The Physical Rehab Distance Communication Initiative: Community Access to Rehabilitation Education

Final Report for the Office of Learning Technology Contributions Program

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Executive Summary

Continuous learning is an important part of our healthcare system; however, Canadian geography often limits access to quality education. This is especially true for specialized physical rehabilitation since expertise is concentrated in regional centres. Healthcare providers in smaller communities often handle complicated rehabilitation cases; such as, spinal cord injuries, strokes, and amputations. Rural healthcare professionals must develop the experience to meet these special needs. An ideal scenario would allow clinicians in rural communities to access physical rehabilitation education at the right time, the right place, and the right cost. This project examined how communication and multimedia learning technologies can be used to attain these goals.

Our technological model involved a Write-Once Publish-Everywhere approach for creating and delivering educational content. Since many aspects of physical rehabilitation rely on vision and touch, multimedia content is needed to convey the necessary information. For this initiative, video-based multimedia content was captured using user-friendly, consumer level software and hardware. The audio / video / text data were integrated into office suite presentation software (Corel Presentations, Microsoft PowerPoint). To maintain the Write-Once Publish-Everywhere objective, text was written such that the module can “stand on its own” as an on-line reference but still be useful as an on-site presentation. Presentation software was used to create handouts, slides, overheads, CD-ROM, web pages, streaming media, Internet-based video conferencing whiteboard pages, and output for a laptop computer projector. Twenty-five modules were produced by Ontario rehabilitation specialists and are available at www.rehab.on.ca/mobile/present_e.html.

Questionnaire and consumer forum evaluations of the various media supported the Write-Once Publish-Everywhere approach for continuing education. Almost all respondents gave above average ratings for the module format, content, and the learning experience. The Write-Once Publish-Everywhere modules were expected to have a positive influence on the participant’s work. While the project team initially thought that study participants would prefer certain media approaches, all forum participants insisted on access to all media formats. Each format had advantages from a level of interaction or ease of access perspective. Even paper copies of the modules were considered valuable since they could be organized in a “learning binder” that could be easily accessed by staff.

Low-bandwidth desktop video conferencing sessions (33-56 Kbps modem) were effective, provided that sites connected 15-20 minutes early for Whiteboard pre-loading. The Write-Once Publish-Everywhere approach was useful for dealing with low-bandwidth situations. For example, if the Internet connection was too slow for live video conferencing the content was viewed from the web site or the CD-ROM (telephone used for audio).

The strong endorsement of the Write-Once Publish-Everywhere modules supports implementation of this approach for developing and disseminating continuing education content throughout the physical rehabilitation field.
Sommaire

L’apprentissage continu constitue un élément important de notre système de soins de santé. Toutefois, au Canada, la géographie entremêle souvent l’accès à une éducation de qualité, notamment en ce qui a trait à la réadaptation physique spécialisée étant donné que les experts se trouvent surtout dans les centres régionaux. Or, dans les petites communautés, les fournisseurs de soins de santé s’occupent souvent de cas de réadaptation complexes tels que ceux qui résultent de lésions médullaires, d’accidents vasculaires cérébraux et d’amputations. Les professionnels de la santé en milieu rural doivent donc acquérir l’expérience nécessaire pour répondre à de tels besoins particuliers. Idéalement, ces cliniciens auraient accès, en temps opportun et sur place, à une éducation en matière de réadaptation physique, le tout à un prix abordable. Le présent projet visait donc à examiner les façons dont les technologies d’apprentissage axées sur les communications et le multimédia pourraient nous aider à atteindre ces objectifs.

Notre modèle technologique était fondé sur la méthode appelée Write-Once Publish-Everywhere (écrit une fois, publie partout) ayant pour but de créer le contenu pédagogique et de le diffuser. Comme bon nombre des aspects de la réadaptation physique dépendent de la vue et du toucher, il faut des outils multimédias pour transmettre l’information nécessaire. Pour les besoins de notre étude, nous avons capté le contenu multimédia sur bande vidéo au moyen d’un logiciel et de matériel conviviaux et accessibles aux consommateurs. Les données audio et vidéo et celles présentées sous forme de texte ont été intégrées dans des logiciels de présentation utilisés couramment dans les bureaux (Corel Presentations, PowerPoint de Microsoft). Afin de ne pas perdre de vue l’objectif de Write-Once Publish Everywhere, le texte a été écrit de façon à ce que chaque module puisse servir de référence autonome en ligne tout en pouvant être utilisé comme outil de présentation sur place. Les logiciels de présentation ont servi à la création de documents à distribuer, de diapositives, de transparents, d’un CD-ROM, de pages Web, de médias enregistrés et lus en continu, de tableaux blancs transmis par Internet dans le cadre de vidéoconférences ainsi que du matériel destiné à un projecteur utilisé avec un ordinateur portable. Vingt cinq modules ont été produits par des spécialistes en réadaptation de l’Ontario. Vous pouvez consulter ces modules à l’adresse suivante : www.rehab.on.ca/mobile/present_f.html.

Les questionnaires et les évaluations des divers médias faites par les clients ayant participé au forum ont révélé que ces derniers appuyaient la méthode d’éducation continue Write-Once Publish-Everywhere. D’ailleurs, presque tous les répondants ont accordé une note supérieure à la moyenne à la présentation par module, au contenu et à l’expérience d’apprentissage. On s’attendait à ce que les modules Write-Once Publish Everywhere aient une incidence favorable sur les travaux des participants. Au début, l’équipe de projet avait prévu que les participants à l’étude préféreraient certains médias à d’autres. En fait, tous les participants ont insisté pour avoir accès à tous les types de médias étant donné que chacun d’entre eux procurait des avantages du point de vue de l’interaction ou de la facilité d’accès. Ils ont même trouvé valables les versions papier des modules, car ceux-ci pouvaient être organisés dans un « relieur d’apprentissage », que le personnel pouvait facilement consulter.
Les séances de vidéoconférence bureautique à faible débit de transmission (modem de 33 56 kbit/s) fonctionnaient bien pourvu que les participants des divers emplacements se branchent entre 15 et 20 minutes avant le début de la conférence afin de permettre le téléchargement des tableaux blancs. La méthode Write-Once Publish Everywhere a permis de contourner les déficiences relatives aux communications à faible débit. Par exemple, si la connexion à Internet se faisait trop lentement pour permettre la vidéoconférence en direct, on pouvait consulter le contenu sur le site Web ou sur le CD-ROM (le téléphone servait à l’audio).

Compte tenu de l’appui solide qu’ont reçu les modules Write-Once Publish-Everywhere, il est recommandé que cette approche soit utilisée pour élaborer et disséminer du matériel d’apprentissage continu dans le champ de la réadaptation physique.
Background

The healthcare sector places great value on continuing education. Since health services are human resource dependent and are in a constant state of advancement, continuing education activities are essential to sustain Canada’s high standard of care. Unfortunately, access to continuing education is not equal throughout Canada.

Most continuing education activities in healthcare are peer-to-peer. Specialists in a content area will present a topic during hospital education rounds, as a symposium, as a conference presentation, or as part of an outreach service. While the peer-to-peer model works in most urban centres, geography often limits access to quality education resources outside these urban areas. This is especially true for physical rehabilitation - an area where expertise is concentrated in regional centres. Since healthcare providers in smaller communities often handle complicated rehabilitation cases, such as spinal cord injuries, strokes, and amputations, these professionals must develop experience to meet each client’s special needs. An ideal scenario would allow clinicians in rural communities to access physical rehabilitation continuing education at the right time, at the right place, and at the right cost. However, rural communities have said that poor access to quality continuing education is an ongoing problem 1-4. Possible reasons for this situation include:

- the geographical separation between learning centres and rural communities,
- environmental factors (snow, ice, etc.) that limit a worker’s ability to travel to a learning centre and an educator’s ability to travel to a community,
- the lack of appropriate technological resources in small community hospitals, clinics, and nursing homes,
- limited technical support in some community hospitals, clinics, and nursing homes,
- limited financial resources to bring-in or travel-to educational services,
- limited staff time to participate in educational sessions.

Various learning technology implementations have been used to help deliver educational content for physical rehabilitation; however, these implementations are usually restricted to one media type and are not supported by structured evaluations 5. Much of the literature involves evaluating classroom-based educational programs and models for education delivery 6-10.

Telehealth initiatives for physical rehabilitation are often cited as providing educational opportunities 3,11,12. Studies by Clark 13, Lemaire et al. 14, and Toth-Cohen et al. 15 have shown that computer-based technology is a viable teaching medium; however, instructional methods must be modified to suit this approach. In the fast paced world of computer communication technology, older research findings often become less useful over time since the studies were based upon obsolete technology 16-17.

Other health sectors have implemented on-line learning using Internet 18-21, virtual reality 22-23, and telehealth technology 24-27; however, much of this work originated from Universities or for-
profit medical information portals. A common theme in these studies is a move from simple content exchange to interactive communication. As stated by Pastore et al. ⁹,

“If two people meet, each with a hundred lire coin in his/her pocket, and exchange the coin, each will leave always with a hundred lire. However, if two people have each an idea and communicate it they will leave with two ideas each.”

Successful continuing education relies on two factors: efficient access to educational content and the instructor’s ability to provide appropriate educational content at the right place and at the right time. Personal-computer and Internet technologies can provide the tools to integrate continuous learning into a distance-independent education delivery model without large investments in hardware and technical personnel. Currently, a new Microsoft Windows based personal computer, office suite software, an Internet connection, and video capture accessories are all that are required for remote access to quality educational materials and specialized expertise. Unfortunately, many learners and educators in the physical rehabilitation field do not use, or under-utilize, these readily accessible technologies. This project examines the multiportion of the term multimedia by providing a user-level approach for providing continuing education in the formats that are most appropriate for a healthcare learner.

**E-learning**

E-learning represents a convergence in education, training, and computer-based information science. Delivery could be over the Internet, from a desktop computer, or from a computer network.

E-learning is such a new field that many definitions exist (http://www.linezine.com/elearning.htm). For example,

“The convergence of the Internet and learning, or Internet-enabled learning.”

“The use of network technologies to create, foster, deliver, and facilitate learning, anytime and anywhere.”

“The delivery of individualized, comprehensive, dynamic learning content in real time, aiding the development of communities of knowledge, linking learners and practitioners with experts.”

“A phenomenon that delivers accountability, accessibility, and opportunity allowing people and organizations to keep up with the rapid changes that define the Internet world.”

“A force that gives people and organizations the competitive edge to allow them to keep ahead of the rapidly changing global economy.”
E-learning allows us to select the most effective approach to presenting the content. Course content may consist of text, audio, still graphics, animation, streaming video, and listservs. E-learning may also include learning management through assessment techniques, testing and evaluation.

