

Strategies to increase access to surgical services in resource-constrained settings in sub-Saharan Africa

Bellagio Essential Surgery group

Kampala

July 22nd – 24th, 2008

Background Paper for Session on Strategies to increase surgical workforce

There is a critical surgical workforce shortage in sub-Saharan Africa. Levels of unmet need for surgical services are unclear making it difficult to estimate the actual numbers of staff needed in this setting. An absolute shortage in surgical staff, inequitable distribution of staff, and problems with recruitment and retention due to lack of incentives and support have been identified as the main challenges. Potential solutions include use of surgical camps and specialist outreach as well as developing standardized non-physician clinician training programs across the continent. However, a one-size-fits-all model of addressing the inadequate surgical workforce in sub-Saharan Africa may not be ideal. Careful thought should be given to local priorities and concerns. Discussions among stakeholders from the Ministry of Health, various academic and professional bodies and clinical staff within each country will be crucial to tailor solutions to fit locally-identified needs.

Several members of the participants who met at the Bellagio meeting in June 2006 are working in countries that have employed innovative strategies. They agreed to come together again in Kampala, with participants from other countries, to develop a collaboration to share their experiences of training programs. This paper lays out some of the issues and questions for the working groups to address.

Key challenges

The un-met need for surgical services is unknown: The burden of disease worldwide due to surgical conditions alone is estimated to be 11% with the lead issues being injury, malignancy, congenital anomalies, peri-natal complications and cataracts.² However, the surgical output is low in developing countries suggesting that there is a high unmet need for surgical care.^{3,4} In a recent article in *The Lancet*, Weiser and colleagues reported that the annual global volume of major surgical cases was 234 million of which 73.6% were performed for 30% of the world's population and only 3.5% for the poorest third in the world.⁵ These data, drawn

from 29% of countries, suggest that surgical volume and unmet need in many parts of the world are not well understood or quantified.⁶ This makes it difficult to determine the number of the surgical personnel needed in any given region and creates major challenges for policy-makers who seek to address shortages in the surgical workforce.

There is an absolute shortage in surgical and perioperative care staff: The absolute number of surgical staff in sub-Saharan Africa is critically low. Ozgediz, et al described their experiences in Uganda and attributed this to emigration out of the continent, internal brain drain to other fields such as infectious disease, public health or hospital administration, and a chronic underproduction of surgeons, clinicians trained in surgery, anesthetists and support personnel.⁷ The pull and push factors associated with brain drain have been well characterized elsewhere with poor remuneration being a key factor.⁸ In Uganda, and elsewhere in SSA, the shift of clinicians from the bed-side to hospital administration, research or other fields is being reportedly anecdotally. With greater donor funding for research and infectious diseases, this move is not wholly unexpected. The lack of adequate production of surgeons and surgical staff has further exacerbated this situation. Makerere University, the sole general surgical training program in Uganda, reports that many postgraduate spots are unfilled each year.⁷ Many other sub-Saharan African countries do not have medical schools or surgical training programs and simply cannot address this shortage.

Costs of training and practice are high: This absolute shortage in surgical workforce is compounded by the costs associated with surgery training, the infectious risks of practicing in sub-Saharan Africa, and an unfavorable perception of the field. Galukande et al reported these findings in a cross-sectional study of interns, surgical house officers and faculty at Makerere University in Uganda.⁹ Interns (or potential surgical trainees) raised the following key issues as barriers to entering the field:

- There is a high risk of acquiring HIV infection during clinical practice.
- The workload during training (academic and service) is heavy.
- Surgery has limited career paths.
- Surgery is largely curative and thus does not attract large funding and attention (media, donors and governments).
- It is poorly funded relative to other fields.
- There are few research activities occurring in surgery and peri-operative care and little funding to pursue innovative ideas making the field less attractive.

