

## Surgical research in sub-Saharan Africa: A role for TeleHealth?

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MAURICE MARS, M.B. CH.B., M.D.

Department of TeleHealth, Nelson R. Mandela School of Medicine, University of KwaZulu-Natal, Durban

As a non-surgeon I feel especially honoured to have been afforded the privilege of presenting this, the 26th annual D. J. du Plessis Lecture of the Surgical Research Society of Southern Africa. I thank Professor Thompson and his organising committee for the invitation.

We are here to remember and honour the late Professor D. J. du Plessis. He was a man of many parts: a soldier, a surgeon, a researcher, and an academic leader. Born in Paarl in 1916, he entered medical school at the University of Cape Town in 1935. At the outbreak of World War II he enlisted and joined the South African Medical Corps, graduating in 1941. After the war he commenced surgical training at the University of the Witwatersrand, moving back to Cape Town in 1949. In 1951 he went to Oxford on a Nuffield Fellowship, where he gained Fellowship of the Royal College of Surgeons of England, and was awarded the Master of Surgery from the University of the Witwatersrand for his work on salivary gland tumours. He then returned to Groote Schuur Hospital as a specialist surgeon.

Professor Du Plessis was appointed to the Chair of Surgery at the University of the Witwatersrand in 1958, where he built up a leading surgery department with a strong research ethos. His academic management skills culminated in his appointment as Vice-Chancellor of the University in 1977, a post he held with distinction during turbulent times.

Professor Du Plessis left a lasting legacy. He founded the Surgical Research Society of Southern Africa and was its first president. He also started the *South African Journal of Surgery* and initiated the biennial meetings of the Association of Surgeons of Southern Africa. His own lasting major contribution to surgical research is probably his work on bile reflux in the genesis of gastric ulceration.<sup>1</sup> At the time of his death, 14 of his trainees chaired surgical departments around the world.<sup>2</sup>

The headline of his obituary in the *Sunday Times* in 1999 summed up the respect that D. J. du Plessis, the man, had gained: 'Brilliant surgeon and Principal of principles'.<sup>3</sup> It is important that we honour his memory, for without his foresight and energy, we would not be gathered here today.

This is also an opportunity for me to pay tribute to my mentors over the years. As a young orthopaedic registrar at the University of Natal I was fortunate to spend many hours

arguing about accepted principles and dogma of orthopaedic surgery with the late Professor K. S. Naidoo. I think it was these discussions and the lack of scientific evidence that either of us could find to support our points of view that sparked my interest in research. I was then fortunate to come under the influence of Professor John Robbs, when he accepted me onto his vascular surgery rotation. My recall of the advice that he gave me about starting out in research was something along the lines of an almost irritated, 'Don't just talk about it, go out and do it.' It is advice that I have been trying to follow ever since. Professor John Brock-Utne was another whose approach to research I have tried to emulate. An anaesthetist, he was head of the Department of Physiology when I joined the Department of Physiology for what was meant to be one year, but turned out to be 16 years, back in 1987. He invariably had a smile, and an enthusiasm and a passion for research, with a desire to get the answers as quickly as possible before enthusiasm for a project waned. To him, research appeared to be an enjoyable exercise and completion of a project merely generated more research questions and more enjoyable research. I have endeavoured to enjoy research to the full, and I recommend this outlook to our younger colleagues. I am indebted to them and to many others.

The title of this lecture is 'Surgical research in sub-Saharan Africa: A role for TeleHealth', which I have subtitled 'W(h)ither Africa – a future for surgical research in Africa?' This was not my initial topic. It has been usual for presenters of the D. J. du Plessis lecture to speak about aspects of their work over the years and outline research avenues for the future, and I had intended to follow this trend. I was going to build on my first paper presented to this Society in 1986, entitled 'A comparison of bloodflow measurement by Xenon<sup>133</sup> skin clearance and transcutaneous oxygen pressure as an index of limb perfusion'.<sup>4</sup> In those days, before PowerPoint and data-projectors, we came to meetings clutching slide holders filled with 35 mm slides, usually blue and white or hand coloured, and everyone hoped fervently that all their slides were the right way up and that the projectionist did not drop the slide carousel while loading it for the presentation.