The Write-Once Publish-Everywhere Approach

This project introduces a Write-Once Publish-Everywhere approach for the creation and delivery of educational content. Since most physical rehabilitation interventions rely on vision and touch, multimedia content must be developed for successful knowledge transfer. To maintain the Write-Once Publish-Everywhere objective, audio, video, and text data are integrated into presentation software (Corel Presentations, PowerPoint, etc.). The accompanying text is written such that the presentation can “stand on its own” as an on-line reference but still be useful during an on-site presentation. Once the final presentation is complete, the presentation software is used to create handouts, slides, overheads, CD-ROM, web pages, streamed Internet media, video conferencing Whiteboard pages, and output for a laptop computer projector (figure 1).

With this multi-faceted approach for providing educational services, rural healthcare providers can access information anytime while taking advantage of various levels of interactivity. For example, rural clinicians can reach a web site from home to learn about range of motion exercises for their clients. An on-line presentation could then be arranged at the community hospital, using the Internet video conferencing system, to review this material and discuss issues directly related to their clientele. On a subsequent mobile outreach team visit, an on-site workshop could be held for a larger group (i.e., including other community healthcare workers; such as, nursing home workers, home care, or attendants). The rural clinicians could review the printed or on-line materials as needed.

As shown in figure 2, this approach creates a continuum of interactivity for accessing continuing education. This approach provides the best blend of interactivity, content options, and time flexibility.

From an educator’s perspective, multimedia content can be created and distributed without extensive investment in equipment, software, training, and publication time. As mentioned previously, healthcare continuing education activities are typically conducted on a peer-to-peer basis. The Write-Once Publish-Everywhere approach provides a mechanism for front-line
Healthcare workers to prepare their educational content such that it can be easily revised and easily presented in the most appropriate manner (i.e., used the appropriate medium for the education recipients without having to recreate the education content for each option).

<table>
<thead>
<tr>
<th>Type</th>
<th>Interaction</th>
<th>Accessibility</th>
<th>Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>In person / on site workshop</td>
<td>• Face to face</td>
<td>• Dependent on schedules, travel, funding, etc.</td>
<td>• Computer projector (multimedia)</td>
</tr>
<tr>
<td></td>
<td>• Physical</td>
<td></td>
<td>• Slides, overheads, handouts</td>
</tr>
<tr>
<td></td>
<td>• Immediate</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Multimedia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telehealth conferencing system</td>
<td>• Remote</td>
<td>• Less dependent on schedules</td>
<td>• Whiteboard</td>
</tr>
<tr>
<td>workshop</td>
<td>• No physical contact</td>
<td>• Need conferencing system</td>
<td>• Live audio/visual</td>
</tr>
<tr>
<td></td>
<td>• Immediate feedback</td>
<td></td>
<td>• Multimedia content</td>
</tr>
<tr>
<td></td>
<td>• Multimedia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web page (Internet)</td>
<td>• Remote</td>
<td>• Immediate</td>
<td>• Multimedia</td>
</tr>
<tr>
<td></td>
<td>• No physical contact</td>
<td>• Internet speed can slow access</td>
<td>• Email, online forms</td>
</tr>
<tr>
<td></td>
<td>• Delayed feedback</td>
<td></td>
<td>• Link to supporting information</td>
</tr>
<tr>
<td></td>
<td>• Multimedia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDROM</td>
<td>• Local</td>
<td>• Immediate</td>
<td>• Multimedia</td>
</tr>
<tr>
<td></td>
<td>• No feedback</td>
<td>• Do not need Internet access</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Multimedia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handout</td>
<td>• Local</td>
<td>• Immediate</td>
<td>• Paper</td>
</tr>
<tr>
<td></td>
<td>• No feedback</td>
<td>• Transportable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No multimedia</td>
<td></td>
<td></td>
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</table>

**Figure 3:** Interactivity continuum.

Educational content produced using common presentation software also falls within the “learning objects” philosophy. Learning objects have been defined as:

- "any digital resource that can be reused to support learning ... The main idea of 'learning objects' is to break educational content down into small chunks that can be reused in various learning environments, in the spirit of object-oriented programming" 29.
- “Learning objects are a new way of thinking about learning content. Traditionally, content comes in a several hour chunk. Learning objects are much smaller units of learning, typically ranging from 2 minutes to 15 minutes. These chunks are self-contained (each learning object can be taken independently), are reusable (a single learning object may be used in multiple contexts for multiple purposes), can be aggregated (learning objects can be grouped into larger collections of content, including traditional course structures), are tagged with metadata (every learning object has descriptive information allowing it to be easily found by a search)” 30.
The Write-Once Publish-Everywhere approach for continuing education can be easily integrated into larger education programs, modified to the current audience’s needs, formatted to a common style, and converted to a standards-based tagged format (XML, etc.).

Integration with Physical Rehabilitation Outreach

The Rehabilitation Centre has been involved with outreach services for more than 20 years. To provide clinical and educational rehabilitation services in both official languages, the Terry Fox Mobile Clinic travels to communities in Eastern and Northeastern Ontario (figure 3). In 1997, the Mobile Clinic delivered 115 educational sessions to 19 different communities. While this outreach model has been successful, new methods have been implemented to improve physical rehabilitation services during our era of sustained or diminished resources.

A computer distance communication project was developed and pilot tested by a partnership with the Mobile Clinic team, the Institute for Rehabilitation Research and Development (IRRD), Arnprior and District Memorial Hospital, Hawkesbury General Hospital, Cornwall General Hospital, Pembroke General Hospital, St. Francis Memorial Hospital (Barry’s Bay), Kirkland and District Hospital, Temiskaming Hospital (New Liskeard), and Englehart and District Hospital. Low-bandwidth video conferencing was integrated with an assessment database, an image library, and custom motion analysis software to provide the tools for remote physical rehabilitation assessment, follow-up, and distance education. Since this system works over regular telephone lines, the Internet, or a computer network, Ontarians are not limited by the communication technology (other telehealth systems require special data lines to connect each site). Besides connecting to any site that has reliable telephone service, low-bandwidth conferencing systems have low purchase and low maintenance costs.

The education portion of the outreach service relies on community input for defining continuing education objectives. Information from the annual education objectives questionnaire and feedback from the past year’s education sessions are used to develop a menu of over 40 educational topics. These topics are available as traditional, on-site workshops.

To address the goals of providing education at the right time, the right place, and the right cost, the most requested education units were produced as multimedia presentations using the Write-Once Publish-Everywhere approach. These presentations were:

- made available as multimedia pages on the World Wide Web (Web),
- presented over a video conferencing system,
- projected from a laptop computer

Figure 4: Terry Fox Mobile Clinic van.
• made available on CD-ROM
• published as Internet streamed media (RealPlayer)
• used to create slides, overheads, or handouts,

The menu of education topics can be viewed at http://www.rehab.on.ca/mobile/edmenu.html. The current on-line modules are located at http://www.rehab.on.ca/mobile/present_e.html. Write-Once Publish-Everywhere content development is being integrated into the Terry Fox Mobile Clinic’s educational mandate.

To ensure quality services for people with disabilities, we must provide quality education for community healthcare professionals. By empowering rural healthcare workers to help people with disabilities, improvements can be made in quality of life without frequent visits to urban centres. The Write-Once Publish-Everywhere concept provides a means for health education specialists throughout Canada to empower these local professionals through education.

Project Objectives

• Continue to improve the quality and access to physical rehabilitation education that is relevant to rural communities,
• Evaluate the technological options for delivering physical rehabilitation educational services to rural communities. These options include the Web, Internet streamed media, desktop video conferencing, and digital tools for on-site workshops,
• Continue to develop on-line education modules for physical rehabilitation using Write-Once Publish-Everywhere - specifically in physical medicine, nursing, physiotherapy, occupational therapy, prosthetics and orthotics, social work, and communication disorders,
• Repackage existing, and new, content using Internet streamed media (RealNetworks G2 technology - SMIL).

Content Development / Dissemination

Write-Once Publish-Everywhere Modules

A wide variety of continuing education modules have been developed to improve physical rehabilitation knowledge dissemination (Table 1). These topics were selected from community healthcare provider feedback, feedback from physical rehabilitation specialists, and examination of continuing education trends from the Terry Fox Mobile Clinic outreach service.

All modules were developed and delivered by front-line healthcare workers. These modules are evidence-based and peer reviewed. Supporting documentation, the evidence, is either listed on the module’s web site or included on a slide at the end of the module. Peer review typically had two stages: a review by a panel of clinicians with expertise in the module’s subject area and by
Almost all presentations have been made available in English and French. The only exception is the *Hearing Loss* module since the hearing test audio content was only available in English.

<table>
<thead>
<tr>
<th><strong>Principles of Transfers for Healthcare Workers</strong> - This presentation reviews the anatomy and proper body mechanics for lifting. Transfers in the presentation include 1-person dependent pivot, 2-person dependent pivot, using a transfer board and repositioning in the wheelchair and the criteria for selection.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assisted Pivot Transfer with a Hemiplegic Client</strong> - With the assistance of video clips, the steps for a successful transfer are explained.</td>
</tr>
<tr>
<td><strong>Assisted Pivot Transfer with a Hemiplegic Client (Transfer Board)</strong> - The set-up, interaction with the client, and use of the transfer board are explained with the help of video clips.</td>
</tr>
<tr>
<td><strong>Assisted Range of Motion Exercises for Arms &amp; Legs to Maintain Joint Flexibility</strong> - The why, when, where, who and hows of range of motion exercises are described. Specific exercises are demonstrated for hip, knee, lower back and wrist.</td>
</tr>
<tr>
<td><strong>Basic Principles of Wheelchair Seating</strong> - The principles of seating are explained as are the benefits, characteristics of normal posture, and normal vs abnormal seating. The 5 areas that must be considered in seating (the pelvis and hip joint area, foot support, trunk support, shoulder and arm position and head position) are dealt with in detail.</td>
</tr>
<tr>
<td><strong>Foot Care (Giving Your Client’s Feet the Thousand Kilometer Checkup)</strong> - Various facets of the foot are explored (e.g., effects of aging on the feet, the diabetic foot, toe nail care, ingrown toe nails, callouses, and corns).</td>
</tr>
<tr>
<td>Module</td>
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<tr>
<td>-------------------------------------------------------------------------------------------</td>
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<tr>
<td><strong>Positioning a Person with a Stroke when Lying in Bed</strong></td>
</tr>
<tr>
<td><strong>Care and Maintenance of Your Lower Extremity Orthosis</strong></td>
</tr>
<tr>
<td><strong>Care and Maintenance of Your Lower Extremity Prosthesis</strong></td>
</tr>
<tr>
<td><strong>Care of Your Residual Limb</strong></td>
</tr>
<tr>
<td><strong>Donning and Doffing a Below Knee Prosthesis with a Liner</strong></td>
</tr>
<tr>
<td><strong>Donning and Doffing a Below Knee Prosthesis with a Wedge</strong></td>
</tr>
<tr>
<td><strong>Donning an Above Knee Prosthesis</strong></td>
</tr>
</tbody>
</table>
**Rehabilitation Approach to Promote Independence** - What is rehabilitation? What are its goals? How is the theory put into practice? What is the process from assessment to evaluation of a treatment plan?


