Clinical Education Program

The 2017 World Congress begins each day with a general session and then offers five distinct education tracks (Pedorthic, Orthotic, Prosthetic, Technical and Business) to provide you with the dedicated learning experience you’ve come to expect from AOPA and its partners.

Tuesday, September 5

1:00 – 5:00 PM  Pre-Conference Education: Flexible Sub-Ischial Vacuum Socket Course
Stefania Fatone, PhD
Ryan Caldwell, CP/L, FAAOP
The Northwestern University Flexible Sub-Ischial Vacuum (NU-FlexSIV) Socket, a socket technique designed to improve comfort for persons with transfemoral amputation. The NU-FlexSIV Socket has lower proximal trim lines that do not impinge on the pelvis; is flexible so muscles can move comfortably within the socket as they contract during activity and improve sitting comfort; and is held securely to the residual limb by vacuum pump suction. Using video we will describe patient evaluation, liner selection, casting, rectifications, fitting and definitive fabrication for the NU-FlexSIV Socket. Review use of the clinical algorithm for mold reductions and rectification mapping that has been developed to facilitate decision making for socket fabrication. Clinical case series and formal case studies will be used to evaluate socket function. Socket comfort score, gait analysis, and clinical outcome measures have been used to assess socket performance in a small group of civilian and military amputees. Anecdotal information from previous course participants and results from ongoing research will be described.

Wednesday, September 6

8:00 AM – Noon  Concurrent Manufacturers Workshops
Noon – 1:00 PM  Lunch on your own
1:00 – 5:00 PM  Concurrent Manufacturers Workshops
5:30 – 7:30 PM  DON’T MISS THE SHOWSTOPPING OPENING RECEPTION as exhibitors greet you—Vegas Style. During the reception exhibitors will compete to show you the best Vegas has to offer through costume, props and entertainment. Be sure to vote using the mobile app AOPA365 under the contest section. Refreshments will be served. The Welcome Reception is included in your full conference registration. You can purchase a guest ticket for $45.

Thursday, September 7

7:00 AM  Breakfast
Breakfast will be available to attendees prior to the general session.
### General Session (GS1)

*Senator Dean Heller (R-NV) Invited*

Dean Heller was sworn in to the United States Senate on May 9, 2011. Prior to Heller’s service in the Senate, he served as Nevada’s Representative to the Second Congressional District, as Nevada’s Secretary of State for three terms, and in the Nevada State Assembly for two terms. He currently serves on the Committee on Finance; Banking, Housing, and Urban Affairs Committee; Committee on Veterans’ Affairs; and the Commerce, Science, and Transportation Committee. These committees provide him a wide variety of opportunities to address his top priorities -- creating jobs, restoring Nevada’s economy, keeping families in their homes and ensuring our veterans receive the benefits they earned and deserve.

### Coffee Break in Exhibit Hall

Take advantage of this time to:
- Meet with exhibitors
- View and Learn about new products and service offerings from around the world
- Participate in Product Preview Theater Presentations
- Network with attendees
- Enjoy the Walk Through Time – Historical Display

### Future of Prosthetics: Analyzing the Tissue Socket Interface (C1)

*Alexander Dickinson, MEng, PhD, CEng MIMechE*

*Hugh Herr, PhD*

*Peter Lee, PhD, BEng (Hon)*

*Ellankavi Ramasamy, MSc*

*Urs Schneider, MD, PhD*

Join us for an interesting symposium as we discuss:
- Quantitative Methodology For The Design And Fabrication Of Transtibial Sockets
- Simulating Lower Extremity Amputee Dynamics Using 3D Finite Element Simulations
- Limb Loading In BK Sockets: Simulated Soft Tissue Socket Interaction
- Pressure Casting And Residual Limb / Socket Interaction

### Free Papers—Improving Outcomes for the Lower Limb Amputee (C2)

*(The following sessions run consecutively within this program.)*

**10:30 AM - Noon**

*Comorbidities, Physical Function, and Daily Step Counts Among Adults with a Unilateral Transtibial Amputation who are Using a Prosthetic (C2A)*

*J. Megan Sions, PhD, DPT, PT*

Outcome measures and step activity monitors are gaining popularity, objectively evaluating physical function and activity-level among adults using a prosthetic. The lecture will review relationships between objective data and comorbidities, challenging providers to consider medical history when interpreting such data.
<table>
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<th>Time</th>
<th>Presentation</th>
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| 10:40 - 10:48 AM | **A Novel Auditory Biofeedback System for Improving Amputee Mobility in the Home and Community (C2B)**  
*Vibhor Agrawal, PhD*  
*Robert Gailey, PhD*  
This presentation will describe a novel auditory biofeedback system for above-knee amputees. The sensors of this system can automatically identify common gait deviations and provide auditory and musical feedback to users. Results of a clinical study and the efficacy of this device will be discussed. |
| 10:50 - 10:58 AM | **Selection and Assessment of a Set of Outcome Measures for Electronically Controlled Knee Users (C2C)**  
*Andrea Giovanni Cutti, PhD*  
Outcome measures are essential to evaluate the tailored rehabilitation program needed when fitting electronically-controlled prosthetic knees. We have selected a group of instruments and tested their validity on a group of patients. |
| 11:00 - 11:08 AM | **Survey on the Validity of the K-Level System and Utility of Clinical Outcome Measures in K-Level Assignment (C2D)**  
*Dylan Borrenpohl, MPO*  
This presentation highlights relevant challenges faced by clinicians who care for patients with lower-limb loss when operating within the K-Level system of classification and reimbursement.  
**The Risk of Major Cardiovascular Events for Adults with Above Knee Amputations (C2E)**  
*Benjamin Mundell, PhD*  
Rates and risk factors for major cardiac events for those with and without an above-knee amputation (AKA) were compared using longitudinal population-based data. Those with an AKA of dysvascular etiology were four times more likely to experience a cardiac event. |
| 11:20 - 11:28 AM | **On the (Im-)Possibility to Predict Who May Benefit from a Microprocessor Controlled Prosthetic Knee Component (C2F)**  
*Andreas Hahn, PhD*  
We analyzed the extent of 60 clinically important factors to justify allocation or non-allocation of an advanced hydraulic microprocessor controlled exo-prosthetic knee component to prosthetic walkers. |
| 11:30 - 11:38 AM | **Comparative Effectiveness of Microprocessor Controlled, Carbon Fiber Energy Storing, and Returning Prosthetic Feet in Persons with Unilateral Transtibial Amputation (C2G)**  
*Brian Kaluf, BSE, CP*  
This effort represents the largest study of microprocessor-controlled prosthetic ankles and the results include clinically relevant outcome measures that matter most to patients, prosthetists, physicians and payers. |
Beatriz Samitier, MD, PhD
This presentation will examine the improvement in gait capability and functional mobility of elderly trans-tibial dysvascular amputees using vacuum assisted suspension systems and analyze the differences compared to a non-amputee control group.