At the time that I was considering my topic, I was

reviewing the state of academic surgery in South Africa for a presentation to the 7th Annual Bethune Round Table Meeting in Canada, on International Surgical Training. 'Surgery in South Africa in crisis' was a headline I came across in the *South African Journal of Surgery's* News section in August 2006.<sup>5</sup> The report summarised a series of three papers by Kahn *et al.*, based on work commissioned by the Association of Surgeons of Southern Africa, which highlighted the shortage of surgeons; up to 26% of specialist surgical posts were unfilled in the State sector; and a dwindling number of trainees were opting for general surgery.<sup>6-8</sup>

If there is a problem in South Africa, what is the situation in the rest of Africa? According to the number of surgeons registered with the Health Professions Council of South Africa there are 2.1 general surgeons per 100 000 people in South Africa.<sup>6</sup> It is worrying that the number of surgeons in South Africa has fallen from 6/100 000 people in 1987.<sup>9</sup> Data for Africa are sparse and are shown in Table I.<sup>10</sup> While South Africa is better off in terms of surgeons per 100 000, the percentage of surgeons in South Africa is lower than in the other African countries for which there are data.

The concern of the Surgical Research Society is research and dissemination of research output. Sub-Saharan Africa's biomedical research and development expenditure in 2002 was 0.5% of the total world expenditure, compared with North America's 37.7%, Western Europe's 24.1% and Japan's 12.9%. South Africa accounts for 60% of the sub-Saharan expenditure.<sup>11</sup> Research expenditure influences research publications, with sub-Saharan Africa again producing only 0.5% of the world's science publications.<sup>12</sup>

For surgical research in South Africa and sub-Saharan Africa to play a meaningful international role we need to have enough surgeons, working in environments conducive to research and reflection. In academia we currently have neither. What is often forgotten is that when there are insufficient surgeons, clinical service takes priority, teaching loads are increased and research is usually the first to suffer. So, for 'Surgery in South Africa in crisis', read 'Surgical research in South Africa in crisis'.

The problems facing general surgery and surgical research in South Africa are not unique and reflect the problems facing health care in general in sub-Saharan Africa.

I propose to outline some of these problems facing African health care, discuss solutions that the developed world sees as appropriate for us, explain why these may not be appropriate and outline a possible way forward for sub-Saharan Africa to

direct its future in surgery training and ultimately surgical research.

## Telemedicine

In 2005, the World Health Assembly saw telemedicine as a possible solution to some of the developing world's health care problems.<sup>13</sup> This was endorsed by the World Health Organization, with a call to member nations to establish National Telemedicine Centres of Excellence.

What is telemedicine and why might it be a possible panacea for some of the world's health problems? Telemedicine is the practice of medicine over distance, using information communication technologies (ICT). Telemedicine is not new. The leper's bell was an early form of ICT that warned people, at a distance, of the impending presence of a leper. Ships sailing the high seas hoisted flags, another form of ICT, to indicate the presence of disease on board or to request medical assistance. The greatest advance in telemedicine was probably the telephone. Everyone here present has practised telemedicine at some time, as we have all either sought or given medical advice using a telephone.

Telemedicine in its current form is divided into synchronous or real-time telemedicine and store-and-forward or asynchronous telemedicine. Synchronous telemedicine uses some form of videoconferencing or teleconferencing for live interaction. In asynchronous, or store-and-forward, telemedicine information such as a digital image is stored and subsequently forwarded by e-mail and a response is received some time later.

TeleHealth is an extension of telemedicine, adding the delivery of health information, in the form of data, information and knowledge, to health services through the use of information technology and communication networks to and from distant locations.

Why is telemedicine and TeleHealth seen as a possible partial solution to Africa's problems? The perceived benefits include: improved rural health care; reduced transportation of patients to referral hospitals; increased patient access to specialists; support for isolated rural doctors; overcoming doctor shortages; delivery of education; and facilitation of research in rural areas. So taken have some sub-Saharan African countries been with the buzzword of telemedicine that several have included it in their strategy to meet their millennium development goals by 2015. Few have actually embarked on any telemedicine projects as yet.

