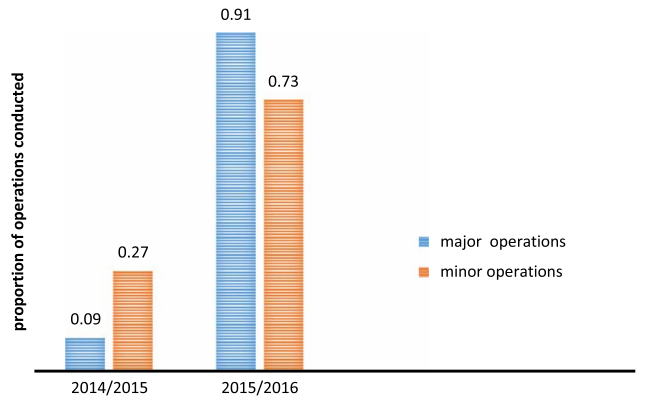

Figure 2. Number of operations conducted before and after the intervention.

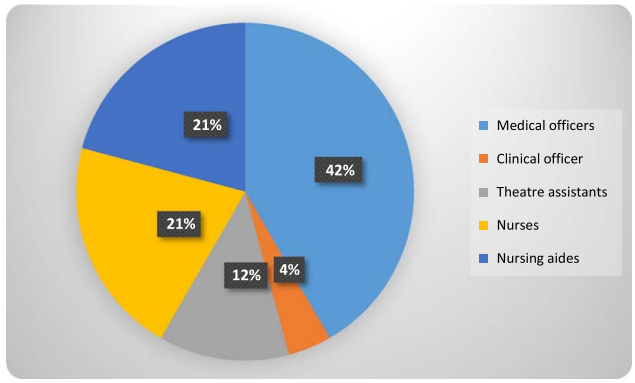

Figure 4. Proportion of health workers mentored.

Discussion

This study confirms the enormous burden of surgical disease at Kuajok Hospital and its catchment area compounded by a severe shortage of essential surgical services. This scenario is similar in greater South Sudan and other hard-to-reach areas of Africa with similarities in social-economic and political challenges affecting priority setting for and within the health sector[8] (https://www.ghdonline.org/uploads/LMICs_with_NSP_GS2030.pdf/https://www.iccpportal.org/sites/default/files/resources/Policy%20Brief_Global%20Surgery%202030.pdf[9,10]). This leaves a formidable negative economic impact[5] (http://www.ssnbss.org/, https://reliefweb.int/sites/reliefweb.int/files/resources/County%20Level%20Poverty%20Estimates.pdf, https://www.ghdonline.org/uploads/LMICs_with_NSP_GS2030.pdf/https://www.iccpportal.org/sites/default/files/resources/Policy%20Brief_Global%20Surgery%202030.pdf). In addition, the prevalent armed conflict has significantly diverted human resource and priority away from health care, leaving South Sudan at the deeper end of the global surgical crisis[5] (http://www.ssnbss.org/, https://reliefweb.int/sites/reliefweb.int/files/resources/County%20Level%20Poverty%20Estimates.pdf, https://www.ghdonline.org/uploads/LMICs_with_NSP_GS2030.pdf/https://www.iccpportal.org/sites/default/files/resources/Policy%20Brief_Global%20Surgery%202030.pdf). Overall, the positive outcomes of this initiative demonstrate that it is a significant addition to earlier undertakings employed to alleviate the surgical disease burden in South Sudan. While contributing to the cumulative impact of interventions applied, this initiative stands out for its integration of efforts and services—with several agencies working in unison to achieve significant positive change in surgical care in a very challenging environment. The deployment of a surgeon at the centre of the project was a key step that justified the expansion of surgical facilities and ensured their optimal utilization. Importantly, this model focused on the long-term empowerment of local health workers through task-sharing, followed by graded task-shifting to ensure the sustainability of standard surgical care and optimal utilization of surgical facilities, as recommended by Gosselin et al[9]. This initiative which seems to be the first of its kind in this setting is also a hallmark of south-to-south cooperation. It enabled South Sudanese medical workers to be mentored by fellow Africans who readily blend with the environment, exploiting similarities in culture and socio-economic background. This instilled confidence among the trainees. The involvement of national and regional governments as major stakeholders in implementation was a critical step to ensure continuity of support and follow-up of the mentees. This mentoring model allows contextual training making it easy for the mentee to learn. This further instills confidence and improves the attitude of mentees. Contrary to models relying on brief surgical camps, the continuous period of 2 years allowed the mentor to demonstrate repeatedly and to follow the mentees' learning steps over a longer period. The duration was also long enough to impact and change the community attitude, as witnessed. Secondary benefits in the

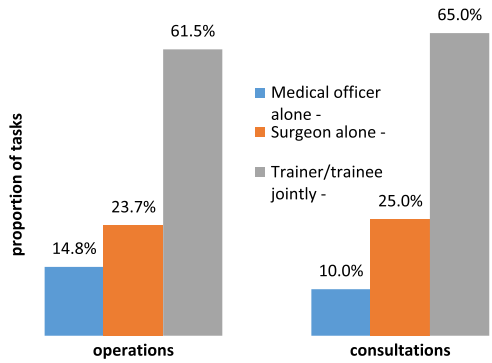

Figure 3. Distribution of tasks among personnel in the first year of the project.

