Telecommunications for health—new opportunities for action

DEREK YACH
World Health Organization, 20 Avenue Appia, Geneva, Switzerland

SUMMARY
Profound and rapid changes in telecommunications are transforming the way in which decisions are made in all fields of human development. Simultaneously, there has been a global review of progress made in moving towards health for all over the last 20 years. This paper highlights lessons learnt since Alma Ata and indicates how telecommunications can address many challenges to health in innovative ways provided barriers to use are removed.

Key words: telecommunications; telehealth; telemedicine

LESSONS SINCE ALMA ATA

Over the last half century of the World Health Organization (WHO)'s existence and more specifically since Alma Ata, there have been sustained and rapid increases in most measures of health status. These are best illustrated by the increase in life expectancy and declines in the infant mortality rate that have occurred in most countries over the past 20 years. However, simultaneously with these global increases have been declines in some measures of health status in countries undergoing severe political, economic and epidemiological change. Thus there have been declines in life expectancy of men in many countries of the former USSR, and between men and women in many countries in sub-Saharan Africa. There is concern that many of the public health gains made over the past decade will not be maintained in the face of potential cutbacks in investment, in public health infrastructure, health systems and services. Further, gaps in health status have increased between countries at different levels of development and within most countries when stratified by measures of social class. These threaten attainment of social justice: the heart of health for all.

Many old and traditional challenges associated with poverty related diseases and development problems, such as illiteracy, the status of women, infectious diseases, high levels of maternal mortality, and under-nutrition beset large sectors of the populations of the developing world. Simultaneously, all countries are experiencing increases in noncommunicable diseases with the major risk factors of tobacco, high-fat diets, physical inactivity and possibly multiple stressors, occurring at ever-higher levels. In many of the rapidly growing cities of the developing world, increased levels of violence and injuries are reported; the former being associated with declines in social stability and cohesion.

Health systems and services since Alma Ata have had to cope with these challenges. Access to health services on a worldwide basis continues to increase, particularly for those elements of primary health care that influence children’s health and survival. In addition, an important steady development of coherent national policies increasingly forms the basis for specific strategies and actions to be taken by ministries of health in partnership with NGOs, the private sector and academia.
HEALTH FOR ALL IN THE 21ST CENTURY: VISION, VALUES AND KEY DIRECTIONS

The new global health policy, Health for All in the 21st Century, reaffirms the importance of the vision of Health for All (WHO, 1997a). The policy emphasizes that the goals of Health for All are to achieve an increase in life expectancy and in the quality of life for all, improve equity in health between and within countries, and ensure access for all to sustainable health systems and services.

These goals will only be achieved through stronger commitment to key values (WHO, 1997a), such as:

(i) provision of the highest attainable standard of health as a fundamental human right;
(ii) continued and strengthened application of ethics to health policy, research and service provision;
(iii) implementation of equity-oriented policies and strategies that place emphasis on solidarity; and
(iv) incorporation of a gender perspective into policies and strategies.

These values are strongly linked, with each serving as a pillar supporting the execution of all policy directions and strategies. They stand in opposition to dominant market forces and the negative consequences of globalization.

TELECOMMUNICATIONS FOR HEALTH

Already in the Alma Ata Declaration of 1978, the role of technology was acknowledged (WHO, 1978). For example, the Declaration states that ‘essential health care is based on practical, scientifically sound and socially acceptable methods and technologies universally accessible... at a cost the community and country can afford’. The new global health policy gives explicit attention to the future role of technologies for health (WHO, 1997a–c; Policy Action Coordination, 1997). In particular paragraph 91 states that:

The scope of technologies for health extends from those that provide a direct benefit to health, such as genetic modification, biologicals, pharmaceuticals and medical devices, to those that support health system functions, such as telecommunications, information technologies, devices for environmental protection, and food technologies. Closer partnerships between science and technology research and development, between users and innovators, and between the private and public sectors will increase the chances of innovations in science contributing to improved health worldwide.