11:50 - 11:58 AM  
**Why do Amputees Prefer Energy Storage and Return Feet? Clues from the Analysis of Step Length Asymmetry and Margin of Stability (C2I)**
Andrea Giovanni Cutti, PhD  
Han Houdijk, PhD
Increasing evidence exists that energy cost is only marginally effected by energy storage and return feet (ESAR). The question why amputees largely prefer ESAR, remains unexplained from the biomechanical standpoint. We hypothesize that an ESAR foot might enhance push off power and enhance the backward margin of stability allowing a more stable and symmetrical gait pattern.

Noon – 12:08 PM  
**Affects of Prosthetic Socket Suspension on Gait in Unilateral Transtibial Amputees**  
(C2J)
Fan Gao, PhD
Hear an overview of an investigation on the affects of prosthetic socket suspension including VASS, suction and locking-pin on gait characteristics in unilateral transtibial amputees.

10:30 AM - Noon  
**Orthotic Management of Post Stroke Gait Dysfunction (C3)**
Jill Seale, PhD, PT
Stefania Fatone, PhD
Join our panel of experts as we discuss orthotic management of post stroke gait dysfunction. Every year, 15 million people worldwide suffer a stroke. Nearly six million die and another five million are left permanently disabled. In many developed countries the incidence of stroke is declining even though the actual number of strokes is increasing because of the ageing population. In the developing world, however, the incidence of stroke is increasing. In China, 1.3 million people have a stroke each year and 75% live with varying degrees of disability as a result of stroke. The predictions for the next two decades suggest a tripling in stroke mortality in Latin America, the Middle East, and sub-Saharan Africa.

Noon – 1:00 PM  
**Lunch and Learn-- Exoskeletons and NeuroRehab – Where are we Headed?**
Join us for a lunch buffet and advanced level discussion on the Indications for Use (i.e. Stroke, MS, Parkinsons, etc); Technology direction; Price Points and affordability; Reimbursement potential; Clinical Trials; and Home vs Clinic. This session is designed for seasoned prosthetists. Space is limited and a ticket are required.

Noon – 1:30 PM  
**Lunch in Exhibit Hall**
**Product Preview Theaters**

1:30 - 3:00 PM  
**Symposium: New Technologies for Prosthetics and Orthotics (C4)**
Thor Besier, PhD
Technology options for improved treatment in orthotics and prosthetics will be presented. Panelists will share innovations on a new approach to smart sensing joint modules in orthotics; a new method to improve socket climate; digital manufacturing in the O&P clinic and 3D printed prosthetic feet--new approaches to functional components.

1:30 - 3:30 PM  **Specializing in Upper Limb Prosthetic – A Free Paper Session (C5)**
(The following sessions run consecutively within this program.)

1:30 - 1:38 PM  **A Wireless Implantable Multichannel Myoelectric System for Prostheses Control (C5A)**
*Daniel McDonnall, PhD*
The goal of this study is to validate an implantable myoelectric system to improve control of prostheses. Our objective is to provide simultaneous multi-degree of freedom prosthetic control, ultimately providing an intuitive control experience. In this study we demonstrate system performance in a chronic animal study.

1:40 - 1:48 PM  **Differences in Southampton Hand Assessment Procedure Scores with and without the Use of Powered Partial-Hand Prostheses (CSB)**
*Lynsay Whelan, MS, OTR/L*
This presentation will evaluate differences between Southampton Hand Assessment Procedure (SHAP) outcome measure scores and kinematic movements during functional tasks for individuals with partial hand limb loss with and without a myoelectric prosthesis.

1:50 - 1:58 PM  **Control within a Virtual Environment is Correlated to Functional Outcomes when using a Physical Prosthesis (C5C)**
*Levi Hargrove, PhD*
This session will show the outcome measures from a virtual environment and how they correlate strongly with physical performance when controlling a prosthesis.

2:00 - 2:08 PM  **Performance and Satisfaction with Intuitive Multifunctional Hand Prosthesis Control (C5D)**
*Sebastian Amsuss, PhD*
*Ivana Sreckovic, PhD*
This study gathers feedback from certified prosthetists and users who had the possibility of testing a system with pattern recognition at home for four weeks. The improvements in unilateral gross manual dexterity and ability to control two degrees of freedom were observed during initial fitting and follow-up measurements.

2:10 - 2:18 PM  **Adaptive Calibration for Enhanced Pattern Recognition Control For Upper-Limb Prostheses (C5E)**
Nathan Brantly  
*Blair Lock, MSc, PEng*  
An adaptive calibration scheme is presented as an alternative approach with the potential to improve prosthesis control and reduce the need for re-calibration.

2:20 - 2:28 PM  
**Factors that Influence Acceptance and Rejection of an Upper Limb Prosthesis (C5F)**  
*Andreas Kannenberg, MD, PhD*  
Leveraging factors that influence rejection of UL prostheses could help improve acceptance, function and quality of life in persons with UL amputations. Based on the findings of our literature search, specific guidelines are proposed to improve prosthesis acceptance that focus on fitting as early as medically possible.

