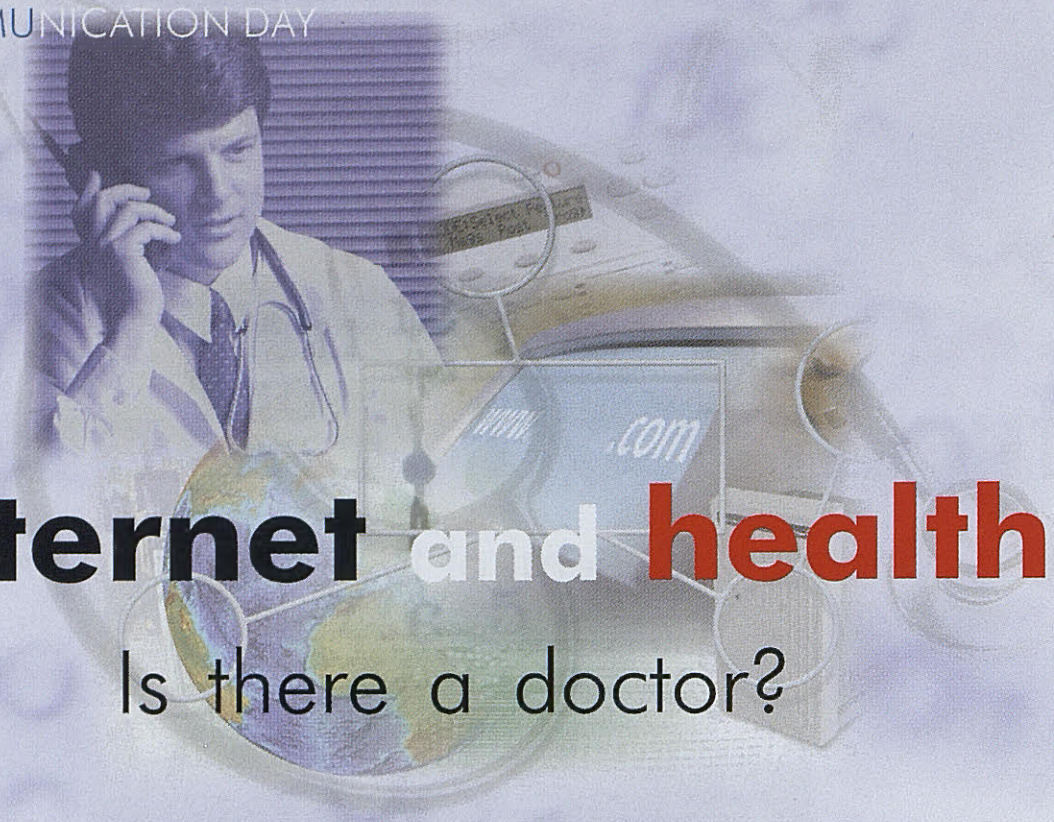
Journal Title: ITU News

Journal Issue: (no. 4) 2001

Article Title: Internet and Health: Is There A Doctor?

Page number(s): pp. 4-7



Internet and health

Is there a doctor?

Picture this. A young child in a poor, rural town, playing football by the side of a busy road, runs out on the street to chase the ball and is hit by a car. The frightened parents take the unconscious child to the nearest medical centre for emergency aid. The doctor, a young, eager but inexperienced practitioner fresh out of medical school, takes an X-ray of the child's skull to determine the extent of the injuries. Although the child is stable, the doctor faces the difficult dilemma of either providing treatment locally, based on his or her own diagnosis, or sending the child on a long, arduous and perhaps dangerous journey to the capital for treatment at the country's better-equipped hospital. It is a choice which could have life or death consequences.

Now picture the same scenario, but with a different ending. The injured child is brought to the rural doctor. The doctor takes an X-ray of the skull, but instead of making the diagnosis, he or she sends the image via the Internet to the hospital in the capital so that more experienced doctors can make the call. The image is sent via low-cost teleradiology equipment, which not only allows X-rays to be sent in a digital format clear enough for experts to identify the extent of injury, but also allows the experts to send advice back to the doctor for treatment. The doctor successfully treats the child, who soon returns home and continues to play football with friends, well away from the busy road.