**TABLE I. TOTAL NUMBER OF GENERAL SURGEONS, NUMBER OF GENERAL SURGEONS AND DOCTORS PER 100 000 PEOPLE AND PERCENTAGE OF DOCTORS WHO ARE SURGEONS, BY COUNTRY**

	Surgeons	Surgeons/100 000 people	Doctors/100 000 people	Surgeons (%)
<b>Kenya</b>	<b>230</b>	<b>0.7</b>	<b>13.2</b>	<b>5.3</b>
<b>Malawi</b>	<b>9</b>	<b>0.1</b>	<b>1.1</b>	<b>9.1</b>
<b>Mozambique</b>	<b>35</b>	<b>0.2</b>	<b>2.4</b>	<b>8.3</b>
<b>South Africa</b>	<b>954</b>	<b>2.1</b>	<b>69.2</b>	<b>3.0</b>
<b>Tanzania</b>	<b>105</b>	<b>0.3</b>	<b>2.2</b>	<b>13.6</b>
<b>Uganda</b>	<b>63</b>	<b>0.4</b>	<b>4.7</b>	<b>8.5</b>
<b>Zambia</b>	<b>50</b>	<b>0.5</b>	<b>6.9</b>	<b>7.2</b>

We need to look at some of the health care problems facing Africa and determine how, and if, telemedicine may be appropriate.

## Health care problems in sub-Saharan Africa

The WHO summarised Africa's problems in its 2006 World Health Report: 'the African region has 24% of the burden (of disease), but only 3% of the health workers commanding less than 1% of world health expenditure'. They add: 'The exodus of skilled professionals in the midst of so much unmet health needs places Africa at the epicentre of the global health workforce crisis.'<sup>14</sup>

### Burden of disease

Sub-Saharan Africa faces the triple burden of infectious disease, chronic disease and trauma. It has the additional triple burden of most of the world's tuberculosis, malaria and HIV/AIDS. Over a million people die of malaria every year in Africa, and two-thirds of all HIV-positive people in the world are in Africa.<sup>15,16</sup> In South Africa we have had an upsurge of tuberculosis and a recent outbreak of extensively drug-resistant tuberculosis.<sup>17</sup>

### Population predictions

Despite this burden of disease, the United Nations Population Division in its medium variant, still forecasts an almost 2½-fold increase in the total population of Africa from 812 million in 2000 to 1 937 million in 2050.<sup>18</sup> In the absence of a cure for HIV/AIDS and widespread dissemination of highly active antiretroviral therapy, and with the increasing prevalence of TB and malaria, there will for the foreseeable future be large numbers of people dying and a fast-growing young population, both of which place demands on the health care system.

### Health care personnel

Is sub-Saharan Africa able to meet these demands? The WHO has identified that Africa requires an additional 1 million health professionals in the next 4 years.<sup>14</sup> In 31 of the 47 African countries for which there are data, there are 10 or fewer doctors per 100 000 people. This is in contrast to Italy, the USA, Australia, and Canada, with 420, 256, 247, and 214 doctors per 100 000 population respectively.<sup>19</sup> It is clear that there are not enough doctors in Africa, and African medical schools are not producing enough doctors to meet their countries' needs.

As there is a marked disparity in the distribution of doctors throughout the world, might sub-Saharan Africa be able to access some of the spare capacity through the use of telemedicine? The current prevailing model of telemedicine in the developed world is based on a fee for service. Is sub-Saharan Africa able to buy a telemedicine service?

### Health care funding

If one takes the gross domestic product (GDP) per capita per annum of a country and multiplies it by the percentage of the GDP that a government spends on health, the product is the amount of money budgeted per capita per annum for health. While Canada, with a GDP per capita of US\$27 079, spends 6.7% of its GDP on health, equating to US\$1 814 per capita per annum, South Africa spends US\$122 per

capita per annum. The situation is far worse in the poorer African countries, with the result that 25 sub-Saharan African countries spend less than US\$10 per capita per annum on health. This is less than 3 US cents per person per day.<sup>20</sup>

### Telecommunication costs

If we are to consider telemedicine as a potential solution, we need to review the cost of telecommunications in sub-Saharan Africa. According to the World Bank, the average total cost of 20 hours' internet access in the USA is given as US\$15. For sub-Saharan Africa the figure is far higher, averaging US\$54.80, with costs ranging from US\$117 in Tanzania and US\$97 in Uganda to US\$33 in South Africa.<sup>21</sup> When these monthly costs are converted to annual costs, 20 hours of internet access a month often exceeds the gross national income per capita of the country by a factor of 3 or more. Even a relatively simple solution like store-and-forward telemedicine can become an expensive proposition.

