

ASSESSMENT AND PRESCRIPTION OF TECHNICAL AIDS USING INTERNET VIDEO

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INTRODUCTION

The project is a collaborative effort between the Institute of Biomedical Engineering (IBME) at the University of New Brunswick, the New Brunswick Easter Seal March of Dimes (NBESMOD), the Stan Cassidy Centre for Rehabilitation (SCCR), The Extra Mural Program (EMP), the New Brunswick Information Highway Secretariat (NBIHS) and NBTel from Saint John, NB. IBME is a Biomedical Engineering research institute and prosthetics fitting centre within the University of New Brunswick. NBESMOD is a Non-Profit organization providing services and rehabilitation equipment to persons with disabilities in the province of New Brunswick. SCCR is the tertiary rehabilitation centre for New Brunswick. EMP provides home based medical and rehabilitation services in New Brunswick. NBIHS is a branch of the New Brunswick government promoting the use of the Internet. NBTel is the primary supplier of high speed Internet access in the province of New Brunswick. This project was funded in part by the Health Infostructure Support Program (HISP) and the NBIHS.

PROJECT OBJECTIVES

Our objective was to develop and test the use of Internet Based interactive video connections to link clients at home and in remote clinics with health care professionals at IBME and SCCR, and with technical support personnel at NBESMOD using networking facilities provided by NBTel (Figure 1). This project tested the technology in the field, assessed the efficacy of the technology and improved it in light of the field trials, and assessed the use of connections that allow three way conversations between client, health care provider, and technical support personnel.

PROJECT BACKGROUND

The Atlantic Provinces in general and New Brunswick in particular are relatively rural and even the cities are small. On the other hand, the level of telecommunication service is very high and NBTel provides Internet access throughout the province.

NBESMOD is the primary referral service for high technology assistive devices for rehabilitation clients in New Brunswick. Rehabilitation centres such as SCCR and the EMP rely on the technical expertise of NBESMOD to ensure the successful prescription of technical aids to clients throughout the province. IBME is a research Institute at the University of New Brunswick which maintains a state-of-the-art prosthetics fitting centre and is the primary provider of powered upper limb prostheses in Atlantic Canada.

NBESMOD, SCCR, and IBME, are all located in Fredericton and face a common problem. When clients who have recently been fitted with prostheses, or have been supplied with assistive technology return home, they are remote from technical support services and in many cases remote from rehabilitation professionals. Problems with fit or technology function that cannot be described well over the telephone then require a trip to the centre for evaluation.

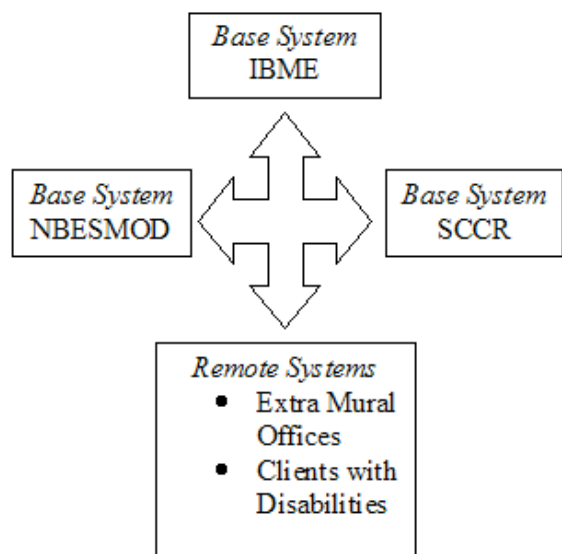


Figure 1 – Communication links

RATIONAL FOR THE PROJECT

The forecasted increase in the population requiring access to specialized rehabilitative services obligates us to explore new technologies and service models that will help deliver these services more efficiently. The equality of access to these services in Canada is additionally difficult as most specialists reside in the urban centers [1]. The rural population of Canada is entitled to the same level of rehabilitative services but this is difficult due to problems associated with travel to urban centers. The use of telehealth technology has been suggested as a possible solution to this problem but the high costs [2] and lack of availability of telecommunication infrastructure for such systems in remote and rural locations has been an impediment to their widespread deployment [3].

