Telemedicine support for the developing world

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Summary

Telemedicine has been used for some years in the industrialized world, albeit with rather mixed success. There is also a considerable literature on the potential use of telemedicine for the developing world. However, there are few reports of the actual use of telemedicine there. A review identified five telemedicine networks providing second opinions; each network had been in operation for over five years. Although they have different aims and methods of operation, they exhibit some common features. In particular, none of them appear to be dealing with markedly increasing referral rates. Rough calculations suggest that only about 0.1% 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. If this analysis is correct, then the right strategy for future telemedicine in developing countries will be 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.

Introduction

Telemedicine has been used in the industrialized world for some years, albeit with rather patchy success.[1] The initial enthusiasm of the 1990s has given way to a more reflective view of the place of telemedicine in health-care delivery, as many of the pilot projects have failed to be sustained once their seed funding ran out. There is little routine telemedicine activity on an enterprise scale, e.g. at the level of national health services.

Telemedicine in the developing world mirrors this pattern to a large extent. The primary benefit of telemedicine lies in it facilitating remote access to health care (i.e. by increasing speed of access and/or reducing cost of access). It is thus a technique which can be used to reduce inequity of access to health care. Since the developing world contains many examples of barriers to accessible health care, there are good reasons for supposing, *a priori*, that telemedicine would be a useful technique.

This being the case, one might wonder why telemedicine is not used more widely in the developing world. I have therefore reviewed the existing work and attempted to draw conclusions about how telemedicine might be employed in future.

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Review

There is a considerable literature about telemedicine in developing countries. I conducted a MEDLINE search for relevant papers, using a range of search terms which were synonyms for telemedicine. This produced 368 articles. However, few of these were reports of the actual use of telemedicine in developing countries, most being comments, letters, discussions, product reports, news items or case reports. Relevant articles (i.e. those reporting practical experience with telemedicine) were first identified from the abstracts and then the 'snowball' method (e.g. examining the articles in the reference lists of these reports) was used to find additional articles reporting the experience of using telemedicine in developing countries. Finally, the reference lists in a number of relevant book chapters were examined.

The review showed that the potential uses of telemedicine in the developing world are the same as those in the industrialized world: for educational and for clinical purposes. The educational work 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 WHO Pacific open-learning network,[2] and a network which uses interactive web-casting is that of the Réseau Afrique Francophone de Télémédecine organization (RAFT).[3]

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

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areas, for disasters (natural and man-made), and for 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[4] 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 audio- and videoconferencing for teleconsultations.

Over a 12-week period, a total of 209 patients was discussed via the satellite link and the diagnosis was altered in 54 of them (26%).[5] One may assume that a change in diagnosis led to improved patient management, and presumably to improved outcome, although follow-up data are not available to confirm this. The major unanswered question in respect of this telemedicine operation — and others subsequently — is whether the resources employed (e.g. telecommunications, equipment, 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:

(1) Partners Healthcare, Boston, USA;
(2) Tripler Army Medical Center, Honolulu, USA;
(3) iPath Association, University of Basel, Basel, Switzerland;
(4) Swinfen Charitable Trust, Canterbury, UK;
(5) Réseau Afrique Francophone de Télémédecine (RAFT), Geneva University Hospitals, Geneva, Switzerland.

Brief details are shown in Table 1.

Utilization rates

From the limited published data about their utilization 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 2.

Costs and benefits

Although formal health economic studies have not been performed, there is some limited information about costs and benefits. For example, the Tripler network reported substantial set-up and training costs, but also reported savings from reduced hospital/travel costs because of fewer hospital admissions.[6] Savings were also claimed in respect of reduced hospital length of stay, consequent on better triage via telemedicine.

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.[7] The Swinfen Charitable Trust has recorded high referrer satisfaction in surveys,[8] and has begun to obtain follow-up data in certain hospitals which provide evidence of clinical benefit to individual patients.[9]

It therefore seems reasonable to believe 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:

(1) they mainly rely on volunteer specialist expertise;
(2) they all seem to be operating at workloads of a few hundred cases per year;
(3) 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.

