

# 2018 PAC RIM CONFERENCE

18th Biennial Pacific Forum  
on Physical Rehabilitation

January 21 - 24, 2018

## PROGRAM & GUIDE



# OUTLINE SCHEDULE

## SUNDAY, JANUARY 21, 2018

9:00 am - 2:00 pm	Golf
2:00 pm - 5:00 pm	Exhibitor Set Up (Valley Isle Ballroom)
3:00 pm - 5:00 pm	Registration Opens (Valley Isle Lounge)
5:00 pm - 6:30 pm	Welcome Reception (Exhibits Open)

## MONDAY, JANUARY 22, 2018

7:00 am	Registration Opens (Valley Isle Lounge)
7:00 am - 7:30 am	Breakfast (Valley Isle Ballroom)
7:35 am - 8:20 am	Keynote Address
8:20 am - 10:00 am	Sessions
10:00 am - 10:20 am	Break (Exhibits Open)
10:20 am - 11:40 am	Sessions
11:40 am - 1:00 pm	Lunch
1:00 pm - 2:40 pm	Sessions
2:40 pm - 5:00 pm	Exhibition & Workshops

## TUESDAY, JANUARY 23, 2018

7:00 am	Registration Opens (Valley Isle Lounge)
7:00 am - 7:30 am	Breakfast (Valley Isle Ballroom)
7:35 am - 8:20 am	Keynote Address
8:20 am - 10:00 am	Sessions
10:00 am - 10:20 am	Break (Exhibits Open)
10:20 am - 12:00 pm	Sessions
12:00 pm - 1:00 pm	Lunch
1:00 pm - 5:00 pm	Exhibition & Workshops
6:00 pm - 9:30 pm	Aloha Conference Dinner

## WEDNESDAY, JANUARY 24, 2018

7:00 am	Registration Opens (Valley Isle Lounge)
7:00 am - 7:30 am	Breakfast (Valley Isle Ballroom)
7:35 am - 8:20 am	Keynote Address
8:20 am - 9:00 am	Sessions
9:00 am - 9:30 am	Exhibition Last Chance
10:00 am - 12:20 pm	Sessions & Workshops
12:20 pm - 12:30 pm	Mahalo & Aloha Oe

# DAYS-AT-A-GLANCE

Key									
	Announcements		Keynote		Meal		Session or Presentation		Workshop or Exhibits

## Monday January 22nd, 2018 - Clinical Sessions

7:00	Registration Opens (Valley Isle Lounge)
7:00 - 7:30	Breakfast (Valley Isle Ballroom)
7:30 - 7:35	Aloha & Opening Remarks From US-ISPO Chair Elizabeth Mansfield
7:35 - 8:20	[Keynote] Reflections on a Career Caring for Persons with Limb Loss Douglas Smith, MD
8:20 - 8:40	A Dynamic Partial Foot Prosthesis David Hughes, CPO
8:40 - 9:00	A Novel Osseointegrated Human-Machine Gateway Rickard Branemark, PhD, MD
9:00 - 9:20	Osseointegrated Implants in Patients with Peripheral Vascular Disease: A Case Series of 5 Patients Munjed Al Muderis, MD
9:20 - 9:40	Unique Considerations and Approaches to Individuals with Quadrilateral Amputation: A Case Series Kimberly Seidel-Miller, MD
9:40 - 10:00	Prosthetic Fitting After Amputative Sacrectomy: A Case Series Brittany Snider, DO
10:00 - 10:20	Exhibition Only (Valley Isle Ballroom)
10:20 - 10:40	Gait Intention Detection for Transfemoral Amputees Junghwa Hong, PhD
10:40 - 11:00	Neuromuscular Electrical Stimulation Use in Transtibial Amputations: A Pilot Study Sara Peterson, CPO, MBA
11:00 - 11:40	Changes in Pressure Distributed with Alignment Changes Andrew Pedtke, MD
11:20 - 11:40	Differential Safety and Function of Prosthetic Knees: Technical and Clinical Considerations for the Selection of Knee Mechanisms Andreas Kannenberg, MD, PhD
11:40 - 1:00	Lunch (Valley Isle Terrace)
1:00 - 1:20	Design of Dynamic Testing System for Robotic Low-Limb Prostheses and Orthoses Inhyuk Moon, PhD
1:20 - 1:40	Material Analysis of Prosthetic Sockets and Comparison to Clinical Outcomes Garrett Hurley, CPO
1:40 - 2:00	Finite Element Analysis of Flax Composite Materials in Orthotics and Prosthetics Steven King, DPM
2:00 - 2:20	The Shifting Paradigms of the Pedorthic Practice: Cast-to-Custom Vs. Central Fab Vs. Prefab Dennis Janisse, CPed
2:20 - 2:40	Yoga-Related Vertebral Compression Fractures: A Case Series Melody Lee, MD and Mehrsheed Sinaki, MD
2:40 - 5:00	Exhibition and Workshops
3:00 - 5:00	[Workshop] Ossur Bionics: Advancements and Clinical Outcomes Justin Pratt, CP
3:00 - 5:00	[Workshop] Introduction to Cybernic Technologies and Oita Robo Care Center Yoshihiro Yasunaga

