RESEARCH & DEVELOPMENT

INSTITUTE FOR REHABILITATION RESEARCH AND DEVELOPMENT

Annual Report

1997/98

The Rehabilitation Centre
505 Smyth Road
Ottawa, Ontario,
K1H 8M2
(613) 737-7350 Ext. 5321 Fax (613) 737-4260

A Division of the
Royal Ottawa Health Care Group

MESSAGE FROM THE DIRECTOR OF RESEARCH

JAMIE MACDOUGALL

I am pleased to present the 1997-1998 Annual Report for the Institute for Rehabilitation Research and Development (IRRD). This continues to be a year of great change for The Rehabilitation Centre (TRC). As an integral part of TRC we are undergoing rapid change and development. We are of course effected by the restructuring for the area and now it is clear that TRC as a whole will become part of the newly formed Ottawa Hospital, although the Centre will continue to have a subsidiary governance arrangement. These new administrative directions will have an effect on the overall functioning of IRRD and we are waiting with anticipation the final structure for this area. In this context, we are continuing to work very closely with the other research institutes as part of the University of Ottawa health system and we are active participants in the Council of Affiliated Research Institutes. We realize that working together with other institutes is an important component for future development in all areas of research and this includes rehabilitation research. Internally, we continue to have an active and successful program. One of the highlights this year was the awarding of a Change Foundation grant of the Ontario Hospital Association. This grant recognizes the innovative work we are doing in the distance education area. We are also active participants in the Rehabilitation Network of Ottawa-Carleton (RNOC) and we intend to maintain a leadership position as far as future developments in this area are concerned. We continue to have a close alliance with the University of Ottawa through our Cooperative Agreement and the established multidisciplinary relationships that we have are producing a number of successful joint projects with the University.

I would like to extend my sincere thanks to the Senior Management team of the Royal Ottawa Health Care Group (ROHCG), as well as the Royal Ottawa Health Care Foundation for their continued support over the years. I would especially like to thank George Langill, Executive Director, for his continued vision and his commitment to research and development as part of rehabilitation, and Irene Giustini has continued in her role as Associate Executive Director to be a strong supporter of our research efforts. We regret the departure of our Physiatrist-In-Chief, Dr. Gaétan Tardif, for Toronto. Dr. Tardif has been a strong supporter of research and has made many contributions to the development of IRRD and the research effort as a whole. We all wish Dr. Tardif well in his future endeavours. I would like to thank all of our dedicated researchers within the Institute and all the other researchers that are affiliated with our research effort. Without this effort, certainly the overall success that we have achieved, would not be possible. I am confident that we will be able to work together in the future for the ultimate good of all our clients. I would like finally to thank the administrative support staff for their efforts during the year, especially Debra Schleyer for her secretarial help and for her help in the preparation of this Annual Report. I would like to thank the Research Assistants, Monica Brown, Carolynn Cook, Dorothyann Curran, and we have been joined this year by Liz Parkin. We look forward to meeting the challenges of the upcoming year in the important area of research and development.

Je suis heureux de vous présenter le rapport annuel 1997-98 de l'Institut de recherche et de développement en réadaptation (IRDR). Encore une fois, ce fut une année de grands changements pour le Centre de réadaptation. En tant que partie intégrante du Centre de réadaptation, nous subissons des changements et des développements rapides. Nous sommes, bien sur, affectés par la restructuration dans la région et il est maintenant clair que le Centre de réadaptation fera partie du nouvel Hospital d'Ottawa récemment créé. Malgré ceci, le Centre continuera d'opérer indépendamment. Cette nouvelle administration aura un effet sur le fonctionnement global du IRDR et nous attendons avec impatience la structure finale dans ce domaine. À l'intérieur de ce contexte, nous continuons de travailler de près avec les autres instituts de recherche puisque nous faisons partie du système de santé de l'Université d'Ottawa et que nous sommes membre actif du Conseil des instituts de recherche affiliés. Nous savons que travailler ensemble avec d'autres instituts est une composante importante pour les développements futurs dans tous les domaines de recherche et ceci inclut le Centre de réadaptation. A l'interne, nous continuons notre programme actif et prospère. L'un des

points les plus marquants de cette année fut l'octroie d'une subvention de l'Association des hôpitaux ontariens. Ceci reconnait le travail innovateur que nous accomplissons dans le domaine de l'éducation à distance. Nous sommes également des participants actifs au niveau du réseau de réadaptation de la région Ottawa-Carleton et nous avons l'intention de garder notre position de leader en ce qui concerne les développements futurs. Nous continuons d'avoir un lien étroit avec l'Université d'Ottawa suite à notre entente coopérative et la mise sur pied de partenariats multidisciplinaires. Ceux-ci nous ont permis d'effectuer, avec succès, un grand nombre de projets conjoints avec l'université.

J'aimerais offrir mes sincères remerciements à l'équipe de gestion sénior du "Royal Ottawa Health Care Group" ainsi qu'à la "Royal Ottawa Health Care Foundation" pour leur support continu au cours des ans. Un remerciement spécial au "Relai 24 heures" de *Labatt* qui soutient nos efforts pour la recherche. J'aimerais particulièrement remercier George Langill, directeur exécutif pour sa vision continuelle et son engagement à la recherche et au développement et Irene Giustini, Directrice exécutive adjointe, fervante partisane de nos efforts de recherche. C'est avec grand regret que nous annonçons le départ pour Toronto du physiatre en chef, le Dr. Gaétan Tardif. Le Dr. Tardif a été un très grand partisan de notre recherche et a contribué grandement au développement du IRDR et aux efforts de recherche. Nous souhaitons tous au Dr. Tardif la meilleure des chances dans ses projets futurs. J'aimerais aussi remercier tous nos chercheurs dévoués à l'Institut ainsi que tous les chercheurs associés de près ou de loin avec nos efforts de recherche. Sans cet effort, nous n'aurions pu atteindre le succès que nous avons remporté. Je suis confiant que nous pourrons travailler ensemble dans le futur dans le but de satisfaire tous nos clients. Finalement, j'aimerais remercier le personnel de soutien administratif pour tous leurs efforts au cours de l'année, spécialement Debra Schleyer pour son aide au niveau du secrétariat et pour son aide dans la présentation du rapport annuel. J'aimerais remercier les assistants de recherche, Monica Brown, Carolynn Cook, Dorothyann Curran et, Liz Parkin, qui s'est jointe à nous cette année. Nous nous réjouissons à l'avance de pouvoir surmonter les défis de l'année à venir dans le domaine important de la recherche et du développement.

MESSAGE FROM THE PHYSIATRIST-IN-CHIEF

GAÉTAN TARDIF

The Institute for Rehabilitation Research and Development, its staff and associated researchers have added another successful year to an already impressive track record. That IRRD has been successful should not be surprising, that it managed to flourish amidst chaos in the health care sector is truly impressive. The Institute became one of the initial recipients of grants from the Change Foundation for its work on tele-health, and its researchers have attracted external funding from high profile agencies such as the National Cancer Institute of Canada and the American Paralysis Association.

The Institute is also well positioned to further develop through partnerships locally and nationally. The IRRD will undoubtedly be a leader regionally through the Rehabilitation Network of Ottawa-Carleton, as well as provincially and nationally. On the eve of my departure from Ottawa, there is no doubt in my mind that the IRRD will be a key partner to the success of rehabilitation research in this country.

Challenges remain, such as the maintenance of an academic rehabilitation upon transfer of The Rehabilitation Centre to a new Board. This will best be achieved through effective fundraising for research, the continuation of a high success rate of our application to external funding agencies for our areas of excellence, and the ongoing development of our research staff, many of whom in the pursuit of academic degrees which will help them achieve their research career goals. Specific congratulations go this year to Dr. Edward Lemaire for successfully defending his Ph.D. thesis. Dr. Lemaire exemplifies the synergy between capable staff and a supportive environment and will no doubt be an example for the many others who are pursuing similar goals.

Good luck to the Institute for Rehabilitation Research and Development as it prepares to enter the twenty-first century. Rehabilitation will more than ever be part of our culture, and IRRD can be a driver in its successful development.

L'Institut pour la recherche et le développement en réadaptation (IRDR), son personnel et les chercheurs associés ont encore une fois ajoutés une année pleine de succès à un répertoire déjà impressionnant. On ne devrait pas se surprendre que l'Institut ait connu du succès, mais ce qui impressionne le plus c'est qu'il prospère dans un environnement très chaotique pour le secteur des soins de santé. Entre autres l'IRDR a reçu une des bourses inaugurale du "Change Foundation" pour son travail en éducation à distance, et ses chercheurs ont aussi obtenu des bourses d'agences reconnues tel que le "National Cancer Institute" et "American Paraplysis Association".

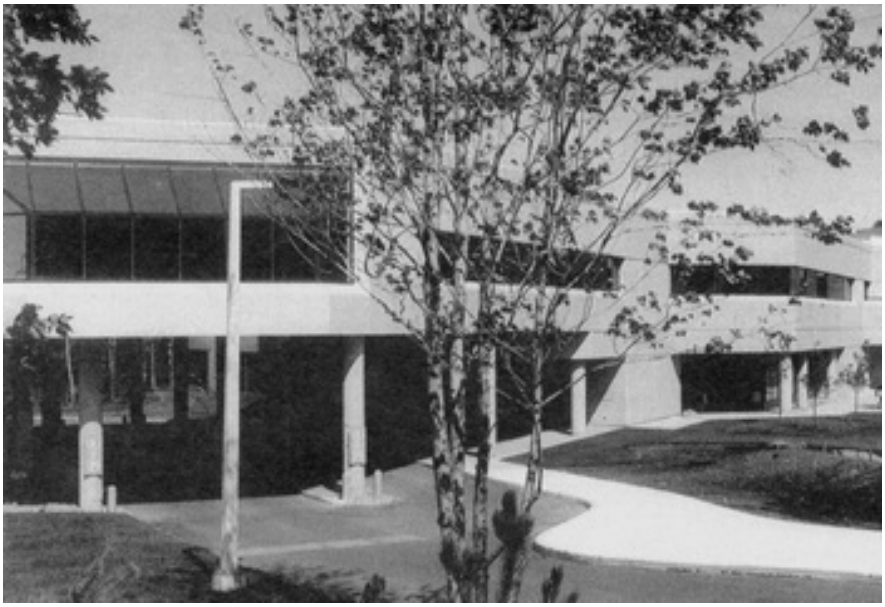
L'Institut est aussi en bonne position pour le développement de partenariats localement et nationalement. Il ne fait pas de doute que l'Institut sera un leader régional de par son rôle au Réseau de réadaptation d'Ottawa Carleton et jouera aussi un rôle ailleurs en province et nationalement. À la veille de mon départ d'Ottawa, je n'ai aucun doute que l'Institut sera un partenaire clé au succès de la recherche en réadaptation dans notre pays.

Certains défis se posent toujours tel que de maintenir le profil de réadaptation académique suivant le transfert du Centre de réadaptation à un nouveau conseil d'administration. Cela requièrera des levées de fonds pour la recherche, un haut taux de succès pour nos applications aux agences d'octrois pour nos programmes, et le développement constant de notre personnel de recherche, incluant la poursuite d'études supérieures qui permettront à plusieurs de nos chercheurs de réaliser leurs objectifs de recherche. Des félicitations particulières cette année vont au docteur Edward Lemaire pour avoir défendu avec succès sa thèse de Ph.D. Le Dr. Lemaire démontre bien la sygnergie qui peut exister entre un personnel compétent et un environnement qui soutient le développement de ses resources humaines. Il ne fait aucun doute qu'il sera un exemple pour plusieurs autres chercheurs qui veulent atteindre de mêmes buts.

Meilleures chances à l'Institut pour la recherche et le développement en réadaptation alors qu'il se prépare à entrer le 21ième siècle. La réadaptation sera sans aucun doute une partie intégrante de notre culture, et l'Institut peut jouer un rôle de leader dans son développement

THE REHABILITATION CENTRE (TRC)

TRC, a division of the Royal Ottawa Health Care Group (ROHCG), specializes in the rehabilitation of individuals with physical disabilities. It serves Eastern Ontario and Western Quebec in both official languages and is a teaching hospital affiliated with the University of Ottawa. It is part of the 88-acre Ottawa Health Sciences Centre on Smyth Road. TRC attracts national and international attention to its comprehensive rehabilitation programs. Visitors from across North America, and from as far away as China and Japan, have visited TRC to see this unique facility where staff and resources for rehabilitation programs are housed under one roof. The two-storey, 77-bed complex provides inpatient and outpatient rehabilitation services for the assessment and treatment of people who have: amputations, spinal cord injuries, strokes, lung disease, chronic pain, communication disorders and other disabilities.



SERVICE VISION

We envision an integrated rehabilitation delivery system for service, education and research in the Ottawa-Carleton region.

We will lead in developing this system and act as its integrator with community partners.

We will strive to:

- Be client focused and align activities with the rights and responsibilities of consumers. We will encourage an active participation of persons with disabilities and their families in the decisions related to care and will foster an optimal level of functioning, community integration and quality of life.

- Base our work on the best available scientific evidence and achieve optimal efficiency. Similarly, we will ensure that our ongoing capacity in specialized rehabilitation and research, education and training of today's and tomorrow's providers, promotes a "best practice" clinical environment.

THE INSTITUTE FOR REHABILITATION RESEARCH AND DEVELOPMENT (IRRD)

IRRD is a program of TRC and is comprised of a solid core of clinical researchers in a variety of clinical services. It is also a partner in research with the University of Ottawa through a comprehensive Cooperative Agreement. This agreement facilitates collaborative research projects between clinicians at TRC and university-based researchers.

The activities of IRRD enhance the role of TRC as an innovative treatment centre by:

- Conducting clinically relevant research;
- Focusing on the clinical and practical application of rehabilitation services with a specific emphasis on outcome studies and program evaluation;
- Research, development training and networking activities on a local, national and international basis;
- Promoting and encouraging active consumer involvement with all research and development activities.

OBJECTIVES

- Direct the research effort at TRC;
- Coordinate research-based conferences, seminars, and public lectures;
- Promote research networking;
- Facilitate multi-centred research studies;
- Provide research consultation and project management expertise;
- Commercialization of devices, products and services;
- Knowledge and technology transfer in the context of global economic development;
- Promote information exchange related to research, education and training through distance communication technology.