Potential demand for telemedicine

What is the potential demand from the developing world for telemedicine second opinions? (This pre-supposes that there is a sufficient resource available to satisfy the demand.) An order of magnitude estimate is as follows. The developing world contains some 5400 million people in 127 countries. Suppose that one in every 10 people sees a health-care professional each year, and that in one in 100 of these interactions, the health-care professional concerned would like to seek a second opinion. Then there would be some 5 million referrals to be dealt with each year.

Since the present telemedicine networks collectively are servicing about 5000 referrals per year, at most, this suggests that only 0.1% of the potential demand is being met.

Table 1 General purpose second opinion telemedicine networks providing services in the developing world

Operator	Referring sites	Expert sites	Date of first operation	Mechanism	Description
Partners Healthcare, Boston, USA	Rovieng Health Centre, Cambodia Rattanikiri Hospital, Cambodia	Sihanouk Hospital, Phnom Penh; Harvard Medical School, Boston	2001	email	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	US-associated Pacific islands	Tripler Army Medical Center, Hawaii	1997	web	A web-based teleconsulting 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	Several (mainly telepathology), e.g. Cambodia, Solomon Islands, Bangladesh Also more recent teleconsultation work, e.g. Ukrainian Swiss Perinatal Health Project	Mainly Swiss, European	2001	web	The iPath software was originally developed for telepathology case conferences (for which it is an excellent tool, and several tens of thousands of case conferences have now been conducted — technically by a number of different organizations who all use the same software). More recently the software has begun to be used for general teleconsulting (i.e. non-pathology work).
Swinfen Charitable Trust, Canterbury, UK	Global (34 countries)	Global (13 countries)	1999	email and web	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 by a more recent web-messaging system.
Geneva University Hospitals, Geneva, Switzerland	Africa (nine countries)	Geneva	2001	web via satellite	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.

A paradox of altruism

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

(1) it is often difficult to obtain a second opinion in developing countries;

Table 2 Utilization rates (second opinions)

Operator	Cases (*n*)	Approximate duration (years)	Other
Partners Healthcare, Boston, USA	900	6	
Tripler Army Medical Center, Honolulu, USA	3000	10	
iPath Association, University of Basel, Basel, Switzerland	c500	5	Telepathology conferences
Swinfen Charitable Trust, Canterbury, UK	1500	9	
Geneva University Hospitals, Geneva, Switzerland	20	5	Distance education

(2) telemedical networks offer a free and often rapid service;
(3) yet demand is not growing rapidly.

This leads to the question why demand for telemedicine is not rising steeply.

Why isn't demand escalating?

There are several possible reasons why telemedicine is not used when it could be. These include:

(1) 'Thatcherism';
(2) cultural problem of asking for help;
(3) inappropriate 'experts';
(4) referrers too busy;
(5) perceived loss of control.

Thatcherism

A central aspect of the economic policies of Margaret Thatcher (Conservative British Prime Minister, 1979–1990)

was the privatization of public services. This was based on a belief that public services are fundamentally inefficient and that people do not value an item or service if it is free. Perhaps 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 health care 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 their lack of competence and to admit a dependence on another person.[10] Whether this is a significant factor in telemedicine is not known.

To shed some light on this matter, I analysed the source of the telemedicine referrals to one network, the Swinfen Charitable Trust. Over a 12-month period, 206 requests for a second opinion were received. The cases were submitted by 67 doctors, of whom about half were expatriate doctors (Figure 1). Perhaps this is evidence that expatriate doctors, mainly trained in industrialized countries, are more willing to acknowledge their limitations and to seek help from a third party?

Although there is little published information about the proportion of indigenous doctors in the developing world, a recent survey showed that 51% of the doctors registered in Malawi were Malawian.[11] If Malawi is representative, then the cultural problem in telemedicine referrals from developing countries may be more imagined than real.