**Aphasia: Communication Etiquette** - Strategies for communicating with people who have communication problems due to a stroke.

**Communicating with a Person with Hearing Loss** - Background information, examples, and strategies for communicating with people who have hearing difficulties.

**Energy Conservation** - A comprehensive overview of energy conservation principles and techniques for people whose pain or fatigue limits their ability to function.

**Swallowing Disorders** - An overview of the swallowing process, identification of swallowing problems, and feeding strategies.

Respiratory Care: Anatomy and Physiology - Describes the anatomy, physiology, and mechanisms related to respiratory compromise and cough complications (spinal cord injuries and neuromuscular diseases).

Respiratory Care: Clinical Pathway - Provides tools for assessing pulmonary status and introduces respiratory interventions.

Respiratory Care: Interventions - Teaches the techniques of lung volume recruitment and assisted cough.

Table 1: Write-Once Publish-Everywhere modules.

Materials

Most of the equipment used to create the electronic media for each Write-Once Publish-Everywhere module is present in the consumer-level telehealth system described in Lemaire, et al. 27. As shown in Table 2, software for image editing and web site design was added to prepare effective content and easily publish and maintain the information. Most equipment can be found in a modern office environment. Video capture capabilities are becoming a common element in computer graphics cards, thereby reducing the cost of ownership and leading to user-friendly video capture software.

No formal training was required to use the software and hardware (i.e., tutorials, on-line help, and co-worker support was sufficient to allow the users to create images and video clips). However, advanced training courses on image editing and presentation software might have increased user confidence and decreased the time to learn advanced skills.

All educational modules that involved motion were supported by video clips; such as, Wheelchair Transfers, Range of Motion Exercises, and Ambulatory Aids. Each clip was captured at 320x240 resolution and 30 frames/second. Indeo or MPEG compression was used to reduce video clips to between 300 K and 3 Mb in size. Target size for video clips was less than 1 Mb.

Audio clips for a module on hearing loss were sampled from a stereo record at compact disk quality. To help the user, these audio clips were saved as WAV, Real Player, and Microsoft Media Player formats.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>Pentium III 450, 12Gb hard drive, 128Mb RAM, 32x CD-ROM, 56K Modem, 17&quot; Trinitron monitor</td>
</tr>
<tr>
<td>Video Capture Card</td>
<td>3COM Bigpicture Video</td>
</tr>
<tr>
<td>Camcorder</td>
<td>Hi8 Palmcorder, tripod</td>
</tr>
<tr>
<td>Microsoft Netmeeting</td>
<td>Desktop conferencing software</td>
</tr>
<tr>
<td>PictureWorks Live</td>
<td>Video capture and editing software</td>
</tr>
<tr>
<td>Software</td>
<td>Corel Office, Microsoft Office, Corel Draw Suite, Macromedia Dreamweaver, RealProducer</td>
</tr>
<tr>
<td>Speaker-phone</td>
<td>Conference quality speaker phone</td>
</tr>
</tbody>
</table>

Table 2: System Components.

Corel Presentations software (part of Corel Office Suite) was used by the educators to combine the text, images, video clips, and/or audio clips into a desktop presentation. After peer review, modules were saved as web pages, NetMeeting whiteboard, CD-ROM files, Real Player streaming media, and PowerPoint files. Presentation files could also be printed on paper, overheads, or slides. These steps were accomplished without editing the content and with minimal adjustment for the differing media.

Content

Most Write-Once Publish-Everywhere content was prepared by front-line staff of the Terry Fox Mobile Clinic at The Rehabilitation Centre (Ottawa). These rehabilitation specialists covered the fields of medicine, nursing, physiotherapy, occupational therapy, chiropody, prosthetics, orthotics, respiratory therapy, and communication disorders/speech language pathology. Additional modules were created by the respiratory therapy team at The Rehabilitation Centre. Some student assistance was used to help with image capture / editing and web site maintenance.

Education module topics were derived from community feedback. The Terry Fox Mobile Clinic Outreach Service polls healthcare providers in the Eastern and North Eastern Ontario annually to determine continuing education needs. The most requested topics were chosen for Write-Once Publish-Everywhere modules. An additional, and important, community request was for each module to be less than 15 minutes in length. Staff in small community health centres felt that they could work continuing education into their daily routine if they could access the information in 15 minute sections (i.e., appropriate for breaks, cancelled appointments, etc.).
Evaluation Methods

*Write-Once Publish-Everywhere* modules were evaluated at each step along the development and delivery processes. The peer review process is critical to ensure that new physical rehabilitation modules are clinically and technically valid. After the developer completed their final layout using the multimedia presentation software, a group of clinicians with expertise related to the module’s content and people with educational design/layout expertise were assembled for peer-review. This group of four to eight individuals critically evaluated each slide, all multimedia materials, and supporting documentation. Recommendations from the review panel were communicated back to the module design team and used to refine the content/layout. This review/modify cycle continued until the reviewers were satisfied with the content. Following these revisions, the project coordinator and Mobile Clinic staff performed a final review to ensure that the panel recommendations had been followed. Additional modifications were often made during the final review to prepare the module for *Write-Once Publish-Everywhere* use; for example, increasing the slide borders for use on an LCD projector, using high contrast colours, replacing text with more common words.

This peer-review process, while part of this project, is an integral part of the physical rehabilitation education strategy and is required to ensure quality. The outcome from this process is to make clinically reliable information available in the best possible format/layout. Peer-review does not preclude the on-going improvement of these modules based on user-suggestions. Feedback is obtained from on-line evaluation forms, email received by the Mobile Clinic staff, annual Mobile Clinic education surveys, and professional contact with community healthcare providers.

To evaluate the various dissemination media, questionnaires were used to collect data on satisfaction and value. For on-site sessions, each participant was asked anonymously to complete a questionnaire and place the sheets into an envelope. The presenter returned the questionnaires to the outreach office. A portable computer projector was brought from The Rehabilitation Centre for on-site presentations.

For sessions using desktop video conferencing, paper copies of the on-site education questionnaire were sent to the community site before each encounter (Appendix A). Upon finishing the workshop, each participant anonymously completed a questionnaire and placed the sheets in an envelope. This envelope was mailed back to the outreach team office for processing by the research assistant.

To evaluate user impressions on Web-based modules, an on-line form was added to the end of each on-line presentation to collect user responses. Hyper-linked text was also added to the title page of each module to inform the user that the evaluation form should be completed after reviewing the content. The Mobile Clinic Coordinator worked with community partners to ensure that appropriate staff at the rural institutions reviewed the modules and completed the evaluation forms. No limits were placed on access to this educational content or the evaluation.
form; therefore, on-line evaluations were obtained from people outside of the Eastern / Northern Eastern Ontario Region. Each evaluation form was automatically sent to the outreach team office by email for analysis. The on-line evaluation form contained the same fields as the on-site evaluation form. Since some users do not feel comfortable entering personal information on the Internet, questionnaire submission was anonymous. Internet streamed-media was evaluated during the debriefing forum.

For the *Write-Once Publish-Everywhere* approach to be considered successful, the majority of participants must have rated the modules as satisfactory. The majority of participants should have also consider the module’s content applicable to their clinical practices. Since the presentations were given in a variety of rural settings, the audio-visual capabilities at each site were expected to vary. The participant questionnaires were analysed in the same manner as the on-site forms. The results from the video conferencing sessions were not expected to be as positive as with the on-site workshop; however, the same satisfaction criteria must be attained before the video conferencing sessions can be considered successful.

In addition to the questionnaire feedback, a debriefing forum was held in Ottawa (November, 2001). Community representatives included Hawkesbury, Pembroke, Englehart, Barry’s Bay, and Ottawa. These areas included a good cross section of Eastern Ontario geographic locations, population sizes, language requirements, telecommunication infrastructures, and education needs. Each participant received a list of topics in advance for discussion during the forum (Appendix B). The forum was facilitated by the Mobile Clinic Coordinator and the Project Coordinator.

### Evaluation Results

#### Web Medium

Following peer review, the *Internet Publisher* feature in Corel Presentations was used to generate web pages directly from the presentation file. Minor editing was performed before posting these web pages to a web server; including, rewording title text for each slide, moving navigation arrows, and reformatting the title page. A navigation screen was created to allow users to find each module easily (www.rehab.on.ca/mobile/present_e.html).

While unsolicited module evaluations were received, most responses were from community healthcare workers in Eastern and North Eastern Ontario who were asked to evaluate the web-based modules. The request for module evaluation was sent to the person responsible for rehabilitation services in each community (i.e., people who completed the on-line evaluation forms were not approached directly). Four people with disabilities, who were part of The Rehabilitation Centre’s *Disability Awareness and Prevention Program*, were also recruited to evaluate the web-based modules from a consumer perspective.
Web-based Module Results

Of the 229 on-line evaluation forms received, *Principles of Transfers for Healthcare Workers* accounted for 19 percent and *Assisted Range of Motion Exercises for Arms and Legs to Maintain Joint Flexibility* accounted for 14 percent. Thirty-nine percent of respondents were Registered Nurses, 23 percent were Registered Nursing Assistants, and 11 percent were physiotherapists. Other respondents were researchers/educators, caregivers, speech language pathologists, occupational therapists, and physicians. Twenty-one percent of respondents were people with disabilities. As shown in figure 4, most people used the web site for personal growth or because their supervisor requested that they go through the continuing education module.

![Figure 5: Reason for using the on-line module.](image)

![Figure 6: How helpful will the module be in the person’s work?](image)
As shown in figure 5, more than 85 percent of respondents considered the modules helpful in their work. Most people who did not consider this information helpful in their work were consumers or family members of people with disabilities. More than 95 percent of respondents were in an environment that encouraged them to apply the concepts presented in the education modules (figure 6). Most respondents had participated in a computer, on-line education session before; however, 33 percent of respondents were having their first exposure to on-line learning.

Figure 7: Degree that the respondent’s job environment encourages use of the skills and concepts from a module.