PERSONNEL

CORE STAFF

Director of Research	Jamie MacDougall
Senior Development Officer	Guy Martel
Education Coordinator	Toby Yan
Research Assistants	Monica Brown*
	Carolynn Cook
	Dorothyann Curran
	Liz Parkin
Lab Assistant	Rose Serjak
Secretaries	Suzanne Leclaire-Roy
	Debra Schleyer

RESEARCHERS

Suzanne Balmer	Discipline Leader	Physiotherapy
Elizabeth Boyd*	Clinical Researcher	Occupational Therapy
Pamela Cooper†	Clinical Researcher	Psychology
Paul Deegan	Mechanical Technologist	Rehabilitation Engineering
Dan DeForge	Clinical Researcher	Medicine
Joyce D'Eon	Clinical Researcher	Psychology
Louis Goudreau	R & D Engineer	Rehabilitation Engineering
Catherine Gow†	Clinical Researcher	Psychology
Diane Lavallée*	Clinical Researcher	Nursing
Edward Lemaire	Clinical Researcher	Prosthetics and Orthotics
Anthony Newall*	Clinical Researcher	Medicine
Jennifer Nymark	Clinical Researcher	Physiotherapy
Patricia O'Neill	Research Engineer/Discipline Leader	Rehabilitation Engineering
Joao Tomas	Electronic Technologist	Rehabilitation Engineering
Guy Trudel	Clinical Researcher	Medicine
Keith Wilson	Clinical Researcher	Psychology

* personnel no longer at TRC
† personnel no longer with IRRD but staff member of TRC

To contact IRRD staff by e-mail: use their 1st initial followed by the first 7 letters of their last name@rohcg.on.ca (eg. jmacdoug@rohcg.on.ca)

UNIVERSITY OF OTTAWA RESEARCH ASSOCIATES

Faculty of Health Sciences

Lucie Brosseau, Physiotherapy Program
Anne Carswell, Occupational Therapy Program
Claire-Jehanne Dubouloz, Occupational Therapy Program
Katherine Harman, Physiotherapy Program
Mario Lamontagne, School of Human Kinetics
Joan McComas, Physiotherapy Program
Ellen Melis, Physiotherapy Program
Patricia Roberts, Audiology/Speech-Language Pathology
Heidi Sveistrup, Occupational Therapy Program
Rachel Thibeault, Occupational Therapy Program
Louis Tremblay, Physiotherapy Program

Faculty of Medicine

Don Hillman, The Centre for International Health & Development
Elizabeth Hillman, The Centre for International Health & Development
Terry Pivik, Department of Psychiatry
Robert Swenson, Department of Psychiatry

RESEARCH IN BIOLOGICAL SCIENCES AT IRRD
THE STUDY OF CONTRACTURES

Submitted by Guy Trudel

The term “contracture” defines the lack of mobility of a joint. Contractures may be the most common problem encountered by clinicians caring for people with disabilities from a wide range of chronic medical conditions (myelomeningocele, muscular dystrophies, fractures, spinal cord injuries, diabetes, stroke, etc.). Depending on the joint affected, a contracture can prevent one from walking, dressing or feeding independently. Accordingly, their management involves a multidisciplinary approach most often delivered by physical rehabilitation clinicians. The treatment consists of mobilization and stretching, with an occasional surgical approach, and has not changed in many decades. Apart from being frustrating (often the contracture develops despite maximal intervention), the actual treatment is expensive in terms of health care resources and often leaves the patient impaired or disabled.

Part of the problem in treatment stems from a lack of detailed knowledge of the contracture mechanism. Research efforts over the past 30 years resulted in the use of early passive motion in the prevention of the contracture. However, despite increased prevention, contractures remain prevalent and take a heavy toll on functional independence. Additionally, contractures have been studied after relatively short periods of immobility (12 days to 8 weeks). At The Rehabilitation Centre, clients developed joint contractures after longer periods of immobility. To better treat these, the contracture process needs also to be studied after long periods of immobility.

The research of Dr. Guy Trudel’s team focuses on the study of joint contractures. Their laboratories are physically located at Guindon Hall, University of Ottawa. The laboratory successfully marries numerous areas of expertise with collaborators in various fields (see Table 1). The laboratory receives students from Canada and abroad to obtain scientific training.

The techniques used routinely include experimental surgery, processing of bone and joints for research purposes, various histological methods, histomorphometry with digitized image analysis, immunohistochemistry and biomechanical testing.

Dr. Trudel and his team seek to expand knowledge on contractures not only from the mechanical, but also and uniquely, from a biological point of view. They have developed over the past two years an animal model for the study of joint contractures, methods and tools to measure the direction and the extent of joint limitation and the importance of muscle changes and joint changes in the contracture process. They also have developed and validated tools to measure the intra-articular connective tissue and synovial intimal proliferation after immobility (see Figure 1). The results of these studies were presented at National and International meetings and published/submitted in peer-reviewed journals.

Biomechanical studies showed that a loss of range of motion (ROM) occurred early (i.e. after 2 weeks of immobility) and progressed until 16 weeks. After that time, they observed a plateau, with the limitation in ROM not having progressed further by 32 weeks of immobility. This study was the first to provide quantitative data on range of motion after prolonged periods of immobility. Consequently, it was the first to identify phases of joint contracture formation. These findings have implications since the different treatments may need to be tailored to the contracture phase.

Another important result was to identify a reduction in motion occurring only at the expense of the structures of the joint that were not under tension supporting treatment and research efforts on these structures. These results may constitute a reference on the topic and further guide research efforts towards the causes of joint stiffness, and their treatment.

Other biological results included the findings that synoviocytes reacted differently to immobility depending on the site of the joint they were located. Further characterization of this finding is underway. This is innovative work not being carried out in other laboratories at the present time.
Actual work focuses on investigating the role of mediators in this process. The studies will focus on Fibroblast Growth Factor-2 (FGF-2), Matrix Metalloproteinase-3 (MMP-3) and Prostaglandin Synthases (PGHS-1 and -2) activities. The laboratory recently received peer-reviewed funding to explore the genetic expression in joint immobility. This truly innovative work places the Bone and Joint Laboratory at the forefront of research on joint contractures.

Future directions include the application of a faster method for articular tissue processing, the development of an intervention model by which trial compounds could be delivered to a diseased joint to prevent joint deterioration. Few clinical trials have described precisely the features and evolution of contractures nor scientifically tested the various treatment approaches. Clinical research is needed in this area to upgrade to an evidence-based practice. Partnership with the pharmaceutical industry may materialize if new treatment approaches arise from this research program.

Support from the Royal Ottawa Health Care Group, the Institute for Rehabilitation Research and Development and the Division of PM&R at the University of Ottawa have merged to make possible this search for alternatives to prevent and treat contractures.

Table 1: Collaborators at the Bone and Joint Laboratory

Dr. Hans Uhthoff, MD FRCSC, Professor Emeritus of Surgery (Orthopaedic Surgery)
Dr. Maha Jabi, MD FRCPC, MSK Specialist, Department of Pathology and Laboratory Medicine
Dr. Odette Laneuville, PhD, Department of Biochemistry
Dr. Hirotaka Sano, Department of Orthopaedic Surgery, Tohoku University, Japan
Mr. David Backman, Mechanical Engineer
Mrs. Clare Booth, Histology Technologist
Dr. Susan Kilborn, Veterinarian, Animal Care Services
Mr. Ba Pham, Statistician
Dr. David Jackson, Editor/Reviewer
Dr. Massayuki Seki, Orthopaedic Surgery Fellow, Sendai, Japan
Ms. Nancy Desaulniers, Biochemistry and Chemical Engineering student

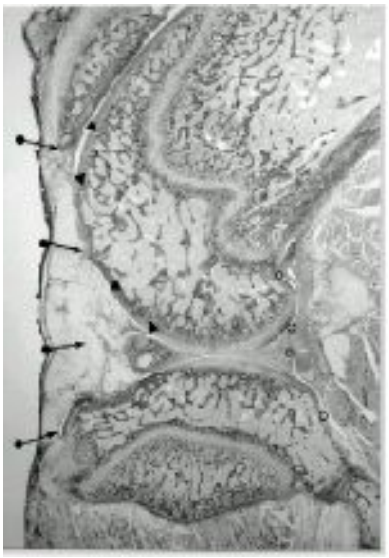


Figure 1. Microscopic picture allowing the study of structures and biological factors acting in the knee joint contracture

RESEARCH FOCUS IN THE CHRONIC PAIN REHABILITATION SERVICE

Submitted by Joyce D'Eon

Research on the Chronic Pain Rehabilitation Service has been systematic and developmental, with new research questions building on previous work. In order to convey this continuity, previous research areas are summarized, current projects are described, and anticipated directions for future research outlined.

Overview of the Service

The Rehabilitation Centre's Chronic Pain Rehabilitation Service consists of an interdisciplinary team with staff from Nursing, Social Work, Vocational Rehabilitation Counselling, Pharmacy, Recreation, Dietary, Occupational Therapy, Physiatry, and Psychology. In 1987, the Service began providing integrated interdisciplinary assessments of individuals with chronic pain. In 1988, a six-bed comprehensive interdisciplinary inpatient component of the service was initiated, in addition to outpatient services. Following this, outpatient services became more integrated, and currently the Service offers an interdisciplinary day hospital treatment program. In 1991, the Chronic Pain Rehabilitation Services was formally recognized as a separate service by TRC.

Currently, the Chronic Pain Rehabilitation Service receives 450 to 650 referrals each year, which represents the largest single patient group referred to TRC. Of these referrals, approximately 300 individuals are seen for interdisciplinary assessment. Currently, more than 100 individuals with chronic pain receive comprehensive interdisciplinary treatment each year. This is the only Centre in the region providing comprehensive interdisciplinary service for individuals with chronic pain. Referrals are received from family physicians, medical specialists and local Pain Clinics, as well as from communities in Eastern and Northern Ontario and Western Quebec.

The Chronic Pain Rehabilitation Service has instituted a Research Committee with membership from three disciplines, and includes the Service Leader and a researcher from IRRD. This committee provides an interdisciplinary impetus and resource for chronic pain research. In addition, awareness of various research initiatives ensures that projects are well coordinated.

Research Areas

Since its inception, the Chronic Pain Rehabilitation Service has incorporated research and clinical activities. The nature of chronic pain, with its multifaceted personal, familial, social and economic consequences, has resulted in projects designed to further the knowledge of the chronic pain experience. Investigators have been researchers from IRRD and members of the Service, as well as doctoral students from the University of Ottawa working under their supervision. Some research has provided honours-level projects for students from both the University of Ottawa and Carleton University.

Five broad areas have received continuing focus and include: 1) assessment; 2) cognition and depression; 3) sleep disturbances; 4) family functioning; and 5) treatment evaluation.

1. <u>Assessment</u>

   Due to the complex nature of pain, the assessment of individuals with chronic pain requires a broad focus. Many measures have been developed, but there has been a lack of consensus regarding which measures to use. The first study conducted at TRC in this area examined the core dimensions tapped by nine self-report measures commonly used to assess individuals with chronic pain. It was found that three measures captured the pain experience with minimal overlap between the measures. The next study explored the comprehensiveness and stability of

the three measures. A recent study investigated the psychometric properties of a measure of pain beliefs. These projects have had both theoretical and practical implications in the assessment of individuals with chronic pain.

A current project has been developed to examine the quality of life of individuals with chronic pain. The purpose of this work is to determine if a quality of life scale adds unique information to our current assessment battery. In addition, this study will provide comprehensive information about the quality of life of chronic pain patients. An important direction for future research in this area will be to examine the impact of treatment on various aspects of quality of life for individuals with chronic pain.

2. Cognition and Depression

In order to facilitate pain management it is important to understand how people think about and respond to pain. When experiencing pain, some individuals tend to think about, and exaggerate, the negative aspects of the experience. This is called “catastrophizing”. An early study explored this construct among chronic pain patients and examined the overlap of catastrophizing with depressive cognitions. Recently, a study examined the emotional characteristics of individuals who catastrophize, and the cross-situational consistency of catastrophizing using an experimental analogue of acute pain. This research contributes to our understanding of how individuals differ in their response to pain, with the ultimate goal of matching specific treatment components to individual needs.

Most interdisciplinary pain management programs report high rates of clinical depression among patients with chronic pain. In one project related to this issue, we conducted a survey of psychologists and psychiatrists who are members of the International Association for the Study of Pain, in order to investigate their views into the nature of this association. We have also conducted epidemiologic research in the Chronic Pain Rehabilitation Clinic that examines the prevalence of depressive disorders among patients seen at TRC, and examines the validity of common diagnostic criteria when applied to this medical population.

3. Sleep Disturbances

Sleep disturbances are common among individuals with chronic pain and these difficulties tend to persist in spite of medication and/or interdisciplinary treatments. Two initial studies investigated the prevalence and nature of these sleep disturbances. A third has compared the severity of the sleep problem when assessed by two different methods: subjective sleep diaries and objective measures of ambulatory nocturnal movement. We have also written a manual for the non-pharmacological treatment of insomnia in chronic pain, and conducted a randomized controlled trial of the efficacy of the intervention.

4. Family Functioning

As chronic pain can affect all aspects of an individual’s functioning, a series of studies have explored the impact of chronic pain on family relations. The first study in this area examined the perceived impact that chronic pain has had on the marital relationship, as reported by both patients and their spouses. A second study examined the role of depression and gender on marital and family functioning. In addition, a study examining the adjustment of adolescents of chronic pain patients has been completed. The goal of this area of research is to be able to identify individuals at risk for secondary problems arising from chronic pain.

5. Program Evaluation

A comprehensive Pain History Questionnaire has been revised, piloted and incorporated into the pre-clinic evaluation. This questionnaire incorporates questions suggested by the International Association for the Study of Pain, but is modified for a Canadian context. In addition this questionnaire has been translated and the French version has been pilot-tested. This history will provide a comprehensive and consistent background of the patients seen, and will be used as a backdrop for evaluation of treatment response. The key outcome variables of interest have been selected and treatment success is being operationalized. In addition, patients are requested to evaluate the services they have received at the end of treatment.

We have also been interested in applying new methods in program evaluation to the assessment of outcome in the Service. This has included the application of statistical techniques to identify the extent to which individual patients have made statistically reliable improvement as a result of treatment. These initiatives will help Quality Assurance initiatives and ensure that the Service continues to evolve in order that patients receive optimal care.

Summary

The Chronic Pain Rehabilitation Service provides treatment to a large group of individuals in need of comprehensive rehabilitation. The complexity of chronic pain necessitates research activities in a variety of areas. The current initiatives in evaluation of quality of life, sleep disturbances and program evaluation build on previous work and will ensure continued integration of clinical care and research on this Service.

CLINICAL OUTCOME VARIABLES SCALE (COVS) DEVELOPMENT

Submitted by Louise Seaby

The Clinical Outcome Variables Scale, used for physiotherapy assessments, has generated a great deal of interest both nationally and internationally. Due to this encouragement the COVS measure is in the process of being professionally packaged for marketing to other institutions and facilities. This package will include a training video (currently in the final stages of editing), an updated version of the COVS guidelines, and a software program for data entry and the generation of reports. A survey of other institutions who use the tool is currently being undertaken in order to better determine market value and interest in this package.

A data base for the COVS has been established at TRC with data being entered for all of TRC inpatients receiving physiotherapy for whom the COVS is an appropriate assessment tool. Formal reports are generated on an as-needed basis for review by physiotherapists.

