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Challenges Facing Surgical Training in the Great Lakes Region in Sub-Saharan Africa: a Review Article

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Background: ***There is a severe shortage of health workers in sub-Saharan Africa yet this sub-continent experiences a significant proportion of the world's disease burden. This shortage is further reflected in the lack of personnel for surgical sub specialities such as orthopaedics, paediatrics, neurology and urology to mention but a few.***
Objective: This review therefore sought to summarize the current literature on the state of surgical training in sub Saharan Africa, discuss the challenges faced and the possible ways to overcome these challenges
Methods: ***We performed online searches of electronic databases i.e. PUBMED, MEDLINE and African Journals online that feature many African Journals not index by the 'regular' databases.***
Results: ***The searches returned 88 articles and 24 of which were included in the review, we present results focused on; training capacity and methods, scope of practice, technology and surgery, and low research capacity and output.***
Conclusion: ***The future of surgical training in Africa will depend on the ability of the leadership to create or and adopt innovative educational technologies, recruit and retain trainers and attract trainees on one hand and on the other, the growth of demand for quality surgical care in the great lakes regions. For those that have excelled in training need to build on those successes and share their stories.***

Keywords: Surgical Training, challenges, sub- Saharan Africa

Introduction

There is a severe shortage of health workers in sub-Saharan Africa yet this sub- continent experiences a significant proportion of the world's disease burden[1]. This shortage is reflected in lack of personnel for sub-specialities of Surgery such as plastics, general, orthopaedics, paediatrics, neurology and urology to mention but a few[2,3]. Many patients in sub-Saharan Africa who require surgical intervention go unattended to and Africa contributes the biggest proportion of the surgical DALY's in the world[4]. A host of factors may be responsible for this shortage which includes but not limited to brain drain, inadequate training, poor funding of training institutions, few or inexistent training institutions, leadership and mentorship gaps[5,6,7].

There is a population explosion with growth rates of up to 3% in many African countries yet there isn't an equivalent growth in numbers of trained health workers[8]. This lack of Human Resources for Health (HRH) ultimately impacts negatively on equitable delivery of surgical services. Previous reports and anecdotal observations have shown that surgical training in sub-Saharan Africa was inadequate and that the surgical output in some parts of the region notably Eastern Africa has stagnated at levels well below other more resourced countries.

There have been several calls in the recent past to improve surgical training through increase of surgical training programs, trainee numbers including efforts to retain the trained surgeons[9-13].
This review therefore seeks to summarize the current literature on state of surgical training in the great lakes region in sub Saharan Africa, discuss the challenges faced and possible ways to address these challenges.

Study context

The great lakes region is made up of 10 countries all categorised as low income by World Bank defined standards[14]. Together, it is home to an estimated population of over 370 million people[15], about the population size of the USA but with physician density of 0.019 per 1,000 for Malawi the lowest to 0.181 per 1,000 for Kenya[16] as the highest. The region has 52 medical schools of which 30 (approximately 60%) are found in Ethiopia and DR Congo and the rest 22 spread among the 9 countries; few offer speciality training in surgical disciplines. The term "African Great Lakes Region" when used in a narrow sense for the area lying between northern Lake Tanganyika, western Lake Victoria, and lakes Kivu, Edward and Albert. This comprises Burundi, Rwanda, northeastern Democratic Republic of Congo, Uganda and northwestern Kenya and Tanzania. When used in a wider sense it includes all of Kenya and Tanzania, for the purposes of this paper it goes as far south as Zambia, Malawi and Mozambique and - north to include Ethiopia, these four countries border one of the Great Lakes[17,18].

Methods

We performed online searches of electronic databases i.e. PUBMED, MEDLINE and African Journals online that feature many African Journals not index by the 'regular' databases. We used educational articles for surgical disciplines in 10 sub-Saharan Africa countries (The Great Lakes countries). Only English language articles were considered. No limits of type of articles and dates of publication were set. We excluded any duplicate articles and those papers not describing training in the great lakes region.

We used the key word terms, 'challenges of surgical training', 'Africa' for all searches and added 'review' as a limiting term. These searches returned a combined 76 articles/titles/abstracts and finally 12 which we reviewed for face value relevancy. To supplement the search we searched several sites including the SAMSS project (sub Saharan Medical Schools Study), MEPI (Medical Education Partnership Initiative) but also snowballed all cited references using terms; surgical skills training, specialist surgeons, competence based training for surgery, and research capacity. We found an additional 12 articles, therefore 24 articles were assessed.

Results

There was a paucity of papers on challenges of surgical training in particular; however several articles concerning human resources for health were available. Training capacity for surgical training and competence based curricula are neglected. Research capacity is thoroughly described for Africa in general; but use of technologies to enhance it is neglected too. In this paper, we present results focused on; training capacity, training methods and scope of practice, technology and surgery, low capacity and output. The searches returned 88 articles and 24 were reviewed (Figure 1).