2:30  2:38PM  
**Sixty Years of Active Prosthesis Use: A Self-Report Case Study with Recommendations (C5G)**  
*Debra Latour, MEd, OTR/L*  
This presentation offers insight to the experiences of an individual over six decades of active and diverse prosthetic use and incorporates the compelling perspective of the individual as a consumer of prosthetic technology, clinician, and contributor to the population and the industry.

2:40 - 2:48 PM  
**The Clinical Application of Pattern Recognition Control in Upper Limb Prosthetics: A Two-Year Retrospective (C5H)**  
*Chris Baschuk, MPO, CPO, LP, FAAOP*  
Pattern recognition control of externally powered prostheses has been commercially available for several years. Presented here is a series of case studies over the course of the past two years demonstrating the clinical success and challenges associated with utilizing this technology.

2:50 - 2:58 PM  
**Liners with Embedded Electrodes for Direct Control Prostheses (C5I)**  
*Matthew Wernke, PhD*  
The RIC developed a liner with embedded electrodes. The evaluation of this device was with participants using pattern recognition control of their myoelectric devices. This work investigates the potential for the liner to work with direct control myoelectric prostheses.

1:30 - 3:00 PM  
**Symposium: Driving Improved Patient Care: Examples from Clinicians on Outcome Use (C6)**  
*Shane Wurđeman, PhD, CP, FAAOP*  
*Matt Luetke, CPO*  
*James Wynne, CPO*  
*Andrea Kinsinger, PT*  
There is growing pressure for the use of outcomes in O&P. In the past few years audiences have been provided with education on the many different outcome measures available for use in O&P care as well as many presentations that highlight theoretical benefits of use of such outcomes in the clinic. This symposium will go the next step by providing real-life case study examples from clinicians using outcomes, demonstrating benefits to the patient and improved processes for delivering outstanding patient care.
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<th>Time</th>
<th>Event</th>
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<tr>
<td>3:15 - 4:30 PM</td>
<td>Instructional Course: Innovative Transfemoral Socket Design (C7)</td>
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<tr>
<td></td>
<td>Stefania Fatone, PhD, BPO(Hons)</td>
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<td>Olaf Gawron, CPO</td>
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<td>Marlo Ortiz, CP(M)</td>
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<td>Michael Schaefer, CPO, Dipl.</td>
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<td>In prosthetics, few topics create greater controversy than the subject of functional socket design in above knee prostheses. This instructional course will present the conditions and demands that need to be taken into consideration from a biomechanical point of view. Experienced clinicians and certified prosthetists will then present design possibilities for modern above-knee prosthetic sockets.</td>
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<td>3:15 - 4:30 PM</td>
<td>Prosthetic Management of the Lower Limb Amputee – A Free Paper Session (C8)</td>
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<td>(The following sessions run consecutively within this program.)</td>
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<td>3:20 - 3:28 PM</td>
<td>Gait Training Interventions for Lower Extremity Amputees (C8A)</td>
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<td>M. Jason Highsmith, DPT, PhD, CP, FAAOP</td>
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<td>Gait training interventions for lower extremity amputees are not well studied. This systematic review evaluated over 10 years of literature revealing 18 articles covering two topical areas, including, overground and treadmill based gait training interventions.</td>
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<td>3:30 - 3:38 PM</td>
<td>Empowering Prosthesis Wearer’s Self-Management Abilities Through Mobile Technology: A Usability and Acceptability Study (C8B)</td>
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<td>Daniel Lee, PT, DPT, GCS</td>
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<td>The most common reason individuals with limb loss consult their prosthodontist is socket comfort. This study compares the usability and acceptability of an interactive self-management mobile app against that of the previously studied paper-based decision trees in adult lower limb prosthesis wearers.</td>
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<td>3:40 - 3:48 PM</td>
<td>Limb Volume Stability in Response to Socket Suspension (C8C)</td>
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<td>Matthew Wernke, PhD</td>
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<td>Elevated vacuum suspension has previously been reported to better manage limb volume compared to other forms of suspension. This study investigates differences in limb volume changes due to suspension and activity.</td>
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<td>3:50 - 3:58 PM</td>
<td>A Case Study of a Hip Disarticulation Amputee Converting to a Transfemoral Amputee (C8D)</td>
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<td>Burhan Dhar, CPO</td>
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<td>Advanced amputation and prosthetic innovation leads to a good quality of life.</td>
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<td>4:00 - 4:08 PM</td>
<td>Development of an Active Cooling System for Improving Comfort and Residual Limb Skin Care (C8E)</td>
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<td>Todd Farrell, PhD</td>
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<td>Thane Hunt</td>
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<td>This presentation will describe efforts toward developing an active cooling mechanism to remove heat from within the socket in amputee subjects. Results from a survey of over 100 prosthetists regarding the prevalence of socket heat and perspiration issues will be presented.</td>
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4:10 - 4:18 PM  A Comparison of Compression and Release Socket to Traditional Transfemoral Socket Designs: Results of the EMU Comparative Study (C8F)

Tyler Klenow, MSOP, CPO, LPO, CPT

Rapid advances are being made in the area of transfemoral socket design. One such advance is the Compression and Release Socket. Results of a University Study comparing the CRS/HiFi socket to a traditional IC socket intervention using 3D motion analysis are presented.

4:20 - 4:28 PM  Comparing Residuum-Socket Interface Pressure and Soft Tissue Deformations for Three Transtibial Trial Socket Designs (C8G)

Joshua Steer, BEng

This presentation shows the value of combining pressure sensor data with surface scanning and MR imaging to evaluate the link between pressure loading, socket rectifications and underlying anatomy.

3:15 - 4:30 PM  Symposium: Gait Salvage: The Importance of Mobility (C9)

David Armstrong, DPM, MD, PhD
Eric Burns, CPO
Mallory Lemons, CPO
Holly Olszewski, CPO

4:30 - 5:30 PM  German Quality Standards of Prosthetic Fittings in Upper and Lower Limb Prosthetics (C10)

Merkur Alimusaj, Dipl.-Ing, CPO
Olaf Gawron, CPO
Michael Schaefer, CPO, Dipl.