NATIONAL & INTERNATIONAL DEVELOPMENT COOPERATION

Submitted by Guy Martel

World Rehabilitation Fund (WRF)

Agreement to collaborate with the World Rehabilitation Fund (WRF) in various projects has been initiated. A visitor from the WRF was in Ottawa to review Canadian resources, meet senior management and discuss potential collaboration areas. The visit continued to Kingston where representatives of the International Centre for the Advancement of Community Based Rehabilitation met and then went on to Montreal to meet with the Executive Directors and visit the Rehabilitation Institute of Montreal and the College Montmorency in Laval Quebec.

Haiti has been identified as a priority. After two exploratory visits to Port-au-Prince by the WRF, it became clear to them that major reorganisation and the equipping of rehabilitation medicine services are necessary in that country. The need for new infrastructures, programs to train physical/ occupational therapists and prosthetists, plus equipment are pressing. WRF anticipates Canadian involvement in the project at various levels based on Canada's demonstrated support of Haiti's efforts in rebuilding. Our contacts with The Centre for International Health and Development (CIHAD) and resources in Community Based Rehabilitation at the University of Ottawa, our capacity to speak and work in french, coupled with our network of Physical Medicine and Rehabilitation and other French speaking Institutions, particularly the Rehabilitation Institute of Montreal (RIM) and the College Montmorency in Laval Quebec, make an Ottawa/Montreal team most likely to succeed. The Montreal based Haitian Community has also been solicited to participate in this project of assistance towards their native land which at this time receives the most support from the Canadian International Development Agency (CIDA).

Landmines

Subsequent to our active participation in the December 1997 Ottawa Conference "An Agenda for Mines Action, A Global Ban on Landmines" and the subsequent Treaty Signing Ceremonies, a proposal was put forth jointly by The Institute for Rehabilitation Research and Development (IRRD) and the World Rehabilitation Fund (WRF) to assist with the physical rehabilitation and social reintegration of survivors from countries suffering from the scourge of landmines. In addition, the WRF and the Howard University have included the IRRD and resources of the University of Ottawa in a project to develop a Rehabilitation Engineering Research Centre. This is a five year program to define, analyse the technology and rehabilitation needs of landmines survivors, assess currently available prosthetic

devices, establish research on related technologies (orthotics, mobility devices, sensory aids) and conduct research on community-based rehabilitation and associated development in engineering technologies, medical, vocational and psychological rehabilitation issues. The Centre, to be situated on site in a needy country, will also act as a catalyst for the exchange of ideas and plans to meet the needs of landmines survivors by establishing a network of experts including landmine survivors, international and national rehabilitation engineering experts.

International Standards Organisation (ISO)

Members of the IRRD staff are actively involved with the establishment of international standards in the area of prosthetics and orthotics (P-O) and represent the Standards Council of Canada on three P-O related work groups: WGI Definitions, Terminology and Nomenclature, WGII Medical Aspects, and WGIII Testing. While a meeting in Dijon, France allowed a subsequent visit to the Headquarters of Handicap International in Lyon, an ISO meeting in Ottawara-chi, Japan facilitated the visit of the National Rehabilitation Centre for the Disabled, the MITI Mechanical Engineering Laboratory and the Hyogo Assistive Technology Research and Design Institute in greater Tokyo.

World Health Organisation (WHO)

The opportunity to meet and work with Dr. Enrico Pupulin, Chief Medical Officer Rehabilitation Unit of the WRF, has facilitated the inclusion of the IRRD in the newly created international WRF network dedicated to “Strengthening Appropriate Prosthetic and Orthotic Services”. IRRD and The Rehabilitation Centre are looking forward to contributing to this international effort.

Baffin Island

Interaction with the Baffin-Ottawa Specialist Services Manager has led to a request that our Prosthetic and Orthotic department serve the Baffin area population with artificial limbs and other orthopeadic appliances. The initial site visit generated some thirty (30) prescriptions for new appliances and or repairs. Casts and measurements where taken back to Ottawa where the braces and limbs will be fabricated and delivered at a subsequent trip to the Baffin area. The IRRD is looking forward to also being involved in an education/research capacity once the logistics are in place and specific needs are identified by the Innuit and their local health care professionals.

VISITORS FROM THE UNITED ARAB EMIRATES EXPLORE VENUES OF COLLABORATION WITH TRC

Submitted by Guy Martel

The Rehabilitation Centre’s programs and clinical activities attracted visitors from the United Arab Emirates. Mrs. Mariam Al Roomy, Director of Social Care and Special Groups, and Mr. Fouad Al Alazaamy, Social Care Expert and Disability Advisor chose to look at services in a number of regions, but having heard positive opinions about our rehabilitation philosophy, were particularly interested in the Canadian approach.

Specific education needs in the field of physical rehabilitation and its related discipline was a prime focus of the visitors. Formal university training, specific skills, technology transfer, and short term on site apprentiship in various disciplines where explored. Research is another sphere of potential collaboration being pursued.

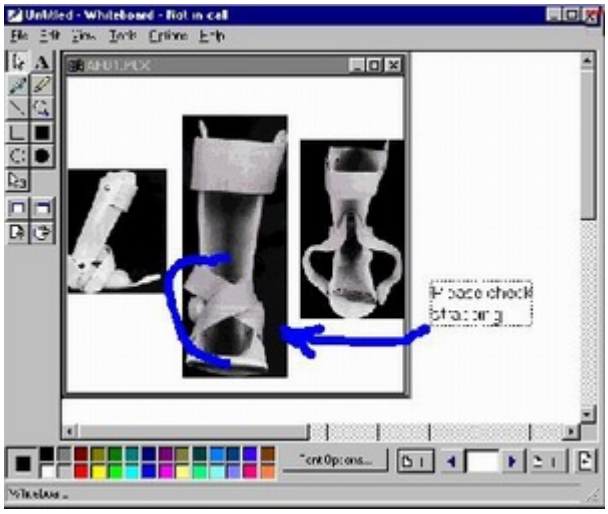
Photograph: From left to right; Mr. Peter Lawless, Manager Partnership & Liaison Office for Disability Issues, Human Resources Development Canada, Dr. Gaétan Tardif, Physiatrist-in-Chief, The Rehabilitation Centre (TRC); Mr. Fouad Al Alazaamy, Social Care Expert and Disability Advisor, Mrs. Hanny Toxopeus, External Affairs, Government of Canada; Guy Martel, Senior Development Officer, Institute for Rehabilitation Research and Development (IRRD), TRC; Dr. James MacDougall, Director of Research, IRRD, TRC; Mrs. Mariam Al Roomy, Director of Social Care and Special Groups; Mrs. Irene Giustini, Associate Executive Director, TRC; Mrs. Anne Lapier, Administrative Director, Specialized Physical Rehabilitation Program, TRC.

COMPUTER APPLICATIONS FOR REHABILITATION

Submitted by Ed Lemaire

The IRRD remains committed to developing and assessing digital technologies that enhance physical rehabilitation services. Over the last two years, we have made substantial advancements in Telehealth, computer-aided design, and motion analysis. Other computer-related developments include clinical databases, computer controlled assistive devices, and custom computer setups (i.e., technology access service).

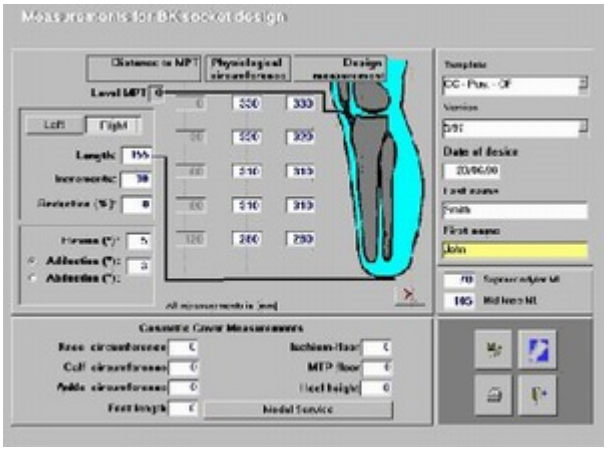
The *Physical Rehab Distance Communication Initiative* is a multi-site Telehealth project. With the recent financial support of the Ontario Hospital Association's Change Foundation and the Harold Crabtree Foundation, low-bandwidth video conferencing systems are being used to provide physical rehabilitation consultation and follow-up for hospitals throughout Eastern and North-Eastern Ontario. Currently, the following community partners are working on the Telehealth initiative with the IRRD and The Rehabilitation Centre's Outreach Services: 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 (Kirkland Lake), Englehart and District Hospital, and Temiskaming Hospital (New Liskeard). The goal of this initiative is to provide specialized physical rehabilitation services at the right place, at the right time, and at the right cost. The success of this initiative is being evaluated using technical, clinical, and satisfaction criteria.



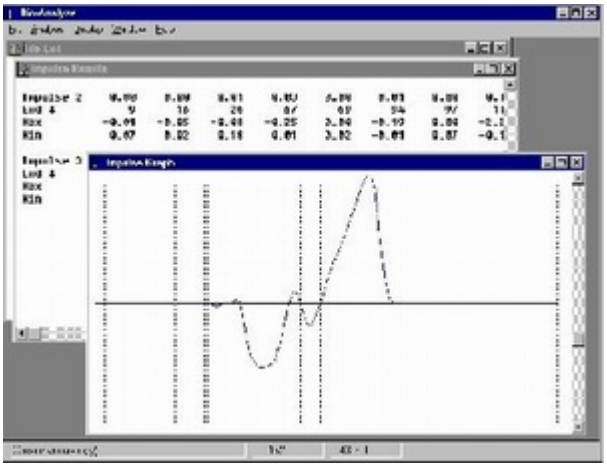
Technically, all sites have been upgraded to take advantage of new, standards-based, video conferencing software. While maintaining cost-effectiveness, the new conferencing system provides tools to display live video, transmit live audio, display and annotate still images, share text, share applications (i.e., database, word processor, etc.), and transfer data files. A regular modem connection to the Internet is used to link all sites. The team is also using new MPEG video compression methods to improve digital video quality and reduce video-clip transfer times. Software development is continuing to provide clinical tools to help identify movement problems.

In addition to clinical services, the *Physical Rehabilitation Distance Communication Initiative* team creates and provides on-line education content. Readily available computer software (WordPerfect Presentations and Power Point) are being used to create multimedia presentations that can be disseminated over the Internet, interactively presented over a conferencing system, distributed on CD-ROM, or presented on-site using a notebook computer or a slide projector. Current topics include wheelchair transfer methods, foot care, range of motion exercises, wheelchair seating, and rehabilitation methods to promote independent living.

Computer Aided Design (CAD/CAM) research has progressed through cooperation between the IRRD, Prosthetics and Orthotics Service (The Rehabilitation Centre), ipos Orthopedics Industry (Germany/USA), and the University of Strathclyde (Scotland). The CADVIEW software package has been successfully validated as a tool for translating manual prosthetic socket modifications into a CAD/CAM template. CADVIEW's analysis capabilities are also being used to solve CAD implementation and application problems at The Rehabilitation Centre.



In association with ipos Orthopedics, a CAD/CAM project has been initiated to determine if measurement-based CAD software is appropriate for fitting new trans-tibial amputees. If successful, our techniques should save time and reduce material costs when designing new prosthetic sockets. Currently, the team is refining the CAD reference library to obtain optimal results when mathematically generating a socket shape.



Motion analysis remains an area of continued software development and clinically relevant research. Development of the Motion Analysis Tools software is ongoing. This program provides tools for simple motion analysis from digital video clips of bitmap images. Besides use in rehabilitation clinics, Motion Analysis Tools is useful when completing on-line Telemedicine consultations.

In conjunction with the University of Ottawa, new analysis software has been created to perform specialized kinematic, kinetic, and muscle activation analyses. These developments support the GAMA Laboratory's clinical assessments and research projects. Future developments include moving all GAMA systems to the Windows 95/NT operating system and improving current results reporting software.

The pace of global technological advancement continues to be both rapid and sustained. With the support of the community partners, industry, and funding bodies, the IRRD will continue to provide innovative digital technology applications that directly support physical rehabilitation service.

CONSUMER INVOLVEMENT IN THE TRC ASSESSMENT VEHICLE RESEARCH PROJECT

Submitted by Mike Nemesvary

I began my position as Education Coordinator of the Disability Awareness and Prevention Program in the Fall of 1995. In December of that year, I met with Joanne McMeekin, formerly the Head of the ROHCG Fund Raising and Community Relations department. Our discussion soon turned to research, and Joanne candidly explained that it was sometimes difficult to raise funds in the community when many research projects are extremely scientific or technical in nature, may have limited practical application, and are often never seen by the public. Nothing more was said, but Joanne's dilemma got me thinking about the potential for developing a high profile fund raising project that would involve consumers at all stages of research, development and implementation, and ultimately have far reaching practical applications for clients of TRC.

Since my fall on the trampoline in 1985 which resulted in a broken neck at level C 4/5, I was determined to one day drive independently. Having had my driver's licence since age 16, I knew the virtues of independent mobility and the many opportunities that result from being in the driver's seat. It was a momentous occasion for me, when in September 1993, I successfully passed my on-road test driving a substantially modified Chevrolet Blazer and received my driver's licence for the second time in my life. The process, which began in 1991, started with a driving assessment with Lynn Hunt through the TRC Driving Evaluation Program. Due to my high level paralysis, I had to undergo various examinations to assess my cognitive, perceptual and physical abilities. With the proper vehicle adaptations and specialized controls, I was considered to be a safe candidate to eventually drive. However, at that point in time right through to present day, the Driving Evaluation Program was not in possession of the necessary assessment vehicles. These vehicles would have allowed me to test my practical skills by providing the opportunity to use the various modifications to the vehicles and try out devices that would enable me to drive safely and confidently. These devices include: various entry/exit lifts, wheelchair tie-down/locks, reduced effort steering, electronic gas and brake and remote control switches for primary and secondary controls. Without the availability of an assessment vehicle, I had to travel to Montreal to try equipment at Kino (now Ricon Ltd.). As it turned out, I had to order some of the equipment through a trial and error process which proved to be somewhat costly and time consuming.

As the old saying goes, "necessity is the mother of invention". Hence, it was my own experiences in learning to drive that were the reasoning for suggesting that TRC consider developing a research project that would see us obtaining our own assessment vehicle for use by clients of TRC. To this end, in January of 1997, I met with Jamie MacDougall and Mary Lou Ware and outlined my idea for a consumer-based research project. Jamie and Mary Lou were both extremely supportive of this proposed project for a variety of reasons. This project would be a natural follow-up to some of the recent consumer related activities. Specifically, Jamie and Mary Lou were instrumental in initiating an earlier conference that examined the role of consumers in research and were advocating for increased consumer involvement in all IRRD research projects. Moreover, consumers would have the most to gain by the realization of a fully modified and equipped assessment vehicle residing at the Centre.

With full support from IRRD, Education Services and Senior Management, I was contracted at a half day per week to define the parameters of the project, generate support from various ROHCG departments and solicit interest from other consumers and the community.