The current surgical house officers added the need for more scholarships to enrol more trainees, curricular changes to reflect the pathology seen in the field and increased mentorship during training. Anecdotally, the opportunity costs for advanced training have been raised as another barrier to pursue a surgical career. Faculty surgeons agreed with

many of these points and highlighted larger constraints such as poor remuneration and lack of supplies and infrastructure support that decrease the attractiveness of the surgical field. It offers “relatively little pay with loads of work that is stressful work for body, soul and spirit during and after training,” according to one respondent at Makerere University.⁹ Low wages also lead to dual practice – public and private – to allow clinicians to make ends meet.⁷ A work environment with limited diagnostic capabilities such as radiology, shortage of anaesthetic staff and inadequate surgical equipment can be a substantial barrier to attract bright students and trainees. Shortage of teaching staff was identified as a compounding problem where the few staff are overwhelmed with academic, clinical, research and administrative responsibilities. Despite these concerns, many house officers interviewed by Galukande et al have stressed motivating factors such as a keen interest in the field, inspiration from colleagues and faculty, immediate job satisfaction from practicing surgery and the acute awareness of the need for trained surgical staff in Uganda.⁹

The workforce is concentrated in urban areas: Despite the absolute shortage in surgical workforce, a substantial mal-distribution also exists throughout sub-Saharan Africa. In Uganda, where 90% of the population lives in the rural setting, most of the surgeons and anesthetists are concentrated in Kampala.¹ The same situation was reflected in Mozambique in 1999, when after civil war only 400 physicians remained in the country with most of the surgeons and obstetric specialists practicing in urban settings.¹⁰ These have led to alternative strategies to provide surgical services especially to rural areas which will be discussed below.

The leadership of the surgical community

Surgeons at the Kampala meeting will be challenged to “recast” their roles; to raise the profile of surgeons across the health system, engage in broader system-wide issues, such as workforce shortages, and redefine the importance of surgical care as a critical component of any health care system. Historically many innovative ideas have been developed by surgeons in each country to improve access to surgical services among the rural, underserved population despite the shortage of trained professionals. The surgical camp and specialist outreach models are good examples of these local solutions, and in some countries surgeons have taken leadership in working with non-surgeons to address the surgical workforce crisis. The meeting recognizes the importance of the surgeon as a leader, educator, and supervisor of all these activities.

Surgical Camp Model: Surgical camps have been innovated by surgical communities as a mode of care delivery to the periphery in many countries so that a rural, hard-to-reach population has better access to surgical services.⁷ The Association of Surgeons of Uganda conducts one to two week camps annually or at times, twice a year, to various districts of the country

which allows for efficient, high-volume surgical care to be delivered in rural settings. Through this arrangement, patients do not have to travel to the capital city to receive care and local medical and clinical officers get continuing medical education and direct supervision by experts in the field. However, disadvantages exist. These camps cannot be conducted frequently because it is dependent on volunteer surgeons. Lack of close postoperative follow-up and overwhelmed supply chains further complicate matters.

Specialist Outreach Model: Outreach by various surgical specialists has also been a method to increase access to surgical services in the periphery. Consultant specialists from teaching universities or NGOs have played a key part in reaching rural populations. There is evidence to support the effectiveness of outreach in increasing access to specialist care.¹¹ However, there is no data available on the short and long term outcomes of care delivered through this approach nor is there evidence to support the use of this strategy to strengthen referral systems. Both of these issues need to be explored further before this approach to surgical services is replicated in other settings.

The role of non-surgeons in addressing shortages in surgical workforce

A common strategy to address the absolute shortage in surgical staff and the mal-distribution present throughout many countries in sub-Saharan Africa is the development of substitute health workers (SHWs) or non-physician clinicians (NPCs). Lack of surgical and obstetric specialists have challenged some countries to design new and alternative approaches to providing surgical services. Through this workforce crisis, new training programs have developed to allow medical doctors, nurses and other clinicians to be trained in specific surgical fields. Some models current in use are discussed below.