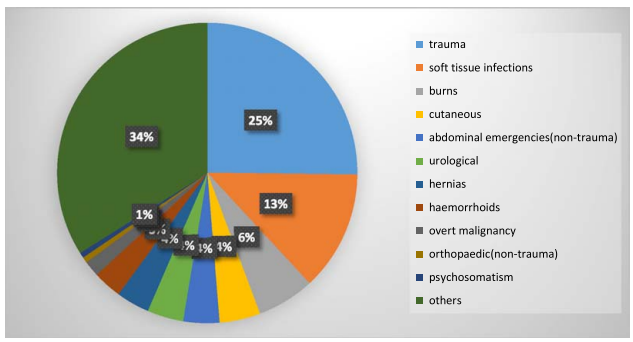

Figure 5. Surgical disease profile for admitted patients over the 2 years.

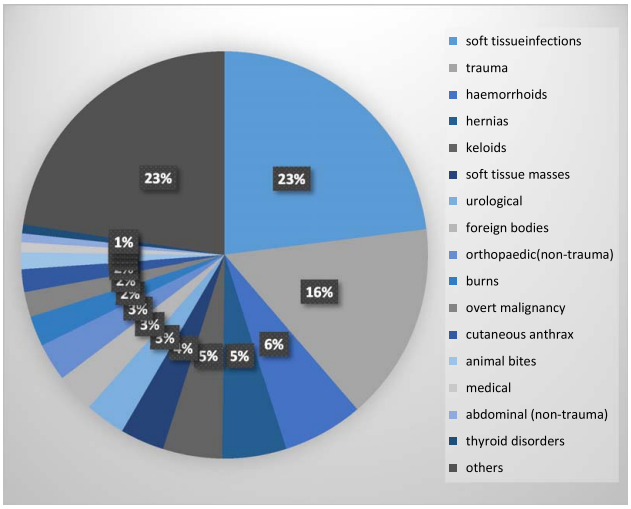

Figure 6. Surgical disease profile for outpatients over the 2 years.

form of cost reduction arose from reduced patient referrals which meant reduced transportation costs and less expenditure by the referred patient and family. The established surgical disease profile provides a basis for assessing and addressing the unmet surgical need. Surgical trauma is the most common condition, largely attributed to war injuries, and many patients present with complications of surgical conditions due to delayed treatment. Soft tissue infections also rank high, a number of which arise as sequelae of neglected trauma, and bites from snakes, animals, and insects. A vicious cycle also exists involving burns and trauma from self-harm, attempted suicide, and homicide associated with psychological and psychiatric conditions like Post Traumatic Stress Disorder, severe depression, and substance abuse. Burns also rank quite high and in several cases occurred concurrently with other forms of trauma, say in instances of explosives. Cutaneous anthrax ranking fourth is evidence of the reemergence of neglected surgical tropical diseases, whereas psychosomatism may be related to the psychological trauma of war in the community. Malignancies recorded were low (2%), probably many of them being managed at home with traditional remedies and several possibly dying in the hands of traditional healers. The proportion of "other conditions" is significantly large and requires a corresponding diversity of resources. Challenges included the initial negative attitude of medical officers towards surgical work. Surgical care was perceived as a burden because the workload was higher and more man-hours were required per patient, so priority easily shifted to other less demanding medical cases, short of this, they were readily referred to distant hospitals. This attitude was changed gradually but consumed effort and time that would have been spent advancing other critical aspects of mentoring. Improvement of the work ethic of many of the health workers was also attained through similar efforts. The negative attitude may also be attributed to inadequate surgical skills and low morale. Some partners did not consider surgical care a priority and so it often competed with other vertical programs like child health and sanitation, which delayed the accelerated improvement of surgical services. The long-term outcomes of this project need to be studied to fully assess the utility of this model, nevertheless, this model of surgical service delivery can be extrapolated directly or modified for application in similar settings in rural Africa (Fig. 6).

Study limitations

Some preproject information was missing due to poor record keeping, prompting complementary qualitative data collection.

Conclusion

Rapid and sustainable improvement of surgical services in Africa's hard-to-reach areas is achievable in the short-medium term, readily done through partnerships and focusing on capacity building and mentoring of native health workers by surgical personnel from fellow African countries.

Ethical approval

This study has not been carried out or published before. It was approved by the hospital and state health authorities. All information was treated confidentially. No special patient consent was required in this study. Preliminary findings from this study were presented at one regional scientific conference.

Sources of funding

None.

Author contributions

R.K.L.: wrote the original draft and reviews. R.A.D., D.S., A.M., and W.M.: reviewed and approved draft.

Conflicts of interest disclosures

The authors declare no conflicts of interest.

Research registration unique identifying number (UIN)

None.

Guarantor

R. Kintu-Luwaga.

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