By the summer of 1997, we were moving full steam ahead and were meeting with key stake holders on a monthly bases. We had established vital support from within the ROHCG; specifically we had interest and representation from Community and Fund Raising, the Driving Evaluation Program, Education Services, Rehabilitation Engineering, Stroke Program and the Spinal Cord Program. The project was given a greater boost by the full time employment of a summer university student, Michelle Flowerday.

Among her activities, Michelle undertook an extensive literature search and developed a client survey for consumers of TRC.

In September of 1996, Michelle and I attended the Association of Driver Educators for the Disabled (A.D.E.D.) Conference in Dallas. This was a timely opportunity to attend interesting seminars and workshops that addressed driving for people with disabilities. We learned about other driver education programs throughout North America, met with driving instructors, talked to representatives in the vehicle modification industry, and saw first hand the latest assessment vehicles and specialized modification equipment coming out on the market. On December 12, 1996 I submitted a report entitled "Proposal for an Evaluation Vehicle for The Rehabilitation Centre" which included substantial and relevant information on the project, my personal observations and recommendations for implementation.

I took a leave of absence from January-July 1997, and during that interim I had hoped that many of my recommendations would be implemented in my absence. Unfortunately, their was no one championing the project and little progress was made towards attaining an assessment vehicle. Upon my return, I negotiated to work approximately 1 day per week on various consumer related research projects. Although I was still supportive of the driving project, I was becoming increasingly frustrated about our slow progress and had opposing views with the other project members as to the direction of the project. Therefore, in the best interest of the project, I notified Jamie MacDougall of my decision to take a "back seat" . We agreed that I would stay involved in the role of a consultant to the project. Although I would not be attending regular meetings, I made myself available for advice and/or direction as and when needed.

Since the fall of 1997 until present day, two new key people, in addition to Lynn Hunt, became involved to keep the momentum behind the project. They are Dr. Shawn Marshall and Research Assistant, Dorothyann Curran. Although my role in the project did not pan out as I had intended, I'm pleased that IRRD is being progressive by their commitment to involving consumers in research. By the same token, my past experiences have shed some light on the challenges of working with other professionals and has taught me some of the growing pains associated with being involved as a consumer in research. My observation is that many research projects are carried out by professionals with minimal involvement of the consumer. Of course, in many cases the ultimate application will be for the benefit of the consumer. Therefore, it is somewhat surprising and paradoxical that consumers are not regularly consulted in conceptualizing, developing and carrying out many of the ongoing research projects. When consumers are involved it is often for time limited applications and there is little ongoing consultation or follow-up.

I am looking forward to participating in the "Spinal Cord Injury Inter-Urban Conference" hosted by TRC next spring, since one of the key themes will be "Consumers in Research". This will be an important platform from which to extol the importance and the benefits of involving consumers in all types of projects and at all levels of research. Let's hope that the majority of attendees are professionals rather than consumers! As the profound civil rights saying goes, and I believe it equally applies to people with disabilities, "Nothing for us without us."

EUTHANASIA AND PHYSICIAN-ASSISTED SUICIDE FEASIBILITY STUDY

Submitted by Keith Wilson

The Federal government has indicated that it will hold a free vote in Parliament to determine whether Canada should legalize voluntary euthanasia and physician-assisted suicide for people who are terminally ill. In preparation for this vote, a special Senate committee was convened to review the issue of legalization, and it concluded in its 1995 report that more research is needed into "how many are requesting euthanasia, why it is being requested and whether there are any alternatives that might be acceptable to those making the requests." This study is being conducted in response to the Senate committee's research recommendation. It is a feasibility study that will involve the administration of in-depth interviews to patients who are nearing death from advanced cancer. The goals of the study are to derive preliminary estimates of: (1) the extent to which people at this point in life support the legalization of euthanasia and assisted suicide; (2) how often euthanasia or assisted suicide would be requested in the event of legalization, and (3) rates of eligibility and recruitment of patients at participating hospitals. The study will also develop and validate a new protocol for assessing various medical, psychological, and social factors that might be related to euthanasia and assisted-suicide requests.

Seventy competent patients with advanced cancer will be recruited from a regional palliative-care unit or through the palliative-care consultation service of two tertiary-care hospitals. Each patient will be interviewed individually by two clinically trained research assistants (to determine inter-rater reliability), and will also complete a series of Visual Analogue Scales (VAS). The interview inquires about attitudes toward the legalization of euthanasia and assisted suicide, and covers a range of measures that have been associated with such attitudes in several distinct bodies of literature. These measures include demographic variables, social support, specific end-of-life concerns, pain and other symptoms, and mental-health considerations. All interviews will be tape-recorded to permit qualitative analysis. Test-retest reliability will be established by having a third interviewer conduct a follow-up 24 to 48 hours later. External validity will be examined by determining the concordance between interview ratings, patient VAS ratings, and clinical staff ratings of the same constructs.

Tape-recorded narratives in which patients describe their reasons for being in favour of or opposed to the legalization of euthanasia or assisted suicide will be transcribed verbatim and subjected to an ethnographic content analysis. Reliability and validity of coefficients for other variables will be computed. Rates of recruitment at each site, as well as the number of patients who express a personal interest in receiving euthanasia or assisted suicide, will be determined.

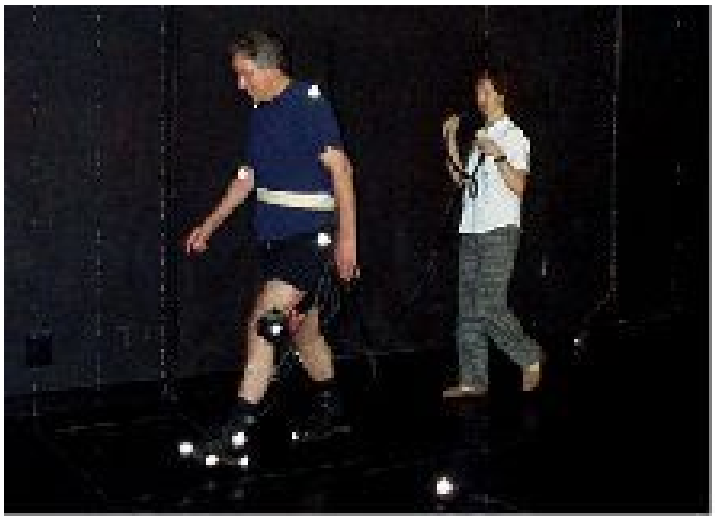
Once we have established the rates of eligibility and recruitment, validated the survey protocol, and identified the percentage of patients who would actually request euthanasia or assisted suicide, we plan to submit a subsequent proposal for a full-scale epidemiologic study that will involve hundreds of terminally ill patients. The goals of this major study will be to: (1) establish more definitively the incidence with which euthanasia and assisted suicide would be requested by patients with advanced cancer; (2) follow the stability over time of the desire to die and, (3) clarify the importance of various risk factors that might be associated with euthanasia/assisted suicide requests. The basic question to be addressed by this research is, "if we legalize euthanasia and assisted suicide, who will ask for them, and why?

GAIT ENHANCEMENT STRATEGIES FOR PATIENTS FOLLOWING AN UPPER MOTOR NEURON INJURY: A CLINICAL AND RESEARCH COLLABORATION

Submitted by Jennifer Nymark & Dan DeForge

A major focus of physical medicine and rehabilitation for our patients is the management of walking problems particularly following a stroke or incomplete spinal cord injury. A working group, comprised of clinicians and researchers, has been formed to recognize our collective expertise and to intensify our efforts in neurological gait recovery programs. This initiative merges the interdisciplinary team of the Gait and Motion Analysis Laboratory with clinicians from the Neurospinal and Stroke services, a pharmacist, a consumer advisor, and academic partners. The objectives of this focus group are to develop gait measures that can provide early detection of impairments, particularly hypertonicity and weakness, and to implement a systematic approach in the evaluation of gait enhancement strategies. Ultimately, this focus will guide our clinical decision-making and research endeavours for optimum treatment selection with our patients.

The work of the focus group is comprised of three components: (1) to gain clinical expertise and patient-feedback in selected, new gait training programs; (2) to develop the most accurate and clinically meaningful measures of severity of paresis and hypertonicity affecting walking using gait and motion analysis correlated with functional walking abilities; and (3) to implement research to evaluate the effectiveness of specific physical and pharmacological gait enhancement interventions. This work is directed toward patients with hemiparesis following stroke, paraparesis and quadriparesis following an incomplete spinal cord injury and a selected group of patients with cerebral palsy.



Gait interventions are often based on clinical findings, prognosis, and on early versus later rehabilitation strategies following the injury. For example, intensive and task-specific motor training strategies may be introduced in the early stages of recovery aimed to reinforce neurological, spontaneous recovery period. Motor re-learning and adaptation, drug therapies or assistive aids and orthotic devices are often implemented in the later stage of rehabilitation to enhance functional recovery. Physical training strategies under investigation include the neurodevelopmental approach of postural control, body weight support treadmill training, functional electrical stimulation to assist ambulation, and specific muscle training programs using biofeedback, specialized strength training or auditory, rhythmical pacing. Pharmacological therapies to improve gait performance are also being investigated and include the agents 4-aminopyridine and botulinum toxin.

Measurement protocols include static clinical tests and gait laboratory measures of hypertonicity, muscle weakness, trunk and limb motion, balance, endurance, and level of ambulation skills at pre and post intervention periods. Emphasis is on the development of dynamic gait analysis measures of hypertonicity, related to the timing of muscle activity and muscle weakness affecting gait performance using surface electromyography, kinematic (motion and time-distance measures) and kinetic (estimated muscle moments of force) motion analysis. An important component of this work is the integration of the normative gait data base developed at this Centre, on non-disabled subjects walking overground and on a motorized treadmill at extremely slow walking speeds (see abstract: Melis et al.). These slower speeds of walking more closely match our patients for more appropriate comparisons. The most

commonly used clinical measures of muscle strength and tone will be added to more quantitative laboratory measures of hypertonicity and gait. A comprehensive evaluation approach will allow us to determine which variables are most related to walking function as measured by the Clinical Outcomes Variables Scale on mobility (COVS).

In this first year, our experience included 6 patients on the body weight support treadmill training; 3 patients, pre-study, on 4-aminopyridine; 7 patients related to botulinum toxin injections; pre-post measures of one patient on intrathecal baclofen pump; and 14 patients referred to the laboratory to assist with the management of specific gait deficits.

This initiative has also led to research endeavours with new collaborators and funding support. Ongoing research and future plans include:

- the evaluation of the effectiveness of 4-aminopyridine drug therapy on gait performance of chronic incomplete spinal cord injured patients funded by the American Paralysis Association and the American Paraplegia Society;

- the beta testing of a newly designed functional electrical stimulator, called the WalkAide™ designed to provide a dynamic ankle-foot orthosis to improve gait performance with chronic stroke patients funded by NeuroMotion Inc, Minnesota, USA;

- the evaluation of hypertonicity during gait of children and adults to assist in the management of spasticity using botulinum toxin injections or alternative interventions;

- the proposal stage of a randomized controlled trial using body weight support treadmill training in the acute phase of traumatic, incomplete spinal cord injured patients in partnership with Dr. H. Barbeau, McGill University, School of Physical and Occupational Therapy, Dr. B. Dobkin, U.C.L.A. and the National Institutes of Health, USA;

- the proposal stage of a longitudinal study to measure the development of hypertonicity and muscle paresis in the early gait recovery phase of patients following a traumatic, incomplete spinal cord injury;

- the preliminary design of motion analysis to detect and monitor postural muscle control and early motor recovery following a stroke; and

- the continued collaboration with Queen's University, School of Rehabilitation Therapy, on gait training strategies for motor recovery following a stroke.

This initiative is supported by the Institute for Rehabilitation Research and Development and the Labatt 24 Hour Relay. Focus group members include: D. DeForge and J. Nymark (coordinators), D. Skillern-Butfoy, S. Gardner, E. Melis, P. McNamara, M. Badour, S. Balmer, E. Lemaire, R. Serjak, L. Goudreau, J. Tomas, A. McCormick, D. Grinnell.

PROGRAM EVALUATION PROGRESS REPORT

Submitted by Louise Seaby

The Program Evaluation project was initiated as a corporate project and has been comprised of three different phases of development. The first phase involved the creation of a document that summarized the latest in rehabilitation and mental health outcome evaluation techniques. This document also included the results of an internal survey that described the status of program evaluation activities within the clinical programs of The Rehabilitation Centre (TRC) and the Royal Ottawa Hospital (ROH). The report was widely circulated both internally and externally and received very positive feedback.

The second phase of development which has now been completed involved piloting a program evaluation approach for a particular service with the objective of determining the feasibility of data collection and its appropriateness with respect to evaluating clinical outcomes. The Stroke Service was selected for this pilot. The results of this phase included the measurement of a set of evaluative questions that included: (1) access (defined as time between initial referral and inpatient admission); (2) outcome (clients' functional improvement); (3) resource use (workload measurement data); (4) goal attainment (the difference between goals set by clinicians at admission and patients actual score at discharge); (5) accuracy of estimated date of discharge (difference between estimated discharge date and actual discharge date); and, (6) client satisfaction.

The third phase which has been underway prior to the completion of Phase 2 involved the roll out of program evaluation to other services within TRC. This involved the participation of TRC as a national pilot site for the testing of the Canadian Institute for Health Information (CIHI) Minimum Data Set. The data collection for this project has now been completed.

Currently, consideration is now being given to the types of standardized reports that could be generated to meet both the needs of clinicians and administration. The emphasis of the program evaluation project will then be to work with the other services to establish and integrate an evaluation strategy that builds on the experience gained from Phase 2.

REHABILITATION ENGINEERING

Submitted by Patricia O'Neill

Rehabilitation Engineering adds a professional engineering dimension to the rehabilitation process by the application of the most appropriate technology and engineering knowhow. Rehabilitation Engineering provides clinical services, is involved in many research activities, performs technology assessments and participates in projects related to the commercialization of rehabilitation products.

Clinical Services

Clinical services include creating custom assistive devices for persons with physical disabilities or adapting existing equipment to meet a specific individual's needs when no commercial system is available. The creation of custom therapy equipment for health care professionals is also a function of Rehabilitation Engineering. Rehabilitation Engineering can become part of any clinical team that requires our input in client care. We are members of the interdisciplinary Gait and Motion Analysis (GAMA) Team and the Technology Access Service (TAS) Team. TAS is an Ontario Assistive Devices Program accredited augmentative communication clinic. Other services include engineering consultations, repair and maintenance of equipment. Approximately 85 requests for our clinical services were completed in the past year.

Research

Rehabilitation Engineering participates in many research and development activities. Ongoing research projects include "A validity-based evaluation of the driving assessment program for stroke patients" and "The development of a voice onset monitor"; abstracts and further details can be found in the Research Project List section of this report. Custom research instrumentation has been developed for research projects. One was a simple periometer, a device that measures peripheral vision. A second project was an instrumented tilting and translating platform for a University of Ottawa researcher Dr. Heidi Sviestrup. Rehabilitation Engineering continues to develop and construct specialized equipment for Dr. Sattar's research at the University of Ottawa's Microbiology Lab.