The use of video provides advantages to both the rehabilitation client and the clinic professionals [4]. Video, rather than telephone, gives the ability to see problems. The interactive video allowed problems to be addressed with the clients in their home or office, reducing the time and expense for travel, and making the response to problems or concerns more timely. For the clinic professionals, links such as this allowed for making better use of scarce time and resources. It may be possible to do much more in terms of follow-up over the network. Clinic-to-clinic or hospital-to-hospital networking has many possible uses in distributing services such as clinical engineering. The availability of high bandwidth Internet connections is increasing at a rapid rate in New Brunswick and across Canada as well. The government of Canada has set the aggressive goal of ensuring that broadband services are available to businesses and residents of all Canadian communities by 2004 [5]. The arrival of affordable broadband Internet access in Canadian communities and the utilization of this medium to transmit video useful for medical purposes have the possibility of altering certain aspects of the current medical treatment models and procedures. This technology has application to healthcare facilities across Canada.

EQUIPMENT

The hardware used during this project consists of desktop and notebook computers with network cards for high bandwidth Internet access and video capture cards with web cams. The regular consumer level computer units proved powerful enough to handle the requirements needed to videoconference without being a barrier that would limit the quality of the videoconference sessions. The video capture cards

included PCI cards for the desktops and PCMCIA cards for the notebooks. Our research indicates that the video capture cards outperform both the USB and Parallel port options for connecting web cams. The 3Com Big Picture web cam with video capture card seemed to provide the best picture quality of all models tested.

The project included time to evaluate different consumer level computer based videoconferencing hardware and software solutions. We found the Microsoft NetMeeting software to perform best among the possible choices for one-on-one videoconference sessions. The NetMeeting software allowed for the throughput necessary for clear video communication and appeared more stable than most other options. The NetMeeting software has a problem reconnecting to a web cam if a problem occurs during a videoconferencing session, forcing the user to completely reboot the system to re-enable the video capability of the system. This problem seems inherent to all software packages we tested. The choices for three-way communication were less numerous and seemed to be more unstable than the NetMeeting software. We found the Ivisit software to meet many of our needs but the instability of the software makes it difficult to recommend or use in a health care setting.

The Internet access used for this project consisted primarily of Asymmetrical Digital Subscriber Line (ADSL) technology. This high bandwidth Internet access option provides the needed bandwidth for maximum quality videoconferencing using the equipment and software used in this project. The ADSL service from NBTel is rated at 700kbps upload and 2MBps download. The 700kbps upload speed was not restrictive as the NetMeeting 3.0 software was limited to a maximum throughput of 621 kbps [6]. The barriers encountered while using this technology have been primarily related to the availability of the service within the province.

RESULTS

The systems were used for a number of applications including equipment troubleshooting, video communication, equipment viewing (figure 2), client assessment and follow-up. The video communication application allowed people who communicate using assistive technologies to directly interact with remote health care professionals instead of communicating via the intermediary of a care giver or other interpreter.



Figure 2 – Equipment viewing

An unanticipated challenge was the unavailability of ADSL service to the SCCR. The SCCR does have access to High Bandwidth networking services through a protected network but we could not transmit or receive audio or video to sites outside their protected network. The inability to get ADSL access at the SCCR obligated SCCR staff to go to either the IBME or NBESMOD offices to videoconference with remote therapists and clients.

Participants were asked to complete a questionnaire regarding their videoconference experience after each session. The data indicates the users of the videoconferencing system were quite comfortable using the computer based Netmeeting videoconferencing system and were pleased with the quality of both the audio and video. The connection process was setup as a speed dial and made connecting to others very easy.

The 31% of the sessions who reported problems while connecting to others and the 33% of the sessions reporting problems while videoconferencing are a reflection on the instability of consumer level computer based videoconferencing technology that is available today. The problems encountered included issues such as computers hanging, lost connections, audio not working or the video not working.

The data indicates 77% of the sessions report meeting their objectives for the session. This number should be evaluated in the context that most sessions were initiated with an initial preconception that the computer based videoconference medium would be satisfactory for the purposes intended. It should also be noted that all sessions that reported not meeting their objectives reported experiencing problems with the computer based videoconferencing system for that session.

The performance of the 3-way computer based videoconference sessions was below what we thought would be acceptable for use in the health care field. The 3-way videoconferencing software packages we evaluated were not very user friendly. Most of the 3-way options had limited bandwidth usage capability. The instability of the available 3-way options made the use of such a system in the field quite difficult.

DISCUSSION

The overall consensus regarding the use of computer based videoconferencing equipment over the Internet for communicating is quite positive. The participants felt comfortable and found the opportunity to communicate by seeing as well as hearing to be productive. There are still issues such as accessibility of high speed Internet access, stability and security that are problematic.

We are interested in continuing our research into the possibilities this technology can have for the health care field. We are interested in a project that would see a larger base of remote units installed for further data gathering, and another project that would allow us to investigate the possibilities this equipment and bandwidth may have for people who communicate using sign language.

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