The use of telecommunications in health has a long history. Advanced applications were developed for epidemiological surveillance from 1926. Figure 1 shows that wireless stations transmitted and received weekly health bulletins in 1938 when information was received from 56 health administrations and 147 reports (Manderson, 1995). Cases and deaths from plague, smallpox and cholera, leprosy, anthrax, recurrent fever; quarantine provisions operating in various ports; details regarding pilgrims and their health; provisions for the diagnosis and treatment of VD-infected seamen; and the numbers of rats caught were all transmitted weekly through Singapore to Geneva. Early activity in the 1950s, when telemedicine services were first used for diagnosis, dissipated until the considerable changes in telecommunications costs and availability occurred in the 1980s. Since then, countries as far afield as Malaysia, South Africa, Finland, Namibia, Venezuela, Australia, Saudi Arabia and Canada, have or are developing national approaches to diagnosis, teaching and data transfer in the area of health (Jannett and Premkumar, 1996; Yellowless and Kennedy, 1997; Lotz et al., 1997; Shin, 1997).

Various terms have been used to describe the use of telecommunications in health. Telemedicine has primarily referred to the use of telecommunications for diagnosis and treatment of disease, while telehealth includes surveillance, health promotion and public health functions. At a recent WHO consultation, telematics for health, as an umbrella term for both telemedicine and telehealth, was defined as:

a composite term for health-related activities, services and systems, carried out over a distance by means of information and communication technologies, for the purposes of global health promotion, disease control and health care, as well as education, management, and research for health. (WHO, 1998)

Information technology has become the number one industry in the USA, with sales having increased 57% since 1990 to US$ 866 billion (International Herald Tribune, 1997). It is a vital industrial sector resulting in the creation of new wealth, new work practices, and new challenges and opportunities for health. The future incor-
Fig. 1: League of Nations Eastern Bureau: wireless stations transmitting and receiving the Weekly Health Bulletin, 1938.
poration of expert systems, electronic language translation and enhanced learning tools into health telematics offers opportunities for Health for All (HFA) currently considered impossible. If the costs of access and use of these technologies continue to decline, the benefits of these advances are likely to be felt by all!

**Health telematics as a means to achieve HFA?**

Health telematics is coherent with and can advance HFA values. For example, telecommunications provide a rapid and permanent means of increasing global awareness of the universal relevance of human rights instruments. The health consequences of human rights abuse can be brought to the attention of the world community through the global reach of telecommunications. As discussed later, the many ethical dimensions associated with telehealth and telemedicine, particularly individual patient and community confidentiality, individual autonomy and choice, require careful consideration.

Equity and access to health telematics are possible through the development of an appropriate economic policy that encourages solidarity (Bezold, 1997). Such a policy should acknowledge that the opportunities presented by new technologies differ between countries at different levels of economic, technological and social development. For the poorest countries, certain aspects of the new technologies offer the chance to leapfrog over their current development paths. However, in doing so it will be vital to avoid copying without adapting the way technologies are used in the most affluent countries. Failure to do so, could increase inequities of access to care in poorer countries.

The unique and complementary needs of women and men and the promotion of greater involvement of women in policy development for health can potentially be achieved through considering important design features of telematics at the earliest possible stage. A gender approach to developing a ‘telecommunications for health’ policy should therefore be explicitly built into the process.

In addition to advancing broad values, health telematics can tangibly contribute to the goals of Health for All. Most of these are likely to be achieved indirectly through the promotion of increased literacy and education, wider access to and use of knowledge, improved trade, and better communications, as opposed to the strict health service applications of health telematics.