The Burkina Faso model of training medical doctors: Burkina Faso has attempted to provide further training for their medical doctors, with a 6-month training for essential surgery, comprised of one month of theory, five months of apprenticeship, and one month of supervised practice with an interdisciplinary team of trainers. This training began in 1994 and since then, 110 doctors have received this training over 9 sessions (12 doctors per session). At a follow-up survey ten years later in 2004, of those alive (5 had died), about 63% of those doctors were still within the health system, 32% in further training, and 5% were in international or private organizations. The assessment from the Ministry of Health regarding this program has been a decrease in morbidity and mortality by the provision of these service services, as well as increased training of health workers. However, the lack of formalized plan to continue this training, inadequate official recognition, and lack of motivation on the part of some participants have been noted as major challenges. These

trained physicians also have had incentives to pursue other work outside of the public health sector suggesting that internal brain is still a major issue in Burkina Faso.

Niger's multi-pronged approach: In 2003, in Niger, they had 1 physician for every 50,000 inhabitants, and of the 257 physicians, there were only 23 surgeons. Almost half of these surgeons were located in Niamey, the capital, where only 6% of the population resides. The distribution of these resources (not only physicians, but other health providers) have implications for the provision of services outside of the capital: only 9 out of the country's 36 district hospitals (which serve catchment areas ranging from 100,000 to 640,000 inhabitants), provide even the most minimum of surgical services.¹⁴ The ministry of health's own assessment of the unmet need in Niger is about 82% for major obstetrical surgeries, compared to 25% in the urban areas. According to this survey, in-hospital mortality for these obstetrical cases were not low: approximately 4% for those women needing major obstetrical surgeries, and 3% for caesarian sections. This survey found that the delay of surgical intervention was not the only factor in the high mortality, but rather other peripheral services (mainly lack of availability of blood products as well as physicians and other health workers) contributed to the relatively high mortality.¹⁵

Niger has attempted to address these issues in the past with the creation of three types of surgical programs. In 1992, the Ministry of Health approved the development of a paramedical specialization in surgery (as well as radiology and emergency/anesthesia), which by 2004 had trained 69 surgeons which form a large part of the surgical delivery network in the country. In 1994, a training program for an "emergency surgeon" (more appropriately later renamed "district surgeon") was created by Projet Population et Projet Medical, and 31 doctors were trained with the additional surgical emphasis. Unlike that of the paramedics, most of the participants were less motivated and saw less need for this, especially because there was no career development available for the "emergency surgeon" as well as few supplies or appropriate training. In 1997, the Ministry of Health created a diploma for specialized study in general surgery as well as another diploma for obstetrics and gynecology, eligible to medical school graduates or existing doctors, in which 20 doctors have been trained. In this line of training as well, they found there was difficulty in recruiting trainees, due to several factors: a lack of career track for this type of work, insufficient resources with which to work, and lack of quality training and supervision. In addition, other barriers that have been previously noted to discourage medical school students from pursuing surgery were also present, especially the lack of surgical equipment, low salary, and risk of HIV and other infectious diseases.¹⁶

The Mozambican model of training *technicos de cirurgia*: In Mozambique, the Ministry of Health created a plan to train Assistant Medical Officers (AMOs) in surgery called "*technicos de cirurgia*" through a 2-year surgical course in response to the massive physician shortages seen

after the war.¹⁷ Their plans were to build capacity at the district hospital level through this approach to provide care for the predominantly rural population. Starting in 1984, 10-25 surgery AMOs graduated every year and were posted in rural settings. Follow-up studies have shown that there are low rates of complications (0.4% and 0.1% in emergency and elective interventions, respectively) despite high volumes of surgery.¹⁸ Surveys have shown that one advantage is long-term retention in rural areas, where physicians refuse to stay. In addition, evidence to support the cost-effectiveness of the Mozambican model has been growing steadily.¹⁷⁻²¹ The *technicos* program now has become the backbone of the Mozambican health system and these clinicians are widely viewed to have contributed greatly to the credibility and capability of the health service at every level.