Figure 8: Comparison between web-based module and a regular, classroom lecture.
Approximately half the respondents preferred the web-based modules to in-person lectures (figure 7). Twelve percent of respondents preferred in-person lectures. Pictures and image quality were considered important factors for a module’s effectiveness (figure 8). As shown in figure 9, only four percent of respondents felt uncomfortable using the web-based modules. Ratings for module content, organization, relevance, and overall satisfaction were high in approximately 90 percent of responses (figure 10).
Results from the debriefing forum supported the Web-based medium for Write-Once Publish-Everywhere modules. All participants agreed on the importance of being able to access continuing education materials according to their schedule (including from home). While having these modules available is necessary, obstacles still exist in the workplace. For many community hospitals, Internet access is limited. This is due to the lack of available computers and the lack of Internet access on computer systems. Computer access and use policies can also limit access to on-line learning during work hours (i.e., computers only used for medical records or workload measurement). To integrate web-based learning into the day-to-day schedules of healthcare workers, multimedia computers must be in the work area; such as, on the hospital wards/nursing units or in team/break areas.

Internet connect speed remains a problem in many community health centres. In several areas, staff connected to the Internet using dial-up modems (connect speed less than 28 Kbps). Satisfaction with on-line learning is higher for healthcare workers who have access to a reliable broadband connection. Besides improving Internet connect speeds, forum participants recommended the addition of pre and post tests to the on-line modules to show people what they must learn and that they have learned something by completing the module.

CD-ROM Medium

The CD-ROM version of the Write-Once Publish-Everywhere content had the objective of allowing the user to navigate between modules easily, play modules directly from the CD-ROM, and, use the Corel Presentations and Microsoft PowerPoint versions of the content. To run the modules from the CD-ROM, Show-on-the-Go files were created using Corel Presentations. These executable files can be run without having any presentation software installed on the local computer.
A series of CD-ROM screens were programmed to help users access content on the disc. The initial version was created by a student using the Ovation software. Due to incompatibilities between Ovation and new versions of Microsoft Windows, the navigation screens were recreated using HTML/JavaScript. This approach produced the same button-based interface as with Ovation while running on any computer with a current web browser. The interface program was much easier to edit as new modules become available. The only issue with this approach was that some older computers may not have a web browser installed. A final version of the navigation interface was created using Macromedia Director. While the Director environment took longer to learn than the HTML/JavaScript method, the resulting program ran more smoothly, did not require a web browser to run, and did not have the web browser interface taking up space on the screen. Once created, adding new modules to the Macromedia Director program is straightforward for advanced computer users.

**CD-ROM Module Results**

The CD-ROM interface programmed in Macromedia Director was the preferred solution for accessing information on the CD-ROM. While the button driven interface can be used to reach the core content files, a logical directory structure was also employed for users who prefer to browse the content directly from the CD-ROM using Windows Explorer. An example of the CD-ROM interface is displayed in figure 11.

![CD-ROM Interface Example](image)

**Figure 12:** CD-ROM navigation interface.

As with the Internet-based medium, user evaluations of CD-ROM-based modules were favourable. Forty-four evaluation questionnaires were received from clinicians in Eastern and
North Eastern Ontario. Approximately 58 percent of respondents were healthcare aids. A third of respondents were either Registered Nurses or Registered Nursing Assistants. As shown in figure 12, most people used the CD-ROM modules for personal growth.

![Pie chart](image)

**Figure 13**: Reason for accessing the CD-ROM module.

![Pie chart](image)

**Figure 14**: How helpful will the module be in the person’s work?
Figure 15: Degree that the respondent’s job environment encourages use of the skills and concepts from a module.

Ninety-five percent of respondents considered the modules helpful in their work, with 30 percent considering the modules extremely helpful (figure 13). Almost all respondents were in an environment that supported their use of new skills, obtained through continuing education, in the workplace (figure 14). Two-thirds of respondents had no experience with CD-ROM - based education materials.

Figure 16: Comparison between CD-ROM module and a regular classroom lecture.
An interesting result was that 70 percent of respondents preferred the CD-ROM modules to classroom lectures (figure 15). All other respondents considered the modules the same as regular face-to-face sessions. As with the Internet-based modules, more than 60 percent of respondents considered the pictures very helpful or essential for understanding the concepts from each module (figure 16). The remaining subjects rated the pictures as adequate. As shown in figure 17, 95 percent of people who review the modules were comfortable or enthusiastic about the
CD-ROM medium. Ratings for content, organization, relevance, and overall satisfaction were very useful or useful for approximately 85-90 percent of respondents (figure 18).

Feedback from the consumer debriefing forum supported the CD-ROM medium due to its portability, image quality, and as a good bridge to the web content. Participants felt that, by making the CD-ROM-based modules available at work, the employer is acknowledging the importance of continuing education. Having CD-ROM copies at work allowed healthcare workers to borrow the education modules for use at home. In addition, CD-ROM content was useful for areas with slow Internet connections. Further improvements to the existing Write-Once Publish-Everywhere CD-ROM content would be to include the streaming media (i.e., voice + images) on the CD-ROM.

**Desktop Video Conferencing (Whiteboard Media)**

Desktop video conferencing products, such as Microsoft NetMeeting, CUseeMe, and ViaVideo, provide many tools to support an interactive learning experience over IP-Networks. For example, by combining the NetMeeting software with a video source (video capture card or webcam), course participants can:

- see and hear an instructor in a live video window (figure 19)
- ask and visually demonstrate questions for the instructor
- transfer data files between sites
- share Microsoft Windows applications between conference sites
- interact visually with an on-line Whiteboard
The Whiteboard provides an ideal medium for static Write-Once Publish-Everywhere content since the instructor and students can look at the slides, point to areas of interest, draw on the slides, and insert new graphics to help answer questions. Video-based Write-Once Publish-Everywhere content can either be sent to each site using the file transfer feature and run locally, played through the live-video feed, or run synchronously at each site using custom NetMeeting software.

For this project, Microsoft NetMeeting was used as the desktop conferencing medium. Initially, Whiteboard files were made for each module by pasting a bitmap image of each slide into the Whiteboard. While this produced visually appealing content and was production time efficient, the download time over a 56 Kbps modem was long for medium-large modules. The Whiteboard file size was drastically reduced by only copying graphic elements into the Whiteboard and re-entering text and a solid background using NetMeeting’s drawing tools. The new files could be downloaded over a 56 Kbps modem line in approximately 15 minutes. This pre-loading phase was performed before the start of each on-line session. A conversion option, from PowerPoint to NetMeeting Whiteboard, would make this formatting process easy and seamless. Since Microsoft appears to consider Application Sharing or web page access as the preferred option for remotely playing PowerPoint files, simple conversion from PowerPoint to Whiteboard may not occur.

All community partners who participated in NetMeeting sessions used a 33 Kbps dial-up Internet connection. Video and data conferencing were run over the Internet connection and voice interactions were over a speaker-phone. A broadband Internet connection was used at the instructor’s site.

As a preliminary investigation of broadband connectivity for Write-Once Publish-Everywhere video conferencing applications, broadband-to-broadband trials were conducted between The Rehabilitation Centre and Baycrest Centre for Geriatric Care (Toronto) and between The Rehabilitation Centre and Sister’s of Charity of Ottawa Health Service (Ottawa). While questionnaires were not collected from participants, qualitative feedback was obtained from post-session debriefing discussions.
Desktop Conferencing Medium Results

Desktop conferencing session questionnaires were received from 51 clinicians in Eastern and North Eastern Ontario. Approximately 60 percent of these people were nurses or nursing assistants and 34 percent were physiotherapists. As shown in figure 20, most participants attended the session for personal growth (44%) or job training / career development (40%). Only one person did not consider the session to be helpful in their work (figure 21). Ninety-one percent of respondents felt that they would be encouraged to use their new skills in the workplace (figure 22).

Figure 21: Reason for attending the session.

Figure 22: How helpful will the session be in the person’s work?
In contrast with the people who evaluated the other media, 41 percent of the NetMeeting session participants had experienced on-line education. Half the participants rated the sessions the same as a regular lecture, while 42 percent considered the on-line session to be better (figure 23). Eighty percent of the respondents considered the pictures to be very helpful or essential to understanding the course content (figure 24). As shown in figure 25 and 26, evaluation results for comfort-level, content, organization, relevance, instructor responsiveness, and overall satisfaction were very high (only four participants found the sessions slightly useful).

![Figure 23](image1.png)

**Figure 23**: Degree that the respondent’s job environment encourages use of the skills and concepts from a session.

![Figure 24](image2.png)

**Figure 24**: Comparison between NetMeeting module and a regular classroom lecture
Figure 25: Role of pictures / images for helping to understand the session content.

Figure 26: How respondent felt while going through the desktop conferencing session.
The ability to interact was better than all media except in-person sessions (i.e., content projected from a notebook computer). Video conferencing has the advantage of providing live audio/video/data communication. Based on feedback from the debriefing forum, desktop video conferencing is an important tool for continuing education. However, desktop video conferencing should not be considered a replacement for the other media.

Various issues were described that can adversely affect adoption of the desktop video conferencing media in healthcare. Apprehension is the main issue. The forum participants noted that many nurses in the community are uncomfortable with technology. During on-line sessions, people are reluctant to speak over the speaker phone. To overcome these fears and to help promote interaction over the computer link, meeting facilitators were recommended by the community partners. These facilitators would require training in the technology and in running a remote meeting. Participants also recommended that an LCD projector or large screen TV be used to provide a larger visual image for on-line participants at each site.

**Internet Streaming Media**

Internet streaming media, such as RealPlayer or MediaPlayer, offer some advantages over other dissemination methods. Since audio, video, and images can be synchronised and sent to the user as a flowing, multimedia presentation, the educator can lead the student through the content in an organized and educator-selected pace. This medium may also be better for people who prefer to listen to the content and supplement their learning using the images and text. Conversely, streaming media may lack some of the flexibility and interactivity of a web page or desktop video conferencing technology.
All streamed modules in this project were created for RealPlayer (figure 27, 28). To integrate the various information sources, an SMIL file was created that provided a module interface within the RealPlayer window and scripted the slides, text, video, and audio. Slides were generated directly from Corel Presentations as JPEG images. Audio was recorded on tape, digitized in CD quality, and converted to a RealAudio file. Video clips were converted from AVI to RealMedia format. A RealText file was created to allow the user to run the RealVideo file in a separate window.

![RealPlayer: Range of Motion Exercises](image)

**Figure 28:** RealPlayer version of the *Range of Motion Exercises* module.

Developing a script for the voice-over recording is potentially a long task that requires writing and media development skills. To help front-line healthcare workers record a verbal soundtrack that enhances the *Write-Once Publish-Everywhere* slides, the following steps were employed by the outreach team staff:

1. Review the module and make notes that relate to an in-person presentation.
2. Record your voice on a tape player or Dictaphone as if presenting to an audience.
3. Send the recording to the hospitals transcription service to generate a word processing file of the presentation.
4. Review and edit the script.
5. Record the presentation using a high quality medium (i.e., poor recording quality results in a very poor streaming media file).
6. Review the recording and, if necessary, edit the script and re-record.