# DAYS-AT-A-GLANCE

Tuesday January 23rd, 2018	
7:00 am	Registration Opens
7:00 - 7:30	Breakfast
7:30 - 7:35	Announcements David Boone
7:35 - 8:20	[Keynote] Response to the 2008 Wenchuan Earthquake and Development of P&O Training in China Aaron Leung, CPO(HK), PhD
8:20 - 8:40	Fitting and Training Amputee Athletes in Ukraine Jon Batzdorff, CPO
8:40 - 9:00	Advanced Prosthetic Training in Ukraine Alicia White, DPT
9:00 - 9:20	Choice of Myoelectric vs. Body-Powered Arms: A Case Study in the Developing World Harold H. Sears, PhD
9:20 - 9:40	Advances in Myoelectric Technologies and Improving Function for Upper Limb Deficiencies Karl Lindborg, CPO
9:40 - 10:00	User Interests in the Restoration of Touch Perception through Upper Limb Prosthetics F. Clay Smither, MD
10:00 - 10:20	Exhibition Only (Break)
10:20 - 11:00	Evidence-Based Approach to the Management of Spinal Deformity John Fisk, MD
11:00 - 11:20	Preliminary Investigation of Pediatric Myoelectric Exoskeleton for Individuals with Unilateral Upper Limb Impairment LeRoy Oddie, CP
11:20 - 11:40	A Passive Exoskeleton to Assist Walking in Children with Neuromuscular Disorders Jessica Zistatsis
11:40 - 12:00	The Use of Osseointegrated Titanium Implants to Treat Bilateral Amputees Munjed Al Muderis, MD
12:00 - 5:00	Exhibition Open
12:00 - 1:00	Lunch on Own
1:00 - 3:00	[Workshop] The End of Rigid Sockets – Latest Innovations for All Amputation Levels (Nantucket Room) Jay Martin, CP
1:00 - 3:00	[Workshop] All MPKs Are Not the Same! (Wilcox Room) Tim Shride, CPO
3:00 - 5:00	[Workshop] Pro-Flex Foot with Torsion: A Clinical Outcomes Focus Justin Pratt, CP
3:00 - 5:00	[Workshop] Choosing the Right Myoelectric System for Your Patient: Terminal Devices, Wrists, Elbows, Control Options...When Do You Choose Them and Why? (Wilcox Room) Tim Shride, CPO
6:00 - 9:30	Aloha Conference Dinner (Aloha Pavillion & Ko'ala)

# DAYS-AT-A-GLANCE

Wednesday January 24th, 2018	
7:00 am	Registration Opens
7:00 - 7:30	Breakfast
7:30 - 7:35	Announcements David Boone
7:35 - 8:20	[Keynote] Exceed Worldwide: A New Beginning for P&O Service Delivery Concepts for Low-Income Settings Carson Harte, CPO
8:20 - 8:40	Challenges in Prosthetics and Orthotics Education in Sub-Saharan Africa Francophone Country Togo Akouetevi Aduayom-Ahego
8:40 - 9:00	Integration of Wheelchair Service Provision Education in Prosthetic & Orthotic Programs in Different Global Context Settings Taavy Miller, MSPO, CPO
9:00 - 9:30	Exhibition Last Chance
9:40 - 12:00	Exhibit Tear Down
10:00 - 11:00	2018 Compliance Update: Compliance Excellence, Best Business Practices and the Successful Accreditation Survey Jim Lawson
10:00 - 12:00	[Workshop] Creation and Use of Flexible Laminated Sockets and AFOs Matt Perkins
12:00 - 12:20	US-ISPO Activities Elizabeth Mansfield
12:20 - 12:30	Mahalo & Aloha Oe David Boone

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## Monday

7:35  
am

### [Keynote] Reflections on a Career Caring for Persons with Limb Loss

Douglas Smith, MD

Speaker: Douglas Smith, MD

Amputation comes as an intense shock to the body and the spirit even in the best of circumstances. We strive to mitigate those impacts with surgical technique and prosthetics technology that is constantly evolving. This is in part what makes this area of orthopedics uniquely interesting and challenging. Most probably know that I retired recently from an active clinical practice at Harborview Medical Center where I dedicated much of my energies to this area. Reflecting on my time there are a few key areas of advancement that intrigue me most that I will discuss: We have new ability to save the knee and retain transtibial levels with creative surgical approaches and improved ability to get soft-tissue coverage; Amputation at the partial foot level is becoming a better functional option for many with the advent of improved prosthetic options; Bone bridging techniques can fundamentally change limb support; Limb transplantation is being done with its own pluses and minuses; And the growth of osseointegration is fundamentally altering prosthetics to relieve the myriad issues of socket fit for more patients.

8:20  
am

### A Dynamic Partial Foot Prosthesis

David Hughes, CPO

Speaker: David Hughes, CPO

This presentation will include examples of two versions of the dynamic partial foot prosthesis. The resurgence of partial foot amputations necessitated a need for a partial foot prosthesis with more dynamic characteristics. Our specific goal was to create a partial foot prosthesis that would allow high level activities, such as running. We also designed the prosthesis to be adjustable in both fit and alignment. We have fabricated and fit over 20 dynamic partial foot prostheses with this system and several of the amputees have achieved the goal of returning to run.

8:40  
am

### A Novel Osseointegrated Human-Machine Gateway

Rickard Branemark, PhD, MD

Speaker: Rickard Branemark, PhD, MD

Amputation prostheses have been used for many centuries, but are still far from fully restoring the functional capacity of the lost limb. Adequate attachment of the prosthesis is one major problem. Osseointegration is a novel approach to address attachment problems. Another problem is control of the prosthesis including both efferent motor control and afferent feedback. How can signals be routed from to the inside the body and how to transfer signals to the external components in a reliable way. In order to overcome these problems, a stable anchorage of the prosthesis has been developed using osseointegration and a permanent bidirectional interface into the human body, the Osseointegrated Human-Machine Gateway (OHMG).

This presentation will give an overview of the development of osseointegrated amputation prostheses during the last 20 years and the recent development of the OHMG.

