



Freedom Beyond 55: Prosthetics and Orthotics for an Aging Society

ISPO Canada Symposium 2005

Program

October 14 – Main Ballroom (Vaughan Estate)		
8:45 – 9:00	Welcome - Introductions	Edward Lemaire, PhD President, ISPO Canada
9:00 – 9:30	An Overview of Prosthetic and Orthotic Care for the Elderly	Meridith Marks MD MEd FRCPC, Physiatrist The Rehabilitation Centre (Ottawa Hospital) Assistant Dean, Medicine, University of Ottawa
9:30 – 10:00	Geriatric Mental Health: Implications for P&O	David Conn, MB, BCh, BAO, FRCPC Psychiatrist-in-Chief, Baycrest Centre for Geriatric Care Associate Professor, University of Toronto President, Canadian Academy of Geriatric Psychiatry
10:00 – 10:30	Biomechanics of Elderly Gait	Edward Lemaire, PhD Research Associate, The Rehab Centre (Ottawa Hospital) Assistant Professor, Medicine, University of Ottawa
10:30-11:00	Break	
11:00 – 12:00	The Functional Levels - are they functional?	Wieland Kaphingst, Dipl.-Ing. (BMT), OMM, CPO(EC), CP(USA) Bio-medical Engineer / Prosthetist / Orthotist
12:00 – 13:15	Lunch (Courtyard Ballroom)	
	Prosthetics – Main Ballroom	Orthotics – Courtyard Ballroom
13:15 – 14:00	The Biomechanics of Lower Limb Prostheses: Exploring the Myths Tim Bach, PhD (Australia)	Effect of Articulated AFO and Functional Electrical Stimulation (FES) on older people with post-stroke hemiplegic gait Aaron Leung, PhD, CPO(HK), MBAPO (Hong Kong)
14:00 – 14:25	Advanced Arm Prosthetics Control Peter Kyberd, PhD	Post Polio Syndrome, an Orthotic Challenge John Fisk, MD, Professor (USA)
14:25 – 14:50	Dermatological Conditions in Lower Extremity Residual Limbs Nancy Dudek, MD, MEd, FRCPC	
14:50 – 15:20	Break	
15:20 – 16:05	Save the knee joint! Anton Johannesson, CPO (ISPO-Sweden)	The Orthotic Management of OA of the Knee: Theory, Research and Clinical Application Stephen Hutchins, CO (UK) MSc, Dip.OTC, SROrth, MBAPO (England)
16:05-16:25		A New Stance Control KAFO Design Terris Yakimovich, MASC (The Rehab Centre/U. Ottawa)
16:25 – 16:45	Prosthesis Alignment and Walking Gait: Kinematic and Kinetic Effects Sharon E. Walt, PhD (New Zealand)	Introduction to the Otto Bock Free Walk Stance Control KAFO Michael Pearce, C.P. (C)
16:45	Closing Remarks	
17:00	Leave for Woodbine Social Evening	

October 15 – Workshops (Sunnybrook Hospital – SCIL)		
9:00 – 10:30	Observational Gait Analysis: Improving Reliability and Validity in Clinical Decision Making Tim Bach, Nerrolyn Ford	Swedish Optimized Amputee Rehabilitation Procedure Anton Johannesson
11:00-12:30		
12:30 – 13:30	Lunch / Closing remarks	
13:30 - 14:00	ISPO Canada Annual General Meeting (Auditorium)	

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Abstracts

Friday Morning

Prosthetic and Orthotic Care for the Elderly

Meridith Marks, MD MEd FRCPC

The Rehabilitation Centre (Ottawa Hospital), University of Ottawa

By the end of this session participants should be able to:

- Recognize the effect of an aging population demographic on their prosthetic and orthotic practice.
- Discuss the impact of medical co-morbidities on an elderly patient's ability to use a prosthesis or orthosis.

Biomechanics of Elderly Gait

Edward Lemaire, PhD

The Rehabilitation Centre (Ottawa Hospital), University of Ottawa

As people age their gait patterns change to accommodate for decreases in muscular capabilities and balance deficiencies. This presentation will summarize how human gait changes with advanced age and how this can affect prosthetic and orthotic practice.

The Functional Levels - are they functional?

Wieland Kaphingst, Dipl.-Ing. (BMT), OMM, CPO(EC), CP(USA)

This presentation will investigate the origins, applications, and funding implications of using functional levels to categorize prosthetic and orthotic users.

