



PROGRAM BOOK

ACPOC 2022 Annual Meeting

April 6–9th Sheraton Sand Key Resort 1160 Gulf Blvd, Clearwater, FL 33767

April 6–9th | Clearwater, FL

General Information

The Association of Children's Prosthetic-Orthotic Clinics provides a comprehensive resource of treatment options provided by professionals who serve children, adolescents, and young adults with various orthopaedic impairments.

Goals

The goal of the annual meeting is to provide a forum for the sharing of knowledge regarding the newest developments in research, equipment, observations, and treatments for children and adolescents with limb deficiencies. The meeting will also encourage and promote investigative endeavors and augment the education of personnel engaged in scientific endeavors related to the field of limb deficient patients.

Objectives

At the conclusion of this activity participants should be able to:

- 1. Provide a format that presents the best available knowledge in the care and treatment of children and adolescents with limb deficiencies and transition into adulthood,
- 2. Examine the indications, techniques and results of various surgical procedures; and describe the management of children's orthopaedic problems,
- 3. Examine the latest prosthetic-orthotic equipment,
- 4. Present the latest in physical and occupational therapy, rehabilitation, adaptive equipment, and techniques.

Activity Goal

This activity is designed to address the following core and team competencies: Patient Care, Medical Knowledge, Practice-based Learning, System-based Practice, and Interprofessional Communication

Target Audience

This activity is designed for new and established orthopaedic surgeons, pediatricians, rehabilitation physicians, nurses, orthotists, prosthetists, physical and occupational therapists, other healthcare professionals who care for children with orthopaedic or related disabilities and educators from with the US and Canada, or in practice outside the US and Canada.

Disclaimer Information

The material presented at the 2022 Annual Meeting has been made available by ACPOC for educational purposes only. The material is not intended to represent the only, or necessarily best, method or procedure appropriate for the medical situations discussed, but rather is intended to present an approach, view, statement or opinion of the faculty, which may be helpful to others who face similar situations.

Furthermore, any statements about commercial products are solely the opinion(s) of the author(s) and do not represent an ACPOC endorsement or evaluation of these products. These statements may not be used in advertising or for any commercial purpose.

The ACPOC disclaims any and all liability for injury or other damages resulting to any individual attending the Annual Meeting and for all claims that may arise out of the use of the techniques demonstrated therein by such individuals, whether physicians or any other person shall assert these claims.

FDA Disclaimer

Some drugs or medical devices described or demonstrated in ACPOC educational programs or materials may not have been cleared by the Food and Drug Administration (FDA) or have been cleared by the FDA for specific uses only. The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or device he or she wishes to use in clinical practice.

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Hotel Map



Meeting App

The ACPOC 2022 Annual Meeting has a mobile app!

To view the program, exhibitors and to network with other meeting attendees, sign in by scanning the QR code or by going to the URL below:

https://virtual.oxfordabstracts.com/#/event/2502/program



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CME Information



Accreditation

In support of improving patient care, this activity has been planned and implemented by Cine-Med and the Association of Children's Prosthetic-Orthotic Clinics. Cine-Med is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

Physicians

Cine-Med designates this live activity for a maximum of 21.75 AMA PRA Category 1 Credit(s)^M. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Other Healthcare Professionals

All other healthcare professionals will receive a Certificate of Participation. For information on the applicability and acceptance of Certificates of Participation for activities designated for AMA PRA Category 1 Credits[™], consult your professional licensing board.

AAPA accepts certificates of participation for educational activities certified for AMA PRA Category 1 Credit[™] from organizations accredited by ACCME or a recognized state medical society.

ABCOP Credits

The ACPOC Annual Meeting has been awarded continuing education credits by the American Board for Certification in Orthotics, Prosthetics and Pedorthics. 19.75 Category 1 Scientific Credits will be awarded.

OPC Credits

The ACPOC Annual Meeting has been awarded continuing education credits by the Orthotics Prosthetics Canada (OPC) for a total of 18 MCEs (Reference #: #2022-030/2022-039).