**Health status, access to services and development status**

Certain global health and development realities that determine current and future use of telecommunications for health are highlighted. Table 1 indicates the variability in life expectancy, the infant mortality rate and adult literacy that occurs between countries at different levels of development (United Nation Development Programme, 1997). A substantial portion of the world lives in countries where the infant mortality rate is still around a hundred infant deaths per thousand live births. Further, levels of literacy, profoundly important for the successful application and implementation of many aspects of telematics, vary widely. In the least-developed countries, just more than a third of the women are literate compared to almost universal literacy levels in the industrialized world.

Thus, for many of the poorest countries, the notion of a bookless society means high levels of illiteracy. A bookless society in advanced industrialized countries, in contrast, is a ‘post-book’ society where universal literacy is the norm. The literacy gap is mirrored by an even larger gap in technological capability. For example, industrial countries have more than nine times as many scientists and technicians per thousand people as developing countries, and about 13 times as many

<table>
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<tr>
<th>Table 1: Life expectancy, infant mortality and adult literacy</th>
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<td></td>
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<tr>
<td>All developing countries</td>
</tr>
<tr>
<td>LDCs(^a)</td>
</tr>
<tr>
<td>SSA(^b)</td>
</tr>
<tr>
<td>Industrialized countries</td>
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\(^a\)Least developed countries. \(^b\)Sub-Saharan Africa.
scientists and technicians engaged in research and development (Griffin and McKinley, 1996).

Table 2, shows that access to health services is still inadequate, particularly in the least-developed countries and those of sub-Saharan Africa, where less than half the population have adequate access to care and an even lower percentage to adequate sanitation. Access to electricity, telephone lines and radios, all necessary but not necessarily sufficient for the successful implementation of telehealth and telemedicine services, varies widely. For example, the ratio of telephone lines (per hundred population) between industrialized and least-developed countries, is 133/1; compared to the ratio for electricity consumption (in per capita kWh) of 102/1. Half the world’s population have yet to make their first phone call and 62% of all phone lines are found in 23 countries who together constitute 15% of the world’s population. These data emphasize the absolute lack of many essential services required to allow countries and populations to achieve their most basic human needs.

OPPORTUNITIES FOR HEALTH TELEMATICS

Health telematics can advance the two major directions of the policy; namely, making health central to sustainable human development and building sustainable health systems. In respect of the former, there is the need to develop multi-sectoral approaches to poverty alleviation. Telecommunications could be a vital lever for growth and development in communities struggling to escape poverty. As road and rail networks assure access for all to commodities, telecommunications could ensure access of all to knowledge, ideas and concepts. The opportunities for global connectivity and the widest use of globally distributed knowledge have never been greater. The challenge is to ensure that local application and adaptability of such global knowledge and information occurs (Rosenau, 1996).

Already there are several important initiatives underway to build a global telecommunications platform that will connect the remotest communities. Two examples illustrate the rate of progress. First, several new satellites are to be launched by global consortia to improve access for remote areas of China, Indonesia and Africa. Second, the first part of an ITU endorsed ‘round Africa’ submarine optical fibre cable will be completed within 2–3 years. Initially it will link Malaysia, South Africa and a number of West African countries.

To ensure that these and similar developments lead to improved health there is an urgent and explicit need for the policies and strategies of ministries of telecommunications, health, education and others to be brought together in a mutually advantageous way.

Figure 2 summarizes the opportunities for telehealth and telemedicine, particularly those related to health systems. Applications vary depending on whether the focus is on individual homes, or on community-based services. Health promoting activities are becoming more widespread and will empower people with better opportunities for health. For home-based applications, two-way interactive linkages are already being used in advanced industrialized countries to inform people about their personal health risks, to alert them to the need for preventive treatment, to inform them about the latest advances in health and medicine, and to provide them with a stronger educational basis on health.