9:00  
am

### Osseointegrated Implants in Patients with Peripheral Vascular Disease: A Case Series of 5 Patients

Munjed Al Muderis, MD

Speaker: Munjed Al Muderis, MD

Peripheral vascular disease (PVD) is a slow and progressive circulation disorder characterised by the narrowing and blockage of blood vessels, leading to severe pain, infected gangrene and often amputation as the final outcome. PVD is the primary cause of lower extremity amputations in developed countries. Over the past three decades, advancements in peripheral vascular surgery have helped salvage many limbs otherwise destined for amputation. Nevertheless, intervention through vascular surgery alone is not sufficient in many cases and additional structural reconstruction through orthopedic surgery is often required. A number of studies exist in the literature showing the beneficial effects of osseointegration in lower limb amputees. However, no study to date has been published regarding the use of osseointegrated implants in vascular amputees.

At the 2-year follow-up time point, all patients were still using the osseointegrated prosthesis. There were no reports of implant failure and no revision surgeries were required. The values of quality of life and functional outcome measures were consistent with the average values obtained from regular osseointegration patients, and showed significant improvements compared to pre-operative levels. A mild superficial infection event was recorded in one case, which was treated successfully with oral antibiotics.

Although this case series represents a minor fraction of the osseointegration patient cohort, the implications of using osseointegration to retain a functional knee joint is significant for patients in terms of mobility, quality of life and even survival. These preliminary results suggest that osseointegration may be considered as an alternative method to help PVD patients maintain a higher activity level after amputation, which in turn improves their chances of survival as well as quality of life.

9:20  
am

## Unique Considerations and Approaches to Individuals with Quadrimembral Amputation: A Case Series

Kimberly Seidel-Miller, MD & Karen Andrews, Brandon Sampson

**Speaker:** Kimberly Seidel-Miller, MD

The need for four-limb amputation is rare. We review three cases of individuals who required quadrimembral amputation following treatment with high dose vasopressive medications for sepsis. Furthermore, we discuss the unique considerations in such cases. They were 20, 56, and 38 years old at time of amputation. Their amputation levels were bilateral transhumeral / transtibial; bilateral transradial / transtibial; and bilateral short transradial / transfemoral respectively. They are currently in varying rehabilitation stages.

Each individual has demonstrated varying and continued goals since amputation. In the early postoperative phase of rehabilitation, focusing on improved function and concrete, achievable goals is important. Setting three to five short-term goals and discussing everyday tasks that are frustrating can be beneficial. This allows the individual with limb loss to work toward modified functional independence and focus on what is important to them. There are different considerations for prosthetic and equipment management depending on the level of amputation, stage of rehabilitation, gadget tolerance and functional goals. The individuals with transhumeral and short transradial amputations use docking stations to facilitate changing terminal devices. All three individuals chose body-powered upper-extremity prostheses, rather than more technically-advanced prostheses, to decrease the weight of their prostheses. Additional considerations include skin protection and wheelchair mobility. Although the individual with bilateral transradial amputations successfully uses her prostheses, she is interested in pursuing hand transplantation.

Individuals with four-limb amputation have complex, unique rehabilitative needs. Rehabilitation is best managed with an integrated, multidisciplinary team.

9:40  
am

## Prosthetic Fitting After Amputative Sacrectomy: A Case Series

Brittany Snider, DO & Sara Harstad, CP, Karen Andrews MD

**Speaker:** Brittany Snider, DO

En bloc resection of spinopelvic tumors is an extensive and challenging surgery, often in the form of a hemipelvectomy or sacrectomy. Amputative sacrectomy is an especially rare surgical procedure that combines external hemipelvectomy with partial or total sacrectomy. This type of resection has many structural and functional implications. The objectives of this case series are to describe the authors' experience with the timeline for prosthetic rehabilitation after amputative sacrectomy and to identify factors that may influence this timeline and necessitate prosthetic modifications.

This case series includes three patients who underwent an amputative sacrectomy and received prosthetic care at the authors' institution. All patients were successfully fitted with a definitive prosthesis. The range of time to definitive prosthetic fitting was 214-439 days. Two patients are now using their prosthesis to function at a K3 level. One patient has ultimately elected not to use her prosthesis.

There are many challenges to prosthetic rehabilitation following amputative sacrectomy. Wound healing and medical complications, neurological deficits, spinal deformity, postoperative pain and residual soft tissue edema are confounding factors that may influence the rehabilitation process and prosthetic timeline. Ideally, rehabilitation is managed with a multidisciplinary, integrated team. It is essential that the rehabilitation team understands the functional outcomes. Likewise, patients should have realistic expectations and goals. Despite the challenges, successful prosthetic rehabilitation is possible, and some patients may rely on their prosthesis for functional independence and primary mobility. Advances in prosthetic technology have greatly enhanced functional outcomes in this patient population.

10:20  
am

## Gait Intention Detection for Transfemoral Amputees

Taekyeong Lee & Junghwa Hong

**Speaker:** Junghwa Hong, PhD

Recent advent power knee prostheses for assisting transfemoral amputees.

