

Telemedicine support for the developing world

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The major potential uses of telemedicine in the developing world are the same as those in the industrialised world: for educational or for clinical purposes. The clinical work that has been performed so far has been in two distinct areas: in the aftermath of disasters (natural and man-made), and to obtain second opinions. Rough calculations suggest that only about one-thousandth of the potential telemedicine demand from the developing world is being met. Possible reasons include the referrers being too busy, and a perceived loss of control. Thus it appears that the correct strategy for future telemedicine in developing countries is to concentrate on the construction of within-country networks that demonstrably alter health outcomes, can be shown to be cost-effective and sustainable, and will provide a model for other countries to copy.

The primary benefit of telemedicine (a form of e-health) lies in its ability to improve remote access to healthcare, in particular by increasing speed of access and/or by reducing the cost of access. Thus, telemedicine is a technique which can be used to reduce inequity of access to healthcare. Since the developing world contains many examples of barriers to accessible healthcare, there are good reasons for supposing that telemedicine would be useful in healthcare delivery.

There is considerable literature on the potential use of telemedicine in developing countries. However, much of this is comments, letters, discussions, product reports, news items or case reports; there are few reports of the actual use of telemedicine in the developing world. It is clear, however, that the major potential uses cover both educational and clinical fields.

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The educational work to date has been either asynchronous in nature (e.g. self-study via the web) or interactive (e.g. videoconferencing). An example of asynchronous education is the World Health

Organization (WHO) Pacific open-learning network which provides continuing education and professional development for health workers in Pacific island countries. A network which uses interactive web-casting for professional education in French-speaking Africa is that of the Réseau Afrique Francophone de Télé-médecine organisation (RAFT). These are both well-established operations.

The use of telemedicine for educational purposes in the developing world seems broadly similar to the use of distance education generally. However, the use of telemedicine for clinical purposes is rather different. The clinical work that has been performed so far has been in two distinct areas: in the aftermath of disasters (natural and man-made) and to obtain second opinions.

Telemedicine for disaster relief

A well-known incident in which telemedicine was employed during disaster relief occurred following the Armenian earthquake in 1988. Approximately 25,000 people were killed and large numbers of others were injured and/or displaced because of the damage to housing. Following the earthquake, a satellite link was established between medical teams in Armenia and doctors in the US and Russia. The satellite link (called a 'space bridge') permitted the transmission of fax data, and allowed audio- and videoconferencing for tele-consultations.

Over a 12-week period, a total of 209 patients were discussed and the diagnosis was altered – presumably improved – in 54 of them (26 per cent). The major unanswered question in respect to this telemedicine operation – and others subsequently – is whether the resources employed, such as the telecommunications, equipment and personnel, might have produced a bigger health gain if they had been used in different, perhaps more conventional ways. That is, improving the management of 54 patients in a situation where there were over 100,000 casualties may not be the best use of the resource.

Telemedicine for second opinions

There is a history in telemedicine of supporting doctors in the developing world. Some of the longer-established operations have developed into substantial networks. Well-known telemedicine networks, which have been operating for five years or more, include those operated by the organisations described here:

Partners Healthcare, Boston, USA

Email consultations are used to support health workers at a rural clinic in northern Cambodia. The email advice comes from specialists at a tertiary hospital in Phnom Penh and from the Massachusetts General Hospital in Boston. In 2003, a second site at a small hospital in northern Cambodia began referring cases.

Tripler Army Medical Center, Honolulu, USA

A web-based tele-consulting system is used by the main US Army hospital in Hawaii to support referrers in hospitals (mainly military hospitals) around the Pacific.

iPath Association, University of Basel, Basel, Switzerland

The iPath software was originally developed for web-based telepathology case conferences. It is an excellent tool for this purpose and several tens of thousands of case conferences have now been conducted – technically by a number of different organisations who all use the same software. More recently the software has begun to be used for general tele-consulting (i.e. non-pathology work).

Swinfen Charitable Trust, Canterbury, UK

In 1999, a simple email teleconsultation system was established at a single hospital in Bangladesh by a UK-based charity. Specialist opinions were obtained from a small panel of volunteer consultants. The operation has now grown to service over 100 hospitals around the world, with a panel of more than 300 consultants. An automatic message handling system is employed, supplemented recently by a web-messaging system (see Box).

Réseau Afrique Francophone de Télé-médecine (RAFT), Geneva University Hospitals, Geneva, Switzerland

The RAFT project provides services from Geneva to nine African countries. The core activity is distance education via webcasting of interactive courses. Some teleconsultation work also takes place, mainly involving specialists in Geneva.

The Swinfen Charitable Trust

The Swinfen Charitable Trust is a UK-based charity which provides telemedical assistance to doctors working in developing countries (see www.uq.edu.au/swinfen). Since 1999, second opinions and management advice have been provided by email to doctors at more than 100 hospitals in 35 different countries. The expertise is donated by volunteer specialists from Australia, the UK and the US (mainly). There are over 300 consultants from about 100 different specialities and subspecialities.

Over the last eight years, telemedical advice has been provided for more than 1,600 patients. Experience has shown that successful telemedicine is possible in a wide range of medical, nursing and allied health specialities – even neurology is possible by email. Surveys have shown that the referring doctors find the advice helpful and that it improves their management of their patients.