The session focuses on the recently published German compendiums, “Quality Standards in Upper Limb Prosthetics” and “Quality Standards in Lower Limb Prosthetics.”

4:30 - 5:30 PM  Unique Considerations in Prosthetic Clinical Care – A Free Paper Session (C11)

(The following sessions run consecutively within this program.)

4:30 - 4:38 PM  Evaluation of a Non-Fluid-Based Variable Cadence Controller (VCC) To Control Transfemoral Swing-Phase over a Range of Walking Speeds (C11A)

Jan Andrysek, PhD
Brandon Burke, BA

The presentation relates to the development of a non-fluid based swing-phase Variable Cadence Controller (VCC) for use in prosthetic knee joints. Findings indicate that the VCC is able to provide cadence responsive control over a broad range of walking speeds.

4:40 - 4:48 PM  Which Functional Elements Stabilize the Residual Limb within Transfemoral Sockets in both Frontal and Sagittal Plane for Optimized Prosthetic Gait? (C11B)

Malte Bellmann, Dipl.-Ing.

Review the findings of a novel study developed to objectify force transmission principles in three types of transfemoral sockets (CAT-CAM, MAS, subischial socket).
4:50 - 4:58 PM  Fluctuating Residual Limb Volume Accommodated with an Adjustable, Modular Socket Design: A Novel Case Report (C11C)
Anthony Ung, CPO
The case study presented will discuss the management of female CRPS with fluctuating residual limb volume using a modular, adjustable, transfemoral prosthetic socket.

5:00 - 5:08 PM  Cost-Effectiveness of Advanced Hydraulic Microprocessor Controlled Knee Protheses in Patients with Lower Limb Amputations (C11D)
Andreas Hahn, PhD
We report on the results of a health economic analysis investigating the impact of fall-related costs on the overall cost effectiveness of advanced hydraulic microprocessor controlled exo-prosthetic knee components. We stratify for subjects with vascular and non-vascular amputation etiology.

5:10 - 5:18 PM  Effects of Prosthetic Socket Suspension on Knee Proprioception and Dynamic Balance in Transtibial Amputees (C11E)
Fan Gao, PhD
This presentation will give overview of an investigation of the effects of prosthetic socket suspension including VASS, suction, and locking-pin on knee proprioception and dynamic balance in unilateral transtibial amputees.

5:20 - 5:28 PM  Viability of Prescribing Increases in Physical Activity in Lower Limb Amputees (C11F)
Georan Fiedler, CP
Emily Heskett, MSPO
Amputees are known to display lower levels of daily physical activity compared to non-amputees, which is detrimental to their health. The aim of this study was to investigate to what extent people with lower limb loss adhere to the increases in physical activity as prescribed.

4:30 - 5:30 PM  Symposium: Integrated Care Models Benefit Your Patients and Your Business (C12)
Andrea Giovanni Cutti, PhD
John Miguelez, CP, FAAOP(D)
Paul Prusakowski, CPO
Silvia Raschke, PhD
Tiffany Ryan, MOT, OTR/L
Michael Schaefer, CPO, Dipl.
This session shows how different experts have implemented an integrated care model approach into their every-day clinical practice. A multi-disciplinary team works closely with the patient to create and implement a prosthetic/orthotic and rehabilitation program. This approach has proved to be effective both in lower/upper limb prosthetics and orthotics, creating excellent outcomes for patients whilst establishing a competitive advantage for the company.

5:30 – 6:30 PM  Centennial Celebration
Join conference participants as we celebrate AOPA’s Centennial and 100 Years of the formalized O&P Profession with a Champagne Toast.
Friday, September 8, 2017

7:00 AM
Breakfast
Breakfast will be available to attendees prior to the general session.

7:30 – 8:00 AM
General Session (GS2)
The Friday morning General Session will include an awards ceremony as well as the best of show Award Winning Thranhardt Presentations

8:00 – 9:00 AM
Best of Show Thranhardt Presentations (C13)
(The following sessions run consecutively within this program.)

8:05 - 8:15 AM
Introducing the Prosthetic Homologue for Embodiment (C13A)
*Michael Wininger, PhD*
We will introduce the concept of the prosthetic homologue: Not just a prosthesis that looks "life-like," but one that "looks like me." We present the first formal scientific inquiry into whether the homologue is truly necessary in order to achieve embodiment.

8:20 - 8:30 AM
Reference Values for Temporal Gait and Loading Symmetry of Lower-Limb Amputees can Help in Refocusing Rehabilitation Targets (C13B)
*Andrea Giovanni Cutti, PhD*
*Gennaro Verni, MEng*
Are there typical values for temporal gait symmetry and loading of lower-knee amputees? Is it always true that amputees tend to overload the sound side? This study on 63 patients will provide you with some quantitative data to support your decision making.

8:35 - 8:45 AM
Do Foot Orthoses Work? Outcomes from a Multi-Clinic Study of 6,658 Pedorthic Patient Visits (C13C)
*Michael Ryan, PhD*
This study reports on the effectiveness and comfort outcomes in 6,658 patients seen in 9 pedorthic clinics in Vancouver, Canada. The outcomes from this analysis offer important insights into the clinical effectiveness of custom foot orthoses for lower extremity injuries on a large-scale sample. There is also good support from this study on the overall usage and perceived comfort of custom foot orthoses.

8:50 - 9:00 AM
The Micro-Processor Controlled Orthosis: What is the Impact to the User Versus the Stance Control Orthosis and Conventional Locked KAFO? (C13D)
*Shenan Hoppe-Ludwig, CPO*
We will evaluate the potential of a microprocessor controlled orthosis (MPO) to improve the functional mobility and quality of life in individuals with lower extremity impairments as compared to the SCO and conventional KAFO.

