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The Possible Use of Telemedicine in Developing Countries

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Introduction

Since the place of telemedicine in the industrialized world is by no means properly worked out yet¹,^[2] it might seem premature to consider its use in developing countries. Nonetheless, there is interest in the possible use of telemedicine in developing countries, from at least two organizations:

1. The Midjan group, an impromptu committee that was formed following the African Regional Telecommunications Development Conference in Abidjan in March 1993. This European telemedicine collaboration group aims to explore the use of telemedicine in developing countries. At present, the group includes representatives from 22 telecommunication and medical informatics suppliers, telecommunication operators, universities, hospitals and medical assistance organizations, administrations and international governmental organizations. It does not, however, include representatives from the developing world or from donor agencies such as UNICEF or DANIDA.
2. A study group of the International Telecommunication Union (ITU). The World Telecommunications Development Conference (WTDC) met in Buenos Aires in March 1994. The Conference noted that 'The widespread use of telemedicine services could allow universal health access and consequently facilitate the solution of the principal health problems connected with infectious disease, paediatrics, cardiology etc, particularly in areas where medical structures are inadequate or non-existing.' The WTDC then established a study group in the development sector of the ITU, which was tasked with the investigation of telemedicine in developing countries, including its costs and benefits.^[4]

Notwithstanding this interest, there is little practical experience yet of the use of telemedicine in the developing world.^[5] So far, it has mainly been used to support humanitarian missions in response to disasters.^[6]

Why Telemedicine in Developing Countries?

Since the place of telemedicine in richer countries has yet to be definitively established, its use in poorer countries must remain speculative at this stage. However, there appear to be at least two reasons why telemedicine may be relevant to developing countries.

First, telemedicine is a technique that has been used in industrialized countries, such as North America and Australia, for bringing health care to rural and remote areas which contain few doctors and other health-care workers. The developing countries have large rural and remote areas and relatively few health-care staff. For example, 24% of the total population of the USA is rural (15% in Australia) in comparison with 64% in the developing world and 79% in the least developed countries. As well as differences in urbanization there are major discrepancies in numbers of health-care staff: in sub-Saharan Africa there is only one doctor for every 18,000 people, in comparison with one for every 6000 in the developing world as a whole and one for every 400 in the industrial countries.[7]

Second, telemedicine appears to be a useful technique in health-care delivery in the industrialized world in some -- but not all -- situations.[2] Developing countries have major problems of health-care delivery. For example, in the least developed countries, only 30% of births are attended by trained health-care personnel, in comparison with 63% of births in the developing world as a whole and 99% of births in the industrialized countries. And in the least developed countries, only 50% of the population have access to health services of any kind.[7]

It is not unreasonable to suppose therefore that telemedicine may have a useful role to play in the developing world. Certainly, the potential is vast, with nearly 80% of the world's population in developing countries (Fig 1).

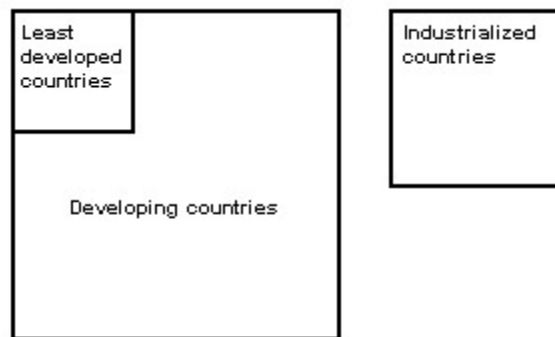


Figure 1: The developing world comprises 127 countries with a total of 4300 million people. (The 47 industrialized countries contain another 1210 million people.) The least developed countries, those of lowest income in the world, are: Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cape Verde, Central African Republic, Chad, Comoros, Djibouti, Equatorial Guinea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa (Western), São Tomé and Príncipe, Sierra Leone, Solomon Islands, Somalia, Sudan, Tanzania, Togo, Uganda, Vanuata, Yemen, Zaire and Zambia.

What Sort of Telemedicine Might Be Appropriate?

Broadly speaking, health care in the developing world is organized in a conventional pyramidal structure, with a hospital sector supported by a primary-care sector (Table 1). One possible use for telemedicine in a developing country is therefore at the top of the health-care pyramid. Telemedicine links between the specialist hospitals (national referral hospitals) and the tier below (district or regional referral hospitals) would most closely match the situation in the industrialized world. Examples of telemedicine applications include teleradiology, telepathology and teleconsulting.