Friday Afternoon - Prosthetics

The Biomechanics of Lower Limb Prostheses: Exploring the Myths

T. M. Bach, PhD

National Centre for Prosthetics and Orthotics, La Trobe University, Melbourne, Australia

Our understanding of the Biomechanics of Lower Limb Prostheses is founded on principles developed by early researchers but never carefully scrutinized by rigorous empirical investigations. These principles include assumptions that lighter prostheses are more energy efficient, that knee flexion during swing is beneficial, that knee flexion during stance is beneficial, that amputation per se causes an increase in energy expenditure that energy expenditure is one of the most important outcome measures. Although the evidence base in prosthetics is limited, current literature provides substantial evidence to contradict some of these assumptions. This paper explores the origins of some of these assumptions examines the related experimental evidence.

Save the knee joint!

Anton Johannesson, CPO, Secretary ISPO-Sweden

Is the knee joint the single most important factor in rehabilitation of elderly after major amputation and if so what can we do more to preserve the knee?

Advanced Arm Prosthetics Control

Peter Kyberd PhD - Institute of Biomedical Engineering, UNB; Adrian S. Poulton - ICT, The Open University, Milton Keynes, UK; Leif Sandsjö - National Institute for Working Life/West, Göteborg, Sweden; Stewe Jönsson - Sahlgrenska University Hospital, Göteborg, Sweden; Ben Jones - Cybernetics department, University of Reading, UK; David Gow - Western General Hospital, Edinburgh, Scotland.

With the increasing numbers of degrees of freedom being fitted to clinical prostheses, there is imposed an increasing burden on the user in terms of mental effort to control the limb using conventional methods. The solution of deferring more of the intelligence to the limb has been demonstrated by Nightingale et al. using multi-degree of freedom hands and arms. It was shown by Storey that if the operator directs the end point motion of the arm, and the controller coordinates the joints, it is possible to control five degrees of freedom from three inputs. More recently, using a modular arm prosthesis we have shown that the effort required to control the end point of a shoulder-elbow combination is far less than by conventional means. This paper will describe the controller and the experiments conducted to demonstrate this.

Dermatological Conditions in Lower Extremity Residual Limbs

Nancy Dudek MD, MEd, FRCPC – Physical Medicine & Rehabilitation

Residual limb skin disorders are a common problem for individuals who use a lower extremity prosthesis. These skin problems can cause pain and discomfort resulting in functional losses that adversely impact the amputee's physical, mental and emotional well being. Our group completed a six-year retrospective chart review of skin lesions diagnosed in patients examined in an outpatient amputee clinic at a regional, referral rehabilitation hospital in Ottawa, Canada. The results of this project, their implications for the care of amputees and for future research will be discussed.

Prosthesis Alignment and Walking Gait: Kinematic and Kinetic Effects

S. E. Walt¹, P. Bargh², C. Sutherland¹

¹ Department of Sport & Exercise Science, The University of Auckland

² Auckland Limb Centre

Introduction: The purpose of the main project is to determine what information gained from a 3D gait analysis could be useful to augment the traditional method of prosthesis alignment. Before that can be achieved, it is necessary to determine the sensitivity and reliability of this technique to small changes in alignment.

Methods: The subject was a 34yr old male with a trans-tibial amputation of the left leg as a result of trauma. His prosthesis had a single axis ankle with a solid foot. Ethical approval was obtained from the University of Auckland Human Ethics Committee and informed consent was given by the subject. An eight camera video based motion capture system with light-reflective 20mm passive markers arranged in a Cleveland Clinic configuration was used to capture kinematic data (joint angles, temporal-spatial information) of self-selected walking gait. Three imbedded forceplates were used to collect ground reaction forces. Kinematic and forceplate data was combined in an inverse dynamics mathematical model in order to estimate joint moments and powers. A custom made device which allowed for both medial/lateral and anterior/posterior changes in alignment was fitted between the socket and prosthetic shaft. The subject first walked several times with the alignment in his usual setting. The alignment was then adjusted in 2, 4, and 6 mm increments to the anterior of the original setting and again in 2, 4, and 6 mm increments to the posterior of the original setting. Six walking trials were collected at each

setting. This procedure was repeated for 2 and 4mm increments in the medial and lateral directions from the original setting. This resulted in 80 walking trials.