Training Capacity

In general terms as an example Uganda has one of the lowest densities of researchers among the most scientifically advanced nations in sub Saharan Africa: only 25 researchers per million inhabitants and has no science Ministry. Kenya has made strides in publications output but mostly skewed to crop science/agricultural[19]. There are few medical training institutions for undergraduate courses and even fewer for speciality training; in fact for many countries on the sub-Saharan Africa have limited capacity to offer most sub-speciality training such as neurosurgery or plastic surgery[20,21,22]. There is also a shortage of trainers at most institutions of higher learning, and the few that are available are overwhelmed with work in mostly challenging work environments due to lack of funding, inadequate infrastructure and lack of funding for research[23].

Internal funding from governments for training and health service delivery is inadequate at best and yet external donor funding is skewed to infectious diseases such as HIV, TB and Malaria[4]. Though a

wakeup call for NCDs including surgical conditions and Health systems strengthening has been sounded and much attention has now been aroused[24, 25].

In the region for the most part training in surgery takes on two pathways: the Masters of Medicine (M.MED) offered by University Medical Schools and Colleges and the Fellowship in Surgery (offered by the College of Surgeons of East, Central and Southern Africa – COSECSA) and they are described elsewhere[10, 26]. The trainers are mostly subject specialists with no training in curriculum development and pedagogical skills.

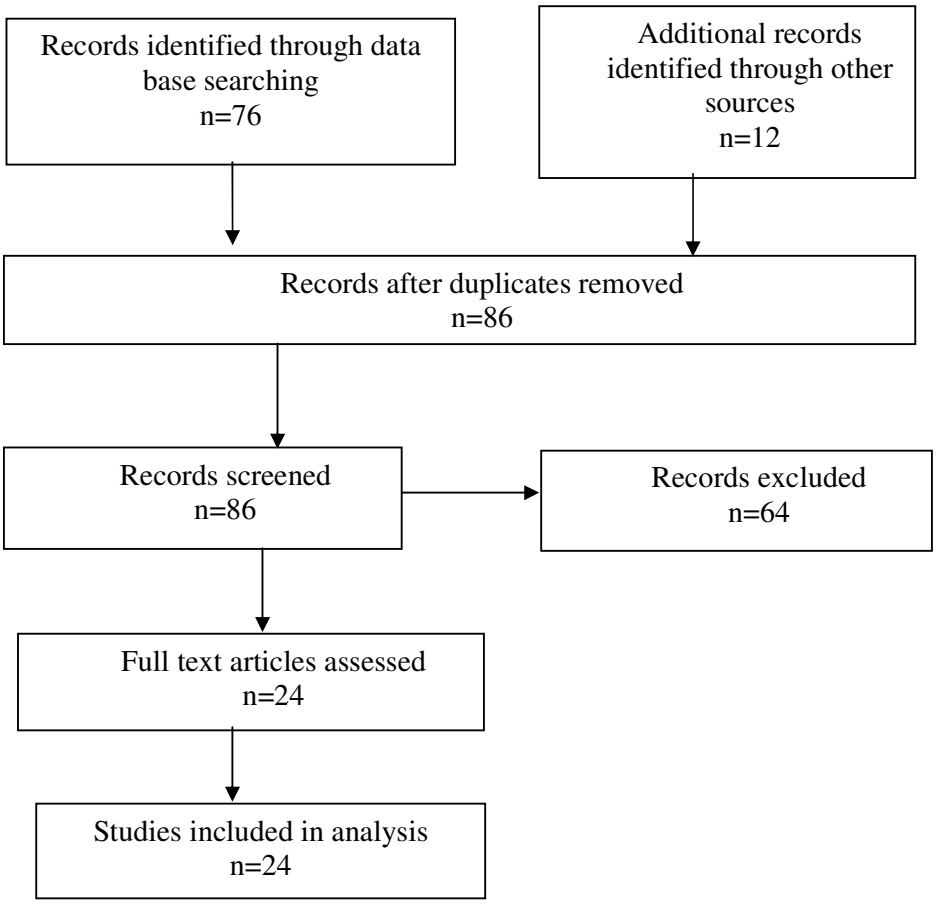

Figure 1. A Flow Chart Showing Search Results

Training methods and scope of practice

Whereas the scope and frequency of the surgical procedures performed at the district hospitals in the region are well documented[27], the same is not true for teaching /referral hospitals, this knowledge may be important if training and assessment (examination) capacities are to be maximally leveraged. Most curricula follow an apprentice model but it's fraught with the lack of consistent supervision by the trainers and the uncertainty of finding the required cases to practice on, therefore adding to the uncertainty of acquisition of the required skills and competences upon graduation.

The most relied upon methods of training are lectures, bedside teaching, operating room OR demonstrations, Projects and groups work.

