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# Is Telemedicine the Panacea for Sub-Saharan Africa's Medical Nightmare?

*"Ever since my eye swelled up, I've gone to church to pray for a cure...I always knew He would send a way to make me better—I just didn't know it was going to be from London,"* says Anna Mobutsu, a 23-year-old farm laborer, who cannot imagine journeying farther than a bus ride from her home in the small African town of Nelspruit. An illiterate single parent with a 7-year-old and an elderly mother to support on about \$56 a month, Anna does not even own a TV to introduce her to a world beyond her own. *"But this afternoon I went to London"* [2].



This story is one of many successful experiences in the adoption of telemedicine in Africa. First coined in the 1970s by Thomas Bird, telemedicine refers to health care delivery where physicians examine distant patients using telecommunications technologies as simple as telephones and fax machines or as complex as PCs and interactive multimedia applications [6]. The delivery of health care using telemedicine has been reported in previous research at an individual level [5], and at a national level of analysis [8, 11].

Health care is one of the most fundamental needs for sub-Saharan Africa considering the region's multiple medical problems. The World Health Organization (WHO) reports that at the end of 2001, more than 70% (28.1 million) of the estimated 40 million people worldwide living with HIV/AIDS were located in sub-Saharan Africa; another 15 % (6.1 million) were located in South and Southeast Asia [4]. Malaria is also responsible for as many as half the deaths of African children under the age of five. The

disease kills more than one million children yearly—2,800 per day—in Africa alone. In regions of intense transmission, 40% of toddlers may die of acute malaria.

Another major problem faced by sub-Saharan African countries is the shortage of medical personnel [1, 9]. The region averages fewer than 10 doctors per 100,000 people, and 14 countries within the region do not have a single radiologist [4]. The specialists and services available are concentrated in cities [3, 4].

In a bid to find a solution to the growing medical problems for this region, many governmental, non-governmental, and international developmental organizations have engaged in an endless effort to implement telemedicine [8]. These efforts take into account the state of the art of the local telecommunications networks and their evolution [8, 10].

Previous research shows that most of the area's telecommunications networks are very poorly developed [9, 10]. Furthermore, African countries cannot afford the more sophisticated telemedicine solutions involving ATM networks, virtual reality imaging, and so on. Despite many obstacles, researchers argue that

telemedicine is still feasible for most, if not all, sub-Saharan African countries [1, 8, 9].

This study presents an overview of two successful telemedicine projects in the region. The focus is on sub-Saharan Africa because the countries in this region share a different socioeconomic structure compared to the wealthier northern and southern African countries [10].

**Telemedicine Project in Mozambique.** With a population of about 17 million, Mozambique covers an area of 801,590 sq. km. It has a per capita GDP of about \$200—one of the lowest in the world. Fertility rates are as high as 5.20 births per woman; the male mortality is 408 per 1,000; female mortality is 364 per 1,000. Life expectancy at birth is 45 years. Such statistics illustrate a dire

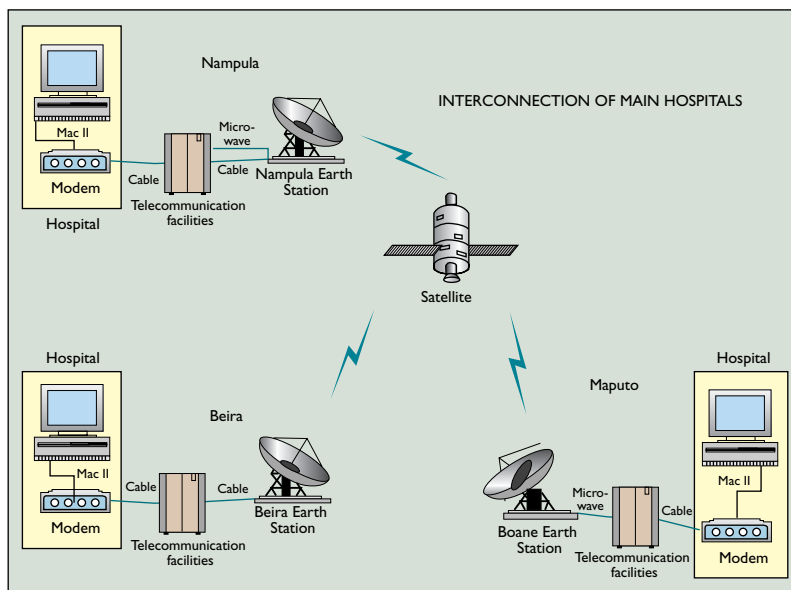
satellite telecommunications systems was established by a multidisciplinary group of partners including Telecomunicações de Mozambique (the country's main telecommunications operator) and WDS Technologies, a telemedicine equipment vendor from Geneva. Figure 1 illustrates the interconnection of main hospitals within Mozambique.