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. Thus it is crucial that telemedicine experts are selected appropriately. Such concerns have been raised before[12] although in practice, this does not appear to be a 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 obtain one might be difficult or impossible. How large a problem this represents for telemedicine is not known. What is known is that a recent experiment in which medical students on elective spent time in developing countries and acted as facilitators of telemedicine referrals has proved very successful.[9]

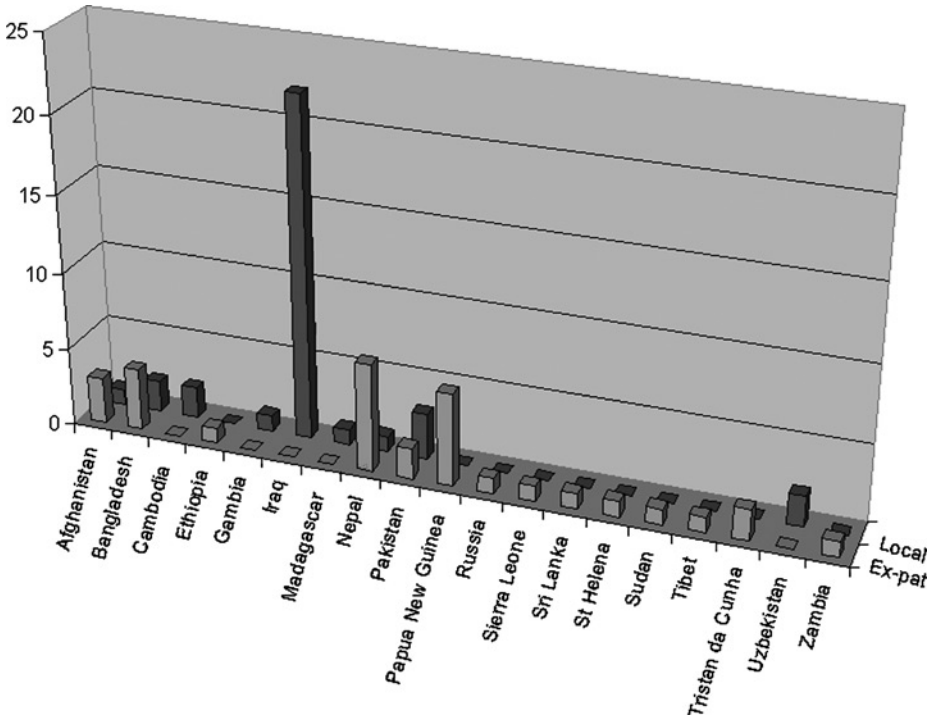

Figure 1 Number of referrers (*y* axis) to the Swinfen Charitable Trust in the 12-month period to November 2007 ($n = 67$; 206 cases). The country of origin of the referrers (*x* axis) and the referrer type (*z* axis) are also shown

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. Some evidence that this is a real problem comes from the saga of telemedicine referrals from a country in the Asia-Pacific region. Several hospitals in this country made regular referrals to the Swinfen Charitable Trust over the course of five years. The referral rate was steady, amounting to 30 cases per year. At the end of 2004, the referrals suddenly ceased without warning (Figure 2).

What caused this abrupt cessation? The cessation of referrals coincided with a new top appointment in the Ministry of Health. The individual concerned was known to have strong nationalistic tendencies. Perhaps this cessation of referrals was coincidence (since correlation does not prove cause and effect), but it seems likely that the individual concerned perceived telemedicine to be promoting a kind of cultural imperialism of health care. As a consequence, policy was changed and referrals from the country via telemedicine were actively discouraged.

What is 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,[8] sustainable and scaleable. However, telemedicine is not yet being used on a significant scale. If the foregoing analysis is correct, then I conclude that telemedicine in the developing world needs to be re-shaped. What then is the right strategy? The sensible approach appears to be to build intra-country telemedicine networks as soon as practicable. By developing a telemedicine network under the control of the appropriate ministry of health, there can be no question about perceived loss of control. That is, we need 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.