Results: The six trials in each condition were time normalized to show one complete stride and ensemble averaged. All kinematic results showed very high consistency within conditions. Most changes in joint angle were observed in the sagittal plane at the hip and knee of the prosthetic leg – generally showing an increased hip and knee flexion during mid-stance and only when the changes in alignment were at the extreme deviations (6mm ant, 4mm lat, 4 mm med deviation from the neutral position). Joint moments and powers seemed more sensitive to smaller deviations, both in the sagittal and frontal planes.

Conclusions: These preliminary results indicate that joint angles do not change greatly with small deviations in alignment and therefore may not be useful tools. However, kinetic variables do show some sensitivity to small changes in alignment and may provide some useful information when further developed.

Friday Afternoon – Orthotics

Effect of Articulated AFO and Functional Electrical Stimulation (FES) on older people with post-stroke hemiplegic gait

Aaron K. L. Leung, PhD, CPO(HK), MBAPO

Post-stroke drop foot prevents the effective swing of the leg and causes an abnormal gait pattern which is characterized by hip hitching, circumduction and toe catch. Thus the patients with drop foot needs increased effort to walk, which in turn makes the walking slow, tiring and unsafe. AFO has been used as the conventional treatment method for patients with hemiplegic gait. FES was introduced in 1961 to correct drop foot. Since then, number of studies reported treatment of drop foot with FES. This presentation will talk about the comparison on the effect of hinged AFO and FES on older people with post-stroke hemiplegic gait.

Post Polio Syndrome, an Orthotic Challenge

John R. Fisk, MD Professor

Acute Poliomyelitis, long absent from the Northern Hemisphere, is still epidemic in some non-industrialized countries. It has left an interesting history of attempts to conquer a disease. In spite of this there are still thousands who are faced with increasing disabilities as they advance in age after having had polio in childhood. Understanding the Pathophysiology accounting for their new problems will help the clinician dealing with this challenging group of patients. Old leathers and steel uprights can be replaced by modern plastics and light-weight devices that better aid in improved function.

The Orthotic Management of OA of The Knee: Theory, Research and Clinical Application

Jones R.K., Richards J., and Hutchins S.W.

University of Salford, Centre for Rehabilitation and Human Performance Research

Osteoarthritis (OA) is a painful condition which affects approximately 80% of individuals by the age of 55, with knee OA occurring two times more frequently than that of the hand or hip (Altman 1987, Oliveria 1995). The condition is more prevalent in the medial compartment of the knee and adversely affects the quality of life of affected individuals due to pain and a lack of functional independence. Patients with medial compartment OA commonly display a varus knee

deformity clinically, with a resulting shift in the mechanical axis and increased axial loading through the medial compartment. This leads in turn to the development of a greater adduction moment during stance leading to greater pain and progression of the osteoarthritis and the varus knee deformity (Kaufman 2001).

Conservative treatment utilising orthotic intervention has included the application of either specifically-designed knee orthoses or lateral wedges added to footwear or inlays. These conservative treatment strategies may unload the medial compartment of the knee joint in dynamic situations like level walking (Pollo 1998). The aim of knee bracing is to unload the painful compartment by applying a direct application of a force system to rotate the knee into a comparatively valgus attitude. Studies of OA knee orthoses have consistently demonstrated an associated decreased pain and improved function and greater confidence (Lindenfeld 1997, Richards 2005). Lateral wedges aim to advantageously influence the magnitude and direction of the ground reaction force (GRF) and therefore reduce the knee adduction moment.

This paper describes the three point pressure systems which need to be externally applied in order to correct a varus knee deformity, and the optimal position of application for these forces. Various current designs of OA knee braces are described and an analysis made of how they provide the required forces and achieve correction.

This paper also discusses and analyses the forces and adduction moments experienced by the human knee during normal ambulation and provides a comparison with those experienced by matched patients with medial compartment OA of the knee. Single stance knee adduction moments (SSKAM) are analysed comparing the two conditions and the relationship existing between the severity of knee OA and the relevant adduction moment discussed.

A New Stance Control KAFO Design

Terris Yakimovich, MASc, Edward Lemaire, PhD, Jonathan Kofman, PhD, PEng

A new electromechanical stance-control knee ankle foot orthosis (SCKAFO) was designed to provide secure gait for people with knee extensor weakness. This SCKAFO inhibits knee flexion while allowing knee extension during weight bearing. During swing or other non-weight bearing activities, the SCKAFO allows free knee motion. A prototype joint was mechanically tested to determine the moment at failure, loading behaviour, and device safety. Quantitative kinematic gait analysis of three able-bodied subjects and three knee ankle foot orthosis (KAFO) users showed that the new SCKAFO had a minimal effect on normal walking gait. The SCKAFO offered increased knee motion in swing and a reduction in gait abnormalities for some subjects with disabilities. Future efforts will increase the safety factor, reduce the power consumption, and reduce the knee joint's physical dimensions.