All messages in the Swinfen Charitable Trust work are handled by an automatic-messaging system which is housed at the Centre for Online Health in Queensland. Its development is part of an active research programme in the area of store-and-forward telemedicine.

Utilisation rates

From the limited published data about their utilisation rates, supplemented by personal communications from those involved, it is possible to estimate the second-opinion workloads of these networks. Note that many of them fulfil other roles as well. Brief details are shown in Table 1.

Table 1. Utilisation rates (second opinions)

Operator	Total no. of cases	Approximate duration	Other roles
Partners Healthcare, Boston, USA	900	6 years	
Tripler Army Medical Center, Honolulu, USA	3,000	10 years	
iPath Association, University of Basel, Basel, Switzerland	c500	5 years	Telepathology case conferences
Swinfen Charitable Trust, Canterbury, UK	1,600	9 years	
Geneva University Hospitals, Geneva, Switzerland	20	5 years	Distance education

Costs and benefits

Although formal health economic studies have not been performed, there is some limited information about the costs and benefits of these telemedicine networks. For example, the Tripler network reported substantial setup and training costs, but these were offset by savings from reduced hospital/travel costs because of fewer hospital admissions. Savings were also claimed in respect of reduced hospital length of stay, consequent on better triage via telemedicine.

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In Cambodia, a beneficial consequence of the introduction of telemedicine was a reduction in the duration of the patients' chief complaints and fewer off-site referrals. The Swinfen Charitable Trust, which operates globally, has recorded high referrer satisfaction in surveys, and has begun to obtain follow-up data in certain hospitals which provide evidence of clinical benefit to individual patients. These successes demonstrate that telemedicine provides a useful service.

Common features

Although these telemedicine networks are different in their aims and methods of operation, they exhibit certain common features:

- ✦ They mainly rely on volunteer specialist expertise
- ✦ They all seem to be operating at workloads of a few hundred cases per year
- ✦ Their referral rates appear to be stable, i.e. they are not changing rapidly.

The fact that the referral rates are relatively constant might indicate that the potential demand for telemedicine is being satisfied. However, rough calculations suggest that the developing world has the potential to generate some five million referrals each year. Since the present telemedicine networks collectively are servicing about 5,000 referrals per year, at most, this suggests that only 0.1 per cent of the potential demand is being met.

Why isn't demand escalating?

If only a fraction of the potential demand for telemedicine from the developing world is being met at present, then there exists what can be called a paradox of altruism. The paradox is this:

1. It is often difficult for doctors to obtain a second opinion in developing countries
2. Telemedical networks offer a free and often rapid service
3. Yet demand is not growing rapidly.

This leads to the question of why the demand for telemedicine in the developing world is not rising steeply. There are several possible reasons why telemedicine is not used when it could be. These include:

- ✘ *No respect for a free service.* There are suggestions that a free telemedicine service is not valued by referrers, and therefore used much less than it might otherwise be. This is probably not relevant in the context of medicine in the developing world, where donor support for healthcare is the norm
- ✘ *Cultural problem of asking for help.* In medicine, a doctor is by definition an expert. It may be viewed as a failure if it is necessary for a doctor to ask for assistance, e.g. to seek a second opinion. This requires the help-seeker to acknowledge the gaps in their knowledge and to admit a dependence on another person. Whether this is a significant factor in telemedicine is not known
- ✘ *Inappropriate 'experts'.* Telemedicine advice in developing countries is usually provided by experts from elsewhere. However, local knowledge of a particular disease or condition may be greater than that of 'experts' from outside the country. In practice, this does not appear to be a significant problem. A concern is also sometimes raised that a specialist may request inappropriate tests to be performed locally. Again, this does not seem to be a major problem in practice
- ✘ *Referrers too busy.* In developing countries, doctors are often overloaded. While they might desire a second opinion about a particular case, it is easy to imagine that finding the time to do so might be difficult or impossible. How large a problem this represents for telemedicine is not known. What is known is that a recent experiment proved very successful, in which medical students on elective placement spent time in developing countries and acted as facilitators of telemedicine referrals
- ✘ *Perceived loss of control.* Most telemedicine networks provide expertise from outside the country of the referrer. This might be perceived as the source country losing control. This is certainly a possible reason that telemedicine is not used as much as it might be.

Choosing the right strategy

The work of the Swinfen Charitable Trust (and others) demonstrates that low-cost telemedicine in the developing world is feasible, clinically useful, sustainable and scaleable. However, telemedicine is not yet being used on a significant scale. What then is the right strategy? It appears that the logical approach is to build intra-country telemedicine networks as soon as practicable. That is, we need to bring into operation telemedicine networks that rely largely on within-country resources. Such telemedicine networks might need to begin with support from outside the country, but they should become independent of outside resources as quickly as possible.

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Whether resources should be concentrated into a single network or into several, it seems clear that the goal should be to demonstrate within-country telemedicine networks (supported from out of country where appropriate) that:

- ✘ Demonstrably alter health outcomes
- ✘ Can be shown to be cost-effective and sustainable
- ✘ Will act as a model for other countries to copy.

This will enable the success of the telemedicine second opinion work which has been performed to date to be exploited on a global scale. ↵

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