10:40  
am

## Neuromuscular Electrical Stimulation Use in Transtibial Amputations: A Pilot Study

Sara Peterson, CPO, MBA

Functional neuromuscular electrical stimulation (NMES) involves low-level electrical stimulation to specific nerves to activate the musculature to improve muscle strength, circulation and function. Use of functional NMES has been researched among persons with spinal cord injuries, multiple sclerosis, and cerebral vascular accidents. However, to date, no randomized controlled trials have investigated the use of NMES on persons with transtibial amputations (TTA) to increase muscle strength and volume of the residual limb or to treat post-amputation symptoms such as edema and pain for individuals with amputation. Thus, a pilot study is being proposed to determine the effectiveness of NMES use with persons with TTA. The overall goal of the proposed research is to determine if 12 weeks of at-home NMES results in benefits to persons with chronic unilateral TTA. We hypothesize that compared to a control group, persons who undergo NMES training will show greater increases in isometric and isokinetic knee extension strength, greater increases in volume of the residual limb, greater decreases in chronic residual limb pain, phantom limb pain and phantom sensation and greater increases in velocity, step length and percentage in stance time on the amputated limb after (post) training when compared to baseline (pre-training). Understanding the effects of NMES on the amputee's residual limb will provide valuable insight on strengthening, shaping, improving gait and decreasing pain in the residual limb. **METHOD** Twenty unilateral transtibial participants who are greater than one-year post amputation were recruited and randomized into two groups. One group received the NMES intervention and the other group continued with their regular activities of daily living. The intervention was applied to the quadriceps, anterior tibials and gastrocnemius muscles. The participant wore the NMES set at the highest intensity tolerated for fifteen contractions per muscle group. The study consists of a baseline visit and four follow up visits. Outcome measures are being assessed by isometric and isokinetic knee extension strength tests, residual limb volume measurements, a pain questionnaire, the prosthetic evaluation questionnaire (PEQ) and gait analysis with the Gaitrite® system. A mixed model repeated measures ANOVA will be used to compare the outcome measures between groups (participants) and over time.

11:00  
am

## Changes in Pressure Distributed with Alignment Changes

Andrew Pedtke, MD & Hurley, G., Williams, J., Das, A., Ung, A.

**Speaker:** Andrew Pedtke, MD

There is general consensus in the prosthetic community that prosthetic alignment is directly related to clinical outcomes. There is, however, not enough clinical outcome data to adequately support and understand stresses experienced at the residual limb. Such studies can advance prosthetic socket design, and can further help meet the demand for evidence-based care and payment justification by healthcare payers.

11:20  
am

## Differential Safety and Function of Prosthetic Knees: Technical and Clinical Considerations for the Selection of Knee Mechanisms

Andreas Kannenberg, MD, PhD

**Speaker:** Andreas Kannenberg, MD, PhD

The selection of prosthetic knee mechanisms is primarily based on the prosthetist's experience and/or insurance coverage criteria. Therefore, this paper aims at identifying more objective criteria for patient-specific prosthetic knee selection in the scientific literature. Most of the references were technical and/or biomechanical, except those for microprocessor (MP) controlled knees. A German-language publication suggested a classification of knees based on their ability for controlled flexion during stance/weight-bearing. Knees were classified into 3 groups that allow for either no stance flexion (locked knees, friction brake ["safety"] knees, 4-bar knees), or limited stance flexion (multiaxial knees with  $\geq 5$  axes), or unlimited stance flexion (non-MP and MP hydraulic stance control knees). Knees with no stance flexion support reciprocal gait on level surfaces only. Knees with limited stance flexion support reciprocal ambulation on slightly uneven terrain and shallow slopes. Knees with controlled unlimited stance flexion (yielding) allow for reciprocal ambulation on all terrains, but knees with non-MP hydraulic stance control require very good muscle strength and coordination to control the vulnerable switching mechanism to prevent falls. In general, non-MP controlled prosthetic knee mechanisms are characterized by an inverse relationship between knee stability (=prevention of knee collapse during stance) and function: The more stable the knee, i.e. the better it prevents collapse during stance phase, the fewer functions, i.e. reciprocal gait on the fewer terrains it supports and vice versa. On the contrary, knees with MP hydraulic stance control have been demonstrated to combine superior safety and function (reciprocal gait on all kinds of terrains) in patients with MFCL-2, -3, and -4. The paper will present detailed considerations for the selection of knee mechanism for patients with specific physical capabilities and mobility needs.

## 1:00 pm Design of Dynamic Testing System for Robotic Low-Limb Prostheses and Orthoses

Inhyuk Moon

Speaker: Inhyuk Moon, PhD

As robotic technology progresses, the number of prosthetic and orthotic (P&O) devices on the market employing robotic technology increases. The distinct function of the robotic P&O is to control the device's motion with limited user intervention. ISO 22523 is a standard for testing P&O devices. Regarding to the test of lower-limb prostheses, there is ISO 10328, however it excludes a flexion test method for a knee joint device to control stance phase. ISO 22675 is another standard for ankle and foot tests which involves applying a synchronized vertical force to the device on a roll-over mechanism. However, it is not a dynamic test method for knee and hip joints. As described above, currently there is no dynamic test method for robotic P&O. This study proposes a dynamic test method with actively-controllable joint parts and a design for its prototype testing system. A dummy corresponding to the human body was designed based on anthropometric data. The total weight of the prototype dummy was 80 kg, which was distributed across each body part according to the anthropometric data. Since each joint of the dummy's lower limbs was designed to be separated, it can be used for testing both kinds of lower-limb P&Os. The prototype test system was designed to work with a speed-controllable treadmill under a vertical load synchronized to the gait cycle. Currently, a new version of the robotic dummy is under development based on the results of this study.

## 1:20 pm Material Analysis of Prosthetic Sockets and Comparison to Clinical Outcomes

Garrett Hurley, CPO

Speaker: Garrett Hurley, CPO

Materials within prosthetic sockets are anecdotally associated with outcomes and patient satisfaction. However, little research has been done to understand, validate, and quantify the significance and clinical relevancy of socket materials. Many prosthetists hold strong opinions as to what materials get the best results, but few of those opinions are supported with empirical evidence. Regardless of differences in opinion, prosthetists should be prepared to justify their reimbursement for sockets and materials used with quantifiable data and results. This study aims to quantify properties of materials in prosthetic sockets and associate results with clinical outcomes.

Dynamic modular prosthetic sockets have been designed and engineered with materials that mimic and complement residual limb anatomy with the objective of provide improved comfort and function. The results of this study suggest that prosthetic sockets with materials that better mimic human anatomy can offer improved prosthetic outcomes over sockets with more rigid materials.