Similarly, the cost of ISDN-based synchronous telemedicine is high. The phone call costs, excluding line rental, for a 30-minute, ISDN-based videoconference to the USA at 128 kbs<sup>-1</sup> average US\$48.60 and range from US\$129.00 in Zambia and US\$70.20 in Uganda to lows of US\$15.80 in South Africa and US\$7.80 in Ghana.<sup>21</sup> This too makes ISDN-based synchronous telemedicine and tele-education an expensive option. While VSAT satellite access is available to all African countries, its use in telemedicine has been impeded by legislative issues, which have tended to restrict private enterprise, resulting in high costs. The average annual VSAT licence fees of 83 African universities in 40 countries is US\$13 553 compared with US\$426 for European Union universities, and the average cost per kbs<sup>-1</sup> via VSAT is US\$7.30 compared with US\$5.46 for land-based services.<sup>22</sup>

### Can telemedicine benefit sub-Saharan Africa?

The reality of sub-Saharan Africa is that there are too few doctors. A second reality is that telemedicine adds work, certainly in its initial phase. The referring doctor has to either gather the patient's information and any images or sound files that have been collected and send an e-mail or arrange a videoconference consultation and participate in it, as must the receiving doctor.

### Telemedicine models

Existing models of international telemedicine are based on the fee-for-service model, as in the Nighthawk services which take advantage of differences in time zones. Digital X-ray images taken at night in some hospitals in the USA are sent electronically to radiologists in Australia and India, who then report on the X-rays during their normal working hours.<sup>23</sup> There are philanthropic international telemedicine services, like the Swinfen Trust and iPath, which offer free store-and-forward telemedicine services. To date the number of cases seen by these services is relatively small and there are concerns over appreciation of local diagnostic and treatment algorithms, available pharmacopoeias and continuity of care.

International service brings with it its set of potential legal and ethical issues relating to licensure, liability, continuity of care and ethical concerns.

**Medico-legal and ethical issues**

At present very few countries have specific telemedicine legislation: Malaysia is one. In an attempt to protect their people from doctors who might not be clinically competent, they require that persons practising telemedicine in Malaysia must be ‘... a fully registered medical practitioner holding a valid practising certificate’. If the consultation is to be with a doctor outside Malaysia, then that doctor must hold ‘a certificate to practice telemedicine issued by the Council (Malaysian Medical Council)’ and must practise ‘telemedicine from outside Malaysia through a fully registered medical practitioner holding a valid practising certificate’. Anyone who practises telemedicine in breach of the legislation is liable to a fine and/or imprisonment for up to 5 years.<sup>24</sup>

Within the context of the shortage of doctors in sub-Saharan Africa, legislation framed along these lines, although well intentioned, will be an impediment to international practice of telemedicine. In all likelihood, such legislation would block access to existing international philanthropic store-and-forward telemedicine services like the Swinfen Trust, iPath and RAFT.

Papers on ethical issues in telemedicine regularly discuss informed consent, confidentiality, data security and standard of care. While obtaining informed consent for a telemedicine consultation may appear to be a very reasonable expectation, the question arises as to what constitutes truly informed consent? For consent to be valid, it has to be based on substantial knowledge of the act consented to by the patient, with the patient having the right to withhold consent.<sup>25</sup> Obtaining informed consent becomes more difficult when the patient has had limited exposure to, and knowledge of, ICT. There is a requirement to explain how the patient’s data will remain secure and how confidentiality will be maintained. This is a difficult task, even for the computer- and technology-literate doctor dealing with the computer-literate patient.

The risk of unauthorised access to electronically transmitted and stored data is a concern. The World Medical Association in 1999 stated that ‘...the physician has an active obligation to ensure that all established standards of security measures have been followed to protect the patient’s confidentiality’.<sup>26</sup> Is this a reasonable expectation in a rural setting in a developing country, where all that may be

available for a doctor to perform a telemedicine consultation with a specialist is a telephone and modem, with an e-mail link, using a commercial service provider? Do you ensure that all established standards of security have been followed when you discuss a patient on your cell-phone? When does the patient’s right to health supersede their right to privacy? Ethical guidelines are required for this in the developing world.

**The KwaZulu-Natal TeleHealth experience as a model**

Local experience in TeleHealth in KwaZulu-Natal (KZN) may serve as a model for TeleHealth in Africa. While South Africa is seemingly well served with 69 doctors per 100 000 people, the situation is worse than it first appears. In KZN, 88% of the population of approximately 10.3 million people is dependent on state health care, for which there are 30 doctors per 100 000 and only 6 specialists per 100 000.<sup>27</sup> There are, for example, only 3 paediatric surgeons, all of whom are in one urban centre and who serve approximately 3 million people under the age of 15 years, the majority of whom live in rural areas.

