CHALLENGES TO BASIC TELEMEDICINE: ISP AND RADIO REGULATORY PROBLEMS

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Objective:

Telemedicine applications in both the developed and the developing world continue to make advances. This is true from the most populous to the most remote areas of the world. There are many different types of applications available for the varied environments/needs, depending upon the underlying communications capabilities. For the remote areas of the world, this sometimes means depending upon what would be considered outdated technology, though still with a degree of ability.

We attempted to improve telemedicine capabilities in two remote areas of Ecuador, Macas and Taisha (both within the province of Morona-Santiago), by means of existing high frequency radio and Plain Old Telephone Service (POTS) technologies.

Methods:

High Frequency Radio

A radio was installed in Macas, Ecuador, consisting of an Icom IC-78 HF SSB transceiver, with a frequency range of 1.5 MHz to 30.0 MHz. A HAL DXP-38 radio data modem was connected to the transceiver and computer and accompanying software was loaded and configured for the CLOVER mode of operation.

The communications equipment in Taisha, Ecuador included an Icom IC-77 HF SSB transceiver and two (2) high capacity 12-volt automotive batteries to power the radio. A HAL radio data modem model DXP-38 was connected to the IC-77 HF transceiver and computer.

Local ISP (POTS) Connectivity

Routine Internet connectivity in the city of Macas, Ecuador is provided by a local (national) Internet Service Provider (ISP) by means of existing telephone lines and provided up to 22 Kbps transmission rate.

Results:

Text data (72 Kb) were exported from the EMR, compressed to a size of 12 Kb, and then transmitted to Macas by radio on a frequency of 9.075 MHz. The transfer required approximately 15 minutes for completion, yielding a data rate of 800 bytes per minute or 13 characters per second. The radio path spanned approximately 70 km and crossed a 1 km-high mountain range.

POTS connectivity had proven useful in the area for routine Internet communications. Service disruptions occurred randomly, sometimes extending for two or more days.

Discussion:

High frequency radio communications have often provided the only means of communication for many of these remote areas. Telemedicine possibilities making use of radio frequency communication have been validated, and have elucidated one of the major problems with this particular application. For a given area, this communications modality is often limited to a narrow frequency band, and must serve many different needs. The data transmission requirements for telemedicine often overload this limited bandwidth solution for extended periods, hindering many of the other, daily needs of the communications network. Without a dedicated frequency, the use of telemedicine solutions for these communities often becomes more superfluous to the needs of the other users. As a result, the equipment becomes surplus and the knowledge of its use disappears. In a small community health center in rural Ecuador, one such unit sits unused and disconnected while the radio remains in use for voice communications, including the limited relay of medical information for patient transfer coordination.

Even in some of the larger communities in rural Ecuador, where communications are not as limited, where there is telephone, cellular, and satellite connectivity, problems arise with service. In the provincial capital of Macas, the majority of users depend upon POTS connectivity, which routinely, and for no discernible reason drops. Often the connectivity for the entire community is absent for two to three days at a time, and is accepted as such. This is one area of communications that has not seen much improvement over the years.

There is still much to be done to improve the state of telemedicine for many of these remote communities, at the basic level of the communications infrastructure.

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