Research directed at gaining a better understanding of the relationship between socket materials and clinical outcomes is continuing. This research may be helpful in justification of billing and reimbursement relating to socket materials.

## 1:40 pm Finite Element Analysis of Flax Composite Materials in Orthotics and Prosthetics

Steven King, DPM & Chad Ulven, PhD NDSU

Speaker: Steven King, DPM

We have completed \$20,000 of sponsored research from Ameriflax at North Dakota State University with Dr. Chad Ulven of the Mechanical Engineering department on the viability of using bio-based earth friendly flax composite materials in orthotics and prosthetics (and more specifically for our patented spring-levered gait system). I would be happy to lecture on the results. Our research was just completed in July and we will be publishing our results in the future.

## 2:00 pm The Shifting Paradigms of the Pedorthic Practice: Cast-to-Custom Vs. Central Fab Vs. Prefab

Dennis Janisse, CPed

Speaker: Dennis Janisse, CPed

Traditionally, like many O&P shops, pedorthic facilities fabricated their own shoe modifications and custom foot orthoses. Over the last two decades, several factors have led a great many pedorthic businesses to outsource their fabrication and/or shift more toward use of prefabricated devices.

Similar to the increasing dilemma in Orthotics and Prosthetics, most recent pedorthic graduates are ill-equipped to fabricate their own devices. In some cases even if they are, the businesses for which they work do not have the space, materials, equipment or time to fabricate in-house. Compounding the confusion are the factors of steadily decreasing reimbursements and the steadily increasing costs of running a business.

What is a business owner to do? In this session, the presenter will compare and contrast in-house fabrication with outsourcing and discuss the pros and cons of each. He will also outline many scenarios where prefabricated devices are not only appropriate but preferable. He will also introduce exciting new technologies like moldable carbon nano ExosB. material and different prefabricated foot orthoses and AFOs.

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# Monday

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2:20  
pm

## Yoga-Related Vertebral Compression Fractures: A Case Series

Melody Lee, MD and Mehrsheed Sinaki, MD

**Speaker:** Melody Lee, MD

**Background:** Yoga has gained great popularity in recent years, being touted as a safe and gentle form of exercise. However, injuries can occur despite the perceived benign nature of yoga. The purpose of this case series is to describe vertebral compression fractures that were directly linked to the practice of yoga.

**Methods:** The study population consisted of 10 patients who had been treated in the musculoskeletal clinic of the PM&R department. All of the patients had identified yoga as the primary cause of their injury and pain. Their charts were reviewed and analyzed retrospectively.

**Results:** All 10 patients had radiographically confirmed vertebral body compression fractures. Mean age: 63.1, height: 162.74, and weight: 65.24. Average T-score: 2.41. All of the patients identified one to two of four poses as the cause of their injury. Among them, bridge pose caused 4(33.3%), seated forward fold caused 4(33.3%), plow pose caused 3(15%), and headstand caused 1(8.3%) of the injuries.

**Conclusion:** To our knowledge, this is the largest case series of yoga-related vertebral compression fractures to date. While yoga potentially has many health benefits, it still carries some risks. Patients who have osteopenia or osteoporosis may be at higher risk of compression fractures or deformities, particularly when performing extreme spinal flexion. Practitioners should address this when prescribing yoga as exercise.

2:40  
pm

## [Workshop] Ossur Bionics: Advancements and Clinical Outcomes

Justin Pratt, CP

**Speaker:** Justin Pratt, CP

This workshop will introduce you to the advancements in design of the new RHEO KNEE Technology and ÖssurLogic software, both that can contribute to the rehabilitation of the amputee in providing enhanced stability and individual guidance in initial training. The results of a clinical trial will also be discussed, showing improvements in 6 MWT and the Borg Scale. In review of the ÖssurLogic software, participants will gain an understanding of how to implement the software for training the user as well as to capture objective data relative to the users daily activities. During this workshop, attendees will learn how to implement this technology into their practice and see the benefits to the end user. This session will be informative and lend to a more validated approach to fitting the Rheo Knee technology.

3:00  
pm

## [Workshop] Introduction to Cybernic Technologies and Oita Robo Care Center

Yoshihiro Yasunaga

**Speaker:** Yoshihiro Yasunaga

Oita Robo Care Center is a subsidiary company of CYBERDYNE, INC., both located in Japan. It uses innovative Cybernic Technology for the good of people and society. Presentation will introduce the technology mainly used in the field of medicine and care, as well as the HAL FIT service of Oita Robo Care Center that helps patients with to improve their physical function.

7:35  
am

## [Keynote] Response to the 2008 Wenchuan Earthquake and Development of P&O Training in China

Aaron Leung

Speaker: Aaron Leung

The Wenchuan Earthquake of 12 May 2008, measuring 8 on the Richter Scale, resulted in approximately 70,000 dead and 375,000 injured. After the earthquake, The Hong Kong Polytechnic University (PolyU) immediately launched a fundraising campaign, and raised a total of HK\$3.4 million to support the earthquake victims. An interdisciplinary Task Force was formed to provide support to the post-quake reconstruction effort. With the endorsement of Senior Management, the Working Group spearheaded the joint initiative with Sichuan University in establishing the “Sichuan Post-Disaster Reconstruction Support and Research Centre” in June 2008, consisting of representatives from both PolyU and Sichuan University. The aim of the Centre is to provide support services, to contact training programs, and to undertake research in connection with post-disaster relief and reconstruction. Since there were large numbers of earthquake victims requiring rehabilitation services, the Centre conducted intensive “Train the Trainers” programs on various rehabilitation services to meet the immediate demand of servicing medical and health care workers in Sichuan. PolyU also received \$10.4 million from the Hong Kong Government to assist Sichuan University to develop undergraduate professional education in prosthetics & orthotics, as well as physiotherapy and occupational therapy. At the same time, PolyU provided professional P&O, PT and OT work forces to the Denyang Disabled Person’s Federation, Hong Kong Red Cross Rehabilitation and P&O Centre, which both offered service to the earthquake victims and acted as training centers for local health care workers. PolyU received further funding from the Hong Kong Jockey Club to conduct Masters and PhD programs to develop potential academics for further enhancement of P&O service and education in Sichuan and other parts of China.