Technology and Surgery

There is a general lack of exposure and practice in Minimal Invasive Surgery (MIS) and use of Information Technology (IT). In 2006, Aminu noted that the Surgery in Nigeria and most of Africa

had not maximised the benefit of computers[28]. Although there is demonstrable effort to encourage the practice of MIS despite the numerous challenges of lack of supplies, training and high costs to patients [29, 30].

Low research capacity and output

Despite some efforts, the research capacity and output of countries remain low. Whereas available data show progress, many nations have big gaps to overcome. The African Innovation outlook 2010 survey showed that only 3 nations Malawi, Uganda and South Africa spent above the 1% of the GDP recommended for research and development. No data was available in this search that delineates investment in research and training in the area of surgery and surgical services. Other issues confronting the region; many laboratories are poorly equipped and science students get little: practice, and practical research training because research centres are often separate from Universities[19].

By using published articles and grants as a proxy for research, there is low output and update among surgeons and surgery as a discipline in general[31,32]. The countries of the Great Lakes region no collective data was found. Whereas there is increasing commitment to foster research surgery by COSECSA and Universities[33], there are very few surgeons with PhD training and few with ready facilitation, time and interest the regularly and consistently engage in research.

Discussion

In this paper we set out to highlight the challenges facing training of surgeons in the great lakes region and the opportunities that lie ahead. We performed a review and found that surgical training in the region is fraught with low numbers of trainees[2, 11] (despite recent increases), and trainers with poor working environment and poor pay[12]. In addition there is low research capacity and output. Training methods and philosophy have not kept up with recent innovations in surgical training missing out on for example simulation advancements and Quota based (log book) training[2, 11, 13]. The gaps in the availability of speciality surgeons: Opportunities therefore now exist to train more, take advantage of availability of new simulation technologies, internet communication, globalization, international travels and increasing access to grant funding from development partners and governments.

Training capacity

There is a severe shortage of trainers, the few that there are, have their time split among administrative work, consultancies and patient care[2, 34,35,36]. The solution is to train more, pay better salaries and improve the working conditions as is regularly articulated[33,37].

Whereas this may be the more desirable solution to the problem, it requires long periods and resources for training surgeons and mentoring them to become competent trainers of surgery.

International collaborations have been advocated for as measure to plug the gaps in numbers of trainers and the actual training process[38]. Across sub Saharan Africa (SSA) international collaborations have been documented to have improved service delivery, and increased the training and research capacity of partner institutions e.g. Makerere University/University of California San Francisco Global Partners in Anaesthesia and Surgery (MU/UCSF GPAS) in Uganda, Vanderbilt and Kijabe in Kenya, Weill Cornell University and Bugando Medical Centre in Tanzania to mention but a few[38, 39]. Such collaborations may include faculty and student exchanges, a variety of training skills transfer workshops and sandwich models for fellowships in various surgical sub specialties[40, 41].

The Royal College of Surgeons of Ireland through COSECSA have in the recent past conducted a Trainer of Trainees course for faculty to make them more effective and efficient motivating trainers of surgeons. These partnerships should be leveraged for mutual learning based on overlapping priorities and interest. As most collaborations seem to be initiated by the foreign partners, it behoves the local institutions to be clear of their priorities and needs as they develop memoranda of understanding.

Training methods and scope of practice

Surgical training has traditionally been modelled on an apprenticeship system, where trainees learn by direct instruction from their seniors, combined with long term observation and assessment from those same seniors. This is accompanied by 'the gradual absorption into a community practice' where participants learn as much from their peers[42].

The process of new skills training techniques is based on established theories of the ways in which motor skills are acquired and expertise developed. Fitts and Posner's three stage theory of motor skill acquisition is widely accepted in both the motor skills literature and the surgical literature. In the cognitive stage (the first stage) the learner intellectualizes the task; at this stage performance is erratic, and the procedure is carried out in distinct steps. However, with practice and feedback, the learner reaches the integrative stage (the second stage) in which knowledge is translated into appropriate motor behaviour. The learner is still thinking about how to move the hands and execute the task with fewer interruptions. In the third and last stage, (the autonomous stage), practice gradually results in smooth performance. The learner no longer needs to think about how to execute this particular task and can concentrate on other aspects of the procedure[43, 44]. What we are currently missing in training is developing skills based on a pre determined list of competencies and following through to ensure that the minimum numbers of supervised procedures are stipulated and seen to be done before the trainee is allowed to graduate.

How much operating time is needed to develop competence, what skills are transferable and which ones are not? What about simulation technology, in the situations where there isn't enough procedures to go round for teaching and practice? There is sufficient evidence that simulation has a role in the development of technical competence during surgical training[42].