Table 2: Population access to basic health services, sanitation, electricity, telephones and radios

<table>
<thead>
<tr>
<th>Population access</th>
<th>Health Services</th>
<th>Sanitation</th>
<th>Electricity consumptiona</th>
<th>Telephone Linesb</th>
<th>Radiosc</th>
</tr>
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<tbody>
<tr>
<td>All developing countries</td>
<td>80</td>
<td>39</td>
<td>10.3</td>
<td>3.3 (11.0)</td>
<td>178 (1.8)</td>
</tr>
<tr>
<td>LDCs</td>
<td>49</td>
<td>36</td>
<td>1.0</td>
<td>0.3 (1.0)</td>
<td>96 (1.0)</td>
</tr>
<tr>
<td>SSA</td>
<td>53</td>
<td>45</td>
<td>5.6</td>
<td>1.1 (3.7)</td>
<td>149 (1.6)</td>
</tr>
<tr>
<td>Industrialized countries</td>
<td>~100</td>
<td>~100</td>
<td>101.5</td>
<td>40.1 (133)</td>
<td>1018 (10.6)</td>
</tr>
</tbody>
</table>

*aRatio of per-capita kWh with LDC = 74. *Per 1000 population (ratio to LDC). *Per 1000 population (ratio to LDC). *Least developed countries. SSA: Sub-Saharan Africa.

and medical care. Health promotion and education programmes are being provided through the mass media to deal with a wide range of health related activities. Most of these applications would fall into the category of telehealth.

The potential to use telecommunications for distance learning is vast, and already there are many examples of programmes underway that aim to strengthen all aspects of public health training on a continuous basis, in the most remote parts of the world. The new ‘global epidemiology course’ being just one example of what is possible (La Porte, 1997; Kularatne, 1997; Balas et al., 1997).

For health services and disease control, the traditionally understood telemedicine services are particularly developed in a number of advanced industrialized countries. The focus has been on diagnosis and several approaches to integrated referral of patients that include ensuring better follow-up of patients with chronic diseases (Perednia and Allen, 1995). Home-based services are expected to displace the need for institutional care by allowing direct home care through interactive service provision. This will result in what Finland is developing, namely ‘a seamless service chain’.

For disease control programmes, many public health functions have focused on surveillance for risk and disease in communities; the management of the overall health system, both with regard to human resources, finances and infrastructure; as well as the potential for increasing collaborative research. Importantly, new approaches to the multidimensional provision of services, particularly including educational, social and health services are starting to occur in a number of countries.

Figure 2 indicates a false division between the cells. In reality there is considerable blurring between individual and community services, as well as between health promotion and disease control. The initial emphasis should be on telehealth applications, as these would address population needs and also could impact on the determinants of health. Telemedicine, being confined to patient care, should be expanded in developing countries with caution—otherwise both equity and health gains could be minimized.

The long-term opportunity to support independent living through the application of information and communications technology is becoming a reality in certain countries. This supports our goals of universal access and equity. The degree to which equity is achieved will be determined primarily by the policy responses of government and international agencies. Further, telematics could dramatically enhance the quality of health services by supporting continuous learning and providing better access to specialists’ advice.

Many of these applications have been operative for several years. For example, a multimedia health promotion programme in South Africa (called ‘Soulcity’) uses a combination of television, radio and print media to reinforce messages about

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**Fig. 2: Opportunities for health telematics.**

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<tr>
<th>Site of Application</th>
<th>Individual homes</th>
<th>Community services</th>
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</thead>
<tbody>
<tr>
<td>Health promotion/education</td>
<td>• interactive learning • modify individual risks • distance education</td>
<td>• mass media • video conferencing • distance education • link partners for health</td>
</tr>
</tbody>
</table>

Health services/disease control

Clinical Services:
- • diagnosis
- • integrated referral
- • better follow-up
- • home care

Public health functions:
- • surveillance of risk/disease
- • management
- • research
- • multidimensional service provision

**Increasing Blurriness**
health on a mass basis. Several innovative approaches to community learning are under way.

An electronic network called ‘HealthNet’, which now covers 28 African, Asian and American countries, is supported by a non-profit-making organization of scientists and medical researchers known as ‘SatelLife’ (Shin, 1997). The network uses two low-earth-orbit satellites to provide E-mail access to medical databases and conferences to government departments and agencies, medical facilities and schools, medical libraries as well as individual health workers.