**Internet Streaming Media Results**

The RealPlayer streaming media approach was the least-accessed medium for this project. Participants in the debriefing forum considered streaming media to be an important component for continuing education delivery; however, the Web-based approach was able to deliver the same quality of learning. Being able to look and listen was considered important for auditory learners. Since the slides and audio play continuously, the learner can start the session and review the content without using controls to move between slides. While this approach is typically beneficial, the streaming modules may be slower to review since the learner could read the content faster than the presenter can speak. Addition of a voice track gives the educator a chance to add anecdotal information and details that help to explain the content but are not necessary for the *Write-Once Publish-Everywhere* slides.

Technically, slow and unreliable Internet connection speeds in some areas hampered the application of streaming media. The lack of RealPlayer software on hospital networks was also an obstacle for people to access these streaming modules. Most healthcare workers do not have the technical ability or confidence to install the Real Player application on their computer. As well, hospital administrations may not permit streaming media players to be installed on their network.

Most participants had not seen streaming Internet media before. If this trend exists throughout Canada, the adoption of streaming media may be held back until healthcare workers become accustomed to accessing this type of content on computer. Other than a lack of awareness about streaming media, people often compare streaming media quality with television. Less than television quality is harder to accept by people who have minimal experience with the Internet.
In-Person Sessions

Since all Write-Once Publish-Everywhere modules were created using office-suite presentation software, these modules can be easily used for in-person education sessions. All in-person sessions were conducted in community hospitals throughout Eastern and North Eastern Ontario. A “notebook computer / portable LCD projector” setup was used to display the electronic media to the course participants. Feedback from in-person sessions are valuable as a comparison with the remote access media and to ensure that the presentation slides remain effective in a classroom setting.

In-Person Session Results

Questionnaires were received from 74 healthcare workers in Eastern Ontario. Approximately half of the session participants had a nursing background (RN, RNA, RPN) and 30 percent were...
physiotherapists or occupational therapists. As shown in figure 29, most participants attended a session for personal growth or career growth/job training. Ninety-five percent of respondents considered that the knowledge gained from an education session would be helpful in the workplace (figure 30). Ninety-seven percent of respondents considered that they would be encouraged to use their new skills in their day-to-day work (figure 31).

**Figure 30**: Reason for attending the in-person session.

**Figure 31**: How helpful will the session be in the person’s work?
As displayed in figure 32, approximately 45 percent of respondents considered the in-person education sessions, using computer projector to display the Write-Once Publish-Everywhere media, superior to regular classroom lectures. Seventy percent of respondents found the pictures to be very helpful or essential to understanding the content (figure 33). Almost all respondents felt comfortable with the in-person education sessions (figure 34). A similar result was obtained for content, organization, relevance, and overall results since almost all respondents rated these topics as useful or very useful (figure 35).

Figure 32: Degree that the person’s job environment encourages use of the skills and concepts from a session.

Figure 33: Comparison between in-person / projected media sessions and regular classroom lectures.
Figure 34: Role of pictures / images for helping to understand the content.

Figure 35: How respondents felt while participating in the in-person session.
Feedback from participants in the debriefing forum indicated the importance of having in-person sessions as part of a continuing education program. The use of Write-Once Publish-Everywhere content enhanced the learning environment due to the superior visual aids (as compared with typical classroom lectures). Since the additional text on the presentation media was not mentioned during the debriefing, we may conclude that working within a fixed font size range was a sufficient criteria for ensuring effective projected slides.

A main drawback for learners in the community, for in-person lectures, was scheduling and release time to attend sessions. The accessibility of stand-alone learning methods was considered an essential complement to in-person sessions.

**Cross Medium Comparisons**

Questionnaire data from the web, CD-ROM, and desktop conferencing approaches were generally consistent. The main areas where results differed between Write-Once Publish-Everywhere modalities were the participant’s background and the reason for participating (figure 36, 37). As shown in figure 36, all media were predominately assessed by nursing-related healthcare workers (registered nurses, registered nursing assistants, healthcare aids). When comparing the Other category between media, the web modules had a much higher percentage of respondents grouped as Other. Overall, the Other category included consumers, family members, researchers, and speech language pathologists. CD-ROM evaluators were predominately healthcare aids. More of the desktop video conferencing participants than the other media groups were therapists. Chi-square test statistics indicated a significant difference (p<0.05) between the four media groups for participant background.
When asked why the participant was reviewing the session, most of the people reviewing the web module indicated that they were asked by their supervisor. An interesting result from the CD-ROM group was that, although many participants were asked by their supervisors to review the CD-ROM content, the predominant response was “Personal Growth”. This result may be related to the high percentage of healthcare aids reviewing the modules (i.e., the content may have higher value to people with less formal healthcare training who are working within a healthcare institution). NetMeeting and In-Person sessions had similar “supervisor request” responses as with the CD-ROM. In these cases, the sessions were selected by the participants; therefore, the higher percentage of “personal growth”, “career development”, and “job training” responses was expected (figure 37). All groups were statistically different (p<0.05, Kruskal-Wallis, Mann-Whitney tests), except NetMeeting and In-Person.
While almost all participants found the modules to be helpful in their work, a significant difference ($p<0.05$) was found between the CD-ROM and Web media (figures 38, 39). The CD-ROM evaluators had higher ratings (87% rated very helpful or extremely helpful). These differences could be attributed to the higher percentage of healthcare aids in the CD-ROM evaluation group or the fact that some people recruited for the web evaluations may not have found every module directly applicable to their work. Similar findings were found for evaluating how the pictures help with understanding, comparisons with regular lectures, feelings while using the modules, content rating, organization rating, relevance rating, and overall rating (figures 43-46). The In-Person session results were not significantly different ($p<0.05$) from the other results.

Figure 38: Reason why respondents used the modules.

Figure 39: “How helpful will the module be for work” ratings.
Figure 40: “Will the participant be encouraged to use the module content in their work?” ratings.

The CD-ROM group also had significantly higher ratings (p<0.05) than the desktop conferencing and In-Person groups, for comparisons with regular lectures and organizational rating (figures 40, 44). In these cases, the majority of the CD-ROM group (over 70% for lecture comparison and over 85% for organization) reported very high ratings. The desktop
conferencing and In-Person group results were more evenly balanced between three and four on a four-point scale.

![Image 1](image1.png)

**Figure 42**: “How helpful are the pictures towards understanding the content” ratings.

![Image 2](image2.png)

**Figure 43**: Participant feelings while using the module.

For the *feeling while using the module, content, relevance* ratings, the desktop conferencing and In-Person results were significantly better (*p<0.05*) than the web results (figure 42, 43, 45). In-Person results were also significantly better that the web results for *overall rating* and significantly better than the CD-ROM results for *organizational rating*. Even though most
participants gave better than average responses for both media, the desktop conferencing and In-Person groups had more responses at the top of the rating scale. This finding may also be attributed to recruiting healthcare workers, or consumers, to review the web modules that may not have direct use for a module in their work. While a significant difference was reported, over 85 percent of respondents gave useful or very useful ratings for all Write-Once Publish-Everywhere media.

**Figure 44**: Content rating.

**Figure 45**: Module organization rating.
Figure 46: Module relevance rating.

Figure 47: Overall module rating.
Conclusions

The *Write-Once Publish-Everywhere* approach for creating and disseminating continuing educational content was an effective means for front-line physical rehabilitation educators to develop course media and deliver this media to healthcare workers. The high overall ratings for content, organization, and relevance should not be solely attributed to the *Write-Once Publish-Everywhere* approach but to the background work by the mobile outreach team and the module creators. The yearly polls conducted by the Terry Fox Mobile Clinic Outreach Service ensured that the educational selections were requested and appropriate for community healthcare providers. Since the polled sites covered a wide geographic area, these education modules have a high relevance potential beyond Canada’s Eastern/North Eastern Ontario region. The modules evolved from existing presentations that had previously been offered in the community (delivered in lecture or workshop formats); therefore, the organization scores were expected to be high.

Another factor that could have contributed to the high content, organization, and relevance ratings is the peer review process. To pass peer review, a multidisciplinary panel must have agreed on the content, format, wording, and organizational structure of the information. While the peer review stage has ensured good content, the process can be lengthy. Setting time guidelines for completing the review may make this phase more efficient.

The *Write-Once Publish-Everywhere* approach endeavours to provide e-Learning at the right time, the right place, and the right cost. All media used in this project were required to provide learning opportunities at the right time and the right place. Creating continuing education content, using the *Write-Once Publish-Everywhere* approach, was effective at addressing the right cost objective. All content was created using desktop computer technology and software that did not require outside training to operate and was a reasonable expense for a hospital with a continuing education mandate. On the learner’s end, a multimedia personal computer with a dial-up Internet connection is all that was required to use the web-based educational content. The learner may have to install a video capture device into their computer to use desktop video conferencing as a *Write-Once Publish-Everywhere* modality; although, video capture at the remote site is not necessary to see the instructor.

Content creation for *Write-Once Publish-Everywhere* modules took longer than creating a typical desktop presentation. While this extra time increases the human resource costs for developing the content, these costs are much less than the costs for sub-contracting multimedia experts to create the content in a variety of media. The extra time was spent on:

1. reviewing the literature (evidence-based),
2. refining the text to stand on its own while still being effective during a live presentation,
3. creating effective graphics, photos, and/or video clips,
4. peer review.
A by-product of the module creation process is that the education content was acceptable to all staff. Within The Rehabilitation Centre, many staff use the Write-Once Publish-Everywhere modules for their on-site presentations. This has reduced the time spent by a person to maintain their own content. Since the education modules are formatted in desktop presentation software, each presenter can easily modify the module to the requirements of their audience.

Write-Once Publish-Everywhere modules can be considered learning objects, both from a philosophical and standards-based perspective. Educators can easily join modules together to create a full education program because each module was developed to address a specific issue and formatted as a series of multimedia slides. Since desktop presentation software was used as the authoring platform, educators can easily cut and paste slides, sections, and multimedia elements to customize each aspect of the complete program. For example, the background can be easily changed to give a consistent feel for a course. Tools are starting to appear that can add XML tags to Microsoft PowerPoint presentations, thereby allowing Write-Once Publish-Everywhere modules to be indexed as part of a Knowledge Management system. This task is made simpler since PowerPoint / Presentations templates were used to format all text.

The fact that project participants would not rank the different media but preferred to have access to all media was an interesting result from this study. Once exposed to the possibilities for accessing continuing education using learning technologies, healthcare workers appeared to favour improved access to quality content over increased interactivity. The critical factor for this result is that all media are capable of attaining the same learning objectives.