Certificates

To claim your CME/CE credits, complete the online Credit and Evaluation form using the following URL:

https://cine-med.com/certificate.php?redirect=acpoc2022. This is a one-time credit submission. Credits should be tracked at the completion of the meeting. Participants will be able to download or print a certificate once the form has been submitted.

Commercial Support

This activity is being provided independent of industry support.



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Disclosure Information

Non-Endorsement

The accredited provider verifies that sound education principles have been demonstrated in the development of this educational offering as evidenced by the review of its objectives, teaching plan, faculty, and activity evaluation process. The accredited provider does not endorse or support the actual opinions or material content as presented by the speaker(s) and/or sponsoring organization.

Disclosures

The accredited provider adheres to accreditation requirements regarding industry support of continuing medical education. Disclosure of the planning committee and faculty's commercial relationships will be made known at the activity. Speakers are required to openly disclose any limitations of data and/or any discussion of any off-label, experimental, or investigational uses of drugs or devices in their presentations. — *All employees in control of content have no relevant financial relationships to disclose.*

All relevant financial relationships have been mitigated. The following participants have **No Relevant Financial Relationships to Disclose:** Shanee Abouzaglo; Mara Atherton; James Benelli, CPO; Jennifer Brondon MD; Jill Cannoy, PT, DPT, PCS; Jonathan Cook, CPO; Colleen Coulter, PT, DPT, PhD; James Del Bianco, CPO; Brian Emling, MSPO, CPO, LPO; Aaron Fitzsimmons, CP, OT; Corey Gill, MD; Ola Harrysson, PhD; Rebecca Hernandez, CPO; Robert Hinson; Nancy Hylton, PT, LO; Emily Marshall; Stephanie Miller, DO; Vinay Narotam, MD; Gabrielle Nguyen, MD; Makenzie Papp, CFo, C.Ped; Allan Peljovich, MD, MPH; Helenlyn Popescu, MPO, CO; Michael Schmitz, MD; Jonathon Schofield, PhD; Liz Selgrade, CPO; Casandra Solis OD; Anna D Vergun, MD, FAAOS; David E Westberry, MD; James Wynne, CPO; Sean Zeller, MBA; Jorge Zuniga PhD

First	Last	Suffix	Commercial Interest	Role
Justina	Appel	CO, PhD, BOCP, FAAOP	Allard USA	Employee
Amy	Barrios	СРО	Orthomerica	Employee
Seth	Cochrill	СО	Wright and Filippis	Orthotist
Phoebe	Scott-Wyard	DO	Hanger Clinics	Consultant
Hugh	Sheridan		Andiamo	Employee, Stockholder

Relevant Financial Relationships



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Clearview, FL April 6-9th Sand Key Resort



Attend our Workshop and Visit our Table

Wednesday April 6th 12.30-1.15pm

Workshop - Reimagining Cerebral Palsy: Placing the Orthotist at the center of CP



Grab life by the paddle.

Kayak, canoe, and paddleboard with the **TRS Hammerhead or Hammerhead Pivot**.



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Point Digit mini

Point Designs' first prosthetic finger designed to accomodate people with smaller hands, including children.

We stock 5 standard lengths of our Point Digit mini (55, 60, 65, 70, and 75 mm measured from the MCP joint center to fingertip)



These new smaller prosthetic fingers are designed for people who have lost one or more fingers at or near the MCP joint.

It is a mechanical, passive device with a robust construction. The Point Digit mini empowers people with partial finger amputation by giving them more mobility, function, and independence.

Key Features:

- 0.71 oz 0.99 oz (20 g 29 g)
- 11 positions of flexion
- Integrated compliant fingertip pads that are touch screen compatible and field replaceable
- Anatomical rotation around the patients MCP joint



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Amputee Blade Runners (ABR) is dedicated to helping lower limb-different athletes of all ages reimagine what is possible in sports and in life.