Epidemiological surveillance is the field where there are the most examples of the uses of both informatics and telematics. The Onchocerciasis Control Programme in West Africa (OCP), involved with 11 countries, is recognized as a major public health success (Shin, 1997). The OCP has used a mixture of satellite and ground radio communications for epidemiological surveillance and modelling which facilitated decisions on optimum aerial spraying and programme management.

**BARRIERS TO USE**

In Table 3, barriers to effective and equitable use of telehealth and telemedicine are summarized. Political and economic issues require actions outside of the health sector; those related to social and cultural issues will require careful consideration and discussion with NGOs and community groups. Those related to ethical and legal issues require strong interaction by public health professionals, international trade lawyers and bioethicists; while the technical and financial issues require input and support by people particularly involved in health systems and services. Many of these barriers can be addressed through rethinking the way technological progress benefits the poor.

**Political/economic barriers**

The expectation–demand gap refers to the direct effect of globalization of providing people at all levels of development with knowledge about the latest technology available. This together with market forces and, often, aggressive marketing, is affecting perceived needs and expectations at a time when a society cannot afford high technology equipment. The effect of this is that technologies that are relatively ineffective for improving population health receive higher priority than they should. The way of dealing with this gap is to emphasize that no single policy would be appropriate for telehealth and telemedicine on a worldwide basis; rather an incremental approach will need to be developed, that emphasizes that technology is a means of achieving Health for All and not an end in itself.

A supportive national policy that gives emphasis to the values highlighted earlier is vital in this respect. The danger is that if this is not done, new, untested costly technology could displace effective and equity oriented approaches to health.

**Socio/cultural barriers**

It is important to focus on health professionals’ attitudes and skills in terms of maintaining and managing the telecommunications infrastructure for health, in providing leadership and innovation in using what may be a highly cost-effective method, and in carrying out appropriate research to adapt to telecommunications technologies specifically to meet the health needs of poorer communities. Building a broad base of technological capability requires placing primary emphasis on mass education, particularly broad literacy and numeracy; then, education in popular science and elementary technical training. Further, a recent report by UNDP stresses that ‘an emphasis on learning-by-applying will ensure that a country is able to institutionalize continuous improvements in its technological capabilities’ (United Nation Development Programme, 1997).

The need to acknowledge and build upon traditional systems of information flow has been emphasized by many scholars, particularly

<table>
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<th>Table 3: Barriers to the effective and equitable use of telehealth/telemedicine</th>
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<tr>
<td><strong>(A) Political/economic</strong></td>
</tr>
<tr>
<td>• expectation–demand gap</td>
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<tr>
<td>• politically supported policy</td>
</tr>
<tr>
<td>based on HFA values</td>
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<tr>
<td><strong>(B) Social/cultural</strong></td>
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<tr>
<td>• health professionals attitudes</td>
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<tr>
<td>and skills</td>
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<tr>
<td>• existence of traditional</td>
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<tr>
<td>information flows</td>
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<tr>
<td><strong>(C) Ethical/legal</strong></td>
</tr>
<tr>
<td>• patient confidentiality, data</td>
</tr>
<tr>
<td>protection</td>
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<tr>
<td>• transnational malpractice,</td>
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<tr>
<td>medical registration</td>
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<tr>
<td>• regulatory capacity and frame-</td>
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<tr>
<td>works</td>
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<tr>
<td><strong>(D) Technical/financial</strong></td>
</tr>
<tr>
<td>• tele-diagnosis can increase</td>
</tr>
<tr>
<td>costs</td>
</tr>
<tr>
<td>• pricing policy</td>
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<td>• evaluation data and methods</td>
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with regard to poorer countries. Bureaucracies and hierarchies often find the new technologies threatening. This needs to be approached sensitively by acknowledging what Julio Frenk, a Mexican health policy analyst, reminds us—‘that the power of ideas will change the ideas of power’ (Frenk, 1995). Nowhere is this more applicable than in relation to increasing globalization and connectivity made possible by modern telecommunications.