Telemedicine has a relatively long history in KZN. Tele-radiology has been ongoing for many years following connection of CT scanners in the state hospitals to the academic radiology unit and its use is no longer monitored.<sup>28</sup> Similarly the academic neurosurgery department has also used store-and-forward telemedicine for many years.<sup>29</sup> In 1999, the National Department of Health launched a large telemedicine project with 28 pilot telemedicine sites in six provinces.<sup>30</sup> Despite initial enthusiasm, there was limited uptake of telemedicine. One reason was lack of buy-in from staff, exemplified by responses such as ‘it is too much work’ and outright refusal, with the comment, ‘it is not in my job description’ (neither is the use of a telephone in their job description, but all use telephones to seek advice and arrange transfer of patients).

**Tele-education**

Following the failure of the national telemedicine project in the province, substantial videoconferencing infrastructure was left unused. With the approval of the provincial Department of Health, videoconferencing units were moved to peripheral hospitals to facilitate postgraduate training from the Nelson

**TABLE II. NUMBER OF ACADEMIC PROGRAMMES OFFERED EACH YEAR, NUMBER OF VIDEOCONFERENCE (VC) BOOKINGS MADE, TOTAL NUMBER OF HOURS OF VIDEOCONFERRING UNDERTAKEN EACH YEAR, TOTAL NUMBER OF PEOPLE INVOLVED IN VIDEOCONFERRING BOTH AT THE LOCAL AND DISTANT SITES AND NUMBER OF PEOPLE-HOURS OF TUITION**

Year	Academic programmes	Number of VC bookings	Total hours of VC	Total people involved	Total person-hours of VC
2001	1	98	98	493	493
2002	2	117	117	680	680
2003	2	119	119	2 495	2 495
2004	4	81	186	8 791	25 066
2005	6	166	473	15 088	58 627
2006	17	320	765	23 125	72 308

R Mandela School of Medicine. In 2001, postgraduate lectures in radiology commenced from Durban to Grey's Hospital in Pietermaritzburg. This was followed by a surgical case presentation series between Durban and Ngwelezane Hospital in Empangeni.

In 2004, multipoint videoconferencing, to a maximum of four external sites, was introduced. Teaching was provided using the established postgraduate seminar programmes in Surgery and Obstetrics and Gynaecology, so that no additional teaching and/or preparation would be required. Teaching sessions are recorded to DVD. A new postgraduate programme in HIV Clinical Management was also introduced, which was designed to be taught by videoconferencing. Use of videoconferencing for tele-education between 2001 and 2006 is shown in Table II.

Videoconferenced education has become popular, with the number of programmes offered increasing from 6 in 2005 to 17 in 2006, and the average number of hours of videoconferenced teaching increasing from 41 to 77 hours per month. Maximum videoconference use was in May 2006, when 127 hours of teaching were broadcast. In 2006, teaching took place to a total of 21 sites, including sites in other provinces and other countries. Of note, in 2006, is that 41.3% (9 894) of people taking part in these teaching sessions were at peripheral sites, and they accounted for 30 369 person-hours of teaching.

The use of videoconferencing in Paediatric Surgery, General Surgery and for the Surgical Forum is shown in Table III. Noting that there are only three paediatric surgeons in the province, in 2006 their weekly seminars reached an average of 55 people a week, 37 of whom were at distant sites, including Umtata and Polokwane.

Three of the academic programmes have been evaluated by questionnaire, completed at the end of a videoconference session or module. The questionnaires aimed at assessing the respondent's experience with videoconferencing over several sessions and not merely the session that they had just completed. Review of the HIV Management programme showed no differences in the examination and evaluation results between students at each of the distant sites and between those who attended lectures face to face and those who received them by videoconference. Fewer than 2% of respondents were negative about videoconferencing and their complaints related to the quality of PowerPoint slides.

Of 68 people who delivered lectures or seminars by videoconference, only 1 person felt that videoconferencing

was a poor teaching tool, with 85% rating it as good or excellent. In the postgraduate seminar programme in Surgery, 5.1% of 138 respondents felt that videoconferencing was not an effective alternative to attending a seminar programme. Eighty-three per cent of participants rated videoconferencing as a good or excellent teaching tool, with no one rating it as poor or bad. Respondents indicated, among other things, that they felt that more sites should be involved; that it was very useful for professional development; that more technical support was required on site; that some lecturers needed to be trained in managing a videoconferenced session; and that this was a largely untapped resource that should be expanded.