Technology Assessment and Commercialization

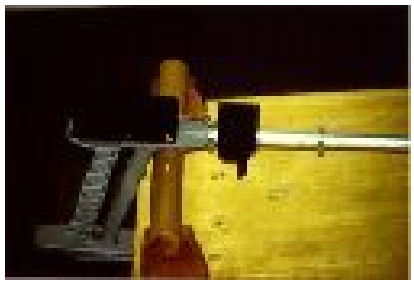
Technology assessments and consultations are carried out for manufacturers of mobility and other assistive devices. The Rehabilitation Centre is one of the two mobility devices test centres in Ontario who advise the Assistive Devices Program (ADP) on whether or not devices should be found eligible for funding by ADP. Mobility devices undergo technical and clinical evaluations to determine safety and performance characteristics. In the past year, one walker and two manual wheelchairs were assessed for this program. An engineering consultation was also provided for a private manufacturer. Rehabilitation Engineering continues to work collaboratively with ipos Orthopedics Industry. Over the past year, both the original *Ottawa Rehab Brim Adapters* and the newer U frames for prosthetic brim holders were made in Rehabilitation Engineering for international distribution by ipos

1997/98 Projects:

The following are some examples of projects completed during this reporting period. Most of our work is devoted to adapting and creating aids and devices to give more function and independence to persons with physical disabilities. Some modifications are simple; others require a more complex solution. We work with clients and other professionals at TRC and other health care facilities in Ottawa to arrive at the best possible solutions.

Modified Reacher

A reacher was modified to meet the needs of a child who used a wheelchair and had diminished hand strength. A pulley system and a ratchet type lever was used so that the gripper on the end could be closed by the client. So instead of squeezing the hand grip, one hand held the hand grip and the other pushed a lever forward, a little at a time, through the pulley system until the end unit closed on the object to be picked up. To release the gripper, the lever was pushed in the opposite direction. The hand grip size was also machined down to fit the size of the child's hand.



Voice Onset Monitor

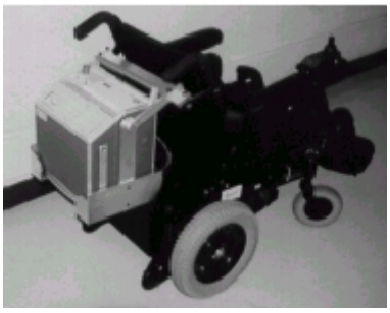
A device to provide feedback to clients learning to control stuttering has been developed through a joint project with the Fluency Program. A third prototype is currently being evaluated clinically. This version incorporates a liquid crystal display.

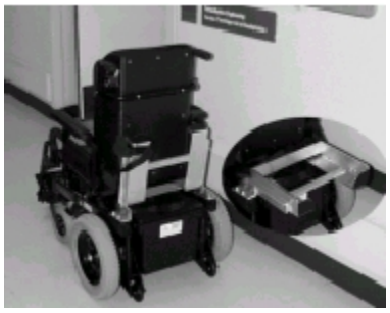
Custom Switch Mounting

Although many commercial systems exist, sometimes switches need to be mounted in a way that requires a custom solution. The first example shows a switch mounting bracket for a client's bed at home; additional components allow the switch to be easily mounted on the client's wheelchair also. The second example is a simple gooseneck holder which has been adapted to hold a switch or a ventilator mouthpiece

Mounting Ventilator Systems on Wheelchaires

More clients are opting for non-invasive home ventilation. This presents challenges in adapting various mobility devices safely and conveniently to accommodate a ventilator, the extra external battery and the mounting system for the mouthpiece. Three custom systems were provided for clients over this reporting period. Shown below are two examples. One system keeps the ventilator tray upright with any tilt and/or recline angle by suspending it across a bar at the back of the wheelchair and allowing it to pivot as the chair changes position. In the second example, the ventilator can be removed and the tray flipped up out of the way when not in use which was helpful when transporting the wheelchair in a van.





Car Modifications

Turn signal arm adapters that transfer all controls on the turn signal arm from the left side of the steering column to the right for persons who have had a stroke are devices that we continue to make. Shown here is a guard made and installed to keep the driver's drop foot on the gas pedal and from unintentionally sliding from the gas to the brake.

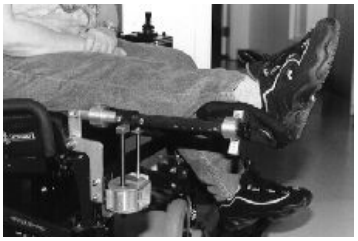
Wheelchair Bumper

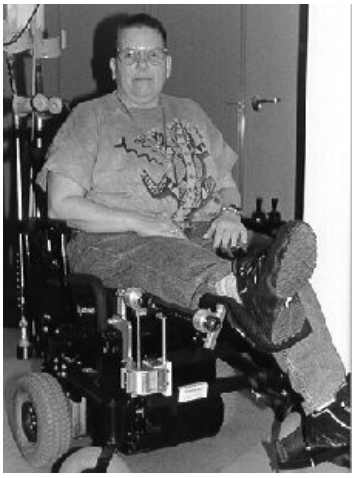
A solid front bumper for a client's power wheelchair was made with a quick release mechanism to ease transfers in and out of the wheelchair. The bumper was given an anodized finish and a thick rubberized material was added on both corners. In addition to protecting the client's feet, this bumper also protects the communication system on her tray.

Research Instrumentation: Periometer and Tilting Platform

A periometer is an instrument that measures the angle at which a person's peripheral vision starts. This simple device was required to provide data for a TRC research project on the assessment of drivers who have had a stroke. As the therapist moves an arm positioned on the top of the device from the side to towards the centre, the client while looking straight ahead indicates when they see a bead hanging down from the arm. The angle is read from the top by the therapist.

An instrumented platform was also developed in Rehabilitation Engineering for research in balance while standing. The platform can be set up to either tilt about a fixed pivot point or move back and forth in the horizontal plane. The control panel, as shown here, allows the operator to switch from linear to angular motion, adjust the maximum distance or angle the platforms travels, reverse the direction of motion, adjust the speed of the motion, and adjust the amount of delay before the device returns to the neutral position. The device adjusts the zero position automatically. After the parameters are set, the starting and stopping of the motion is controlled by the operator via a footswitch. Values on the current position of the platform can be output to a computer. It is intended that the platform will be used with a harness system to prevent someone from falling when balance is being tested. It was designed so that the platform area was open so that the testing can be video taped from different angles for the purpose of motion analysis.





Custom Adjustable Leg Support

A custom leg support was made for a client with a fused knee. Unable to find a commercially available leg rest for her power wheelchair that would give her leg adequate support and keep her leg elevated and straight, the client tolerated much discomfort. The custom solution allowed the client to have the support and positioning required. A specialized mechanism was incorporated to allow the client, who also had weakness due to osteoporosis, to independently adjust the elevation as needed.

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Nelson, M.A., (in press). A view of social work advocacy in hospitals in eastern Ontario. Social Work in Health Care.

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Wilson, K.G., Séguin, N., Goodman, A.M., Green, G., & Pole, M. (in press). Satisfaction of rural health professionals with a rehabilitation mobile outreach program. Archives of Physical Medicine and Rehabilitation.

CONFERENCE PRESENTATIONS

Badour, M. (1997, November). Body weight support treadmill training in the sub-acute stage of recovery after incomplete spinal cord. Presented at The Rehabilitation Network of Ottawa-Carleton Education and Research Day, Ottawa, Ontario.

Balmer, S.J. (1996, November). Evidence-based practice: Getting the bus onto the road. Presented at the Evidence-Based Practice in Rehabilitation Education and Research Day, Ottawa, Ontario.

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Blair, R., Hunt, L., O'Neill, P., Barwin, J., Boyd, E., Harper, D., Pepin, P., & O'Hara, P. (1997, November). A validity based evaluation of the cognitive behavioural driver's inventory and The Rehabilitation Centre's driving assessment for stroke patients (inter-rater reliability results). Presented at The Rehabilitation Network of Ottawa-Carleton Education and Research Day, Ottawa, Ontario.

Blair, R., Hunt, L., O'Neill, P., Barwin, J., Boyd, E., Harper, D., Pepin, P., & O'Hara, P. (1998, May). A validity based evaluation of the cognitive behavioural driver's inventory and The Rehabilitation Centre's drving assessment for stroke patients (inter-rater reliability results). Presented at the 19th Annual Meeting of the Inter-Urban Stroke Academic Association, Kingston, Ontario.

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Brosseau, L., Tousignant, M., Budd, J., Chartier, N., Duciaume, L., Plamondon, S., O'Sullivan, J., O'Donoghue, S., & Balmer, S. (1997, May). Intratester and intertester reliability and criterion validity of the parallelogram and universal goniometers for active knee flexion in healthy subjects. Presented at the Congrès Annuel de l'ACFAS, Trois-Rivières, Québec.

Curryer, G.J. (1997, February). CAD/CAM foot orthoses. Presented at the Ontario Society of Chiropodists Annual Conference, Toronto, Ontario.

Curryer, G.J. (1997, February). Common foot problems and orthotic solutions. Presented at the Orthotic Review Course, University of Ottawa, Faculty of Medicine, Division of Physical Medicine & Rehabilitation, Ottawa, Ontario.

Curryer, G.J. (1997, February). Orthopaedic solutions to diabetic foot pressure problems. Presented at the Ontario Society of Chiropodists Annual Conference, Toronto, Ontario.

Curryer, G.J. (1997, March). Practical demonstration of AMFIT CAD/CAM foot othoses system. Presented at The Ontario Chiropody Program, Toronto, Ontario.

Curryer, G.J. (1997, May). Functional Hallux Limitus (FHL): Fact or fiction. Identification of the temporal and pressure anomalies suggested as an indicator for the presence of FHL. Presented at the Clinical Conference & Research Symposium, The Toronto Hospital, Toronto, Ontario.

Curryer, G.J . (1997, June). Functional Hallux Limitus (FHL): Fact or fiction. Identification of the temporal and pressure anomalies suggested as an indicator for the presence of FHL. Presented at the IRRD Research Working Group Meeting, Ottawa, Ontario.

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Lemaire, E.D. (1997, May). Low-bandwidth orthotic telemedicine. Presented at the International Symposium: CAD/CAM Systems in Pedorthics, Prosthetics & Orthotics, Nuremberg, Germany.

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Lemaire, E.D. (1997, November). Rehabilitation computer applications for measurement and evaluation. Presented at the School of Physical and Occupational Therapy, McGill University, Montreal, Quebec.

Lemaire, E.D., & Bexiga, P. (1996, July). A quantitative method for defining manual socket modifications. Presented at the Canadian Association of Prosthetists and Orthotists Convention, Vancouver, British Columbia.

Lemaire, E.D., & Bexiga, P. (1997, May). A quantitative method for defining manual socket modifications. Presented at the International Symposium: CAD/CAM Systems in Pedorthics, Prosthetics & Orthotics, Nuremberg, Germany.

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Lemaire, E.D., & O'Neill, P. (1996, November). Using the Internet to support evidence-based practice. Presented at the Evidence-Based Practice in Rehabilitation Education and Research Day, Ottawa, Ontario.

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Martel, G., Torres-Moreno, R., Lemaire E.D., & Vaszquez-Vela, E. (1997, May). The introduction of CAD/CAM technology as applied to prosthetic limb fabrication in Mexico. Presented at the Orthopädie+Reha-Technik World Congress, Nuremberg, Germany.

McIlwraith, R., De Wet, C., & Wilson, K.G. (1997, June). Rural and remote communities: Issues for clinical psychology practice and training. Presented at the 58th annual meeting of the Canadian Psychological Association, Toronto, Ontario. Canadian Psychology, 38, 3 (abstract).

McKim, D.A. (1996, November). Airway management in neuromuscular disease. Presented at the Respiratory Therapy Society of Ontario Educational Forum, Eastern Ontario Chapter, Ottawa, Ontario.

McKim, D.A. (1997, October). Chronic respiratory failure. Presented at the Canadian Society of Respiratory Therapy National Education Forum, Ottawa, Ontario.

McKim, D.A. (1997, November.) Assisted cough in spinal cord injury. Presented at The Rehabilitation Network of Ottawa-Carleton Education and Research Day, Ottawa, Ontario.

McKim, D.A., LeBlanc, C., & Gardner, S. (1998, January). Pulmonary rehabilitation in meuromuscular disorders. Presented at the Visiting Professor, Department of PM&R, Queen's University, Kingston, Ontario.

McKim, D.A., LeBlanc, C., & Walker, K. (1997, March). Entirely outpatient provision of non- invasive positive pressure ventilation. Presented at the 6th International Home Ventilation Conference, Lyon, France.

McKim, D.A., LeBlanc, C., Walker, K., Corbin, T., Thivierge, C., Liteplo, J., & Brule, I. (1997, June). Exploring breathing support options non invasively. Presented at the ROHCG, Ottawa, Ontario.

Melis, E., Balmer, S., Nymark, J., Levac, D., & Lemaire, E.D. (1998, April). Normal EMG phasic timing at extremely slow walking speeds. Presented at the 3rd Annual Gait and Clinical Movement Analysis Meeting, San Diego, California. Gait and Posture 7(2):172, 1998 (abstract).

Milne, K., & Pelletier, F.L. (1997, May). Group programming in community reintegration. Presented at the 17th Annual New Beginnings Conference, Niagara-on-the-Lake, Ontario.

Morin, M., Brosseau, L., & DeGirardi, C. (1997, May). A theoretical framework for low level laser therapy (classes I, II and III) application in physiotherapy. Presented at the Congrès Annuel de l'OPQ, Québec, Québec.

Morin, M., Brosseau, L., & DeGirardi, C. (1997, May). A theoretical framework for low level laser therapy (classes I, II and III) application in physiotherapy. Presented at the OPSEP, Ottawa, Ontario.

Nelson, M.A. (1997, November). Advocating for clients: Results of a recent study of the advocacy role of social workers in hospitals in eastern Ontario. Presented at The Rehabilitation Network of Ottawa-Carleton Education and Research Day, Ottawa, Ontario.

Nymark, J., DeForge, D., Skillern-Butfoy, D., Lemaire, E.D., Melis, E., Badour, M., McNamara, P., Serjak, R., Goudreau, L., & Tomas, J. (1997, November). Gait enhancement strategies in the early rehabilitation of persons following a stroke or spinal cord injury. Presented at The Rehabilitation Network of Ottawa-Carleton Education and Research Day, Ottawa, Ontario.

Nymark, J., Lemaire, E.D., Balmer, S., Tomas, J., Goudreau, L., & O'Neill, P. (1996, November). Using gait and motion analysis in evidence-based practice. Presented at the Evidence-Based Practice in Rehabilitation Education and Research Day, Ottawa, Ontario.

O'Neill, P. (1998, May). Rehabilitation engineering: Clinical and research services. Presented at the Regional Rehabilitation Science Rounds, The Rehabilitation Centre, Ottawa, Ontario.