8:20  
am

## Fitting and Training Amputee Athletes in Ukraine

Jon Batzdorff, CPO & Alicia White, DPT

Speaker: Jon Batzdorff, CPO

Prosthetika was asked to propose a way to raise the image of people with disabilities in Ukraine. We decided to found a disabled sports and leisure program for physically disabled people. Our first project for athletes was multidisciplinary, as our prosthetists fit upper and lower extremity amputees and our physical therapists and sports trainers worked with them in their sport of choice. Activities included running, volleyball, archery, cycling, fencing, and Crossfit. A primary focus of the project was to train local prosthetists and therapists in the fitting and training techniques so that they could provide follow-up and deliver similar services to more people after the Prosthetika team left. This presentation will share fitting techniques, and training techniques, discuss the challenges of working in Ukraine, and the results.

8:40  
am

## Advanced Amputee Training in Ukraine

Alicia White, DPT & Jon Batzdorff, CPO

Speaker: Alicia White, DPT

The focus of this discussion will be to explain the contents of the trip to Ukraine to train five individuals to use high level prosthetic devices as well as train local physical therapists to continue the mission. In July 2017, a team of medical professionals traveled from across the world to Dnipro, Ukraine to design, develop, and train five individuals to use a lower limb prosthesis for sporting activities. These individuals were first evaluated to determine their goals and physical limitations. While the prosthetists created the limbs, the individuals with limb loss participated in a general strength and conditioning program to advance their physical skills in their current prosthesis while the physical therapists from Ukraine learned how to treat these patients. When the new limbs were ready, the team taught the patients how to use them properly to advance their physical fitness and avoid potential injury. The contents of this talk will assist audience members to learn about advanced prosthetic rehabilitation, the benefit of multidisciplinary care and how to manage it, as well as the importance of education for all healthcare providers in the realm of prosthetic rehabilitation.

9:00  
am

## Choice of Myoelectric vs. Body-Powered Arms: A Case Study in the Developing World

Harold H. Sears, PhD & David Rotter, David Krupa CP

Speaker: Harold H. Sears, PhD

The debate over externally-powered (myoelectric) vs. body-powered (B-P) components is best answered by the specific needs of the UL prosthesis wearer, considering the pros and cons of the components. In the developing world, further questions are relevant: e.g., how does availability of resources, trained professionals, and component service affect the prosthetic choices?

To generalize: the pros and cons of myo and B-P components are:

**B-P Pros:** less complex (less costly), more robust, emphasize function over cosmesis.

**Cons:** control cables cause discomfort & limited work envelope and lack simultaneous DOF.

**Myoelectric Pros:** no control cables, better comfort and work envelope, higher pinch force, simultaneous DOF possible.

**Cons:** higher cost, weight, complexity.

Hybrid (myo and B-P) prostheses may offer “the best of both worlds.” Especially in developing countries, the right combination may increase value, without compromising function. Complexity is lowered, reducing cost and difficulty of fitting, and improving dependability and function.

9:20  
am

## Advances in Myoelectric Technologies and Improving Function for Upper Limb Deficiencies

Karl Lindborg, CPO

Speaker: Karl Lindborg, CPO

I would like to provide a review of the various technologies that are improving upper limb myoelectric control, including Pattern Recognition, Gesture Control, and Proximity Control, as well as some of the new interface materials like the milled silicone used for socket interfaces. I would be providing a global review of all that is available and emerging including some of the partial finger technologies like Naked Finger and Point Designs, as well as M fingers. Finally, I would like to discuss the emerging world of the 3-D printing and design of myoelectric systems.

9:40  
am

## User Interests in the Restoration of Touch Perception Through Upper Limb Prosthetics

F. Clay Smither, MD & Tyson Scrabeck, Kristin Zhao, PhD, Karen Andrews, MD

Speaker: F. Clay Smither, MD

Providing sensory feedback through an upper extremity prosthesis is an ambitious task. It is important to understand how individuals with upper limb loss feel this would be best achieved.

To optimally create an online survey, a preliminary telephone survey was developed to assess user interest in possible noninvasive options for active sensory feedback. The study included nine individuals who had been involved in initial testing of a prototype prosthesis. Participants were asked to rank the perceived acceptability and effectiveness of noninvasive sensory feedback to areas of intact sensation on the residual limb. Four main types of haptic information were assessed: object contact, proprioception, surface texture and grasp force. Participants were also asked how best to convey sensation with a variety of stimuli.

Responses from nine individuals were analyzed. Many participants were interested in possible options to allow active sensory feedback to restore touch perception to their prostheses. Participants expressed greatest interest in grasp force, with eight individuals (89%) identifying it as their highest priority. When given a list of challenging activities to be performed with their prosthesis, seven (78%) participants thought sensory feedback would facilitate the task of holding a cup. The results of this survey will guide researchers as they develop sensory feedback for individuals with limb amputations.

10:20  
am

## Evidence-Based Approach to the Management of Spinal Deformity

John Fisk, MD

Speaker: John Fisk, MD

Consensus and controversy exist in the orthotic management of spinal conditions. Lacking in P&O education has been a resource document dealing with these issues. Such a tome has brought together the necessary materials for developing courses on the orthotic management of spinal disorders. An authoritative Atlas, available on line and free to interested individuals and institutions, has recently been published. The editors have brought together 24 leading contributors from around the world to author a work of as many chapters.