Technology and Surgery

With the fast pace of globalization, technology is permeating all aspects of life including the practice of surgery and communication. The modern surgeon even in SSA needs to be "tech savvy" to catch up with the technological advances in minimally invasive surgery (MIS), take advantage of more efficient communication technologies, and use the internet and other electronic resources.

Although there is a general lack of exposure and practice in minimally invasive surgeries there may be innovative ways around some of these challenges. For example simulation boxes are becoming more readily available for surgeons starting out in the learning of these laparoscopic skills. Interestingly, several centres have used ordinary cardboard or plastic boxes fitted with a simple webcam and computer to create their own effective and cheap training boxes. A cost cutting technique for laparoscopic appendectomy has been described[29]. Although not in sub Saharan Africa, a report from India documented innovative use of homemade devices and other basic equipment adapted to use in MIS[45].

In the future, the application of computers in surgery would make surgical knowledge and practice simplified with increased productivity, even for the more technically challenging procedures and in this era of global surgery and international collaborations, such technology will be key[28]. The uptake and utilization of Minimally Invasive Surgery in much of the developing world has been fraught with challenges and gross disparities. By 2003, the Aga Khan teaching hospital in Kenya had reported tremendous steps towards use of laparoscopy with no mortality, low complication rates (< 1%) and conversion rates of 1.96%[30]. In 2011 in Uganda, laparoscopy was deemed feasible at a teaching hospital with low major complication rates of 1.7% and 2.2% conversion rates[29]. It suffices to say that MIS in SSA is riddled with challenges of acquisition of equipment, repair and maintenance, as well as supply of related consumables. Also there are challenges with training of surgeons, nurses and biomedical technicians in the use and maintenance of this equipment.

Partnerships have been formed to improve training e.g. skills transfer workshops with teams from developed countries where MIS is more routine[45]. Teaching models for Fundamentals of laparoscopic surgery including tele-simulation have been evaluated and found relevant to training[46, 47]. Also several surgeons at a particular centre may form a group where they support each other e.g. after these workshops. Another possibility would be to engage manufactures of MIS equipment and supplies to invest in training the surgeons who are in effect their consumers. As is the case of Ethicon Johnson & Johnson and Nairobi Surgical Skills centre in Nairobi.Electronic resources are increasingly becoming more available for training and research e.g. the Ptolemy project of University of Toronto in conjunction with COSECSA[48]. The 'School for Surgeons' portal offers valuable resources for surgical trainees under the COSECSA track. Surgery in Africa reviews, HINARI, and several University libraries among others, offer access to useful texts for the surgical trainee. . However it remains unknown to what extent these resources are being utilized by the intended users

Low research capacity and output

Many of the published articles are of low levels of evidence and with poor adherence to reporting standards as was demonstrated in the analysis of articles published in the African Journal of Paediatric surgery, a publication of APSON/PAPSA[49]. Such articles may not contribute much to informing decisions of patient care or other areas of service delivery. There is generally lower funding for surgical research and even internationally fewer grants are won by people in surgical than in infectious disease disciplines[31]. It has been argued that in part this is a reflection of low grant applications in the first place[50]. However, there has for long time been an international focus on communicable disease. Opportunity maybe at the surgeons' door as non-communicable diseases start to take centre stage in global health. Cancer, trauma and aspects of patient safety that are increasingly becoming of public health concern and do involve significant amounts of surgical input.

There is evidence that Africa's future is in strengthening indigenous educational systems and institutions for generating and applying knowledge by assuring public support with emphasis on research capacity. In addition to individual skills developed in research work, research capacity includes quality of research environment, funding, adequate infrastructure, research incentives and time availability for the researcher[50]. In most African countries, conditions for research are severally compromised[36, 51, 52].

The lack of interest from potential trainees

Surgery is perceived as 'hard' fraught with hardships including the risk of catching HIV from needle stick injuries, plus the perceived lack of heavily funded research as is the case with other disciplines, such as internal medicine , paediatrics and public health[13].

The gaps and opportunities

We do need

- more numbers of specialists to provide a service and leadership in surgical care delivery and research
- Better quality education, focusing on acquisition of predetermined competences with supervision and mentorship by the more trained and experienced surgical specialists.
- To know what the needs of the communities are through assessment of the surgical disease burden, against which we can measure our successes.
- Collaborations that are mutual and equitable, where resources are shared for the mutual benefit of the rich and poor countries.
- To strengthen the platforms we have already, the pre- practice training opportunities[22], to better structured surgical camps and leverage the in-service training opportunities.
- To utilize better the advocacy opportunities that exist through the various associations to enhance political will and civil society activism

Conclusion

The future of surgical training in Africa will depend on the ability of the leadership to create and or adopt innovative educational technologies, recruit, retain trainers, attract trainees on one hand and on the other hand the growth of demand of quality surgical care as the middle class in the great lakes regions grows. For those that have excelled in training need to build on those successes and share their stories.

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