	England and Wales	Tanzania
Population	52 million	29 million
Area (km ²)	151,000	950,000
Hospitals	1970	195
Hospital Beds	23,000	26,000
Primary-Care Centres	9700	3800
Health-Care Staff	c. 900,000	43,000
Total Cost of Health Care (\$)	c. 50 billion	67 million

Table 1: Comparative health-care statistics
Data from UK,[12][13] Tanzanian[14] and UN[7] sources.

Another possible use for telemedicine is at the bottom of the health-care pyramid. Here the situation is quite different from that in industrialized countries. Telemedicine applications might include the use of email to improve communications generally, and access to the Internet for continuing medical education (CME). In the context of the latter, it is worth noting the potential savings offered by distance learning. In one Tanzanian programme for the training of primary-care workers by conventional means, travel and subsistence accounted for more than 80% of the total costs.[8]

These cases represent two extremes. In the first, telemedicine would be used at tertiary level; in the second, it would be used more like a public health measure. Clearly, the potential value of telemedicine would be critically dependent on the actual health-care problems faced in the developing world.

Health-Care Problems in Developing Countries

Problems of delivering health care in developing countries amount to a general lack of resources, but in many countries this is compounded by poor management, inappropriate donor interference in the healthcare system, and other political factors.[9] Specific problems include:[10]

1. infrastructure:
 - poor-quality electricity supplies,
 - poor-quality water supplies,
 - poor-quality telephone services,
 - isolation and lack of CME for health-care staff,
 - poor supervision of health-care staff;
2. organization:
 - lack of medical supplies, especially drugs,
 - poor referral system (and usually no feedback to the person originating the referral),
 - lack of transport,
 - not enough doctors and other health-care workers,
 - too many patients.

Telemedicine has great potential value in supporting remote primary-care workers and for improving communications with the hospital sector, and therefore the organization of the health-care system overall.

Counter-Arguments

When telemedicine for developing countries is discussed, various counter-arguments are commonly put forward. These include:

1. Can health-care workers do anything on the basis of the advice they receive? For example, in the case of international telemedicine, it is not much help for the local doctor to be told that the patient requires haemodialysis or a heart transplant if these are not available in the country concerned. Similarly, in the case of intra-country telemedicine, if a doctor from a large hospital tells the village midwife that a Caesarean section is required, can this be done?
2. Is it an appropriate use of resources? Surely if extra resources become available for health care in a developing country, they would be better used in conventional public-health measures, such as providing medical supplies, clean drinking water or proper sanitation?

In the absence of any real experience with telemedicine in the developing world, these questions are unanswerable. What is known from experience elsewhere is that successful telemedicine requires much more than the delivery of the right equipment to the user. Indeed, it has been observed that the technical problems are the least: much more important to successful telemedicine is solving the organizational and administrative problems.[2]

Pilot Projects

The essential question -- whether telemedicine (of whatever form) in a developing country is cost-effective -- cannot be answered in advance of pilot projects being carried out. In order to facilitate the introduction of telemedicine into the health-care systems of the industrialized countries, the point has been made that telemedicine projects should be evaluated in a properly controlled, scientific manner.[2] It will be just as important to carry out pilot projects in a scientific way in the developing world, else the information required to answer the question about the appropriate use of resources will not be gathered.

When telemedicine projects begin in the developing world, it will therefore be crucial that appropriate resources are devoted to supporting them and to monitoring their effects on the health-care system. As has been noted elsewhere,[11] it is difficult both to measure changes in health status in developing countries and to link those changes to specific healthcare interventions.

Strategy

From the foregoing, the logical steps to determine the place of telemedicine in the developing world appear to be:

1. to identify potential telemedicine projects the Telecommunication Development Bureau of the ITU is trying to do this and has recently sponsored missions to various countries in Africa and Asia;
2. to carry out one or more pilot projects in order both to demonstrate technical feasibility and to measure the benefits to the health-care system;
3. to calculate the costs of large-scale deployment;
4. only at this stage can a rational decision be made about whether telemedicine would be an appropriate use of additional resources in a developing country.

Conclusion

There are reasonable grounds for supposing that telemedicine may be a useful technique for health-care delivery in the developing world, but almost no practical experience so far. Pilot projects are required. Assuming that telemedicine is shown to be beneficial, it is only at this stage that a rational decision can be made about whether telemedicine would be an appropriate use of additional resources in a developing country, as opposed to alternative uses of those resources to solve other important problems of health care.

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