The Tanzanian model's assistant medical officer approach: Tanzania established a curriculum for an AMO program incorporating surgical and obstetrical training in 2000. The Ministry of Health initiated this to address a need for a cadre in between Clinical Officers and Medical Officer, lessen the healthcare worker shortage, increase availability of human resources to provide care to the mostly rural public, and allow for advancement opportunities for COs. COs with three years of experience were eligible to enter the AMO program. The two year course includes rotations through the major departments as well as training in health system planning and management, environmental health and leadership skills. This model allows for extensive responsibilities given to AMOs. This broad training allows for flexibility in practice as AMOs who work in pediatrics are also capable of serving as the emergency surgeon for acute surgical conditions such as emergency caesarian section for obstructed labor.²² The results of this program and its lessons will have important consequences for the policy implications of this approach and may also have direct relevance to other countries in sub-Saharan Africa.

Other strategies

Establishing non-physician programs may not be the optimal long-term solution for every sub-Saharan African country. Other strategies that could be used in a multi-pronged manner include plans to increase the number of trainees choosing surgical careers in the long-run while implementing shorter-term solutions such as surgical camps and specialist outreach. These approaches include early exposure to surgery and rural medicine in medicine school, such as the COBES program at Makerere University, funding post-graduate scholarships to immediately decrease the number unfilled positions in every surgical and anesthetic training program and integrating surgical and anesthetic skills into internship training to better equip graduating physicians to practice in rural settings. The use of ex-patriots or ex-patriot-led organizations has also been used as one method of addressing shortages in surgical staff. Various NGOs, in particular faith-based NGOs, will long histories of working in difficult to

reach settings have developed relationships with visiting clinicians from “Northern” countries. While these collaborations are often very effective, they are more challenging to scale-up to address the workforce shortage.

Some questions the working groups might like to address include:

- The costs of training NPCs are noted to be lower than those for physicians however they are nevertheless substantial. What challenges does this pose to scaling up this approach?
- What skills should general physicians and NPCs acquire to function in resource-constrained settings?
- What is the optimal length of training for NPCs?
- What mechanisms need to be developed to support these professionals in practice?
- What is the appropriate regulatory setting that is need for this approach to be successful? How can quality assurance be ensured? How should complication rates be monitored?
- How can appropriate referral systems be put in place?
- What professional development opportunities should be offered to these clinicians?
- How can buy-in from local stakeholders be ensured for this approach to work?
- What curriculum or training components can be standardized or should be uniform across the continent?
- How can the problems of insufficient trainers and training sites be addressed so that the scarce numbers of surgeons in each country are not overloaded with more responsibilities?

References:

1. Ozgediz, D., et al., *Africa's neglected surgical workforce crisis*. Lancet, 2008. **371**(9613): p. 627-8.
2. Debas, H., et al., *Surgery*, in *Disease Control Priorities in Developing Countries*, J.D.e. al., Editor. 2006, World Bank: Washington DC.
3. Nordberg, E., S. Holmberg, and S. Kiugu, *Output of major surgery in developing countries. Towards a quantitative evaluation and planning tool*. Trop Geogr Med, 1995. **47**(5): p. 206-11.
4. Fenton, P.M., *The epidemiology of district surgery in Malawi: a two-year study of surgical rates and indices in rural Africa*. East and Central African Journal of Surgery, 1997. **3**(1): p. 33-41.
5. Weiser, T.G., et al., *An estimation of the global volume of surgery: a modelling strategy based on available data*. Lancet, 2008.
6. Bickler, S.W. and D.A. Spiegel, *Global surgery-defining a research agenda*. Lancet, 2008.
7. Ozgediz, D., et al., *The neglect of the global surgical workforce: experience and evidence from Uganda*. World J Surg, 2008. **32**(6): p. 1208-15.
8. WHO. *Recruitment of health workers from the developing world: Report of the Secretariat*. 2004 [cited August 29]; Available from: http://www.who.int/gb/ebwha/pdf_files/EB114/B114_5-en.pdf.
9. Galukande, M., S. Luboga, and S.C. Kijjambu, *Improving Recruitment of surgical trainees and Training of Surgeons in Uganda*. East and Central African Journal of Surgery, 2006. **11**(1): p. 17-24.
10. Vaz, F., et al., *Training medical assistants for surgery*. Bull World Health Organ, 1999. **77**(8): p. 688-91.
11. Gruen, R.L., et al., *Specialist outreach to isolated and disadvantaged communities: a population-based study*. Lancet, 2006. **368**(9530): p. 130-8.
12. Dovlo, D., *Using mid-level cadres as substitutes for internationally mobile health professionals in Africa. A desk review*. Hum Resour Health, 2004. **2**(1): p. 7.
13. Mullan, F. and S. Frehywot, *Non-physician clinicians in 47 sub-Saharan African countries*. Lancet, 2007. **370**(9605): p. 2158-63.
14. Atelier., *Les strategies d'amelioration de la couverture et de la qualite des soins medicochirurgicaux essentiels et d'urgence.*, M.d.I.S.P.e.d.I.L.C.I.E. République du Niger, et Coopération Technique Belge., Editor. 2004.
15. *Rapport de mission*. in *Rencontre sous-regionale sur les soins medico-chirurgicaux essentiels et d'urgence*. 2004. Ouidah, République du Bénin.
16. *Atelier: Les strategies d'amelioration de la couverture et de la qualite des soins medicochirurgicaux essentiels et d'urgence*. 2004, **République du Niger, Ministère de la Santé Publique et de la Lutte Contre les Endémies et Coopération Technique Belge**.