Introduction to the Otto Bock Free Walk Stance Control KAFO

Michael Pearce, CP (C), Otto Bock Health Care – Canada

It has been recognized that providing a Knee Ankle Foot Orthosis that allows knee stability during the stance phase of gait, yet permits the knee to freely flex during the swing phase of gait, would benefit those patients with knee instabilities greatly. This is an introductory lecture that will discuss how to assess, select, measure, fit and gait train this unique Knee Ankle Foot Orthosis.

Workshops

Observational Gait Analysis: Improving Reliability and Validity in Clinical Decision Making

T. M. Bach, PhD

National Centre for Prosthetics and Orthotics, La Trobe University, Melbourne, Australia

N. E. Ford, PhD

School of Health Sciences, Jönköping University, Jönköping, Sweden

Observational Gait Analysis (OGA) is the most common tool used by clinicians in diagnosis and monitoring of gait problems. However, studies of OGA reliability and validity have suggested that it is an insensitive and unreliable tool and may, therefore, lead to invalid decisions. The purpose of this workshop is to assist clinicians to improve the reliability and validity of their decision making by:

- Understanding the OGA methods utilized by expert observers
- Optimizing viewing conditions
- Reducing task complexity
- Using challenging gait protocols
- Understanding types and sources of bias
- Being aware of OGA research

Speaker Bios

Meridith Marks, MD MEd FRCPC

The Rehabilitation Centre (Ottawa Hospital)

Assistant Dean, Medicine, University of Ottawa

Born in Port-aux-Basques, Newfoundland, Dr. Marks completed her early schooling in the Newfoundland public school system. After completing undergraduate studies in Kinesiology at the University of Waterloo and studying Orthotics and Prosthetics in Toronto, Dr. Marks returned to Newfoundland to complete medical school at Memorial University of Newfoundland. She became a Fellow of the Royal College of Physicians and Surgeons of Canada in 1992 in Physical Medicine and Rehabilitation. Dr. Marks has a clinical practice at The Rehabilitation Centre in Ottawa with a focus on amputee rehabilitation. She has a particular interest in gait analysis, and the impact of medical co-morbidities on rehabilitation outcomes. In addition to her clinical role, Dr. Marks is also the Assistant Dean, Professional Affairs in the Faculty of Medicine at the University of Ottawa.

Dr. David Conn, MB, BCh, BAO, FRCPC

Psychiatrist-in-Chief, Baycrest Centre for Geriatric Care Associate Professor, U. Toronto President, Canadian Academy of Geriatric Psychiatry

Dr. David Conn is the Psychiatrist-in-Chief at Baycrest Centre for Geriatric Care and Associate Professor in the Department of Psychiatry, University of Toronto. He is the President of the Canadian Academy of Geriatric Psychiatry and Co-Chair of the Canadian Coalition for Seniors, Mental Health. His academic interests include the psychiatric consequences of the brain disease in the elderly, nursing home psychiatry and pharmacoepidemiology. He is the co-editor of three textbooks, including .Practical Psychiatry in the Long-Term Care Facility: A Handbook for Staff. Dr. Conn has been a part of the District Mental Health Services for Older Adults Program team since September 2002. As the team's psychiatrist, Dr. Conn providing weekly consults for the Older Adults Program through Tele- Health technology.

Edward Lemaire, PhD

Research Associate, Institute for Rehabilitation Research and Development, The Rehabilitation Centre (Ottawa Hospital)

Assistant Professor, Faculty of Medicine, University of Ottawa

President, ISPO Canada, Chair ISPO 2007 World Congress

Edward Lemaire has been extensively involved with the evolution of telehealth for clinical service and continuing education and the evolution of assistive devices that improve mobility for people with disabilities. Key successes include integrating Multimedia Internet-based (MIB) video and data conferencing into physical rehabilitation outreach services and the Write-Once Publish-Everywhere model for creating and disseminating multimedia-based continuing education content. Telehealth research activities include remote assistive device control / configuration / monitoring over Internet-based networks, the development of novel Internet-based clinical / diagnostic protocols, virtual reality technology for living space assessment, and the integration of MIB technology into continuing education. In the area of assistive devices, Dr. Lemaire has lead initiatives in the use of computer aided design (CAD/CAM) for producing artificial limbs, braces, and custom wheelchair seats. Extensive work has also been completed on the biomechanical analysis of motion for people using new prosthetic and orthotic devices. Current activities include evaluating new foot orthotic designs, developing better joints for knee-ankle-foot braces, wireless motion analysis technology development, and communication technology for enhancing international prosthetic and orthotic expertise.