O'Neill, P., Goudreau, L., Deegan, P., Pepin, P., LeBlanc, C., & Walker, K. (1997, November). Custom mounting of ventilators on mobility devices. Presented at The Rehabilitation Network of Ottawa-Carleton Education and Research Day, Ottawa, Ontario.

Olney, S., Nymark, J., Zee, B., Martin, C., & McNamara, P. (1997, October). Effects of computer-assisted gait training (BioTRAC) in early stroke- a randomized clinical trial. Presented at the North American Stroke Meeting, Montreal, Quebec.

Pelletier, F. L., & Caughey, S. C. (1997, October). Health promotion for women with brain injuries. Presented at the 11th Pacific Coast Brain Injury Conference, Vancouver, British Columbia.

Pelletier, F. L., & Ferland, M. (1996, October). Outcome measurement in brain injury rehabilitation. Presented at the Sisters of Charity Spring Conference on Brain Injury, Ottawa, Ontario.

Pelletier, F.L., & Milne, K. (1996, September). Application of group programming to cognitive rehabilitation. Presented at the Tenth Annual Cognitive Rehabilitation and Community Integration Conference, Washington, DC.

Pelletier, F.L., & Milne, K. (1997, October). Promoting community integration through group therapies. Presented at the 11th Pacific Coast Brain Injury Conference, Vancouver, British Columbia.

Roberts, P.M., Bock, C., Tobin, M., Godin, J. (1997, August) Perceived naturalness of treated stutterers'speech: Differences across rater groups. Presented at the International Fluency Association Second World Congress on Fluency Disorders, San Francisco, California.

Taylor, J., & Lemaire E.D. (1996, July). Analysis of shape data using Orthocad and Cadview. Presented at the Canadian Association of Prosthetists and Orthotists Convention, Vancouver, British Columbia.

Torres-Moreno, R., Lemaire, E.D., Martel G., & Vaszquez-Vela, E. (1997, June). Canadian computer-aided technology for central fabrication of prosthetic sockets in Mexico. Presented at the Canadian Physiotherapy Association National Congress, Winnipeg, Manitoba.

Trudel, G. (1996, September). Pilot results on the myogenic and arthrogenic components of articular contractures due to immobility in the rat knee. Presented at the 65th Annual Meeting of the Royal College of Physicians and Surgeons, Halifax, Nova Scotia. Clinical and Investigative Medicine, 19, (Suppl), 79 (abstract).

Trudel, G., & Jabi, M. (1997, September). Assessment of intra-articular tissue proliferation after immobility in rat knee joints. Presented at the 66th Annual Meeting of the Royal College of Physicians and Surgeons, Vancouver, British Columbia. Clinical and Investigative Medicine, 20, (Suppl): 77 (abstract).

Trudel, G., Uhthoff, H., & Brown, M. (1998, May). The late phase of joint contracture: An experimental study. Presented at the 2nd Mediterranean Congress of Physicial Medicine and Rehabilitation, Valencia, Spain.

Walker, K. (1996, November). Non invasive positive pressure ventilation and volume augmentation. Presented at the Respiratory Therapy Society of Ontario Educational Forum, Eastern Ontario Chapter, Ottawa, Ontario.

Wilson, K.G. (1997, August). Euthanasia and physician-assisted suicide: Mental health considerations. Presented at S.S. Canetto (Chair), Psychological dimensions of the euthanasia/assisted suicide debate. Symposium conducted at the one hundred and fifth annual meeting of the American Psychological Association, Chicago, Illinois.

Wilson, K.G. (1998, February). Talking to the terminally ill about euthanasia and physician-assisted suicide. Presented at the Clinical Epidemiology Unit, Loeb Research Institute, Ottawa, Ontario.

Wilson, K.G., & Currie, S.R. (1997, November). Cognitive-behavioural treatment of insomnia associated with chronic pain. Presented at The Rehabilitation Network Education and Research Day, Ottawa, Ontario.

Wilson, K.G., O'Neill, P., & Lemaire, E.D. (1996, November). Using the literature to answer clinical questions. Presented at the Evidence-Based Practice in Rehabilitation Education and Research Day, Ottawa, Ontario.

Wilson, K.G., Petersen, E., Montuoro, L., & Robert, R. (1997, June). Reliable individual change in cognitive-behavioural group therapy for chronic pain. Presented at the 58th annual meeting of the Canadian Psychological Association, Toronto, Ontario. Canadian Psychology, 38. 59 (abstract).

Wilson, K.G., Séguin, N., Goodman A.-M., Greene, G., & Pole, M. (1997, November). Satisfaction of rural health professionals with a rehabilitation mobile outreach program. Presented at The Rehabilitation Network Education and Research Day, Ottawa, Ontario.

RESEARCH PROJECT LIST

Pg #	Title	Investigator	Affiliation	Funding Source	Funding Amount
41	A multicenter, prospective study to clinically evaluate the neuromotion walkaide™ : A neuromuscular stimulator for foot drop in stroke rehabilitation	D. DeForge D. Skillern-Butfoy E. Melis J. Nymark R. Serjak J. Tomas L. Goudreau	TRC TRC TRC/UO TRC TRC TRC TRC	NMI	10,000
41	Assessment and treatment of insomnia in chronic pain	S. Currie* K. Wilson	UO TRC	PMRF NHRDP LR	5,000 54,000 12,173
42	A validity based evaluation of the driving assessment program for stroke patients	L. Hunt P. O'Neill E. Boyd* R. Blair D. Harper P. Pepin	TRC TRC TRC SCOH SCOH TRC	LR TDC	14,542 14,552
42	Body weight support treadmill gait training in the subacute recovery phase of incomplete spinal cord injury	D. DeForge J. Nymark H. Barbeau M. Badour S. Bercovitch J. Tomas L. Goudreau J. MacDonald	TRC TRC MU TRC TRC TRC TRC CA	LR	15,000
43	Comparison of CAD/CAM and conventional techniques for the fabrication of trans-tibial sockets with supracondylar suspension	E. Lemaire P. Bexiga* T. John G. Martel	TRC TRC TRC TRC	ORTC LR ORTC	10,000 2,800 578
43	Computer assisted feedback in the treatment of stroke patients	S. Olney J. Nymark B. Zee P. McNamara S. Lyonnais* M.-A. Paquin J. Tomas D. Grinnell I. McBride C. Martin S. Brown M.J. Demers S. Bagg G. Shanks	QU TRC QU TRC TRC TRC TRC TRC QU SML SML SML SML SML	OMH	218,000

Pg #	Title	Investigator	Affiliation	Funding Source	Funding Amount
44	Computer interfaces for persons with severe disabilities	L. Goudreau J. Tomas P. Deegan P. O'Neill	TRC TRC TRC TRC	LR	2,050
44	Depression, hopelessness and suicidal ideation in the terminally ill	H. Chochinov K. Wilson M. Enns S. Lander	UM TRC UM UM	MMHRF MCTRF	10,000 10,000
44	Development and pilot testing of a measurement based CAD/CAM system for fitting people with new trans-tibial amputations	E. Lemaire D. Nielen J. Fawcett Y. Jeffreys W. Kaphingst C. Hagemann	TRC TRC TRC TRC IPOS IPOS	LR	17,000
45	Distance communication and remote rehabilitation services	E. Lemaire Y. Boudrias G. Greene	TRC TRC TRC	TCF HCF	92,200 10,000
45	Early access, open label trial of riluzole 50 mg bid in treatment of amyotrophic lateral sclerosis (ALS)	A. Newall* M. Hunt N. Ridgeway	TRC TRC TRC	RPR	35,650
46	Effect of 4-aminopyridine on gait in ambulatory spinal cord injuries: A double-blind, placebo-controlled, crossover trial	D. DeForge J. Nymark E. Lemaire S. Gardner R. Serjak M. Hunt L. Martel L. Goudreau J. Tomas	TRC TRC TRC TRC TRC TRC CA TRC TRC	APA APS	9,318 12,876
46	Efficacy, safety and tolerability study of SR57746A in patients with ALS	A. Newall* D. Jackson K. Walker	TRC TRC TRC1	SAN	245,852
47	Euthanasia and physician-assisted suicide feasibility study	K. Wilson J. Scott I. Graham J. Kozak S. Chater R. Viola	TRC SCOH LOEB SCOH OCH OCH	NHRDP	25,000
47	Evaluation of the voyager prosthetic foot/ankle	E. Lemaire A. Platzer C. McCarthick	TRC TRC SLS	SLS LR	7,915 2,140

Pg #	Title	Investigator	Affiliation	Funding Source	Funding Amount
47	Functional hallux limitus (FHL): Fact or fiction. Identification of the temporal and pressure anomalies suggested as an indicator for the presence of FHL	G. Curryer E. Lemaire	TRC TRC		
48	Intratester and intertester reliability and criterion validity of the parallelogram and universal goniometers for maximum active knee flexion and extension on patients with knee restrictions	L. Brosseau S. Balmer M. Tousignant J.P. O'Sullivan S. Gingras C. Goudreault M. Goudreault	UO TRC UO UO UO UO UO	LR	6,000
49	Normative EMG patterns of overground and treadmill walking at extremely slow walking speeds	E. Melis S. Balmer J. Nymark E. Lemaire	UO TRC TRC TRC	LR	16,340
49	Perceived naturalness of treated stutterers'speech: Differences across rater groups	P. Roberts C. Bock* J. Godin M. Tobin	UO TRC UO UO		
49	Role of fibroblast growth factor-2 on connective tissue proliferation during articular contracture formation	G. Trudel	TRC	LR	33,999
50	Satisfaction of rural health professionals with a rehabilitation mobile outreach program	K. Wilson N. Seguin A.-M. Goodman G. Greene M. Pole	TRC UO TRC TRC TRC		
50	Study of process of meaning perspectives transformation during a modification of occupational performance balance during occupational therapy treatment in neuro-rehabilitation	C.-J. Dubouloz C. Lachaine	UO TRC	UO LR	2,400 2,500
51	The development of a voice onset monitor	L. Goudreau J. Tomas A. Meltzer	TRC TRC TRC		

* Investigators no longer at The Rehabilitation Centre

KEY	Affiliation	
	CA	Consumer Advisor
	IPOS	ipos Orthopedics
	LOEB	Loeb Research Institute
	MU	McGill University
	OCH	Ottawa Civic Hospital
	QU	Queen's University
	SCOH	Sisters of Charity of Ottawa Hospital
	SLS	Seattle Limb Systems
	SML	St. Mary's of the Lake Hospital
	TRC	The Rehabilitation Centre
	UM	University of Manitoba
	UO	University of Ottawa

Funding Source	
APA	American Paralysis Association
APS	American Paraplegia Society
HCF	Harold Crabtree Foundation
INT	Internal
IPOS	ipos Orthopedics
LR	Labatt 24 Hour Relay
MCTRF	Manitoba Cancer Treatment and Research Foundation
MMHRF	Manitoba Mental Health Research Foundation
NHRDP	National Health Research & Development Program
NMI	NeuroMotion Inc., USA
OMH	Ontario Ministry of Health
ORTC	Ontario Rehabilitation Technology Consortium
PMRF	Physical Medicine Research Foundation
RPR	Rhône-Poulenc Rorer Pharmaceuticals
SAN	Sanofi Pharmaceuticals
SLS	Seattle Limb Systems
TCF	The Change Foundation
TDC	Transportation Development Centre
UO	University of Ottawa

RESEARCH PROJECTS

A MULTICENTER, PROSPECTIVE STUDY TO CLINICALLY EVALUATE THE NEUROMOTION WALKAIDE™ : A NEUROMUSCULAR STIMULATOR FOR FOOT DROP IN STROKE REHABILITATION

D. DeForge, D. Skillern-Butfoy, E. Melis, J. Nymark, R. Serjak, J. Tomas, L. Goudreau

A North American multi-center clinical testing is being conducted by NeuroMotion Inc. (Minnesota, USA) to determine the clinical benefits and client satisfaction of a new device designed to improve ambulation in stroke victims. Frequently, a stroke causes unilateral paresis affecting muscles that produce a safe foot clearance during the swing phase of walking. The WalkAide™ is an externally applied functional electrical stimulator worn as a cuff around the lower leg directly below the knee. The device is programmed by the physiotherapist to artificially stimulate the nerve and the paretic ankle muscles in order to facilitate foot clearance and avoiding foot drop during walking. This device may provide an innovative alternative to the conventional ankle-foot orthosis with an added opportunity for possible therapeutic muscle training. A total of 50 patients from six sites is planned and The Rehabilitation Centre was invited to participate in this clinical trial to evaluate 10 individuals over the next 18 months. The objectives of the study are to evaluate the effects of the device, worn daily for one year by the participant, on muscle control of the affected lower limb, walking deficits and changes in activities representing the quality of life. Test results are compared within each participant between wearing an ankle-foot orthosis (if applicable) or using the WalkAide™ device for correction of ankle dorsiflexion. Individuals undergo a screening evaluation, an initial orientation and training visit, and follow-up visits at 1 month, 2 months, 3 months, 6 months, and one year. Test measures include a motor recovery scale for the lower limb (Chedoke-McMaster Motor Assessment), gait analysis measures of joint motion, muscle timing and estimated forces, balance performance (Berg Balance Scale), Physiological Cost Index (PCI) of walking tolerance, and the SF-36 quality of life assessment scale. Participants, family, and physiotherapists are requested to provide comments on compliance in wearing the device and feedback on the possible cost-benefits of this technology. The first three participants have been identified to commence in June, 1998.

ASSESSMENT AND TREATMENT OF INSOMNIA IN CHRONIC PAIN

S. Currie, K. Wilson

Insomnia is a significant problem for many people with chronic pain. In this program of research, we are investigating the nature and severity of the sleep disturbance in this patient group (using the subjective and objective assessment methods), examining the clinical correlates of the sleep disturbance, and developing a non-pharmacological intervention to treat it. To date, we have found that among chronic pain patients who complain of insomnia, sleep fragmentation (maintenance insomnia) is virtually universal, although not all patients have sleep onset problems. Pain intensity shows the most consistent correlations with the severity of the sleep disturbance, but only when sleep is assessed by self-report rather than by physical activity measures. We have also written a treatment manual for insomnia and pilot-tested it with a small group of patients who have chronic pain complaints. The results were promising, so we are currently recruiting patients into a formal randomized controlled trial of the intervention. To date, over 50 patients have been enrolled.

A VALIDITY BASED EVALUATION OF THE DRIVING ASSESSMENT PROGRAM FOR STROKE PATIENTS

L. Hunt, P. O'Neill, E. Boyd, R. Blair, D.Harper, P. Pepin

The Rehabilitation Centre, Ottawa (TRC) has developed a standardized procedure for assessing the suitability of patients to resume driving after stroke. A clear "gold standard" for such assessment based on cognitive and behavioural performance has emerged from the professional and research literatures. This Cognitive Behavioural Driver's Inventory (CBDI) provides a possible alternative procedure to be used at the Centre.