17. Pereira, C., et al., *Meeting the need for emergency obstetric care in Mozambique: work performance and histories of medical doctors and assistant medical officers trained for surgery*. BJOG, 2007. **114**(12): p. 1530-3.
18. Vaz, F., et al., *Training medical assistants for surgery*. Bull World Health Organ, 1999. **77**(8): p. 688-91.
19. Kruk, M.E., et al., *Economic evaluation of surgically trained assistant medical officers in performing major obstetric surgery in Mozambique*. Bjog, 2007. **114**(10): p. 1253-60.
20. Meo, G., et al., *Rural surgery in southern Sudan*. World J Surg, 2006. **30**(4): p. 495-504.
21. Pereira, C., et al., *A comparative study of caesarean deliveries by assistant medical officers and obstetricians in Mozambique*. Br J Obstet Gynaecol, 1996. **103**(6): p. 508-12.
22. *Improving Access to Surgery in sub-Saharan Africa*, in Bellagio Essential Surgery Group: Bellagio.

Appendix 1 – Summary of key articles on SHWs/NPCs.

Dovlo, in a desk review, explored the concept of SHWs and their education and scopes of practice among other issues.¹² The interpretation of the SHW concept varied across sub-Saharan Africa with different forms of substitution occurring in each setting. Four permutations seemed to exist:

1. substitution using an existing but different profession e.g., nurse anesthetists who carry out tasks previously done by physicians;
2. substituting an existing profession with new and different cadres e.g., clinical officers in Malawi;
3. delegation of specific tasks to less-trained cadres from the same profession e.g., diploma courses in ophthalmology for general physicians, and
4. delegation of non-technical work to relieve clinicians of unnecessary workload e.g., use of nursing aides for bathing or lifting patients in Ghana.

Based on the interpretation of the SHW concept, the training and scopes of practice varied between countries. Cadres with training in surgery in Tanzania, Malawi and Mozambique had extensive post-basic education and performed complex procedures whereas, limitations in scopes of practice have been said to limit the usefulness of such cadres in Zambia. The key advantages of SHWs identified through the Dovlo review include the lower remuneration costs compared to physicians, protection against international migration and lower costs of training and deployment.