Write-Once Publish-Everywhere was a very good approach for both low-bandwidth (dial-up Internet connection) and broadband situations. The CD-ROM and paper handouts were always available when Internet connectivity was problematic. Study participants could switch between web site, streaming media, and desktop video conferencing to deal with Internet communication issues. By having the modules available in a variety of formats, and optimizing the modules for minimum bandwidth requirements, people throughout North America can take advantage of this approach. For example, a web-based questionnaire response from a University educator in the United States indicated that she would use the web content on Care of Your Residual Limb in her classroom to train nurses. Consumers have used the wheelchair transfer sessions to improve their ability to care for family members with a disability. These people are accessing, and using, the Write-Once Publish-Everywhere modules over the complete spectrum of Internet bandwidths.

Web-based Module Conclusions

Evaluation of the World Wide Web-based modality for education module dissemination supported continued use of this medium and demonstrated the ease at which continuing education materials can be made available. High evaluation ratings were obtained, although almost one third of the participants had limited or no experience with on-line learning. A possible reason for the success with new on-line learners is the simple web interface. To maintain the Write-Once Publish-Everywhere principle of limiting the time spent on formatting,
the web pages consisted of the module slides, navigation buttons, and a drop-down list with slide titles. This resulted in a simple interface with only the required options for moving between slides, running video clips, and returning to the home page. The project team did not instruct participants on how to navigate through the presentations.

Most of the people who were anxious or uneasy when using the web-based modules were new to on-line learning or new to the Internet (4 percent of respondents). Although these people felt some anxiety, they rated the modules as average or above average.

A key factor for the Write-Once Publish-Everywhere approach is to provide continuing education at the right time, the right place, and the right cost. The web-based option for publishing the education modules was effective for addressing the right time and right place objectives. Feedback from people in the community and examination of the on-line questionnaire receiving times showed that the web-based modules were accessed throughout the day and evening. People were accessing the modules at work or at home. In some community health facilities, computer access policies do not permit nursing staff access beyond using the clinical records system or nurses have difficulty finding time to use a computer for continuing education during the regular work day (i.e., not enough computers for staff or not enough education time). In these cases, the ability to reach continuing education activities outside the healthcare facility is important. Web-based access was also effective in facilities where most computers did not have CD-ROM drives to run the CD version of the education modules.

The Internet, web-based, option for publishing course content was supported by both healthcare workers in smaller communities and urban areas as a viable means for accessing continuing education in physical rehabilitation. Continued evaluation of other Write-Once Publish-Everywhere media is required to ensure that this approach maintains a quality educational experience at the right time, the right place, and the right cost.

**CD-ROM Module Conclusions**

The CD-ROM modality was well received by healthcare workers in Eastern and North Eastern Ontario and by people throughout North America who ordered a copy of the CD-ROM after looking at the Web-based modules. CD-ROM users fell into two groups: people who reviewed the CD-ROM as learners and educators who use the presentations on the CD-ROM in their teaching program (i.e., each CD-ROM has the PowerPoint files, Presentations files, video clips, audio clips, reference lists, and handouts). Evaluation questionnaires were obtained from learners.

From the learner’s perspective, CD-ROM modules were an important part of an e-Learning strategy. Questionnaire results showed that content on CD-ROM was expected to have a positive effect in the workplace, thereby improving patient care. A surprisingly high percentage of respondents rated the CD-ROM modules as better than regular lectures. Feedback from the debriefing session supported the belief that convenience was the main issue for “better than
typical classroom lectures” ratings. In many cases, community healthcare workers were unable to attend face-to-face sessions due to scheduling and patient care responsibilities. The CD-ROM sessions were portable, did not have Internet-bandwidth issues, and could be reviewed at the learner’s pace and at the appropriate time.

Healthcare workers who reviewed the CD-ROM media did not experience limitations in their ability to understand the content. The extra effort in supplying quality pictures and digital video clips may be one reason for the success of the CD-ROM-based modules.

While the Write-Once Publish-Everywhere approach may have been the reason for the high user satisfaction, the novelty of using e-learning technology may also have contributed to the high ratings. Almost two-thirds of the CD-ROM respondents had not used e-Learning techniques for education before. This may have artificially inflated the responses for the comparison with typical classroom lectures question.

The other aspect for the inexperience with e-Learning result is that almost all CD-ROM evaluators felt comfortable with this educational approach. Many people with limited computer experience feel uncomfortable using a new medium. This is especially true in cases with limited on-site support (i.e., the CD-ROM evaluations). Since office suite software was used to publish the content, the Write-Once Publish-Everywhere module layout and controls may have been more familiar to the healthcare workers than proprietary e-Learning approaches.

While the CD-ROM results were higher than the other media, the consensus from learners and educators in the debriefing forum was that the CD-ROM on its own was not sufficient to meet their continuing education needs. The CD-ROM-based modules should be made available in parallel with on-site, web, streaming, and video conferencing to provide education at the right time, the right place, and the right cost.

Desktop Video Conferencing Conclusions

Desktop video conferencing was an effective Write-Once Publish-Everywhere modality due to the enhanced interactivity and multi-site conferencing potential. Desktop video conferencing is one level of interaction below in-person sessions on the interactivity continuum. Even over a dial-up Internet connection, the NetMeeting / Whiteboard approach for presenting the Write-Once Publish-Everywhere modules was well received. The key factors for success over the low-bandwidth connection were to:

- prepare the slides using the Whiteboard’s drawing tools (paste cropped version of graphic images from the presentation software) to reduce file size and download time,
- connect 15-30 minutes before the session to verify the Internet connection and to allow the Whiteboard to pre-load. After pre-loading, Whiteboard pages can be advanced in real-time,
- ensure that the instructors use the Whiteboard pointers, drawing tools, and live video to support the discussion (i.e., bring audiences beyond the screen),
have participant sites download module video clips from the web site before the session for local access. The video clips can also be run from the CD-ROM,

- use a speaker-phone for audio (Voice over Telephone). This approach ensures quality audio and frees bandwidth for video and data traffic. Broadband is needed for Voice over IP,
- use an LCD projector or simultaneous output to a television to provide a larger view of the computer screen,
- interactive sessions around the computer work best with 5-8 people.

Application sharing is an important desktop conferencing tool that can share office suite software among all sites. This approach eliminates the need to reformat content for a Whiteboard. While application sharing is effective for certain programs, PowerPoint and Presentations performance over low-bandwidth connections was too slow to be effective during a continuing education session. Over broadband connections the slide transition rate was appropriate but the application sharing frame rate was not sufficiently high for transition effects and animations. At present, the Whiteboard is still considered the optimal tool for remote communications due to the superior drawing and communication tools.

While the Write-Once Publish-Everywhere modules were effective over low-bandwidth conferencing connections, the learning experience is improved over broadband. Broadband connections were more reliable, had better video quality / size, allowed for audio over the Internet connection, slide pre-loading was not required, and the web content (video clips) could be run at the same time as the desktop conferencing system.

A stable Internet connection is the main issue for most participants in this project. Wide variations in public Internet connectivity creates stress for the participants, and especially for the presenter. Participants are forced to wait for content to appear or to abandon the conferencing technology until Internet congestion dissipates. In some cases, the CD-ROM was used as a substitute for web page or Whiteboard content when Internet connectivity became unavailable. Redundant information sources, using different media, will likely remain useful until reliable Internet access is available across all regions of Canada.

From an organizational perspective, desktop video conferencing has many of the same issues as in-person sessions. Staff must be scheduled to meet at a pre-set time to attend the session and someone must be available to handle the audiovisual requirements. On the positive side, eliminating travel requirements reduces the costs for running the continuing education session. The same session could be presented at different times, or on different days, to accommodate shift work (i.e., the instructor does not have to travel and stay on-site). Since multiple sites can connect to a desktop conference, smaller groups at each site could be accommodated while meeting course enrolment requirements.

Community participants suggested that staff at each facility be trained as on-line learning facilitators. These people would help with technical operations during the session (connecting to the host site, running the conferencing software), stimulate interaction at their site, and act as a champion for e-Learning. Participants in the debriefing forum found that hospital staff were
reluctant to speak over a speaker-phone or touch a computer during an education session. A facilitator could help their peers overcome their reluctance/techno-anxiety and acquire confidence with the technology.

Internet Streaming Media Conclusions

The streaming media modality (RealPlayer) was considered an important part of the *Write-Once Publish-Everywhere* approach; however, the healthcare workers involved in this project were less sure about how and when they would use this approach in their own continuing education strategy. All reviewers liked the opportunity to listen to a presenter and synchronously see the visual content. While web-based access to the streaming media was considered important for universal access, participants in the debriefing forum also wanted the streaming media to be available on the CD-ROM. Inclusion on the CD-ROM would solve Internet bandwidth and quality of service issues in small communities.

Healthcare workers feel the need for streaming media as part of a continuing education once they have been exposed to the technology. However, almost none of the community healthcare providers had used RealPlayer, Microsoft Media, or similar streaming products in their professional or personal lives. Many people may use the web page content since they are more used to this format as opposed to streaming from a plug-in player. Integrating the streaming content into a web page, instead of running an SMIL program from within RealPlayer, may be a better option to speed adoption of this streaming approach.

Two other obstacles for increasing streaming media adoption are that learners must sit and listen to the text on each slide. Web-based content may be quicker to review. To help the learner, buttons were added to the *Write-Once Publish-Everywhere* streaming interface so that people could jump to any slide in the module. The second issue is that people are not used to looking and listening to a computer. As audio/video streaming is used by more people in their private lives, especially people outside of large urban areas, the streaming experience will hopefully be similar to watching an educational television show. The benefit of *Write-Once Publish-Everywhere* streaming content is that users do not need a television network to broadcast content.

Healthcare continuing education is not the only sector that has problems implementing streaming media. In fact, the time for universal broadband access and streaming media to be a major force throughout the Internet has been incorrectly predicted for many years. The lack of streaming media content in Eastern Ontario healthcare facilities is likely due to the lack of readily accessible content, the lack of computer systems and/or bandwidth, and concerns over the use of the streaming media players. For some people, streaming media is considered a tool for listening to Internet Radio stations while at work. In fact, some organizations have greatly restricted the flow of streaming media content in an effort to conserve bandwidth (i.e., streaming media is given the lowest priority on the network). Since network administrators do not have tools to
differentiate between continuing education and commercial content, access to this *Write-Once Publish-Everywhere* modality will be inconsistent.

Even with these obstacles, various initiatives are pushing through into healthcare. In addition to our physical rehabilitation content, mental health, geriatric care, pediatric care, and acute care facilities in Ottawa and Toronto are starting to use streaming audio/video to share live presentations with colleagues. The federal government’s programs for providing broadband Internet access for all Canadians will allow healthcare providers to access streaming education content from home or from other public facilities (libraries, schools, etc.). The Ontario Hospital Association’s HealPlex initiative (http://www.healplex.com) will be providing a Knowledge Management solution for continuing education that can be subscribed to by Ontario healthcare facilities. Healplex content uses a combination of streaming audio and slide learning objects.