Tele-education has proved to be popular, and there is growing interest in it among other medical schools in South Africa. Two of the current programmes are regularly shared with another medical school, and the College of Radiologists of South Africa has recently run a trial videoconference project linking the eight medical schools in South Africa, to share postgraduate specialist training. There is also interest from medical schools in Africa to participate in the postgraduate surgical seminar programme, and pilot projects are planned. There is a substantial body of relevant knowledge throughout Africa's medical schools and funding is being sought to trial a pan-African surgical education network. While it is proposed that teaching will initially come from South Africa, it is envisaged that in time it will evolve into a lecture/seminar series given by experts from around Africa. This will serve to optimise the use of the scarce human resources within Africa.

## Service telemedicine in KwaZulu-Natal

Since the lack of uptake of telemedicine in the 1999 National Project, some services have been developed in KZN, based on an enthusiast-driven model. Synchronous videoconference-based teledermatology has been running for 3 years at Port Shepstone Hospital, 120 km from the medical school. Patients who would normally be transferred to Durban for a dermatology consultation are asked to attend a videoconferenced clinic which is conducted monthly. By December 2006, 27 sessions had taken place, 132 patients had been seen and treated and 105 (79.5%) patients were saved a transfer to Durban. Audit of the referring doctors', dermatologists' and patients' opinion of the service showed high levels of satisfaction. The service has been extended to

**TABLE III. NUMBER OF VIDEOCONFERENCED TEACHING SESSIONS OFFERED IN PAEDIATRIC SURGERY, GENERAL SURGERY AND THE SURGICAL FORUM IN 2005 AND 2006, AVERAGE NUMBER OF SITES CONNECTED, TOTAL NUMBER OF PEOPLE ATTENDING VIDEOCONFERENCED SESSIONS, AVERAGE NUMBER OF PEOPLE PARTICIPATING IN A SESSION, AVERAGE NUMBER OF EXTRA PEOPLE REACHED BY VIDEOCONFERENCING, AND AVERAGE AND TOTAL NUMBER OF EXTRA PEOPLE PARTICIPATING**

		Sessions	Sites	People	Avg. people	Avg. extra	Total extra
Paed. Surg.	2005	24	3	932	40.2	17.7	391
	2006	47	4	2 066	54.5	37.3	1 254
Surg. Sem.	2005	29	5	3 128	111.1	41.6	1 111
	2006	40	5	4 229	108.3	53.3	2 031
Surg. Forum	2006	34	5	2 317	68.2	31.7	1 077

two more hospitals. A store-and-forward teledermatology service has been running in parallel from several hospitals in the province but has not yet been evaluated.

A store-and-forward tele-ophthalmology service has developed at one site using a slit lamp and a digital camera. By late 2006, 282 cases that would normally have been sent to Durban had been dealt with by e-mail. Of the patients 151 (53%) were saved an unnecessary transfer to Durban and 76 (27%) were given appointments for elective surgery, a process that would previously have required a journey to Durban. In only 3 (1.1%) cases was referral requested by the ophthalmologist because the images were of poor quality. Attempts to establish similar services at other hospitals have not yet been successful.

Fledgeling services have commenced in plastic surgery and paediatric surgery and are due to start in burn management, psychiatry and diabetic retinopathy screening.

## Conclusions

The crisis facing surgery and surgical research in South Africa is no different to the crisis facing other medical disciplines in Africa. There is a shortage of doctors and health care is under-funded by governments. The shortage of doctors in the state and academic sectors increases individual clinical workloads. Staff shortages in the academic sector mean that not only clinical workloads but teaching commitments increase. Both impinge on research time. There is a need to address surgical training and increase the number of surgeons in South Africa and sub-Saharan Africa before we can expect surgical research to flourish. There is a demand for teaching in rural areas and a demand for collaborative teaching of surgery in sub-Saharan Africa that can be met through the use of ICTs.

The question that we have to answer in determining whether TeleHealth is a possible solution for surgery and surgical research in Africa is, how can we effectively, within the constraints of Africa, use TeleHealth to improve patient care, promote professional development, retain scarce skills and ultimately re-grow our research base?

In trying to answer this, we need to rethink Africa's priorities. I believe that collaborative tele-education should take precedence over attempts to set up telemedicine services. I believe that tele-education and exposure to videoconferencing and other ICTs will ultimately lead to the development of international telemedicine services, for which we need enabling legislation and ethical guidelines.

In the same way that telephone use is ubiquitous in the practice of medicine, we need to provide innovative solutions to Africa's health care problems through the appropriate use and integration of other ICTs into the daily practice of medicine.

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