In 2007, Mullan et al published a review on the use of non-physician clinicians in 25 of 47 sub-Saharan African countries.¹³ All 25 countries had been previously identified by the WHO as having a critical shortage of health care workers. This review highlighted many of the same issues as Dovlo and confirmed that neither training nor scope of practice was standardized across the continent. Programs particularly differed based on whether they recruited nurses or not. Some countries opted out of training nurses as NPCs with concerns that this would deplete their already scarce numbers of nurses. Others noted that skilled nurses may be like to emigrate out of sub-Saharan Africa. In terms of the structure of the training programs, most relied less on hospital-based and high-tech curricula compared to ones that train physicians and provided practical skills to address common pathology encountered in the field. Information from five countries reflected the time and cost savings from using NPCs and details of each country's programs are shown below.

Mid-level workers and their roles in Africa				
Country	Title	Entrance requirement	Pre-service education	Scope of practice
Angola	clinical officer	secondary school	3	medicine, <i>minor surgery, obstetrics (no CS)</i>
Burkina Faso	clinical officer	secondary school	3	medicine, <i>minor surgery</i>
Botswana	nurse clinician	RN with experience	1	medicine, <i>obstetrics (no CS)</i>
Cape Verde	health officer	secondary school	3	medicine
Ethiopia	health officer	BSc or RN	3	medicine, <i>minor surgery, obstetrics</i>
	health officer	secondary school	3	medicine, <i>minor surgery, obstetrics</i>
Gabon	clinical officer	secondary school	3	medicine
Guinea-Bissau	clinical officers	secondary school	3	medicine
Ghana	medical assistant	RN with 3-5 yrs experience	1	medicine, <i>obstetrics (no CS)</i>
	medical assistants	secondary school	3	medicine, <i>minor surgery, obstetrics</i>
Kenya	clinical officer	secondary school	3	medicine, <i>minor surgery, orthopaedics, dermatology, anaesthesia,</i>
Lesotho	nurse officer	RN with 5 yrs. Experience	1	medicine, <i>obstetrics (no CS)</i> , public health
Liberia	physician assistant	secondary school	3	medicine, <i>obstetrics (no CS)</i>
Malawi	clinical officer	secondary school	3	medicine, <i>minor surgery, obstetrics, orthopaedics, dermatology, ophthalmology</i>
Mauritius	community health care officer	secondary school	3	medicine, <i>obstetrics (no CS)</i>
Mozambique	clinical officer	secondary school	2.5	medicine, <i>minor surgery, obstetrics, dermatology, public health</i>
Rwanda	nurse clinician	RN with experience	1	medicine, <i>obstetrics (no CS)</i>
Senegal	health officers	NA	NA	medicine only, but can take <i>additional courses to train in minor surgery, obstetrics and others</i>
Seychelles	nurse clinician	RN	1	medicine
Sierra Leone	community health officer	secondary school	2	medicine, <i>obstetrics (no CS)</i>
South Africa	physician assistant	secondary school	3	medicine
Sudan	clinical officer	secondary school	3	medicine only, but can take <i>additional courses to train in minor surgery, obstetrics and others</i>
Tanzania	assistant medical officer	3 years experience	2	medicine, <i>minor surgery, obstetrics, dermatology, anaesthesia</i>
	clinical officer	secondary school	3	medicine, <i>obstetrics (no CS)</i>
Togo	medical assistant	RN	2	medicine, <i>minor surgery, obstetrics (no CS), ophthalmology</i>
Uganda	clinical officer	secondary school	3	medicine, hospice care
Zambia	clinical officer	secondary school	3	medicine, <i>obstetrics (no CS), anaesthesia, orthopaedics</i>
	nurses	secondary school	na	medicine, <i>minor obstetrics (no CS)</i>
Zimbabwe	health officer	secondary school	2-3	medicine, <i>obstetrics (no CS)</i>

Table 1: Estimated production: physicians and substitutes in selected countries¹²

Average annual output

Country	Clinical officer/ Medical assistants	Assistant medical officer (Postbasic)	Doctors
Ghana	30	0	200
Tanzania	300	40	50
Kenya	300	30	200
Malawi	100	N/A	20
Mozambique	300	N/A	20–25