Headquartered in Nashville, TN, ABR provides free custom running and sports prosthetics to lower-limb different individuals seeking to regain an active lifestyle. Active amputees are a small minority of the overall amputee community and many struggle to find practitioners with a skill set that propels them forward. ABR was founded by prosthetists and technicians who volunteer their time, equipment, and skill to give the joy of running. Through this generosity and favorable pricing from vendors, ABR's cost to provide equipment to new athletes is only \$3,500.

www.amputeebladerunners.com

Social Media: @AmputeeBladeRunners





The BraceWyse, developed by Gaffney Technology, is a compliance monitor automatically logging patient's wear time of a brace.

Key features include:

- Best-in-class temperature response time among wireless monitors
- Dedicated case design for easy and secured mounting on a brace
- On-demand data retrieval by mobile phones- no need to wait till office revisit
- Automatic data uploading to a Web portal for practitioners' review without seeing the patients
- Interactive charts and reports for analysis
- Free Apple and Android apps

Technical specifications:

- 10-minute sampling interval
- Local storage: 6 months of data, rewritable by settings in apps
- Cloud storage: 3 years of data
- Replaceable battery lasting up to 18 months
- Battery: 2032 Lithium
- Wireless protocol: NFC (the same technology used in Apply Pay and Google Pay)
- Effective dimensions: 11mm in height, 30mm in diameter (about the size of a cap of bottled water). A mounting hole of 30mm in diameter on the brace is recommended
- Weight: Approximately 0.03 pounds (14 grams)
- Phones with NFC: iPhone 6S and later, Android phones vary

Additional notes:

If equipped, NFC in iPhones is turned on by default; in Android phones, NFC needs to be turned on manually for some models.

For more information, please contact: <u>gaffneyhinge@gmail.com</u> or by phone 503-640-1217 or visit https://www.bracewyse.com





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Spinal Technology is the global leader in the design and fabrication of a variety of Spinal Orthoses, for the stabilization, immobilization, and the correction of various abnormalities of the spine.

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- Kyphosis Brace
- Kyphologic Brace

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Spinal Technology,Inc.

In-Brace X-ray & Brace Design Consultation

 Email in-brace x-rays for review by one of our team to improve patient outcomes



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(all times listed are EDT)

Wednesday, April 6th

10:00am–8:30pm	Registration
11:30am–6:15pm	Technical Workshops (Moderators: Colleen Coulter, Brian Emling, Robert Lipschutz)
11:30am–12:15pm	Cranial Remolding: How it Works, Why it Works — Orthomerica Products, Inc.
12:30–1:15pm	Reimagining Cerebal Palsy: Placing the Orthotist at the Heart — Andiamo
1:30–2:15pm	Benefits of the Scout Pediatric Foot — College Park Industries
2:30–3:15pm	Optimizing Post Scoliosis in Brace X-Rays — Boston Orthotics & Prosthetics
3:30–4:15pm	Pattern Recognition Controls with MyoPlus — Ottobock
4:30–5:15pm	Scan to Print Cranial Remolding Using MyCro Band Technology — Ottobock
5:30–6:15pm	The Benefits of 3d Printing in Pediatric AFOs and CROs — Invent Medical USA
	ACPOC is not advocating any technology or methods by providing time for workshops
6:30-8:30pm	Welcome Reception with Vendors in Exhibit Hall
7:30–10:00pm	Board of Director's Meeting

Thursday, April 7th

7:00am–5:00pm	Registration
7:00-8:00am	Continental Breakfast
8:00–8:05am	Welcome Anna Vergun, MD — ACPOC President
8:05-8:15am	New Investigator Research Awards Presentation Anna Vergun, MD — ACPOC President