9:00 – 10:30 AM  **Coffee Break in Exhibit Hall**
Take advantage of this time to:
- Meet with exhibitors
- View and Learn about new product and service offerings from around the world
- Participate in Product Preview Theater Presentations
- Network with attendees
- Enjoy the Walk Through Time – Historical Display

10:30 AM - Noon  **Symposium: Power in Prosthetics (C14)**
*Steven Collins, PhD*
*Hans Dietl, PhD*
*Alena Grabowski, PhD*
*Levi Hargrove, PhD*
*Kenton Kaufman, PhD*
*David Moser, PhD*
*Jeff Ward, PhD*
*Jason Wilkin, PhD, MPT*
*Saeed Zahedi, PhD*
Learn the status of science in the area of power in prosthetics. We will discuss the current industrial experiences, and user evidences of the benefit of this advance in technology.
- Welcome and Introduction to our 3rd Joint Symposium
- Industry vision for 2020
- Two different pathways to apply power
- User experience and requirements
- Underlying science of biomechanical need
- Research findings to date
- Chicago Rehab Institute research
- Spring active/Ossur experience
- Biom/Otto Bock experience

10:30 AM - Noon  **Improving Function for the Upper Extremity Orthotic Patient – A Free Paper Session (C15)**
(The following sessions run consecutively within this program.)

10:30 - 10:38 AM  **Improvement in Functional Elbow Movement with a Myoelectric Orthotic Device: A Novel Application of a Post-CVA Assistive Rehabilitation Orthotic Device (C15A)**
*Vahe Fahradyan, MD*
Brachial plexus injuries are devastating and can lead to permanent loss of upper extremity function. This presentation will introduce new treatment modalities for the patients with poor functional outcome following brachial plexus reconstruction.
10:40 - 10:48 AM  Report on Three Users’ Function After One Year of Using Upper Extremity Myoelectric Custom Orthosis to Remediate Brachial Plexus Injury Paresis (C15B)
David Coleman, CPO
A case series following 3 brachial plexus injury patients after one year using the MyoPro externally powered EWHO. An evaluation of outcomes in active range of motion, manual muscle testing, functional task ability, and quality of life.

10:50 - 10:58 AM  Functional Utility of Wearing a Myoelectric Upper Extremity Orthosis in Chronic Stroke Survivors with Moderate Hemiparesis (C15C)
Lauren Wengerd, MS, OTR/L
This work investigates the clinical utility of wearing an upper extremity myoelectric orthosis to maximize function in individuals with hemiparesis post-stroke. Results of this study, clinical implications, and future directions in the field of myoelectric orthoses will be discussed.

11:00 AM - 11:08 AM  Economic Impact of Brace Use to Treat Adolescent Idiopathic Scoliosis on Total Charges in the United States (C15D)
Sean Zeller, MBA, MSPO, CPO
This presentation outlines a model for discussion of the potential economic impact of bracing relative to surgical management. This discussion is critical to decision making and to future efforts to improve care.

11:10 - 11:18 AM  Asymmetric CAD/CAM Bracing for Idiopathic Scoliosis ≥ 40 Degrees (C15E)
Ken Mandler, L/CO
Marc Moramarco, DC
We will discuss 3D asymmetric bracing for moderate and severe idiopathic scoliosis at the later stages of skeletal maturity. We will present the initial in-brace corrections (short-term result) of a cohort of 28 patients.

11:20 - 11:28 AM  Effect of Sacroiliac Belt on Activity Pattern of Lumbopelvic Muscles in Patient in with Unilateral Sacroiliac Joint Instability in Different Loading Condition (C15F)
Sarvenaz Karimi
We assessed the effect of the sacroiliac belt on lumbopelvic muscles in a patient with sacroiliac joint instability in different loading condition. The belt decreased muscles activity and muscle activity could have replaced by belt.

11:30 - 11:38 AM  Cranial Remodeling Orthosis Quality Management in Patients with Brachycephaly and Plagiocephaly (C15G)
Julie McCulley, MPO, MS, ATC/L
To establish the best practices in the monitoring of patient outcomes, utilizing cranial remodeling orthoses, standardized recording and reporting of CVAI and CR within the patient EMR were adopted. This allowed Continuous Quality Improvement (CQI) efforts with CRO and benchmarking against published data.

David Speers, CPO/L
This study looks at femoral fracture bracing as a viable option for treating pediatric diaphyseal femur fractures which currently are being treated with a hip
Symposium: World Perspectives on Polio & PPS Management (C16)

10:30 AM - Noon

Gorden Jackman, BSc. MA1st Dip Ed.
Jason Jennings, CPO, LO, FAAOP
Marmaduke Loke, CPO
Mac McClellan, CPO, LPO, FISPO, FAAOP

Polio care is very relevant around the world and is still a major factor in the USA. Orthotic care is the most important treatment factor to improve the quality of life for a polio survivor. This course will educate an orthotist’s traditional methods as well as advanced methods of improving the lives of mild to severe cases of polio.

Symposium: Current Strategies for Managing Charcot-Marie Tooth (CMT) Disease (C17) (P5)

10:30 AM - Noon

David Cooney, PT, CPO
Kenneth Cornell, CO
Marmaduke Loke, CPO
David Misener, BSc (HK), CPO, MBA
Glenn B. Pfeffer, MD

CMT is the most commonly inherited disorder of the peripheral nervous system affecting 1 in 2,500 people, 2.8 million worldwide and 150,000 in the USA. Studies reveal most patients report a poor experience with orthotic/pedorthic management. This symposium will describe the pathology of the disease, mechanism of deformity, physical deficits and associated gait impairments. The panel will present current orthotic and pedorthic strategies and advance tri-planar management.

11:50 - 11:58 AM

Maintaining Upright Posture: Balancing Moments and Preventing Falls (C15I)
J. Kim Ross, DC, PhD

Understanding the mechanisms utilized in maintaining upright stance is essential in the prevention of falls. As the baby-boomer population is aging, clinicians need to be aware of interventions which may minimize the likelihood of a fall and the negative sequelae that can occur.