Wieland Kaphingst, Dipl.-Ing. (BMT), OMM, CPO(EC), CP(USA)
ortho-bio-med.llc and Össur PM (R&D)

Formal Education:

- Bio-medical Engineer, academic degree and diploma of Bio-Medical Engineering (Dipl.-Ing.), Germany
- Certified Prosthetist (USA), Certificate in Orthotics and Prosthetics (ISPO Category I, Germany and Europe, CPO-EC)
- Master of Orthopedic Mechanics (OMM – Orthopädie Mechaniker Meister, - Germany)
- Certified Orthopedic Technician (Technologist ISPO Cat. II, Germany)

Professional skill and experience:

- Over 30 years of clinical, technical, educational, and supervisory experience as an orthotist/prosthetist
- Technical and Clinical Director of small and large German O&P companies
- Clinical aspects and knowledge-base of bio-medical engineering
- Guiding and instructing younger colleagues and students (O&P, PT and medical) in clinical applications of O&P and rehabilitation technologies
- Personal clinical emphasis is on lower extremity prosthetics

Academic / Applied Sciences

- Instructor (full-time and part-time) of academic contents for O&P and bio-mechanics in ISPO category II and category I O&P schools world-wide.
- Academic/scientific aspects and content of bio-medical engineering.
- Bio-mechanical product evaluation and testing (alpha testing) for Ossur (rheo knee)
- Clinical aspects and co-development of O&P CAD/CAM systems (ipoCAD, OssurCAD)

Timothy Michael Bach

MSc (Kines), Simon Fraser University; PhD, La Trobe University

Associate Professor in Biomechanics

National Centre for Prosthetics and Orthotics and Department of Human Physiology and Anatomy, School of Human Biosciences, La Trobe University

Tim Bach is Associate Professor in Biomechanics at La Trobe University. His teaching and research activities include normal and pathological human locomotion with a particular emphasis on the biomechanics of lower extremity amputee gait. He has been heavily involved in the activities of ISPO Australia as chair of their Scientific and Education Committee and as a convenor of two of their recent Annual Scientific Meetings. He is Chair of the Scientific Program Committee for the ISPO 2007 World Congress.

Anton Johannesson, CPO, Orthopaedic Technology Inc., Kristianstad, Sweden, Secretary ISPO-Sweden

Anton Johannesson holds a Bachelor Degree in Orthopaedic Engineering from the Department of Rehabilitation, Jönköping University, School of Health Sciences, Sweden (1990). Since 1993 he runs the prosthetics division at OTAB (Orthopaedic Technology Inc.) Kristianstad, Sweden. He is currently working half time on his PhD in Lower Limb Amputation and Prosthetics at the Department of Neuroscience and Locomotion, Psychiatry, Linköping University. His research interest is the population that undergo amputation, with special emphasis on the post operative treatment, pressure casting, walking ability and rehabilitations outcome. He is now secretary of the Swedish Society of Prosthetic and Orthotics (ISPO-S).

Peter Kyberd PhD, Canada Research Chair in Rehabilitation Cybernetics, Institute of Biomedical Engineering, University of New Brunswick

Peter Kyberd gained a first degree from Durham University before gaining a Masters in Electronic Engineering and then going on to a PhD in Control of a Multifunction prosthetic hand from Southampton University in 1990. During the 1990's Peter worked at the Oxford Orthopaedic Engineering Centre a department of Oxford University within the Nuffield Orthopaedic Centre, a leading Orthopaedic hospital. Here he was involved in a verity of projects from measuring the effect of surgery on driving to the recovery from injury to knee ligaments and the monitoring of migration of hip and knee prostheses using X-rays. He also headed up two projects funded by the European Union investigating aspects of the design and control of prosthetic arms. From 2000 he was a lecturer at the Cybernetics Department of Reading University. In 2003 he took up a Canada Research Chair in Rehabilitation Cybernetics at the Institute of Biomedical Engineering here in Fredericton, were he is continuing to advance research in the clinical application of intelligent prosthetic arms.