This Atlas' contributors have used evidence-based contributions to set the basis for a meaningful approach to the management spinal disorders. Addressing the discipline of the orthotic management of spinal deformity, as an example, this presentation will highlight how The Atlas of Spinal Orthotics is a resource for all members of the clinical team.

The arguments for the selection of specific orthoses and the approach to patient care will be based on evidence based literature. Ample time will be allowed for questions and discussion.

**11:00  
am**

## **Preliminary Investigation of Pediatric Myoelectric Exoskeleton for Individuals with Unilateral Upper Limb Impairment**

LeRoy Oddie, CP

**Speaker:** LeRoy Oddie, CP

For pediatric individuals with upper limb impairment, regardless of diagnosis, therapeutic or functional solutions are very limited. These individuals often have no alternative than to adapt to life unilaterally with the contralateral upper limb. For such impaired individuals with a trace Electromyographic (EMG) signal, an externally powered exoskeleton may provide an appropriate solution to permit bilateral upper limb tasks. This presentation considers the viability of a prototype powered exoskeleton to restore function in pediatric individuals with unilateral upper limb impairment.

**11:20  
am**

## **A Passive Exoskeleton to Assist Walking in Children with Neuromuscular Disorders**

Jessica Zistasis, Kristie Bjornson, Brian Glaister, Kat M. Steele

**Speaker:** Jessica Zistasis

Children with neuromuscular disorders such as cerebral palsy (CP) often have walking disabilities and experience motor function developmental delays. Even with the help of therapy and assistive devices such as walkers and crutches, children with CP get significantly less walking practice than typically developing (TD) peers. Time in therapy is often insufficient for improvements in gait mechanics to extend to community ambulation. The purpose of this study was to evaluate a novel passive pediatric exoskeleton to improve community walking practice for children with CP. This exoskeleton utilizes elastic elements to store and return energy throughout the gait cycle. When the child's assisted leg extends posteriorly, the spring stretches and energy is stored. During terminal stance and swing, energy returns to the system and the exoskeleton guides the swing phase. Children ages three to six years with hemiplegic CP and Gross Motor Functional Classification System (GMFCS) levels I-III were recruited. Each child was evaluated for joint kinematic and spatiotemporal changes such as step width, step length, and walking speed in five over-ground shod walking conditions: no assistive devices or orthoses, with their prescribed orthoses, and with the exoskeleton set at low, medium, and high stiffness. We hypothesize an increase in gait symmetry and an improvement in hip flexion and ankle dorsiflexion angles. These gait improvements would motivate a longitudinal study in community environments to demonstrate that a passive exoskeleton could translate walking therapy from the clinic to the community and encourage guided walking practice.

**11:40  
am**

## **The Use of Osseointegrated Titanium Implants to Treat Bilateral Amputees**

Munjed Al Muderis, MD

**Speaker:** Munjed Al Muderis, MD

Current socket prostheses remain problematic, resulting in more than 90% of patients with bilateral above-knee amputations being confined to a wheelchair due to the difficulty of mobilizing with prosthetics on both lower limbs. Osseointegration has been regarded as a novel approach to overcome persistent socket prosthetic issues, using a transcutaneous implant directly attached to the residual bone. A number of bilateral amputees have been treated with osseointegration in our center since July 2012. This paper reports the early clinical outcomes in this particular group of patients, including the results of functional and quality of life assessments, and safety of the osseointegration procedure.

Comparisons were made using differences between the mean pre-operative and mean post-operative values for each outcome measure. Significant improvements in all validated outcome measures were observed. The occurrence levels of adverse events, including the infection rate and revision rate, were similar to other established trans-femoral osseointegration studies.

These preliminary results indicate that osseointegration surgery is a safe and effective alternative treatment for bilateral amputees experiencing socket-related discomfort. Compared to the suboptimal outcomes of socket prostheses, osseointegration currently provides one of the best chances for any bilateral amputee to walk again and regain the ability to perform daily activities.

**1:00  
pm**

## **[Workshop] The End of Rigid Sockets – Latest Innovations for All Amputation Levels**

Jay Martin, CP

**Speaker:** Jay Martin, CP

Through working with NASA, Martin Bionics' created counterintuitive new methods for connecting prosthetics to amputees using conforming materials and fabrics vs. encapsulating the limb with traditional rigid plastics. The Martin Bionics' Socket-less Socket™ technology fits like a sneaker, and provides superior control and unparalleled comfort and conformity.

Discover all new socket configurations, and now for all amputation levels.

This session will discuss how fitting the Socket-less Socket™ technology offers a more efficient clinical practice, increased revenue, and fewer follow-up adjustment appointments compared with conventional fitting methods.

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# Tuesday

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**1:00  
pm**

**[Workshop] All MPKs Are Not the Same!**

Tim Shride, CPO

**Speaker:** Tim Shride, CPO

This 2 hour workshop will discuss the various microprocessor knees available from Ottobock, and their features and functions. The purpose is to provide an overview of the differences between the various Ottobock MPK functions, to assist the clinician in making decisions for various patient presentations.

**3:00  
pm**

**[Workshop] Pro-Flex Foot with Torsion: A Clinical Outcomes Focus**

Justin Pratt, CP

**Speaker:** Justin Pratt, CP

The Pro-Flex family of feet have been designed with the sound limb in mind. The Pro-Flex with Pivot technology is aimed at reducing the negative effects imposed on the sound limb which are associated with traditional prosthetic feet. Considering the incident rate of osteoarthritis being 17 times more likely to occur in persons with trans-tibial amputations than that of non-disabled people. This shocking statistic regarding the sound limb stems mainly from two key factors: asymmetrical gait and increased impact. This new design, which has been shown to offer decreased impact and moment on the sound side leg, and discovery has prompted Ossur to extend the design characteristics of the Pro-Flex with Pivot into other foot designs such as the Pro-Flex XC and Pro-Flex LP. Furthermore, the expansion of this foot family to include torsion and shock absorption is expected to further increase the clinical value for the prosthetic user. Join us for an in depth presentation and discussion of the Pro-Flex family of feet and the new direction prosthetic foot designs have taken as Ossur leads the way.