Even though access was an issue, participants in this study liked the RealPlayer-based modules and considered them an important part of a complete learning environment. Instructors like the opportunity to add anecdotes or to expand on the information provided in the multimedia slides. Course participants like the opportunity to scan the slide and then listen to the instructor. Since some people are predominately auditory learners, the streaming media approach may be more important for some learners.

**In-person Session Conclusions**

The overall high ratings for the in-person sessions, using *Write-Once Publish Everywhere* media, are not surprising. In these cases, the community healthcare providers had immediate access to a physical rehabilitation specialist who was presenting a focussed topic. The presentations were supported by high quality visual media (pictures, video clips) that were not typically used for on-site lectures/workshops. Typical visual aids were overhead transparencies.

A satisfying outcome from the *Write-Once Publish Everywhere* perspective was that the additional words on each slide did not have an adverse effect on the participants reaction to the education sessions. Since a minimum font size standard was enforced during development, text projection was clear and easily read. This approach also limited the amount of text that could fit on each slide, thereby helping to make the content acceptable during an in-person session.

Scheduling and travel issues remain the main drawback for in-person sessions. The cost and time requirements for educators and/or participants to travel to a common location for continuing education limit the number of encounters and the number or participants. Even when an educator travels to a community, staff have difficulty attending education sessions due to patient requirements, administrative issues, and shift-work. Initially, the project team considered that in-person presentations would be the preferred method for accessing continuing education. The insistence by debriefing forum participants that all learning modalities must be considered equal is a strong message concerning the importance of easy access to quality learning materials.
The Future: Steps for Improved e-Learning

Write-Once Publish-Everywhere

The project results supported the Write-Once Publish-Everywhere approach for providing continuing education for physical rehabilitation. To implement Write-Once Publish-Everywhere healthcare and educational facilities would have to address the following:

**Staff training:** Staff training is required on advanced office presentation software (Microsoft PowerPoint, Corel Presentations, etc.), recording digital video clips, notebook/LCD projector use, desktop video conferencing software, and presentation skills over different media.

For remote sites, some staff should receive special training as an e-Learning facilitator. This person/people can act as champions for e-Learning within an organization. Besides helping with technical issues (connecting to another site, finding the on-line e-Learning content, etc.), the facilitator can run the remote end of desktop video conferencing sessions.

**Technical support:** Technical support is likely needed to upload and format content on a web site, maintain desktop video conferencing systems, maintain and format streaming media content, and maintain an easy-to-use interface for the CD-ROM version. The Write-Once Publish-Everywhere approach will be easier to implement if technical support is available to help with digital video clip processing and fine-tuning digital pictures.

**Communication technology:** The host facility must have access to a web site, streaming media server, multimedia computer with a CD-RW drive, and a desktop video conferencing system. The only technologies that must be on-site are the multimedia computer and a desktop video conferencing system (for a low-cost solution, these could be the same system).

**Relationships:** While technology is an enabler, a successful e-Learning program must be built on strong relationships between the educator and the learner and between organizations. These relationships will ensure that the appropriate content is available; continuous improvement of the content and delivery approach is based on user feedback; scheduling is optimized; and people are informed of the progress of the e-Learning program. Strong relationships enhance sustainability.
Staff Time to Develop Content

Canada has amassed invaluable healthcare expertise. Unfortunately, day-to-day pressures of working within today’s healthcare environment limit the time that healthcare workers can spend on e-Learning. Facilities with a mandate to provide continuing education must provide protected time for staff to generate high quality, evidence based, and peer reviewed educational content. Providing technical and educational support structures will reduce the time for front-line workers to prepare the content. Improved access and use of learning objects should eventually further reduce the time requirements to produce an effective Write-Once Publish-Everywhere module. Unfortunately, few learning object source materials are available for physical rehabilitation.

Broadband Access for All Canadians

Until all Canadians have broadband Internet access, full implementation of e-Learning in physical rehabilitation / long term care will not be possible. The Write-Once Publish-Everywhere approach can compensate for the lack of reliable and fast Internet access in Eastern and North Eastern Ontario communities by providing a mix of on-site, low-bandwidth, and high-bandwidth media. However, any video-related content suffers from poor on-line access (either from increased compression or from problematic streaming / video conferencing). Continuing education for the fields of physical rehabilitation and long-term care typically deal with human motion; hence, access to full motion video is an important aspect for any e-Learning offering. Broadband access in smaller communities, to work and to the home, will allow healthcare workers to access multimedia content and to assimilate communication technologies as they access broadband content in their private lives.

Revised e-Learning Policies in Healthcare

In many locations, policies and on-site resources limit e-Learning applications. Lack of multimedia computers (i.e., sound, digital video playing software, CD-ROM drive) and Internet access in the work place does not allow e-Learning to become part of an organization’s culture. Computer access policies must allow for staff to use information technology for work-related activities outside medical records. In many facilities, clinical staff must remain close to their department / ward. Therefore, e-Learning computer systems must be located in each work area. If continuing learning modules have been designed to be accessed in 12-15 minute blocks, healthcare workers can use e-Learning content on breaks, between client appointments, or at pre-scheduled education times.

Knowledge Management

Knowledge Management is a critical principle for the application and sustainability of e-Learning within a healthcare environment. e-Learning implementation requires technology, corporate systems/policies, and cultural evolution. These three principles are the cornerstones of Knowledge Management. A Knowledge Management framework also promotes the synergies
between e-Learning, e-Health, and telehealth. A Write-Once Publish-Everywhere approach within a Knowledge Management framework can be used to improve the retention, understanding and dissemination of health-related knowledge.

Acknowledgements

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References


Appendix A - Evaluation Questionnaires
The Physical Rehab Distance Communication Initiative

Education Evaluation Form

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
</tr>
</thead>
</table>

1. What is your background/occupation (RN, RNA, Caregiver, PT, OT, etc.)?

________________________________________

2. Why are you taking this session/workshop (please check one)?
   a) Personal growth, development and fulfilment
   b) Career development
   c) Job training
   d) Request by supervisor
   e) Other _________________________________________________________

3. Will the information from this session be helpful in your work (please check one)?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td>Extremely</td>
</tr>
</tbody>
</table>

4. What information/activities will be most useful to you in your work?

________________________________________

________________________________________
5. What information/activities will be **least useful** to you in your work?

____________________________________________________________________________________

____________________________________________________________________________________

6. What will you do **differently** on the job as a result of this session/workshop?

____________________________________________________________________________________

____________________________________________________________________________________

7. To what degree do you think that your on the job environment will encourage you to use the skills and concepts from this session (please check one)?

<table>
<thead>
<tr>
<th>It will discourage their use</th>
<th>No encouragement</th>
<th>To some degree</th>
<th>To a great degree</th>
</tr>
</thead>
</table>

8. Have you participated in a computer, on-line education session before?

[ ] Yes  [ ] No

9. How would you compare this distance communication course to a regular, classroom lecture?

<table>
<thead>
<tr>
<th>Much worse</th>
<th>Worse</th>
<th>Same</th>
<th>Better</th>
<th>Much better</th>
</tr>
</thead>
</table>

10. How well do the **pictures / images** help you understand the course content?

<table>
<thead>
<tr>
<th>Does not help at all</th>
<th>Helps a little</th>
<th>Adequate</th>
<th>Very helpful</th>
<th>Essential</th>
</tr>
</thead>
</table>

| Distance Communication Education Evaluation Sheet 58 |


11. How did you feel while participating in the on-line session?

<table>
<thead>
<tr>
<th>Would not participate again</th>
<th>Uneasy</th>
<th>Comfortable</th>
<th>Optimistic</th>
<th>Prefer this type of session</th>
</tr>
</thead>
</table>

12. Please rate the following aspects of this education session (please check the appropriate rating for each item).

<table>
<thead>
<tr>
<th>RATING</th>
<th>Disappointing</th>
<th>Somewhat useful</th>
<th>Useful</th>
<th>Commendable / Very Useful</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relevance of material</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Group activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructors responsiveness to questions and concerns</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructors demonstrated knowledge of the subject matter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The session as a whole</td>
<td></td>
<td></td>
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</table>
13. How would you improve this educational session?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

14. What topics would you like to attend in the future?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

15. Additional comments

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
1. What is your background/occupation (RN, RNA, Caregiver, PT, OT, etc.)?

________________________________________________________________________

2. Why are you taking this session/workshop (please check one)?
   a) Personal growth, development and fulfilment
   b) Career development
   c) Job training
   d) Request by supervisor
   e) Other ___________________________________________________________________

3. How helpful will the information from this session be in your work (please check one)?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td>Extremely</td>
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</table>

4. What information/activities will be **most useful** to you in your work?

________________________________________________________________________

________________________________________________________________________

5. What information/activities will be **least useful** to you in your work?

________________________________________________________________________

________________________________________________________________________

6. What will you do **differently** on the job as a result of this session/workshop?

________________________________________________________________________

________________________________________________________________________

7. To what degree do you think that your on the job environment will encourage you to use the skills and concepts from this session (please check one)?

<table>
<thead>
<tr>
<th>It will discourage their use</th>
<th>No encouragement</th>
<th>To some degree</th>
<th>To a great degree</th>
</tr>
</thead>
</table>


8. Have you participated in a computer, on-line education session before?

   Yes  No

9. How would you compare this distance communication course to a regular, classroom lecture?

<table>
<thead>
<tr>
<th>Much worse</th>
<th>Worse</th>
<th>Same</th>
<th>Better</th>
<th>Much better</th>
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</table>

10. How well do the **pictures / images** help you understand the course content?

<table>
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<tr>
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<th>Helps a little</th>
<th>Adequate</th>
<th>Very helpful</th>
<th>Essential</th>
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</table>

11. How did you feel while participating in the on-line session?

<table>
<thead>
<tr>
<th>Anxious</th>
<th>Uneasy</th>
<th>Indifferent</th>
<th>Comfortable</th>
<th>Enthusiastic</th>
</tr>
</thead>
</table>

12. Please rate the following aspects of this education session (please check the appropriate).

<table>
<thead>
<tr>
<th>Content</th>
<th>Organization</th>
<th>Relevance of material</th>
<th>Group activities</th>
<th>Instructor’s responsiveness to questions and concerns</th>
<th>Instructor’s demonstrated knowledge of the subject matter</th>
<th>The session as a whole</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RATING</td>
<td></td>
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<tr>
<td></td>
<td>Not useful</td>
<td>Slightly useful</td>
<td>Useful</td>
<td>Very Useful</td>
<td>Not applicable</td>
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</tr>
</tbody>
</table>

13. How would you improve this educational session?

   ____________________________________________________________

14. What topics would you like to attend in the future?

   ____________________________________________________________

15. Additional comments

   ____________________________________________________________
The Physical Rehab Distance Communication Initiative

CD-ROM Evaluation Form

Module | Date
--- | ---

1. What is your background/occupation (RN, RNA, Caregiver, PT, OT, etc.)?

________________________________________________________________________

2. Why are you reviewing this CD-ROM module (please check one)?
   
a) Personal growth, development and fulfilment
b) Career development
c) Job training
d) Request by supervisor
e) Other ____________________________

________________________________________________________________________

3. How helpful will the information from this module be in your work (please check one)?

<p>| | | | | |</p>
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________________________________________________________________________

________________________________________________________________________

5. What information/activities will be **least useful** to you in your work?

________________________________________________________________________

________________________________________________________________________

6. What will you do **differently** on the job as a result of this module?

________________________________________________________________________

________________________________________________________________________

7. To what degree do you think that your on the job environment will encourage you to use the skills and concepts from this module (please check one)?