11:58 - Noon

Relative Influence of Orthotic Support Features within an Open Frame AFO Versus a Total Contact AFO on Function, Endurance, and Activity Level in Patients with Spastic Equinovarus Secondary to Chronic Stroke (C15J)
Beatrice Janka, MPO, CPO

Traditionally, total contact orthoses are recommended to provide the highest level of support for the postural deficits associated with neuromuscular conditions. Alternatively, open frame orthotic designs are sometimes used, offering a variety of benefits. The focus of this pilot study was to determine the relative influence of the orthotic support of open frame versus total contact AFOs on function, endurance, and activity level in subjects with spastic equinovarus secondary to chronic stroke.

Noon – 1:30 PM

Lunch in Exhibit Hall
Product Preview Theaters

1:30 PM - 3:30 PM  
**Advancements in Osseointegration Technology for Amputees (C18)**

*Munjed Al Mudenis, MB, ChB, FRACS, FAOthA*  
*Rickard Branemark, MD, PhD*  
*Jonathan Forsberg, MD, PhD*  
*Richard McGough, MD*  
*Richard O'Donnell, MD*

Stay abreast of the latest news, research and advancements in Osseointegration for prosthetic users of all types. Our panel will provide you the latest research from around the world including the research being conducted at Walter Reed National Military Medical Center.

1:30 PM - 3:30 PM  
**New Considerations in Lower Limb Orthotic Management – A Free Papers Session (C19)**

(The following sessions run consecutively within this program.)

1:30 - 1:38 PM  
**The Variable Resistance Orthotic Knee (C19A)**

*Edward Lemaire, PhD*

New components for a microprocessor-controlled, variable resistance orthotic knee joint were designed for novel 3D printing technology to achieve 14.7% lighter and 18.2% shorter components, with no increase in profile thickness. Mechanical testing proved that the new design can resist 4500N loads applied to the hydraulic system.

1:40 - 1:48 PM  
**Safety and Effectiveness Results from the C-Brace Retrospective Registry (C19B)**

*Russ Lundstrom*

A retrospective registry was developed to gather outcome data from patients fitted with a C-Brace®, a microprocessor-controlled stance and swing controlled orthosis. Safety results reveal a potential for a dramatic reduction in falls. Effectiveness results showed a clinically meaningful increase in walking speed and patient-perceived balance confidence and significant improvements in the ease of performing activities of daily living, particularly those related to mobility.

1:50 – 1:58 PM  
**Development of a Bench Testing Procedure in Quantifying the Mechanical Properties of Ankle-Foot Orthoses in Additive Manufacturing (C19C)**

*Tsurayuki Murakami, BSc (Hons)*

With the absence of strong evidence in the mechanical properties of AFOs in additive manufacturing, this presentation advocates for a robust mechanical testing procedure to ensure the safe use of additive manufacturing devices among users. This presentation also provides insight on how the mechanical properties of a polycarbonate AFO fabricated from fused deposition modelling compares to a conventionally fabricated poly propylene AFO.

2:00 - 2:08 PM  
**Additional Weight Added to Ankle Foot Orthoses Could Increase Coordination of Gait in Pediatric Patients (C19D)**

*Marlies Cabell, CPO*

This case series introduces the concept of incorporating additional weight to pediatric AFOs intentionally to increase proprioceptive feedback and enhance motor coordination for gait.
Case Study: Gait Analyses of Tuning AFOFC for an Adult with Ankle Plantar-flexed Contracture (C19E)  
Sun Hae Jang, MSc, CO, FAAOP  
Paul Huhta  
This case study focuses on a subject presenting with a plantar-flexed ankle contracture, and analyzing gait changes with a solid AFO aligned to different shank-to-vertical angles (SVA) and shoe modifications per Elaine Owen's clinical algorithm for tuning AFOFCs. The Edinburgh Visual Gait Score and Step Length were used to measure outcomes.

Choosing the Optimal Passive-Dynamic Ankle Foot Orthosis for your Patient (C19F)  
David Knapp, CPO  
This is a guide to the selection criteria needed to choose a passive-dynamic AFO for your patient. The course spans patient evaluation, matching patient goals to the biomechanical goals, and designing a device to reach those goals.

Challenging Current Practices and Beliefs in Using AFOs for Pediatric Patients with Cerebral Palsy (C19G)  
Curt Bertram, CPO, FAAOP  
For years pediatric patients diagnosed with cerebral palsy have been managed with standards of practice and beliefs that are now being challenged by new paradigms and research. This article will address these existing beliefs of current practice and the new paradigms that have begun to challenge them as myths.

Prevalence of Flat Foot/Pes Plannus among School Children between 6 - 10 Years Old (C19H)  
Mansoor Ali, CPO  
Muhammad Sajid, CPO  
An analyses of 714 children concluded that the prevalence of flat foot in school children, ages 6-10, is 14.8% and is also more common in male children with a bilateral incidence of 76.4%.

A Flexible AFO: Contradiction to Traditional Thought? (C19I)  
Suzanne Guiffre, PT, EdD  
Traditionally, the use of rigid thermoplastics and thermoset materials is the standard when fabricating an AFO. The preliminary results of this study support the use of a more flexible thermoplastic AFO. Benefits include increased walking ability, improved balance and client satisfaction without negative changes in ROM, strength or spasticity.

Case Study: Gait and Functional Analysis of Three Carbon Fiber Ankle Foot Orthoses (AFOs) and Their Effectiveness Addressing Drop Foot (C19J)  
Maria DeShaw  
Sun Hae Jang, MSc, CO, FAAOP  
In this study, three carbon fiber AFOs were analyzed and included a posterior leaf spring, a lateral or medial strut with posterior cuff, and an anterior toe off. The participant performed a modified Emory Functional Ambulation Profile (mEFAP) and video recording was used for the Edinburgh visual gait score.
1:30 PM - 3:30 PM  **Symposium: Pediatric LE Orthotic Gait and Functional Design, Tuning and Alignment (C20)**

*Bryan Malas, MHPE, CO*
*Klaas Postema, MD, PhD*

We will review the biomechanics of gait that are needed to understand the indications and function of an AFO. Learn the importance of a proper tibial inclination and assess different gait characteristics in children with various diagnoses and how to choose the proper AFO. Review the concept of tuning, alignment and design that have applications across multiple pathologies including CP.