**Nancy Dudek MD, MEd, FRCPC – Physical Medicine & Rehabilitation,
Assistant Professor – University of Ottawa – Faculty of Medicine
Associate Staff – The Ottawa Hospital & The Rehabilitation Centre
Medical Staff – Ottawa Children's Treatment Centre**

Dr. Nancy Dudek is an Assistant Professor in the Faculty of Medicine at the University of Ottawa. She received her MD from The University of Western Ontario in 1999 and became a Fellow of the Royal College of Physicians and Surgeons of Canada in 2004 in the specialty of Physical Medicine and Rehabilitation. In 2005 she completed a Master of Education program at the University of Toronto. She has a diverse clinical practice and works at The Rehabilitation Centre in Ottawa, Canada. She focuses on Amputee Rehabilitation, Prosthetics, Orthotics and Musculoskeletal Medicine.

**Aaron K. L. Leung, PhD, CPO(HK), MBAPO
Assistant Professor, Department of Health Technology and Informatics of The Hong Kong Polytechnic University**

Dr. Aaron Leung is currently an Assistant Professor of the Department of Health Technology and Informatics of The Hong Kong Polytechnic University. He is the deputy programme leader of the BSc (Hons) in Biomedical Engineering programme, which includes professional education in prosthetics and orthotics. He is also the chairman of the departmental taught postgraduate programme committee. Dr. Leung is also the president of the Hong Kong Society of Certified Prosthetist-Orthotists.

**John R. Fisk, MD,
Professor, Department of Surgery, Southern Illinois University, School of Medicine**

- State University of New York at Buffalo School of Medicine MD 1969
- University of Minnesota Orthopaedic Residency 1969-1974
- Academic Pediatric Orthopedic Surgeon
- Past President Association of Children's Prosthetic/Orthotic Clinics
- ISPO Activities: Vice President ISPO International, Past President US-ISPO
 - Tack officer for Management of Polio Instructional Course
 - Chair of the 2007 International Congress Committee
- Editor: Children's section AAOS Atlas of Prosthetics and Amputation Surgery
 - AAOS Atlas of Orthotics and Assistive Devices
- Recipient: SIU School of Medicine Humanism in Medicine award

**Stephen Hutchins, CO (UK) MSc Dip.OTC SROrth MBAPO
Directorate of Prosthetics and Orthotics, University of Salford
Centre for Rehabilitation and Human Performance Research**

Stephen Hutchins is a Senior lecturer in Orthotics at the University of Salford, Manchester, England. He is a certified Orthotist in the UK and still undertakes clinical practice in orthotics. He is past Chairman of The British Association of Prosthetists and Orthotists (BAPO) and has represented the orthotic profession on a number of national committees. His research interests centre around lower limb orthotics. In particular he has undertaken research in orthotic knee joint design and footwear adaptations – particularly rocker soles and other adaptations.

**Terris Yakimovich, MASc
Research Engineer, Institute for Rehabilitation Research and Development, The
Rehabilitation Centre (Ottawa Hospital)**

Terris Yakimovich has a Master's degree in Mechanical Engineering from the University of Ottawa. His thesis work on the development and validation of a new Stance Control Knee Ankle Foot Orthosis (SCKAFO) has resulted in a patent application and the 2005 Student Design Competition Award from RESNA (Rehabilitation Engineering and Assistive Technology Society of North America). Mr. Yakimovich continues work on SCKAFO research and development at The Rehabilitation Centre in Ottawa.

**Sharon E. Walt, PhD
Senior Lecturer, University of Auckland; Manager, University of Auckland Gait Clinic**

Dr. Walt earned her degrees in Systems Design Engineering from the University of Waterloo and went on to earn a PhD in Kinesiology. She is currently a senior lecturer in the Department of Sport & Exercise Science at the University of Auckland, New Zealand. Her teaching and research interests are in the application of biomechanics to the areas of ergonomics and clinical gait analysis. She is also the manager of the University of Auckland Gait Clinic, the only clinical gait clinic in the country.

**Michael Pearce, CP (C)
Otto Bock Health Care – Canada**

Michael is the newest member of the Otto Bock Canada Professional Services Team. Originally from the United Kingdom, Michael gained his certification in Prosthetics in 1994 after spending four years in a craft apprenticeship program in limb manufacture and repair at J.E. Hanger Co. Ltd in Roehampton, London, England. After four years of clinical experience, Michael moved to St. John's, Newfoundland in 1998 to complete his prosthetic internship. He then moved to London, Ontario where he continued to practice clinically for four more years, before joining Otto Bock in the summer of 2005