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<tr>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. Have you used a computer CD-ROM for continuing education before?

Yes  No

9. How would you compare using this CD-ROM module to a regular, classroom lecture?

<table>
<thead>
<tr>
<th>Much worse</th>
<th>Worse</th>
<th>Same</th>
<th>Better</th>
<th>Much better</th>
</tr>
</thead>
</table>

10. How well do the **pictures / images** help you understand the course content?

<table>
<thead>
<tr>
<th>Does not help at all</th>
<th>Helps a little</th>
<th>Adequate</th>
<th>Very helpful</th>
<th>Essential</th>
</tr>
</thead>
</table>

11. How did you feel while using the CD-ROM?

<table>
<thead>
<tr>
<th>Anxious</th>
<th>Uneasy</th>
<th>Indifferent</th>
<th>Comfortable</th>
<th>Enthusiastic</th>
</tr>
</thead>
</table>

12. Please rate the following aspects of this education session (please check the appropriate).

<table>
<thead>
<tr>
<th>Content</th>
<th>Organization</th>
<th>Relevance of material</th>
<th>The module as a whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATING</td>
<td>Not useful</td>
<td>Slightly useful</td>
<td>Useful</td>
</tr>
</tbody>
</table>

13. How would you improve this educational module?

________________________________________________________________________________________

________________________________________________________________________________________

14. What topics would you like to attend in the future?

________________________________________________________________________________________

________________________________________________________________________________________

15. Additional comments

________________________________________________________________________________________
Appendix B - Consumer Debriefing Forum Forms

e-Health and Continuing Education Forum

Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 - 10:00</td>
<td>Coffee / muffins</td>
</tr>
<tr>
<td>10:00 - 10:30</td>
<td>Welcome, introduction, review of objectives</td>
</tr>
<tr>
<td>10:30 - 11:00</td>
<td>Review of project background, demonstration</td>
</tr>
<tr>
<td>11:00 - 12:30</td>
<td>Feedback on web, Real Player, CD-ROM, and NetMeeting approaches for education modules</td>
</tr>
<tr>
<td>12:30 - 13:30</td>
<td>Lunch</td>
</tr>
<tr>
<td>13:30 - 14:30</td>
<td>Summarize feedback, discuss education technology as applied in the workplace</td>
</tr>
<tr>
<td>14:30 - 16:00</td>
<td>Discuss future work, new education topics, sustainability, access, partnerships</td>
</tr>
<tr>
<td>16:00 - 16:30</td>
<td>Summary of day, wrap-up</td>
</tr>
</tbody>
</table>
Questions to be Addressed

1) What are the preferred methods for accessing continuing education? Please report on personal perspective, co-workers perspective, institutional perspective? To aid in this task, please rank the following media with 1 being the preferred choice.

<table>
<thead>
<tr>
<th>Method</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>On site workshop / presentation</td>
<td></td>
</tr>
<tr>
<td>• instructor on-site using a notebook computer</td>
<td></td>
</tr>
<tr>
<td>attached to LCD projector)</td>
<td></td>
</tr>
<tr>
<td>Desktop video conference (NetMeeting)</td>
<td></td>
</tr>
<tr>
<td>• use live video, audio, whiteboard, and application sharing to remotely access a live session</td>
<td></td>
</tr>
<tr>
<td>Web site</td>
<td></td>
</tr>
<tr>
<td>• access a multimedia web site with slides, video clips, questionnaires, background information / references</td>
<td></td>
</tr>
<tr>
<td>Real Player</td>
<td></td>
</tr>
<tr>
<td>• watch and listen to a presentation as it streams over the Internet (slides are linked to the presenters voice, may include video clips)</td>
<td></td>
</tr>
<tr>
<td>CD-ROM</td>
<td></td>
</tr>
<tr>
<td>• run the multimedia presentations and video video clips from a CD-ROM</td>
<td></td>
</tr>
<tr>
<td>Paper handout</td>
<td></td>
</tr>
<tr>
<td>• look at a printout of the slides</td>
<td></td>
</tr>
</tbody>
</table>

2) How can we sustain the ability for healthcare workers to access continuing education (as a recipient of continuing education, provider of continuing education, administrator, etc.)?

3) How do staff at your facility access continuing education (where, when, etc.)?

4) What new education modules would benefit people in your facility and in your region?
Appendix C - Consumer Debriefing Forum Summary

Participants: Sabina Mersmann  Andree Campbell  Mary Pole
              Susan Parks  Janie Tessier  Joanne Gauthier
              Christine Rochefort  Marcel Desrosiers  Jackie Barwin
              Toby Yan  Ed Lemaire  Gayle Greene

The meeting began with introductions, a review of the purpose of the meeting and the objectives for the day, a review of the e-Learning Project and a demonstration of the various approaches for providing education.

Feedback on the approaches, such as ease of access, effectiveness and challenges were solicited with the following results:

In-Person / On-Site Education Sessions

• impossible to get all nursing staff to attend due to scheduling, ward coverage
• cannot accommodate all nursing shifts
• an “education day” approach, involving the community, may be better
• in person sessions are linked to the chance for people to interact
  • most important
  • interact together, not just with presenter - a sense of gathering
• more cost efficient for community (presenter travels to site)

NetMeeting

• no one wants to speak over the speaker phone
• many nurses afraid of technology as not an integral part of education process
• need a facilitator
• “live” aspect is a plus
• as with In-Person, limiting in terms of staff attendance and time
• fosters interaction among participants and less with teacher
• as computer monitor small, need to have an LCD projector to display screen

Web

• limited Internet access (e.g. few computers, certain times of day not conducive to good access such as noon)
• computer availability and facility policies can limit access to on-line learning
• computer must be close to nursing unit for access
• good method due to convenience, as long as Internet speed is fast enough
• add pre and post tests to show people that they have learned something (quiz)
• need for facilitator due to discomfort with use of computer
• PR needed
CD-ROM

- more portable
- good bridge to the web content
- good to make available at work (acknowledges that continuing education is important)
- can borrow from work to bring home or use off-hours
- may address ‘comfort’ issue
- good to have voice-over for CD-ROM

Handouts

- good to give to patient / family
- good to reinforce points
- good for people who dislike technology
- must make it easier to get printed versions (prefer colour)
- handouts are good in support of the other media and can peak interest for next sessions
- handouts are portable
- recommended as ‘accompaniment only’ as little or no interaction

From the above discussion, several themes emerged - comfort with computer, access to computer, time to commit to education, need for reason to participate, differences in adult learning, the need for a site facilitator/emcee and PR. Differences between the needs of medicine, nursing and of therapists was also noted.

The afternoon looked at education technology in the workplace and future direction and work. Areas discussed also included new educational topics, sustainability, access and partnerships.

- provide local training for participants and facilitator for all media
  - may be needed for up to 50% of staff (as many not computer literate)
  - try and link this training with other new learning (i.e., teach while learning how to use new electronic records system, workload measurement, email, etc.)
- people need to get something back from the session (value)
  - education credit, paid-for lunch, break from work, chance to interact with peers, make job easier, recognition from employer, reward for attending and presenting
  - can send a summary of attendance to administration at each site
  - not everyone needs these incentives
- need to provide content in French and English
- attitude change needed (start from handout and work up)
- use modules with patients
- need to find natural allies within facilities to promote e-Learning
  - work hard to bring champions on board and encourage them to talk to their peers
- all media, except handouts, ranked similarly
  - nursing liked in-person and CD-ROM; therapy staff liked in-person, NetMeeting, CD-ROM; and physicians might like the web medium
  - telehealth - very unsure about this and more research needed
- better if people are not on their own at the start (need for peer support)
Distance Communication Education Evaluation Sheet

- telehealth coordinator important for sustainability
- PR is part of sustaining an e-Learning service
  - needed for resource existence
  - add discussion list
  - include contact list for people working with mobile clinic
  - email list for Mobile Clinic sites - “chat room”, posting of new modules, general communication, etc.
- try to have more than one facilitator at each site
  - need computer skills (people expect facilitator to teach computer)
  - other people need to see facilitator use the equipment to become comfortable
  - need some technical support or a “Hot Line” (need to train the technical people)
  - develop champions (grass roots)

Future

- need theory and practical application in modules
- generate new modules (see list below)
  - gait for CVA patients
    - if you see “this” then there is probably a problem with “that”
    - more on diagnostics
  - general back care
  - use “real patients” in pictures
  - wound care
  - splinting
- list references (client and clinician), resource list for clients
- set time period for review of modules to keep them up to date
  - include review or revised date
- address PR which will impact on issues of comfort and access
  - within facility
  - by TRC/MC

List of suggested topics with preferences noted:

- neuropsychology (memory and attention)
  - for staff
  - for families and with handouts*
- neurogait**
- back care - general**
- wound care*
  - basic**
  - advanced
- splinting*
  - basic**
  - advanced
- augmentative devices**
- worthwhile websites**
• change and transition in families**
• bladder & bowel retraining*
• sexuality & disability*
• aphasia - basic
• nursing assessment**
• new techniques e.g. botox
• self-medication
• depression
• falls, including risks*
• assessment and screening tools and outcome measures***
Appendix D - Project Dissemination and Promotion

Publications


Presentations


**Other**

1. A description of the Write-Once Publish-Everywhere model is included in a community information kit on Telehealth services (distributed by The Rehabilitation Centre, Ottawa).
2. Handouts with the educational module web site address were distributed at physiotherapy, occupational therapy, speech language pathology and respiratory therapy conferences,
3. CD-ROM versions of the modules have been distributed to partner sites in Eastern and North Eastern Ontario and to people across North America (due to requests for the CD-ROM version). Two CD-ROMS were requested from Asia.
4. Web site (www.rehab.on.ca/mobile/present_e.html).