Ironically, this is exactly what had been proposed in the country described above. In mid-2004, an AusAid-funded project was proposed, in which all hospitals in the country were to be connected by a telemedicine network, to be managed from the national referral hospital. Only super-specialist referrals which could not be dealt with at the national referral hospital were to be sent out to the Swinfen Charity network for reply.

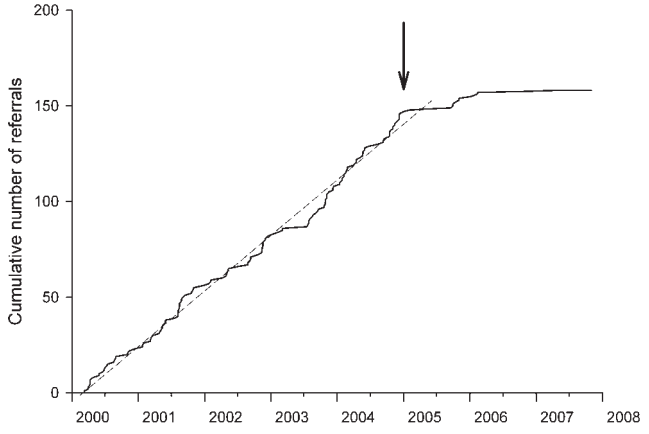

Figure 2 Cumulative number of referrals to the Swinfen Charitable Trust from the index country

Policy implications

If we accept that the future strategy for telemedicine in the developing world is to concentrate on the development of intra-country networks, then there are some policy implications. Successful implementation would result in one or more exemplars — obviously successful telemedicine projects — that could be replicated widely. (This begs the question, what is 'obviously successful'?[13]). In this connection, it is worth noting the Peruvian telemedicine network which is based on email transmission by VHF radio link. A recent study has documented fewer urgent patient transfers from health posts and health centres[14] and there is emerging evidence for cost-effectiveness.[15]

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

(1) demonstrably alter health outcomes;
(2) can be shown to be cost-effective and sustainable;
(3) 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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Preliminary test of an Internet-based diabetes self-management tool

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Summary

Self-care is a way of helping the health service to manage the growth in long-term chronic conditions. We developed an Internet-based self-management tool for diabetes following detailed consultations with patients. The Virtual Clinic allows a patient to communicate with their health professionals, find information about their condition and share support and advice with others through peer-to-peer discussions. We conducted a test of the Virtual Clinic with five patients prior to the start of a six-month pilot study to evaluate its feasibility, acceptability and effectiveness. The test session involved an interactive computer-based element followed by a focus group to gather feedback. All five patients were positive about the Virtual Clinic. A user-centred approach to developing an Internet intervention is important to ensure that it will meet patients' needs and that they will be enthusiastic about using it.

Introduction

Self-care is increasingly being seen as a way of helping the health service to manage the growth in long-term chronic conditions. There are over 2 million people with diagnosed diabetes in the UK and rising rates of diabetes have been identified as a particular challenge to the health of people in England.[1] Self-care in diabetes has been shown to reduce the risks of later, severe complications arising from poor glycaemic control and lack of monitoring, and therefore has the potential to both improve health outcomes for the patient and reduce the associated costs to the NHS. There are several recent studies of Internet-based interventions in diabetes care.[2–6] Such interventions, with their benefits of interactivity, wide accessibility and low marginal cost, represent an opportunity to support these patients. In particular the Internet offers ready access to peer support, which is a feature routinely identified as important and valued by patients.[2,7–9] Taking a user needs approach we have developed an Internet-based 'Virtual Clinic', which allows a person with diabetes to share information and support with other users through discussion boards and a chat room. It also allows them to communicate with their health-care providers and find information about their condition. This paper reports on the preliminary test of the intervention.

Methods

The methodology for the overall development and evaluation of the Virtual Clinic followed the Medical

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