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Thursday, April 7th

8:15–9:55am	Session I – Lower Extremities Orthotics (Moderator: Colleen Coulter)
8:15–8:25am	Arthrogryposis Contracture Management with HKAFO Seth Cochrill, CO
8:25–8:35am	Maintaining Clubfoot Correction While Treating Hip and/or Knee Dislocation: The Thermoplastic Splint Experience at University of North Carolina, Chapel Hill Vinay Narotam, MD; Anna Vergun, MD
8:35–8:45am	The Implications of Typical and Precise Somato-Sensory Information in Successful Orthotic and Wear Nancy Hylton, BS
8:45–8:55am	Orthotic Intervention Considerations for Children on the Autism Spectrum with Sensory Dysfunction Disorders Justina Appel, PhD
8:55–9:05am	Discussion
9:05–10:05am 10:05–10:50am	Please, Let's Define Function Colleen Coulter PT, DPT, PhD; Jorge Fabregas, MD; Anna Vergun, MD; Rebecca Hernandez CPO/LPO Refreshment Break
10:50–11:30am	Session II – Outcomes and Research Presentations (Moderator: Sandra Ramdial)
10:50–11:00am	Implementation of Mental Health Screening in the Pediatric Lower Limb Deficiency (LLD) Population Emily Marshall, BS; Eileen Shieh, MD; Jeanne Franzone, MD; Susan Dubowy, PA-C; Paul Enlow, PhD
11:00–11:10am	Sex and Racial Differences in Fibular and Femoral Deficiency Mara L. Atherton, BA; Hank D. White, PT; PhD, Janet Walker, MD
11:10–11:20am	COVID-19 Related Pediatric Amputations – A Case Series Gabrielle Nguyen, MD; Stephanie Miller, DO
11:20am-11:30am	Discussion

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Thursday, April 7th

11:30am–12:30pm	Presidential Guest Speaker Jennifer Brondon, MD
12:30–1:30pm	Lunch in Exhibit Hall
1:30–2:45pm	Vascular Anomalies <i>(Moderator: Robert Lipschutz)</i> Anna Vergun, MD; Sean Zeller, CPO; Jennifer Brondon, MD; Rebecca Hernandez, CPO, LPO; Jill Cannoy, PT, DPT, PCS
2:45-3:30pm	Break
3:30–4:50pm	Session III – Clinician Guided Forum (Moderators: Anna Vergun and Jorge Fabregas)
4:50-5:00pm	Discussion
5:00pm	Adjourn

Friday, April 8th

7:00am–5:00pm	Registration
7:00–8:00am	Continental Breakfast
8:00–10:15am	Session IV – Upper Extremity (Moderator: Phoebe Scott-Wyard)
8:00–8:10am	Challenges Associated in Identifying and Designing Functional Devices for Patients with Congenital Upper Extremity Deficiencies Brian Emling, MSOP; Richard Welling, MSOP; Colleen Coulter, DPT; Alan Peljovich, MD; Joshua Ratner, MD
8:10-8:20am	Shiners Children's Hero Arm Experience - Lessons Learned and Patient Perspectives Liz Selgrade, MSPO
8:10–8:20am 8:20–8:30am	Shiners Children's Hero Arm Experience - Lessons Learned and Patient Perspectives Liz Selgrade, MSPOBrain Lateralization in Children with Upper-limb Reduction Deficiency Jorge Zuniga, PhD; Rakesh Srivastava, CPO