A vision of the future? No! A snapshot of reality in countries such as Mozambique shows that "telemedicine" is making a real impact on the availability of health care and health care information in the developing world. Telemedicine is a term which has emerged to describe the provision of medical services and health care via telecommunications-based systems such as the Internet, either by terrestrial, wireless or satellite links. Mozambique is being viewed as perhaps one of the most successful examples of telemedicine in action. In cooperation with the International Telecommunication Union, through its Telecommunication Development Bureau (BDT), the Government of Mozambique has established a telemedicine link between the central hospitals of Maputo, the capital, and Beira, the country's second-largest city some 1000 km away from the capital. The link allows the hospitals to exchange messages regarding laboratory results and treatments, as well as radiographs.

As a result, doctors in Beira can refer cases to the central hospital in Maputo for primary or secondary opinions and to send medical records to the capital so that experts there can determine whether patients facing more serious problems can be treated locally or transferred to Maputo. The project was especially important for the hospital in Beira since it had no radiologist when the telemedicine link was established. "They were handling roughly ten thousand X-ray films per year," noted Leonid Androuchko, a Geneva-based professor of telecommunications who formerly headed an ITU telemedicine programme. "On simpler cases it was easy to interpret the image locally, but for more complex cases they had to refer to the capital. That was not only frustrating but very costly."

For developing countries, such telemedicine projects tend to be relatively inexpensive to implement. Mr Androuchko also said that the approximate cost in hooking up Maputo and Beira was around USD 50 000, with the main cost being the digitalization of the X-ray images. The Government of Mozam-

bique is so satisfied with the results that its Prime Minister has written to the ITU to ask for help in establishing additional telemedicine links with a hospital in Nampula, the country's third-largest city, with part of the cost to be covered by the government.

A similar project is being implemented in Senegal, where a telemedicine link will be established between the country's main hospital in Dakar Fann and regional hospitals in the towns of St Louis, Diourbel and beyond. The link will not only allow for the transmission of medical images and medical information, but will also allow doctors to discuss cases in detail via videoconferencing. Like in Mozambique, the telemedicine connection is especially important for the regional hospitals in interpreting X-ray images as neither hospital has a staff radiologist.

Additional telemedicine projects have been set up with ITU assistance in countries such as Bhutan, Georgia, Malta, Uganda and Ukraine.

When opinions count

The Research Institute of Radiology and Interventional Diagnostics in Tbilisi, Georgia, provides a number of sophisticated medical services using modern technology. From time to time, however, doctors at the Institute seek to verify some difficult cases with colleagues from other medical centres within Georgia and abroad. The telecommunications link connecting the Institute with other medical centres not only allows doctors to obtain a second opinion quickly and efficiently, but also provides enhanced access to medical information within the nation and abroad.

In September 1998 the first medical file, including an X-ray film, was sent over the Internet to Switzerland for a second opinion. Specialists from the Centre of Imaging Diagnostic in Lausanne studied the case, and within 48 hours the Institute of Radiology in Georgia had received an opinion with recommendations for treatment. During September and October of 1998, high-level medical professionals in Switzerland analysed more than 10 cases from Georgia, several of which were of professional interest to doctors at both ends of the line.

In Georgia, the project is relatively simple and involves trans-telephonic electro-cardiogram (ECG) monitoring systems. With this simple system, a cardiovascular patient holds a small, box-shaped ECG device that transmits information to a hospital-based cardiologist. The remote monitoring allows cardiologists to monitor their patients' progress after they are discharged from the hospital, cutting out the time and expense of frequent return visits.

Petko Kantchev, the coordinator of ITU's telemedicine projects, says the benefits of telemedicine are not only the ability to bring rural areas into the net of the national health care service at relatively low cost, but also the ability to better utilize the intellectual resources within a country. "The typical rule in a developing country is the concentration of the most-able intellectuals and professionals in the capital," he noted. "These people, who tend to be very few in number, have extremely important know-how and experience which is pertinent to the local environment. They are more familiar with the diseases and illnesses which can be handled locally rather than consulting with doctors in Canada, Russia, Germany or the United States."