The present study, using both concurrent and predictive validity approaches, is designed to answer the question of whether the currently employed technique is as good as or superior to the CBDI in predicting "pass" or "failure to pass" on a standardized on-road driving test. In addition, each assessment procedure will be costed to determine which is more cost effective.

An inter-rater reliability study was undertaken to ensure that the TRC procedures could be reliably administered by two different rehabilitation clinicians. The results indicated that the inter-rater reliability was extremely high and statistically significant.

Having established good inter-rater reliability data collection for the research subjects commenced. Fifteen subjects have started in the data collection process; complete data sets for nine of the fifteen subjects has been collected. It is anticipated that data collection will be completed by the fall of 1999.

BODY WEIGHT SUPPORT TREADMILL GAIT TRAINING IN THE SUBACUTE RECOVERY PHASE OF INCOMPLETE SPINAL CORD INJURY

D. DeForge, J. Nymark, H. Barbeau, M. Badour, S. Bercovitch, J. Tomas, L. Goudreau, J. MacDonald

A pilot study was conducted on five patients with an incomplete spinal cord injury (iSCI) using a body weight support treadmill training (BWSTT) gait strategy within the subacute phase of recovery. The objectives of this project were to define appropriate candidates, identify treatment parameters, select impairment and disability outcome measures, and solicit consumer input in preparation for a clinical efficacy trial.

Five patients, ranging from C2 lesion to T10, consented to participate and were within two months post-injury. A commercially available mechanical suspension frame straddled a motorized treadmill and a modified climber's harness was used for support. All participants were non-ambulatory on entry into the study. The BWSTT intervention, consisting of 36 one hour sessions over a three month period, was conducted by physical therapists and was customized to the patient's abilities. Evaluations were conducted at baseline, at six weeks, and at the 12-week post-test interval. Clinical impairment measures included muscle strength, sensation, muscle tone, perceived exertion, and treadmill training endurance. Gait analysis provided dynamic quantification of kinematic and surface electromyography (EMG) of five muscles of the right lower limb on all participants on the BWS treadmill and overground walking. A disability outcome measure was used to grade the level of ambulation function. A consumer team member conducted feedback interviews with participants to obtain their input into this research direction.

Lower limb unloading varied from 26% to 83% of body weight. All participants completed the 12-week training program and four individuals eventually progressed to overground walking. The fifth participant, with the most severe motor impairments, did not achieve functional overground walking without the aid of bilateral knee-ankle-foot orthoses. Improvements were evident in the clinical measures of strength, endurance, and %BWS. Positive changes were recorded in temporal-spatial, joint motion, and EMG gait measures matching increased ambulation function in four out of the five patients. Gait analysis

changes in one patient were highlighted to illustrate dynamic measures of motor recovery. Consumer input and patient-feedback were positive and included suggestions for improvements. *Conclusions:* A multi-centre randomized controlled trial is advocated to evaluate the efficacy of a BWSTT gait strategy in the subacute recovery phase of iSCI. This pilot work resulted in specific recommendations in the selection of candidates, in the training and evaluation parameters, and the potential value of consumer input for future research. Different phases of this study have been presented at conferences and the final results have been submitted for publication.

COMPARISON OF CAD/CAM AND CONVENTIONAL TECHNIQUES FOR THE FABRICATION OF TRANS-TIBIAL SOCKETS WITH SUPRACONDYLAR SUSPENSION

E. Lemaire, P. Bexiga, T. John, G. Martel

A quantitative method was developed for reverse-engineering manual socket modifications, averaging these modifications over a series of clients, and using the average modifications as a template in commercial CAD/CAM systems. The CADVIEW software program was written to provide prosthetists with tools to visualize, analyse, and compare CAD and manual sockets. Comparison functions provided tools for aligning sockets to a common axis, visualizing the differences between sockets, generating modification outlines, assigning apex point values, and averaging the modification outlines. A CAD template generated in this manner should be the best general representation of a prosthetist's modification style. To test this hypothesis, thirteen people with trans-tibial amputations were fit with both a manual and a CAD/CAM socket. Questionnaires were completed by the subjects and by the prosthetist to obtain information on prosthetic comfort, function, and overall satisfaction. Ground reaction force and stride parameter data were also collected for each prosthesis during gait laboratory testing. No significant differences were found between the manually designed socket and the CAD/CAM designed socket for all measures except the vertical peak forces on the amputated side. These results support the clinical application of this quantitative technique for making the transition from manual to CAD/CAM prosthetic modification procedures.

COMPUTER ASSISTED FEEDBACK IN THE TREATMENT OF STROKE PATIENTS

S. Olney, J. Nymark, P. McNamara, S. Lyonnais, M.-A. Paquin, J. Tomas, D. Grinnell, I. McBride, C. Martin, S. Brown, M.J. Demers, S. Bagg, G. Shanks

Stroke is an important source of disability in the aging population. Increased understanding of the biomechanics of the gait of persons with stroke and the availability of new technology prompted this study of the effectiveness of a computer-assisted method of training (BioTRAC). The objectives of the study were to test whether treatment using computer assisted feedback would improve the self-selected speed of walking, the symmetry of walking, and the joint excursions during gait compared to those who received only traditional gait training. A two-centre, randomized control design was used. A total of 106 subjects from two rehabilitation centres were randomly allocated to fifteen treatments of BioTRAC or to traditional treatment only. Measures were taken before and after the treatment program, and three months after cessation. Some measures were taken at two intervals during the program. Both groups made major gains in the three outcome measures. Speed increased over the treatment period an average of 26 cm/s for the BioTRAC group and 22 cm/s for the traditional group when measured by a free walk. Corresponding values, when measured during a videotaped walk, were 22 cm/s and 12 cm/s, values that were significantly better for the BioTRAC group. Symmetry improved and joint excursion, during gait, increased by 11.1 degrees for the BioTRAC group and 3.8 degrees for the traditional group. These differences were not significant, though differences in joint excursion narrowly missed significance. Multiple linear regression revealed that BioTRAC was significantly more effective in attaining more joint excursion during gait if prognostic factors were controlled in the model. No differences between treatments were statistically significant if differences between initial and three-month post-treatment values were used in the analyses. In summary, large gains in all outcomes were

achieved with either treatment. Generally, treatment using computer assisted methods yielded better, but not significantly better, results in terms of speed, symmetry, and joint excursion. The main results were presented at the North American Stroke Meeting, October 1997, Montréal, and the abstract was published in the Journal of Stroke and Cerebrovascular Diseases. Article publication is planned for the Fall, 1998.

COMPUTER INTERFACES FOR PERSONS WITH SEVERE DISABILITIES

L. Goudreau, J. Tomas, P. Deegan, P. O'Neill

In our ongoing development of computer interfaces, in the past year our efforts were focused on the further development and testing of a mouthstick for loading and retrieving computer disks. As part of a fourth year engineering design project at Carleton University, Kathleen English redesigned the original prototype to make it much easier to manufacture. Also, protocols and questionnaires were designed to evaluate prototypes with non-impaired subjects and with consumers, with additional input from Occupational Therapy at TRC. This project was co-supervised by Dr. Donald Russell, Prof. Mechanical and Aerospace Engineering at Carleton University.

DEPRESSION, HOPELESSNESS AND SUICIDAL IDEATION IN THE TERMINALLY ILL

H. Chochinov, K. Wilson, M. Enns, S. Lander

In the early 1990's we collected an extensive dataset addressing the psychosocial and mental health concerns of patients receiving palliative care for advanced cancer. In-depth structured interviews were conducted with 200 dying people. This dataset continues to be a rich source of information for addressing basic questions about the psychological dimensions of the end of life. To date, it has served as the basis for articles dealing with the assessment of depression(Am. J. Psychiatry, 1994, 151, 537-540; Am. J. Psychiatry, 1997, 154, 674-676; forthcoming book chapter), and has been an important source of data informing the euthanasia/assisted suicide debate (Am. J. Psychiatry, 1995, 152, 1185-1191; Can. J. Psychiatry, 1995, 40, 593-602; Psychosomatics, 1998, 39, 366-370).

DEVELOPMENT AND PILOT TESTING OF A MEASUREMENT BASED CAD/CAM SYSTEM FOR FITTING PEOPLE WITH NEW TRANS-TIBIAL AMPUTATIONS

E. Lemaire, D. Nielen, J., Fawcett, Y. Jeffreys, W. Kaphingst, C. Hagemann

Computer Aided Design (CAD/CAM) is an efficient and consistent way of making a prosthetic socket. The easiest way of defining a socket shape is to take a series of measurements that the CAD system can use to calculate an appropriate socket shape. The prosthetist can then use the CAD software to customize this shape for the client. While this system has been effective for trans-femoral (TF) prosthetic socket design, less success has been achieved for mature trans-tibial (TT) sockets. In theory, a measurement based CAD/CAM system could work well for new amputees since the typical residual limb has a more bulbous shape. A prosthetist will also try and influence the changes in limb shape over the first months by introducing an appropriate socket. Measurement based system should accomplish this reshaping task in a more efficient and consistent manner. In this development study, a new socket shape will be defined specifically for new TT amputees. Once the shape is defined it will be incorporated into the ipoCAD CAD/CAM system and used to fit a series of new TT amputees. Information of socket fit, modifications, manufacturing times, and clinician satisfaction will be collected and used to assess the feasibility of this design/manufacturing approach.

DISTANCE COMMUNICATION AND REMOTE REHABILITATION SERVICES

E. Lemaire, Y. Boudrias, G. Greene

The accomplishments over the last three years have resulted in a viable method for remote rehabilitation consultation using computer distance communication technology; however, this model must be introduced and evaluated on a broader scale to ensure that the success of this technique was not a local effect. Implementation of this model should also help community hospitals, The Rehabilitation Centre, and *The Rehabilitation Network of Ottawa Carleton* adapt to health care funding and administration changes. In addition, clinical validation is necessary for other areas of physical rehabilitation that differ from the previous, assistive device-oriented, pilot test.

During the next two years, funding from The Change Foundation, the Labatt's Relay Research Fund, The Rehabilitation Centre, and the community partners will be used to install low-bandwidth computer conferencing systems in many communities serviced by the Terry Fox Mobile Clinic. The clinical and technical staff in these community hospitals will be trained to operate the computer system and to use the communication tools to complete rehabilitation consultations. The Mobile Clinic team will act as technical resources during this learning period, as well as the specialized rehabilitation consultants. To help with the learning process, a user-focussed manual and instructional video are currently being developed. This initiative will provide an opportunity to field-test the manual and video. Clinical assessment and follow-up sessions will be scheduled at regular intervals to ensure that the community clinicians maintain their computer skills and so that evaluative data can be collected. In addition to the clinical service objective, the on-line educational content initiative will continue. During the next two years, more content will be developed and the current educational sessions will be assessed.

EARLY ACCESS, OPEN LABEL TRIAL OF RILUZOLE 50 MG BID IN TREATMENT OF AMYOTROPHIC LATERAL SCLEROSIS (ALS)

A. Newall, M. Hunt & N. Ridgeway

ALS (amyotrophic lateral sclerosis, or Lou Gehrig's Disease) is a rare but devastating degenerative disorder of the nervous system. For reasons as yet unknown, motor neurons in the brain and spinal cord begin to die, leading to a relentless loss of muscle control. ALS is ultimately fatal: 50% of ALS patients die within 3 to 4 years of the onset of symptoms. The most common cause of death is respiratory failure, due either to paralysis of respiratory muscles or to infections from accidentally inhaled food and/or upper airway secretions.

In two earlier clinical studies, ALS patients taking riluzole showed a significant increase in median survival over those taking placebo. Survival was defined as the time until tracheostomy, intubation, artificial respiration, death, or the end of the trial period, and median survival as the time when 50% of the patients in each group of the study were surviving. During the trials, median survival with riluzole was longer by 3 months in the phase-2 study, and by 2 months in the phase-3 study.

Although riluzole has not yet been approved for use in Canada, Health Canada's Special Access Programme has been permitting its use in clinical trials, in this case a phase-4 open-label study which monitors patients for longer-term effects. This trial at the Rehabilitation Centre has been in progress since September 1995; as of September 1998 a total of 70 patients have been enrolled in the study, with 17 currently still registered.

EFFECT OF 4-AMINOPYRIDINE ON GAIT IN AMBULATORY SPINAL CORD INJURIES: A DOUBLE-BLIND, PLACEBO-CONTROLLED, CROSSOVER TRIAL

D. DeForge, J. Nymark, E. Lemaire, S. Gardner, R. Serjak, M. Hunt, L. Martel, J. Tomas, L. Goudreau

Currently, approximately 50% of spinal cord injuries are incomplete, with sparing of motor and sensory function below the level of the injury. Consequently, there is a greater number of recently injured individuals that have the potential for ambulation. Animal models of chronic incomplete spinal cord injury (ciSCI) show that one of the pathologies in areas of spared spinal cord function is demyelination. Demyelinated axons conduct inefficiently, with axonal slowing and conduction block, causing fatigue, weakness and sensory loss, contributing to pathologic gait patterns in this population. The aminopyridines, specifically, 4-aminopyridine (4-AP), enhance central conduction in demyelinated axons in animal and human studies. Clinical trials with this drug in multiple sclerosis, Eaton Lambert syndrome, and more recently, spinal cord injury, show that this medication may improve strength, sensation, spasticity, mobility and walking ability (gait). The purpose of this study is to evaluate the effect of this agent on gait enhancement of persons with a ciSCI. This study is a double-blind, placebo-controlled, crossover design. Fifteen, consenting ciSCI individuals, who are community ambulators, will be recruited. The participants act as their own controls and are initially randomly assigned to either the placebo group or the 4-AP group. After two weeks in the initial group, these individuals cross over to the opposite group for an additional two weeks. Participants are examined at baseline, after two weeks on placebo and after two weeks on 4-AP. At admission to the study, muscle and sensory loss (ASIA score) is measured to determine the level of impairment. Outcome measures are obtained at baseline, 2 weeks, and 4 weeks from admission to the study. Measures include muscle strength of the lower limbs using a hand-held dynamometer, gait analysis impairments, walking abilities (COVS subscore), compliance, and subjective comments from each participant. Gait analyses are conducted in the gait laboratory and include measures of three dimensional kinematic (joint motion and time-distance), kinetic (estimated muscle forces) and dynamic, surface electromyography of the major lower limb muscles. Qualitative ambulation changes of each subject are monitored from the video recordings and from a subject-feedback questionnaire designed by the consumer advisor. Ten out of the targeted 15 participants have been recruited with plans to complete the study by late Fall, 1998. The results of this study may provide preliminary quantitative and qualitative evidence of the efficacy of 4-AP on gait enhancement in persons with ciSCI.