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Friday, April 8th

8:00–10:15am	Session IV – Upper Extremity (Moderator: Phoebe Scott-Wyard)
8:40–8:50am	Assessing the Control of Residual Muscles in Children with Congenital Upper Limb Deficiencies Anita Bagley, PhD, MPH; Justin Fitzgerald, BS; Marcus Battrow, BS; Jonathan Schofield, PhD; Wilsaan Joiner, PhD; Michelle James, MD
8:50–9:00am	Discussion
9:00–10:00am	Craniosynostosis and Ocular Manifestations - Multidisciplinary Management Casandra Solis, OD, FAAO, Rebecca Spragg, MSPO, CPO
10:00–10:10am	A Study on the Effectiveness and Compliance of Pectus Orthoses Makenzie Papp, CFo, C.Ped.BA; James Del Bianco, CPO, BSE
10:10–10:15am	Discussion
10:15–11:00am	Break
11:00am–12:00pm	Session V – Gait, Orthotics, and Prosthetics (Moderator: Kelly Jeans)
11:00–11:10am	What if We Don't Agree if a Prosthesis Fits? Hank White, PT, PhD; Joel Eastman, MS; Sam Augsburger, MS; Eric Miller, L/CPO; Janet Walker, MD
11:10–11:20am	Randomized Trial of the Effect of Ankle Foot Orthoses on Ambulation in Pediatric Patients with Charcot Marie Tooth Disease Phoebe Scott-Wyard, DO; Abygaile Almoite, MS; Andrew Skalsky, MD; Chamindra Konersman MD
11:20–11:30am	Does Use of Ankle Foot Orthoses affect Dynamic Motor Control During Walking? David Westberry, MD; Lisa Carson, MS; Lauren Hyer, MD; Prabhav Saraswat, PhD
11:30–11:40am	Boys to Men: High Activity Prosthesis For a Young Man with Fibular Hemimelia Aaron Fitzsimmons, CP
11:40–11:50am	What The Flip? Transfemoral Socket Design for Pediatric Dancer/Gymnast Aaron Fitzsimmons, CP
11:50am–12:00pm	Discussion

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Friday, April 8th

12:00–1:00pm	Member Business Meeting and Lunch
1:00–2:00pm	Hector Kay Lecturer Ola Harrysson, PhD
2:00-2:30pm	Session VI – New Investigator Awards (Moderator: Rebecca Spragg)
2:00-2:20pm	Transition Experiences of Young Adults with Complex Health Care Needs: A Qualitative Study Helenlyn Popescu, MPO; Robert Lipschutz, CPO
2:20–2:30pm	Discussion
2:30-3:15pm	Break
3:15-4:40pm	Session VII – Clinician Guided Forum (Moderators: Anna Vergun and Jorge Fabregas)
5:00–6:00pm 6:30–9:00pm	Board of Directors Meeting Optional Social Event
2:00-2:30pm 2:00-2:20pm 2:20-2:30pm 2:30-3:15pm 3:15-4:40pm 5:00-6:00pm 6:30-9:00pm	Session VI - New Investigator Awards (Moderator: Rebecca Spragg) Transition Experiences of Young Adults with Complex Health Care Needs: A Qualitative Study Helenlyn Popescu, MPO; Robert Lipschutz, CPO Discussion Break Session VII - Clinician Guided Forum (Moderators: Anna Vergun and Jorge Fabregas Board of Directors Meeting Optional Social Event



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Saturday, April 9th

7:00am–12:00pm	Registration
7:00–8:00am	Continental Breakfast
8:10-8:50am	Session VIII – General (Moderator: Sheila Mason)
8:10–8:20am	Epidemiology of International Patients with Lower Limb Deficiencies Treated at a United States-Based Pediatric Prosthesis Clinic Shanee Abouzaglo, BS; Hannah Worrall, MPH; John Herring, MD; Charles Johnston, MD; Corey Gill MD, MA
8:20–8:30am	Characterization of Patellofemoral Instability in Pediatric Patients after Below- Knee Amputation Corey Gill, MD, MA; Matthew Igbinigie, MD; Hannah Worrall, MPH; Madison Brenner, BASc; John Herring, MD, Henry Ellis, MD
8:30–8:40am	Targeted Muscle Reinnervation (TMR) and Pain Control: The Utilization of TMR for Pain Control in Pediatric Sarcoma Patients Jill Cannoy, PT, DPT, PCS; Dell McLaughlin, MD; Allan Peljovich, MD; Colleen Coulter, PT, DPT, PhD, PCS; Richard Welling MSPO, CPO
8:40-8:50am	Discussion
8·50-9·50am	Session IX – Challenging Cases (Moderator: David Rotter)
0.50 9.50dill	
8:50-9:00am	The Pen (Cap) Is Mightier Aaron Fitzsimmons, CP
8:50-9:00am 9:00-9:10am	The Pen (Cap) Is Mightier Aaron Fitzsimmons, CP Clinical Presentation and Challenges of Treating a Child Diagnosed with Meningococcemia: a Multidisciplinary Team Approach Colleen Coulter, PT, DPT, PhD; Michael Schmitz, MD; Allan Peljovich, MD, MPH; Rebecca Hernandez CPO/LPO
8:50-9:00am 9:00-9:10am 9:10-9:20am	The Pen (Cap) Is Mightier Aaron Fitzsimmons, CPClinical Presentation and Challenges of Treating a Child Diagnosed with Meningococcemia: a Multidisciplinary Team Approach Colleen Coulter, PT, DPT, PhD; Michael Schmitz, MD; Allan Peljovich, MD,MPH; Rebecca Hernandez CPO/LPOSuspension Considerations for Bilateral Congenital Amputee for an individual with Bilateral Congenital Amputations Aaron Fitzsimmons, CP