Table 2: Estimates of physician and "substitute" stocks – selected countries¹²

Current available estimates of practicing cadres

Country	Clinical officer/Medical assistants	Assistant medical officer (postbasic)	Doctors
Ghana	442@	0	*1600
Tanzania	Not available	Not available	Not available
Kenya	4300# (2300 in public sector)	N/A	*4900 (1200 in public sector)
Malawi	442#		315
Mozambique	627(basic cadre)@	301 (postbasic)@	278@
Central African Rep.	182		121
Uganda (1991)	750	0	671
Zambia	1458	40 (CO anesthetists)	900 (approx)

Includes both "basic" and "postbasic" cadre types; @ public sector figures only. Data on this table are from: Zambia: WHO Representative's Office; Ghana Health Service HRD Database Kenya Medical Training Centre, Nairobi; Mozambique: CIHI Country Health Profile Series. Country Health Profile-1995. Center for International Health Information. 1601 N. Kent Street, Suite 1014. Arlington, VA 22209.; Uganda: CIHI Country Health Profile Series. Country Health Profile-1995.

Table 3: Cost determinants – doctors and doctor substitutes ¹²

Doctors	Clinical officers/Medical assistant, etc.
<ol style="list-style-type: none"> 1. Require longer pre-professional education 2. Professional training is significantly long 3. Training requires expensive and highly qualified tutors 4. The training is in tertiary facilities with sophisticated equipment and diagnostic facilities 5. The training tries to meet "International standards", which may mean non-relevant courses 6. Their salaries are higher; they are difficult to retain in rural areas and are more likely to migrate due to international complementary recognition 7. Often require expensive technical backup and support (laboratories, etc.) 8. Patient outcomes better? (Fewer repeat visits?) 	<ol style="list-style-type: none"> 1. Need shorter basic or pre-professional education 2. Require shorter professional training 3. Requires smaller numbers of highly trained tutors and professionals 4. Can be trained in secondary and primary care facilities 5. Training can focus on specific immediate and relevant needs 6. Salaries after employment are considerably lower whilst being retained in rural areas. Unlikely to emigrate: skills not marketable internationally 7. Use of fewer expensive diagnostic tests and equipment in their practice 8. Cost of outcomes/complications to clients may be a problem

Table 4: Reported training cost per year for NPCs in selected sub-Saharan African countries¹³

	Training cost per year (tuition plus room and board)	Length of training (years)
Ethiopia	\$1200-1500 per year	3
Ghana	\$4000 per year	1
Malawi	\$2000 per year	3
Tanzania	\$1300-2000 per year	3
Zambia	\$1000-1500 per year	3

\$=US\$. Only one of these countries (Ghana) has a nurse based training programme; the rest are non-nurse based programmes.

Table 5: Advantages and disadvantages of using substitute health workers (SHWs) ¹²

Possible advantages of SHWs	Possible disadvantages of using SHWs
<ol style="list-style-type: none"> 1. Substitutes are country-specific, not internationally tradable and are more easily retained within the country 2. Emoluments and incentives for such cadres are significantly lower than for cadres substituted for 3. Pre-service training costs are also much lower 4. Academic entry requirements into technical training are less problematic and training is accessible to a wider range of entrants from all segments of society 5. All training is local and practical 6. Substitute cadres accept postings into rural/hardship areas and are retained there 7. Substitutes may reduce other service costs by requiring fewer diagnostic tests and less sophisticated equipment and by prescribing generic medications 8. They may relate better with communities by being less elitist and more integrated 	<ol style="list-style-type: none"> 1. Quality of care may suffer with poor clinical decision-making or poor supervision of their practice (they still require supervision by a professional) 2. Ethical considerations may be less strong in new cadres who don't have existing traditions and norms. Practice regulation is absent for many such cadres 3. The perceived low costs may be offset by poor treatment results and outcomes to patients and high morbidity 4. Scaling up the numbers of substitutes to achieve higher coverage will mean similar expansion in the numbers of professional cadres required for supportive supervision 5. Eventually cadres carrying out similar tasks want remuneration and incentives similar to those of the original cadres. Interprofessional conflict and demotivation may ensue