3:15 PM - 4:30 PM  **Symposium: Predicting Walking Ability Following Lower Limb Amputation (C21)**

*Jason Highsmith, PhD, DPT, CP, FAAOP*
*Jason Kahle, MSMS, CPO, FAAOP*
*Kenneth Kaufman, PhD*
*Hans Schaepper*

Criteria to determine prosthetic candidacy following amputation has not been standardized, exposing amputees to the vulnerability of prosthetic denial by CMS and LCD. This has led to a large variation in prosthetic prescription and access to care. Implementation of value-based incentives of healthcare is looming; an evidence based solution needs to support the medical necessity of prosthetic candidacy for all amputees. AOPA has addressed this issue by commissioning a systematic literature review to serve as a basis for development of a clinical practice recommendation and algorithm for determination of prosthetic candidacy and walking ability. Learn about existing high quality literature and evidence based statements to support prosthetic candidacy, for all patients regardless of predictive factors such as age, level, pain, gender and comorbidities.

3:15 – 4:30 PM  **Technology Transfer Program (C22)**

Join inventors and researchers from educational, clinical and manufacturing sectors, both within and outside of our industry, to present their ideas to an audience of manufacturing and clinical representatives, along with investors and venture capitalists from outside our industry. Review state of the art ideas, processes, designs and products about to be commercialized. A one hour networking wine-and-cheese reception will be held for inventors and investors to network following the presentation.

4:30 – 5:30 PM  **Poster Session**

Research posters will be on display throughout the day on Thursday and Friday. The congress has dedicated an hour for you to meet with researchers and learn more about their presentation while enjoying a glass of wine.

5:30 – 6:30 PM  **Happy Hour in Exhibit Hall**

What better way of wrapping up a full day of learning than spending an hour in the exhibit hall enjoying refreshments and networking with your colleagues and exhibitors. The Happy Hour is hosted by exhibitors. A list of sponsors will be included in the final program and on the website to make it easier for you to partake in the fun.
Saturday, September 9

7:30 AM  Breakfast
Breakfast will be available to attendees prior to the general session.

8:00 – 9:00 AM  General Session (GS3)
Healthcare Delivery Systems from Around the World
The provision of orthotic, prosthetic, and pedorthic care varies from country to country due in part to differences in their Healthcare Delivery Systems. Government regulations, financing, patient access, and the integration of new technologies into O&P are just a few of the topics that an international panel of invited speakers will discuss in this symposium. Attendees will listen to a series of overview presentations on the subject followed by a moderated panel discussion that hopes to provoke a stimulating and informative discourse with relevance to orthotists and prosthetists worldwide. The discussions will focus on the impact different healthcare systems have on the quality and delivery of orthotic and prosthetic care in each respective country represented.

9:00 – 10:30 AM  Coffee Break in Exhibit Hall
Take advantage of this time to:
- Meet with exhibitors
- View and Learn about new product and service offerings from around the world
- Participate in Product Preview Theater Presentations
- Network with attendees
- Enjoy the Walk Through Time – Historical Display

10:30 AM - Noon  Symposium: Amputation and Prosthetic Treatment after Partial Foot Amputation (C23)

10:30 AM - Noon  Symposium: Pediatric UE Functional Orthotics for Children with Neuromuscular Diseases (C24)
Tom Kramer, BA
Bryan Malas, MHPE, CO
Jonathan Naft, CPO
Michael Schaefer, CPO, Dipl.
The instructors in this course give an overview of current orthotic treatment options for the upper extremities of children with neuromuscular movement disorders. They also illustrate the importance of minimalist construction principles with maximum benefits and demonstrate state-of-the-art principles of construction. Besides providing a high level of functionality, these principles also take into consideration the outward appearance and child-friendly design of modern orthosis care. Innovative function and manufacturing methods such as the use of external-power operated function-improving arm-orthotics, and also the harnessing of 3-D print technologies, are pointing the way to possible orthotic treatment concepts in the future.

10:30 AM - Noon  Prosthetic Free Papers—Advancing Care for Today (C25)
(The following sessions run consecutively within this program.)

10:30 - 10:38 AM  Differences in Stepping, Functional Level and Cost-Efficacy of the Genium and C-Leg Microprocessor Knees (C25A)
M. Jason Highsmith, DPT, PhD, CP, FAAOP
This randomized clinical trial compared the Genium MPK with the C-Leg in multidirectional stepping, functional level and cost-efficacy.

10:40 - 10:48 AM Osseointegrated Implants in Patients with Diabetes Mellitus: A Case Series of Eight Patients (C25B)
Munjed Al Muderis, MD
Traditionally, diabetic patients with amputations have been excluded from osseointegrated reconstruction due to higher risks of complications. This is the first study reporting on the clinical outcomes of diabetic patients receiving an osseointegrated reconstruction.

10:50 - 10:58 AM Clinical Results on the Use of a Microprocessor Controlled Prosthetic Knee Component for Above-Knee Amputees of Low Mobility (C25C)
Andreas Hahn, PhD
Hear a multicentric, international, randomized controlled cross-over trial to investigate the impact of an innovative advanced hydraulic microprocessor controlled exo-prosthetic knee on amputees with low mobility grade ratings. The study provides an evidence level amongst the highest yet available in P&O.

11:00 AM - 11:08 AM The First 500 of the POQOL-100 (C25D)
Michael Wininger, PhD
What quality of life questions are we asking our patients and in what settings? The POQOL project is run by clinicians in attempt to better understand patient care and evidence-based practice.

11:10 - 11:18 AM Clinical Trials are the Future of O&P (C25E)
Kristine Houck, MA, ELS
Michael Wininger, PhD
Clinical trials are the pinnacle of medical evidence, however, there are surprisingly few clinical trials in P&O. The case will be made that now is the time for our profession to adopt a clinical trials mindset.