Dermatological diseases are an example of a type of illness which is prevalent in developing countries and where telemedicine can facilitate treatment. A telemedicine project, now being considered in Ethiopia, would allow digital and video images of patients in rural areas suffering from skin disorders to be sent, via the Internet, to doctors in the capital. These doctors would then consult among themselves and forward advice on treatment. The project has become more feasible thanks to the widespread availability of digital cameras. "There are a lot of skin disorders in these countries which rural medical staff don't know how to deal with," Mr Kantchev remarked.

An area in which the Internet can instead make a difference is in the support of medical research and the training of health professionals. After all, the Internet was until recently a purely academic/research network — a function which still holds a strong and solid presence among academics and researchers in developing countries.

The possibility to gain access to a vast source of medical information and profession-

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als on a global scale provides unique learning opportunities for medical students and other health professionals. Distance-education opportunities are not new, but the Internet and its unique communication features provide a new and unprecedented medium for gaining access to educational services worldwide. Distance education in the health sciences was hampered — as in other disciplines — by some of the traditional problems from which all non face-to-face education suffered: poor interaction with tutors and no interaction with other students, a slow response rate, a sense of isolation and lack of incentives to continue, therefore, a high drop-out rate. Furthermore, in the medical sciences there were considerable problems in sharing images and explaining hands-on procedures.

With the Internet, most of these problems are gone. Even with a slow Internet connection, the educational experience can be dramatically different.

Another way in which the Internet is making a difference is in the easy, fast, and almost free distribution of high-quality educational material to support the activities of health workers working on the ground at the community level. An example of this is the launch of the *Tools for Life Kit*, a versatile health communication kit that includes Activity Cards and Information Cards designed to enhance community health workers' education and counselling skills. The Tools for Life Activity Cards can assist in engaging communities in relevant health issues, such as safe motherhood, nutrition and infant health, diarrhoea, prevention of common illnesses and reproductive health. The Tool Kit has been posted on the Web for comments and improvement. The open and collaborative nature of the Internet has, in the first three months of the pre-test, attracted more than 5000 visitors from 29 countries to the "Tools for Life" website, many of whom have provided valuable comments and contributions to the design of the material.

Advocates of telemedicine are quick to note that it is not a panacea for a nation's health

care woes. In fact, a number of telemedicine projects introduced in the late 1960s and early 1970s failed for reasons such as inadequate medical regulations in force, the high cost of equipment, lack of suitably trained staff and administration and, in the case of teleradiology, poor image quality. "To make it work, you need a good telephone line, a good ISDN connection or a VSAT (very small aperture terminal) link," noted Kantchev. "You also need good local leadership to ensure proper implementation and follow-up." Many developing countries are setting up national committees or task forces comprising representatives from both the telecommunication and health care sectors. These groups play a very important role in enlisting support from all stakeholders in the country and in formulating viable telemedicine projects.

Most telemedicine projects call upon a mix of delivery paths. High-precision remote surgical interventions, for example, or remote access to very complex imagery such as brain scans, dictate the use of high-speed broadband telecommunication links. However, in many cases, the public Internet offers huge possibilities. It provides fast access to medical data and expertise nationally, regionally or globally, thus bringing medical care to patients, who would have been otherwise unattended to. Whether for seeking advice on standardized symptoms or real physiological data, including a patient's vital signs from on-line doctors that can be anywhere on the planet, the Internet is increasingly being exploited. The improving quality of videoconferencing and audio tools on the Internet are also providing a valuable resource for live, remote consultation and diagnosis.

Great leaps in digital imaging and compression techniques have spurred a new wave of enthusiasm for telemedicine, allowing specialist medical expertise to be delivered to regions and locations where doctors are few on the ground

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The continuing decline in the cost of telecommunications and information technology, as well as great leaps in digital imaging and compression techniques have spurred a new wave of enthusiasm for telemedicine, particularly in developing countries. It is in these countries where telemedicine's greatest asset — allowing specialist medical expertise to be delivered to regions and locations where doctors are few on the ground — shows the best prospects for success. For governments struggling with limited health care budgets, a shortage of doctors and other health care professionals, dispersed rural hospitals and poor transportation infrastructure, telemedicine may help them overcome some of these difficult challenges in meeting the health care needs of their citizens. ■