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Saturday, April 9th

8:50–9:50am	Session IX – Challenging Cases (Moderator: David Rotter)
9:30–9:40am	Deja Vu All Over Again - Posterior Mount Feet for Bilateral Fibular Hemimelia Aaron Fitzsimmons, CP
9:40–10:00am	Discussion
10:00–11:30am	Session X – Clinician Guided Forum (Moderators: Anna Vergun and Jorge Fabregas)
11:30am–12:00pm	Closing Remarks Anna Vergun, MD — ACPOC President
12:00pm	Meeting Adjournment



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Speaker Information



Aaron Fitzsimmons, CP, OTR

I have a BS from MTSU, a BS in Occupational Therapy from UT medical School, and a degree in Prosthetics from the University of CT. I worked for 2 years as an OT and 20 years as a CP. I completed my residency under Ronney Snell CPO and ran the St Jude amputee clinic with him for 3 years. I founded Amputee Blade Runners 501c3 in 2009 charity organization after 6 years of mission work in Haiti, Guatemala, and Panama. I lecture as adjunct faculty at Belmont DPT program, TSU DPT, and Vanderbilt Engineering. I practiced in private practice for 6 years and then started Amputee Associates to establish and operate physician based prosthetic clinics. I run 9 prosthetic clinics in 6 different states. My goal is to establish prosthetics as a recognized "allied healthcare provider" and not the "vendor status" we currently occupy in the healthcare system.



Amy Barrios, CPO attended the Newington Certificate Program and has been an ABC-certified clinician since 2012. She has been involved in all aspects of O&P patient care including prosthetics, adult upper and lower extremity orthotics, Functional Electrical Stimulators, pediatric orthotics, contracture management, spinal, and cranial remolding orthoses. She worked for Hanger Clinic in multiple markets and participated in several multi-disciplinary clinics using a team approach to patient management. She consistently applies the perspective of considering the whole patient and not just the diagnosis.

Amy's current position is the Cranial Clinical Manager at Orthomerica Products Inc. She works directly to support Certified practitioners providing cranial treatment as well as product and program development. Her role as gives her the ability to bridge the gap between practitioners, engineering, and manufacturing.



Anna D Vergun, MD

Dr. Vergun's clinical focus is on hip dysplasia, clubfoot, limb deformity, and limb deficiencies. She completed residency at University of California, Los Angeles and her fellowship in Pediatric Orthopedics at Hospital for Sick Children in Toronto, Ontario, Canada. She is an active member of the Association of Children's Prosthetics and Orthotics Clinics, the Pediatric Orthopedic Society of North America, and the American Academy of Orthopedic Surgeons. She also volunteers with international organizations, including MiracleFeet and The Palestine Children's Relief Fund. In her spare time, she enjoys her three children and horseback riding.