EFFICACY, SAFETY AND TOLERABILITY STUDY OF SR57746A IN PATIENTS WITH AMYOTROPHIC LATERAL SCLEROSIS (ALS)

A. Newall, D. Jackson & K.A. Walker

ALS (amyotrophic lateral sclerosis, or Lou Gehrig's Disease) is a rare but devastating degenerative disorder of the nervous system. For reasons as yet unknown, motor neurons in the brain and spinal cord begin to die, leading to a relentless loss of muscle control. ALS is ultimately fatal: 50% of ALS patients die within 3 to 4 years of the onset of symptoms. The most common cause of death is respiratory failure, due either to paralysis of respiratory muscles or to infections from accidentally inhaled food and/or upper airway secretions.

This research, sponsored by Sanofi Pharmaceuticals, is part of a multinational phase-3, double-blind, stratified, placebo-controlled trial of an investigational new drug - SR57746A - which from earlier trials is known to have potent neuroprotective properties. During this trial, the natural progression of ALS is being closely monitored over an 18-month period in 810 patients randomly assigned to three subgroups - 270 receiving a daily dose of 2 mg of the study drug, 270 on 1 mg per day, and 270 on placebo. Disease progression is being measured with a battery of validated scales, both objective and subjective, and intergroup comparison of these scales at the close of the study is expected to show significant slowing of disease progression in those taking the active drug.

We began screening ALS patients in October 1997 and continued to screen and enroll study subjects until April 1998. As of September 1998, at slightly past the halfway point in our study, we have done 109 clinical assessments and 60 interim telephone checks on our study subjects. At the end of their 18-month participation, all study subjects will be given the option of continuing in a phase-4 open-label trial, similar to that for riluzole.

EUTHANASIA AND PHYSICIAN-ASSISTED SUICIDE FEASIBILITY STUDY

K. Wilson, J. Scott, I. Graham, J. Kozak, S. Chater, R. Viola

In Canada, as in many other countries, there is an ongoing debate as to whether we should legalize voluntary euthanasia and physician-assisted suicide for people with terminal illness. In 1995, a special committee of the Senate of Canada reviewed the issue of legalization and concluded that more research is needed into "how many are requesting euthanasia, why it is being requested, and whether there are any alternatives that might be acceptable to those making the requests." This study is being conducted in response to the Senate committee's research recommendation. It is a feasibility study that will involve the administration of in-depth interviews to about 70 people who are nearing death from advanced cancer. With these interviews, we will derive preliminary estimates of (1) the extent to which people at this point in life support the legalization of euthanasia and assisted suicide, and (2) how often euthanasia or assisted suicide might be requested in the event of legalization. We will also develop and validate a new assessment protocol for evaluating various medical, psychological and social factors that might be related to euthanasia and assisted-suicide requests.

EVALUATION OF THE VOYAGER PROSTHETIC FOOT/ANKLE

E. Lemaire, A. Platzer, C. McCarthick

A pilot study is being initiated to evaluate the Voyager Foot/Ankle unit for geriatric people with trans-tibial amputations. The Voyager unit provides a faster foot contact-to-foot flat time during walking, thereby improving stability. The unit also provides some assistance in rotating the lower leg over the foot. Three subjects will undergo an evaluation of their walking style when wearing their usual prosthesis and when wearing their prosthesis with a Voyager foot/ankle attached. The prosthetist and subject will both complete a questionnaire to assess their satisfaction with the device. Evaluation of the questionnaire and walking data will provide valuable information about how the Voyager foot/ankle unit affects walking style and whether this unit improves mobility for people with lower extremity amputations.

FUNCTIONAL HALLUX LIMITUS (FHL): FACT OR FICTION IDENTIFICATION OF THE TEMPORAL AND PRESSURE ANOMALIES SUGGESTED AS AN INDICATOR FOR THE PRESENCE OF FHL

G.J. Curryer, E. Lemaire

Despite recent research demonstrating the lack of any scientific correlation between static biomechanical measurements and dynamic foot function and the inter and intra reliability problems associated with superficial clinical measurements most clinicians still utilize the *Root Paradigm* for applied biomechanical therapies based on these static observations. The "Sagittal Plane Facilitation of Motion Model" and its interpretation of dynamic pedal, lower limb and postural mechanics, has been suggested as a more scientific alternative based on the assessment of temporal and pressure gait anomalies indicating an interruption in the forward progression of the body in the sagittal plane. This study examined specific gait pattern parameters in seven, healthy, asymptomatic subjects using the

Electrodynogram (EDG®) system. All seven subjects presented clinically with relaxed calcaneal eversion, neutral calcaneal varus position and functional hallux limitus (FHL). The temporal and pressure anomalies suggested as an indicator for sagittal plane blockade of motion were identified although no definitive link between these anomalies and functional hallux limitus was demonstrated. Their significance in any pathological process was not investigated, however, the evidence suggests the need for a more objective approach to dynamic foot function and supports a paradigm shift toward the Sagittal Plane Facilitation of Motion Model.

INTRATESTER AND INTERTESTER RELIABILITY AND CRITERION VALIDITY OF THE PARALLELOGRAM AND UNIVERSAL GONIOMETERS FOR MAXIMUM ACTIVE KNEE FLEXION AND EXTENSION ON PATIENTS WITH KNEE RESTRICTIONS

L. Brosseau, S. Balmer, M. Tousignant, J.P. O'Sullivan, S. Gingras, C. Goudreault, M. Goudreault

In physical therapy practice an essential component of range of motion evaluation is the goniometer. Since the centre of rotation of the joint varies with position changes, placing the goniometric fulcrum over this point with the commonly used universal goniometer (UG) is difficult. To overcome this weakness, the Rehabilitation Centre of Ottawa developed the parallelogram goniometer (PG) in 1983. Our research was designed to 1) examine the intra and intertester reliability of the UG and the PG; 2) examine the criterion validity of these two instruments by comparing them with x-rays; 3) examine the convergent validity of visual estimation (VE) by comparing it with goniometric measurements.

Twenty-nine subjects with knee restrictions were recruited and sixteen goniometric measurements were collected per patient. Subjects were evaluated in two positions, knee flexion and knee extension. To serve as a gold standard for range of motion, x-rays were taken in both positions. Intraclass correlation coefficients (ICC), based on repeated-measure ANOVAs, were chosen to estimate the intra and the intertester reliability of both goniometers. To examine the criterion and convergent validity, Pearson product-moment correlation coefficients (r) were used. Significance level of $p<0.05$ for all tests.

The UG intratester reliability in knee flexion (ICC=0.997) and knee extension (ICC=0.981-0.995). The PG intratester reliability was 0.995 (ICC) for flexion and 0.943-0.981 (ICC) for extension. The UG intertester reliability for knee flexion (ICC=0.969-0.976) and extension (ICC=0.929-0.984. The PG intertester reliability ranged form 0.958-0.976 (ICC) for flexion and 0.836-0.897 (ICC) for extension. Criterion validity varied from 0.532 to 0.987 (r) for flexion and 0.215-0.972 (r) for extension with the UG. With the PG the criterion validity was good for flexion (r=0.975-0.988) and fair for extension (r=0.489-0.584). Concerning the convergent validity, the results found for the VE versus the UG were 0.855 and 0.957 (r) for flexion and 0.636-0.930 (r) for extension. When comparing VE versus PG the results indicated a similar convergent validity for flexion (r=0.869-0.957) and for extension (0.663-0.942).

In general, intra and intertester reliability were found to be high for both goniometers, especially with knee flexion. However the results of the UG were slightly more superior. As for the criterion validity, the results were quite variable depending on the subject's position and the testers' experience. Our study also revealed that it is preferable to use the goniometer rather than the visual estimation when measuring active knee range of motion. Considering its adequate psychometric properties and reported ease of application, the PG is recommended, but further studies need to be conducted on other pathological joints with this instrument.

NORMATIVE EMG PATTERNS OF OVERGROUND AND TREADMILL WALKING AT EXTREMELY SLOW WALKING SPEEDS

E. Melis, S. Balmer, J. Nymark, E. Lemaire

A common gait observation in the Rehabilitation Centre's clientele with neurological conditions is the extremely slow walking speed of 0.15 to 0.30 m/s. In quantifying motor patterns of gait using dynamic surface electromyography (EMG), it is necessary to isolate the effects of slow walking speed from actual motor deficits.

Thirty subjects with no past or present walking difficulties participated and walked overground as well as on a motorized treadmill at three different walking speeds: self-selected, 0.3 m/s and 0.2 m/s. Each of the walking trials was repeated three times. During walking, EMG activity was recorded from 5 selected leg muscles (right side only), joint range of motion was determined using a 2-D motion analysis system, kinetic data were recorded on a force plate and temporo-spatial were calculated.

Preliminary kinematic and EMG data from 10 subjects walking overground revealed a decrease in joint excursion with slower walking speed and a proportionate decrease in stride length and cadence. EMG amplitude decreased for all muscles. The gastrocnemius muscle maintained its phasic activity and still appeared to be a major contributor during push-off, while its activity during late swing decreased. The proximal muscles (quadriceps and hamstrings) no longer seemed to be acting as decelerators and showed a prolonged low level of activity.

Complete analysis of the thirty subjects, including kinetics, muscle activation and timing, for the overground and treadmill conditions will provide more insight into the gait characteristics at slower walking speeds. This information is fundamental for the present and future clinical and research directions of upper motor neuron gait studies in the Gait and Motion Laboratory at TRC.

PERCEIVED NATURALNESS OF TREATED STUTTERERS' SPEECH: DIFFERENCES ACROSS RATER GROUPS

P. Roberts, C. Bock, J. Godin, M. Tobin

This study compared the ratings of three types of judges who listened to speech samples and rated who natural they sounded. Some of the speech samples were of adults who stutter, but who spoke fluently after receiving treatment. Other samples were of adults with no communication problems. The judges were 1) university students (18); 2) civil servants and teachers (18); and 3) adults who stutter (19). Results show that the students gave significantly lower ratings (they were the most critical of the speech quality) than the other two groups and the raters who stutter were the most leniant in their ratings. These findings should lead clinicians to train clients to rate themselves more critically. Researchers who use only university students as raters (a common practice since most researchers have easy access to students at their own university) may obtain results that are not typical of the general population.

ROLE OF FIBROBLAST GROWTH FACTORE-2 ON CONNECTIVE TISSUE PROLIFERATION DURING ARTICULAR CONTRACTURE FORMATION

G. Trudel

Still today, many persons suffer functional limitations from joint contractures secondary to immobility. The histological changes of pannus formation (the pannus is constituted of synoviocytes, fibroblasts and adipocytes proliferating and secreting extracellular matrix [ECM]) and adherences to the joint surfaces characterizing articular contracture have been described for a long time, but the pathophysiology remains unclear. Much has been learned recently about the role of different growth factors on connective tissue cell homeostasis. The fibroblast growth factors (FGF), transforming growth factor-beta, insulin-like growth factor and interleukin-1 have been studied with that regard. Among these, FGF-2 in vitro, is mitogenic for most mesodermal-derived connective tissue cells, enhances ECM secretion and also prevents the cytodifferentiation of chondrocytes into bone. Accordingly, FGF-2 is strongly suspected of playing a role in the genesis of contracture, but this has yet to be explored. We intend to establish an animal model of articular contracture to later enable the performance of intervention trials. Rat knees will be immobilized unilaterally with a fixator, causing a knee contracture to develop. At defined intervals, study and control rats will have their fixator removed, the range of motion of that knee joint measured with a goniometer. The pannus proliferation in the tissues will be studied for histomorphometry, proliferation indices and FGF-2, immunolocalization. This study will demonstrate the biodistribution of FGF-2 in contracture formation in vivo and based on the results, the action of agonists or antagonists of intra articularly administered FGF-2 can be studied. Applications from this work are obvious in developing tools to alter the course of a developing, or to treat an established contracture.

SATISFACTION OF RURAL HEALTH PROFESSIONALS WITH A REHABILITATION MOBILE OUTREACH PROGRAM

K. Wilson, N. Seguin, A-M, Goodman, G. Greene, M. Pole

We have recently completed a survey assessing the extent to which rural health professionals are satisfied with consultation services provided by The Rehabilitation Centre's interdisciplinary outreach team--the Mobile Clinic. The subjects included 36 rural physicians (response rate = 53.7%) and 62 allied health professionals (response rate = 92.5%) who were involved in the care of patients referred to the team. Most respondents (94.7%) indicated that they were satisfied or very satisfied with the interdisciplinary consultation, with comparable rates of satisfaction reported by physicians and allied health professionals. The highest satisfactions ratings were given to items addressing the clarity of recommendations provided by team members, and the quality of the team's interaction with patients. The lowest ratings were associated with the waiting time between visits. Of the individual disciplines on the team, physiatry was rated as most important for rural consultations. However, in open-ended comments, respondents indicated that the interdisciplinary aspect of the service was its most valued characteristic whereas infrequent visits were the greatest drawback. In conclusion, the interdisciplinary outreach approach to rehabilitation consultation receives high satisfaction ratings from rural health professionals who refer patients to the team, thereby supporting this model as one way of enhancing rehabilitation services in rural communities.

STUDY OF PROCESS OF MEANING PERSPECTIVES TRANSFORMATION DURING A MODIFICATION OF OCCUPATIONAL PERFORMANCE BALANCE DURING OCCUPATIONAL THERAPY TREATMENT IN NEURO-REHABILITATION

C-J. Dubouloz, C. Lachaine

Transformative learning is a process of deep personal change in clients treated in Occupational Therapy. This process is triggered by a state of illness or by a major trauma and is stimulated by critical reflection by the individual on his values, beliefs, feelings and knowledge. These dimensions are the primary constituents of meaning perspectives which influence people's decisions and actions (Mezirow, 1991).

The research objective is to define the process of meaning perspectives transformation or process of change during a situation of modification of occupational performance balance. This occupational performance balance is a state of comfort felt by individuals during their daily life activities or their occupation. After an illness or a trauma this balance is disrupted. In rehabilitation the objectives of occupational therapists is to regain a new balance according to a new way of dealing with occupation.

Four to six neurologic clients will be repeatedly interviewed (4 to 6 times) during the course of their treatment period in occupational therapy. A qualitative research design (Strauss &Corbin, 1990) will be used.

The process of transformation will consist of describing the meaning perspectives and their transformation over time. The results will emphasize the utmost importance of critical reflection with clients and underline the significance of the construction of new values and beliefs as forces for change during Occupational Therapy intervention.

THE DEVELOPMENT OF A VOICE ONSET MONITOR

L. Goudreau, J. Tomas, A. Meltzer

Rehabilitation Engineering in collaboration with the Fluency Program are developing a portable device to provide feedback to people monitoring their voice onset. People who stutter may have very abrupt voice onset curves. This monitor will provide feedback while the user is trying to develop a more gradual or gentle onset. The third prototype has now be completed and is undergoing evaluation with clients of the Fluency Program. In this prototype the light emitting diode (LED) display has been replaced by a liquid crystal display (LCD). The LCD display allows for much better resolution in the display of the voice onset curve. Also, the design has been greatly simplified. It is intended to be used with with a set of exercises whereby the client practices saying single syllable words, each in a certain time frame. The theory upon which the exercises are based is explained by the speech-language pathologist who also trains and demonstrates how to use the monitor.