**3:00  
pm**

**[Workshop] Choosing the Right Myoelectric System for Your Patient: Terminal Devices, Wrists, Elbows, Control Options...When Do You Choose Them and Why? (Wilcox Room)**

Tim Shride, CPO

**Speaker:** Tim Shride, CPO

This 2 hour workshop will discuss when to choose myo electric control and justification criteria. What are the benefits of external power as well indications and contra-indications? Input devices, wrist, terminal device, and elbow options will be discussed. Other topics will include pattern recognition as a control method, and custom silicone for improved user comfort.

7:35  
am

## [Keynote] Exceed Worldwide: A New Beginning for P&O Service Delivery Concepts for Low-Income Settings

Carson Harte, CPO

**Speaker:** Carson Harte, CPO

Exceed Worldwide (formerly The Cambodia Trust) has been a leading Not for Profit NFP organisation, working in Prosthetics and Orthotics in South East Asia since the early 1990s.

Initially formed in Cambodia, as a Prosthetics service provider, dealing with amputations from Landmines, the work quickly diversified into Orthotics, in response to the large numbers clients with Post-Polio syndrome.

In 1993, the organisation recognised that O&P education (of local students) was the key to sustainable O&P services in that country, and so, with partners, established The Cambodian School of Prosthetics and Orthotics. In 2004, the school was replicated in Sri Lanka, 2008 In Indonesia, 2011 in The Philippines and in 2015 in Myanmar.

Carson Harte, the founder director of CSPO, and now the chief executive of Exceed worldwide, will discuss the route to development which includes internationally accredited education, developments in technology, research, infrastructure and sustainability. Recent innovation within Exceed has shifted the service (NFP) model to that of Social Enterprise, where business and charity combine. This paper will discuss the shifting paradigm and offer thoughts on the repeatability of the model as a possible route to sustainability

8:20  
am

## Challenges in Prosthetics and Orthotics Education in Sub-Saharan Africa Francophone Country Togo

Akouetevi Aduayom-Ahego & Yoshihiro Ehara, Shota Inoue

**Speaker:** Akouetevi Aduayom-Ahego

Limited publications exist concerning prosthetics and orthotics education and service provision in the francophone developing countries. Understanding the current situation in one of the accredited programmes is essential. This study aimed to explore the perceptions of students and alumni regarding the challenges in the prosthetics and orthotics programme in the sub-Saharan African francophone country of Togo. Alumni and current students enrolled in the Prosthetics and Orthotics department at Ecole Nationale des Auxiliaires Médicaux, Lomé, Togo, were invited to complete a survey in April 2017. The authors analyzed the responses using descriptive statistics to identify emergent challenges in the prosthetics and orthotics field. Twelve respondents of the alumni and nineteen current students completed the survey. The vast majority of the respondents of each group were male, predominance respectively; 11 (91.7%) and 16 (84.2%). The prosthetics and orthotics education in Togo faces many challenges mainly related to the lack of continued education, lack of research facilities, and lack of biomechanics devices in the existing training programme. All respondents desired improvements to the prosthetics and orthotics field.

8:40  
am

## Integration of Wheelchair Service Provision Education in Prosthetic & Orthotic Programs in Different Global Context Settings

Taavy Miller, MSPO, CPO

**Speaker:** Taavy Miller, MSPO, CPO

This is one of the first studies to describe the current wheelchair service provision education in prosthetic and orthotic (P&O) curricula around the world. Wheelchair service provision education is one key way to ensure the quality of wheelchair service offered to wheelchair users regardless of their resource settings. To improve the quality of wheelchair service worldwide, the results of this study focus on a sample of P&O instructors from five different countries and their current level of wheelchair service provision integration into P&O programs. The study design used was a generic qualitative methodology approach using a semi-structured interview guide designed to explore the current status of wheelchair content in health professional university curricula and the associated facilitators and barriers. The study was approved by the Institutional Review Board of the University of Pittsburgh (PRO016070410). The research team purposively recruited a volunteer sample of representatives from five different universities using an email invitation. The goal was to obtain a balanced sample with respect to resource level. Each interview was analyzed using a qualitative thematic analysis applying an inductive approach. Upon completion of the interviews, an in-depth thematic analysis was completed using NVivo for Mac (version 11.4.1, QSR International PTY Ltd, Australia) and collaboratively the team identified overarching themes. The main themes that emerged and discussed in this paper are educational strategies, context and integration. These results will inform development of P&O programs and future discussions for role and scope of P&O professionals worldwide.

10:00  
am

## 2018 Compliance Update: Compliance Excellence, Best Business Practices and the Successful Accreditation Survey

Jim Lawson

**Speaker:** Jim Lawson

In this day and age, compliance with O&P standards is immeasurably valuable—it can make or break your business. Join this educational opportunity and discussion on best business practices and ways to help your facility comply with the ABC accreditation standards.

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# Wednesday

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**10:00  
am**

**[Workshop] Creation and Use of Flexible Laminated Sockets and AFOs**

Matt Perkins

**Speaker:** Matt Perkins

This session will cover what led to the creation and use of more flexible laminated sockets, as well as the alternatives to carbon fiber that are used. This workshop will also have a more in-depth look at exactly how more flexible sockets are laminated, including vacuum and locking vacuum sockets and AFOs.