**Ethical/legal issues**

Increasingly, some of the issues related to patients’ confidentiality and data protection are receiving attention. For example, the World Conference on Human Rights in Vienna (14–25 June 1993) noted that certain advances, notably in the biomedical and life sciences as well as in information technology, may have potentially adverse consequences for the integrity; dignity and human rights of the individual, and called for international cooperation to ensure that human rights and dignity are fully respected in this area of universal concern.

More complex will be the means to deal with transnational approaches to malpractice and medical registration. For example, already doctors registered in one country are providing diagnostic services through telecommunications to patients in another country. If this results in harm to the patient, who is liable and how does one obtain legal redress? These issues require substantive and urgent debate. The lack of national capacity in all aspects of public health law has been well documented (L’hirondel and Yach, 1998). This will need to be urgently addressed if an appropriate regulatory environment can be implemented for telecommunications for health.

**Technical/financial issues**

A major concern with all diagnostic technologies early in their life course of application is that they may detect conditions for which therapy has not been defined, is not available or is not affordable. This can lead to serious cost escalation. When remote diagnosis is available through telemedicine, and local therapy is not, the costs for many countries will increase. For example, in many developing countries the absolute lack of transport facilities means that better information about when to transfer pregnant women to prevent maternal deaths would not be usable.

Pricing policies must make telehealth available for all. The recent decision to sell a 30% share of the public telecommunications services in South Africa to an international consortium is an example of this. A condition of the sale was that all hospitals and clinics must be connected to modern telecommunications networks within 5 years and that the cost will be borne by the consortium. (Telkom, personal communication, 1997). By early 1998, services have been provided to 84.5% of 3388 sites. The balance, in remote areas, is to be connected soon. This is but one example of how private capital can be used to advance socially desirable goals, when government is willing and able to provide such leadership.

As with many technologies in their early phase of introduction, evaluation methods and results are still lacking. The first major evaluation of telemedicine, based upon 80 clinical trials of electronic distance technology applications over the last 30 years was recently published in the *Journal of the American Medical Association* (Balas *et al.*, 1997). The conclusions were that while there were significant benefits for many aspects of health care including childhood immunizations, the management of osteoarthritis, diabetes and cardiac rehabilitation, the results were mixed with regard to tobacco use and several other areas. Greater emphasis needs to be given not only to assessing the effectiveness of teleservices for health, but also to the impact of these services on all aspects of health systems functioning, including human resource needs and deployment.

**Getting the policy right**

Olson (1996), a well-known economist, recently commented, when considering what made certain countries rich and others poor, that it was not access to knowledge *per se* that determined whether a country would undergo economic growth and improvements in human capital. Rather, the institutional and economic policies of government make the difference. This has profound implications for health telematics.

By being more forceful at the point of countries developing their policies, WHO could ensure that the benefits of telecommunications become available for Health for All. To do so, WHO will need to work closely at a global level with ITU, The World Bank, UNESCO, WTO and others to
sure that global telecommunications policy explicitly includes consideration of the needs of the health system and of how telecommunications can advance the vision and goals of HFA. At the country level, WHO should build upon increasing expertise in many countries to support the building of sustainable technological human and institutional capacity, and the regulatory and financing frameworks needed for all countries to enjoy the benefits of scientific progress in telecommunications for health.

ACKNOWLEDGEMENTS

In addition to important ideas received from WHO colleagues, I would like to thank Sinclair Wynchank, Clem Bezold and Steve van der Walt for important insights and suggestions.

Address for correspondence:
Derek Yach
World Health Organization
20 Avenue Appia
Geneva
Switzerland

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