The project uses standard low-cost teleradiology equipment based on two PCs equipped with a radiological film digitizer (CobraScan CX-612T) and the appropriate software and telecommunications interfaces. The system conforms to the American College of Radiology guidelines concerning image quality. Images are digitized in less than 30 seconds in up to 4,096 gray-levels with up to 300 pixels-per-inch, and compressed automatically without any loss of information,

at a factor ranging from 5.5 to 3.0. The images are then sent via dial-up telephone lines using a modem (up to 56Kbps). The link between the two main hospitals uses digital microwave transmission (Figure 2).

The teleradiology software, designed by WDS Technologies and tested at the University Hospital of Geneva, provides support for the exchange of images. The user interface is easy to use by any technician or doctor familiar with Windows OS after a brief training [12]. The project enables the two central hospitals to rely on standard low-cost teleradiology equipment for the transmission and exchange of images and radiographs as well as their visualization (see Figure 2).

**HealthNet Project.** Sponsored by a Boston-based charitable group named SATELLIFE, HealthNet is a computer-based telecommunications system linking health care professionals around the world [4]. With implementations in 20 countries throughout Africa, HealthNet is the most developed and expansive initiative aimed at improving the practice of telemedicine among health professionals. Using low-earth orbit satellites (LEO) and phone lines, SATELLIFE provides email access in sub-Saha-



**Figure 1. The interconnection of main hospitals in Mozambique.** (Source: [7]).

need for improved medical care. The Telecommunications Development Bureau (BDT) of the International Telecommunications Union launched its first telemedicine project in Africa in 1998 [7]. Between the central hospitals of Beira and Maputo in Mozambique, a telemedicine link using existing terrestrial and

ran African countries, serving over 10,000 health care workers. SATELLIFE and other organizations also provide higher-capacity email and Internet connections where adequate telecommunications links exist, which allow sending email attachments such as image files, permitting a form of low-cost telemedicine.

The patient's findings are described, and digital photographs of the patient and their examinations, such as electrocardiograms and X-ray films, are attached. This "store-and-forward" telemedicine does not allow real-time interaction, but it does permit specialist support in the management of difficult cases and is cost efficient. Small, robust, inexpensive digital cameras are used to capture the images. Indeed, these cameras have been used on several telemedicine projects to create high-resolution images adequate for skin diseases and other similar medical problems.

Among the other HealthNet telemedicine projects in place since the mid-1980s [3] are:

- *Physician collaborations.* Burn surgeons in Mozambique, Tanzania, and Uganda have used HealthNet to consult with one another on patient treatment and reconstructive surgery techniques.
- *Data collection.* Health care workers in Gambia who once traveled 700km per week to collect data for a clinical trial employed HealthNet to send this information via email.
- *Health care delivery.* Physicians in Ethiopia use HealthNet to schedule consultations and referrals, making it unnecessary for ill patients to travel long distances with no guarantee of seeing a physician.
- *Medicial alerts.* Health care workers in Zaire's Vanga Hospital use HealthNet to send regular dispatches to report on progress in treating trypanosomiasis to health organizations in the North.
- *Research.* Malaria researchers at a remote site in

northern Ghana used HealthNet to communicate daily with the London School of Hygiene and Tropical Medicine and the Tropical Disease Research Center in Geneva.

## Conclusion

Africa is typically portrayed as a troubled continent with no hope for resurrection from its many grueling socioeconomic problems in general, and its medical nightmare in particular. However, this column shows that steps are being taken to combat the many medical problems of the continent through the adoption of telemedicine.

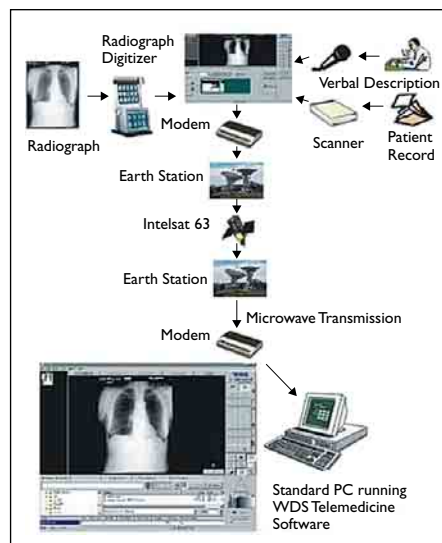
The following commonalities (that could benefit from further research) were observed among the projects covered in this study:

- The use of African-foreign alliances involving agencies from developed countries. This finding agrees with earlier studies that show that sub-Saharan African countries should have some level

of foreign cooperation for their telecommunications-based projects [10].

- The use of low-cost technologies such as store-and-forward networks.
- Governmental involvement and support for telemedicine projects.
- Involvement and cooperation with the telecommunications operator or incumbent.

This study does not claim that telemedicine can solve all the medical problems of the region. However, the research contends it is a starting point to reach Africans living in areas with limited medical facilities and personnel. The study also offers important contributions to the body of knowledge for this very under-researched part of the world that could benefit the academic and scientific community, industry, and gov-



**Figure 2. Teleradiology in Mozambique.** (Source: [12]).

ernment sectors in sub-Saharan Africa and, by extension, other developing countries. Hence, these findings could have far-reaching consequences as the world looks to help this region's medical problems. ■

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