M. Jason Highsmith, PhD, DPT, CP, FAAOP
Tyler D. Klenow, MSOP, CPO, CPO, CPT
Exercise testing provides for an alternative or adjunct method of functional classification of individuals with a history of amputation to the current K-level system. Results of a systematic literature review of exercise testing in the amputee population are discussed. A proposed clinical treatment pathway will also be presented.

11:30 - 11:38 AM Adjustable Liners and Sockets for Prosthetic Devices (C25G)
Lenore Rasmussen, PhD
Ras Labs' Synthetic Muscle™ will allow amputees to continue their active lives without needing to adjust the fitting of their prosthetic device(s) throughout the day. This technology will resolve major issues facing amputees, most notably the pain of prosthetic slippage and the inconvenience of adding or removing prosthetic socks.
*David Moser, PhD*
The efficacy of microprocessor knees (MPKs) with enhanced standing support was tested for different prosthetic ankle types. The combination of an MPK, with standing support active, and a hydraulic ankle, produced balance and limb loading measurements closest to those of able-bodied controls.

11:50 - 11:58 AM  **On the Use of Health Economic Instruments to Evaluate Prosthetic Services (C25I)**
*Andreas Hahn, PhD*
Using data from 81 amputees, this research study investigates the suitability of utilizing health economic instruments to evaluate prosthetic services.

Noon – 1:00 PM  **Lunch on your own**

1:00 - 2:30 PM  **Symposium: Multi-Scale Integration in Upper Limb Prosthetics (C26)**
Matthew Mikosz, CP, LP
Sam Phillips, PhD, CP
Patrick Pilarski, PhD
*Gerald Stark, PhD, MSEM, CPO/L, FAAOP*
*Michael Wininger, PhD*
Upper-limb prostheses (ULPs) are essential to one’s own sense of self and the ability to complete activities of daily living. Yet abandonment rates are as high as 50% in some patient populations. In this course, subject-matter experts will address several key domains where ULPs are most critically lacking, and where there are accessible opportunities for improvement. Our panelists come from varied backgrounds, with expertise in ULP design, development, and delivery.

1:00 - 2:30 PM  **Orthotic Symposia: Stance Control (C27)**
*Gary Bedard, CO, FAAOP*
*Sam Hale MSPO, CPO, LPO*
*Andreas Kannenberg PhD*
The commercial technology of stance control orthoses has been a clinical solution option for practitioners facing patients with lower limb gait instabilities for over twenty years. In this presentation, representatives of the three main manufacturers involved with the production of component options will present an industry review. The symposium will help practitioners refine their clinical decision making and reimbursement justification.

1:30 – 2:50 PM  **Prosthetic Free Papers (C28)**
(The following sessions run consecutively within this program.)

1:40 - 1:48 PM  **Changes in Pressure Distribution and Outcomes with Alignment Changes (C28A)**
*Garrett Hurley, CPO*
This study aims to quantify and understand stresses experienced at the residual limb with prosthetic alignment differences. Results suggest that alignment does affect forces within the socket and that force sensors within the prosthetic socket may be helpful in determining appropriate alignment.
1:50 - 1:58 PM  
**Change in Pressure Distribution and Outcomes with Loose and Tight Tension (C28B)**  
*Garrett Hurley, CPO*  
Data quantifying the relationship between pressure distribution on a residual limb and patient outcomes are critical for rational prosthetic socket design and may help justify costs when payers challenge the need for socket replacements. This study uses an adjustable socket design as a research tool to change the fit of the socket in real time while keeping other variables consistent.

2:00 - 2:08 PM  
**Comparison of Timed Submerged Swimming Trials with and without Lower Extremity Prostheses (C28C)**  
*Duffy Felmlee, MSPO, CPO*  
*Michael McCauley, MSPO, CPO*  
Land based activities require additional energy expenditure depending on amputation level. Is is hypothesized that a submerged aquatic activity will reduce energy requirements independent of amputation level as compared to land-based activities. Hear the results of two trials with six amputees of various levels of amputation.

2:10 - 2:18 PM  
**Impact Test for Prosthetic Feet (C28D)**  
*Eric Nickel, MS*  
An impact loading test has been developed for prosthetic feet to simulate high impact activities that may be encountered in construction, fire and rescue, and military service. This presentation will present validation data and results of testing commercially available feet intended for high-impact activities.

2:20 - 2:28 PM  
**The Provision of Prosthetic Limbs through Vocational Rehabilitation Enables People with Amputation to Achieve Successful Employment (C28E)**  
*Lee Childers, PhD, MSPO, CP*  
The RSA-911 database contains data on individuals with amputation that utilize vocational rehabilitation (VR) services. This database was used to determine who received funding for prosthetic devices and how that has a positive effect on gaining employment.

2:30 - 2:38 PM  
**Assessment of Prosthetic Mobility and its Relationship to Fall History in People with Lower Limb Amputation (C28F)**  
*Sheila Clemens, PT, MPT, PhD(c)*  
*Ignacio Gaunaurd, PT, PhD, MSPT*  
The Timed-Up-and-Go (TUG) test is frequently used to assess mobility in people with lower limb amputation (LLA). The purpose of this study was to identify limitations in prosthetic mobility using the cTUG, and investigate the potential relationship to falls in the amputee population.

2:40 - 2:48  
**An 18-Month Review of Implementing Outcome Measures in Clinical Practice (C28G)**  
*Brittany Pousett, CP(C), MSc*  
This presentation will share insight with regards to the feasibility of implementing standardized OMIs, the impact they have on individual patients, and how their use can contribute to the development of interpretability parameters.
Symposium: Everyday Risk & New Regulations of Isocyanate in the O&P Work Environment (C29)

Carlo Luetto
Fletcher Session

Orthotists and Prosthetists are exposed on a routine basis to isocyanates found in synthetic casting materials. The National Institute of Health studies have shown that isocyanates can result in health risks for both the technician applying the cast and the patient. This presentation will examine the function of isocyanate in casting materials, as a catalyst to potential allergic reactions, other risks and guidelines and how to minimize those risks.