Brian Emling, MSPO, CPO, LPO graduated in 2013 with a Master's of Science in Orthotics and Prosthetics from Eastern Michigan University. Following, he attended residency at the University of Oklahoma Health Sciences Center, a Level 1 trauma center and home to the Amputee Clinic specializing in Osteomyoplastic reconstruction. In 2015 he began working at Children's Healthcare of Atlanta in the Orthotics and Prosthetics Department. Brian is particularly interested in emerging technologies to advance O&P care and has presented nationally on CAD design and 3D printing in O&P. Brian initiated the use of 3D printing within the O&P Department at Children's Healthcare of Atlanta and in-house preoperative model printing for Orthopedics. Brian attends a multidisciplinary Cerebral Palsy Clinic, serves on the Children's Healthcare of Atlanta Cerebral Palsy Conference Planning Committee and a member of Children's Comprehensive Limb Difference Program. Brian's clinical care is broad although his interest in CAD CAM technology has lead to the development of partial hand devices as well as early intervention transradial prostheses utilizing silicone injection molding.

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Speaker Information



Casandra Solis, OD, FAAO

Dr. Casandra Solis earned her optometry degree from Pacific University College of Optometry in Forest Grove, Oregon. She then completed a residency in comprehensive Pediatric Optometry at Children's Mercy Hospitals and Clinics in Kansas City, Missouri.

Dr. Solis joined the Akron Children's Hospital Vision Center in August of 2014 and provides comprehensive diagnostic evaluation and treatment for a wide range of ophthalmic medical and vision disorders.

In 2020, Dr. Solis, partnering with The Ohio State University College of Optometry, created a Pediatric Optometry Residency program at Akron Children's Hospital. In addition to facilitating the training of one optometric resident per year she also acts as one of the preceptors for the Pediatric Ophthalmology Fellow and rotating Ophthalmology Residents.



Claire Repisky

Claire has been with Invent Medical USA for over 3 years. Starting as an Account Manager, she quickly connected with the company's goals of Helping through Innovation. She gladly assumed more roles and now works closely with the Business Development team to focus on education and digital marketing in pursuit of sharing Invent Medical's mission worldwide.



Colleen Coulter, PT, DPT, PhD

Dr. Coulter is a Board Certified Pediatric Clinical Specialist through the APTA practicing in the field of pediatrics for 46 years. For the past 35 years, Colleen has worked alongside of orthotists and prosthetists being employed by the Orthotics and Prosthetics Department at Children's Healthcare of Atlanta. She is the team leader for the Limb Deficiency Program and has lectured nationally and internationally and published in peer review journals and books on topics relating to physical therapy interventions in children with limb deficiencies that include chapters in the Atlas of Prosthetics and Limb Deficiencies and Campbell's Physical Therapy for Children.

Dr. Coulter also serves as the physical therapist in the Cranial Remolding Program at Children's Healthcare of Atlanta and was instrumental in co-authoring the 2013 and 2018 update of Physical Therapy Management of Congenital Muscular Torticollis: an evidence based Clinical Practice Guideline from the American Physical Therapy Association and the manuscript Developing Evidence-Based Physical Therapy Clinical Practice Guidelines. In 2004 she co authored the chapter Identification and Treatment of Congenital Muscular Torticollis in Infants in the 2004 supplement to JPO, Orthotic Treatment of Deformational Plagiocephaly, Brachycephaly and Scaphocephaly.

In 2009, Dr. Coulter was awarded honorary membership to the Academy of Orthotics and Prosthetics and in 2012, the distinguished Bud DeHaven Award from the APTA Section on Pediatrics. She is an active member of the Section on Pediatrics of the American Physical Therapy Association and the Association of Children's Prosthetics and Orthotics Clinics, ACPOC. Dr. Coulter is an Assistant Adjunct Professor at Emory University's School of Medicine Department of Rehabilitation and teaches in Georgia Tech's MSP&O program. Currently, Dr. Coulter serves on the Amputee Coalition's Scientific Medical Board and Upper Limb Advisory Council as well is a member of the ABC Board of Directors. She has served two terms on ACPOC's Board of Directors.

Dr. Coulter received an undergraduate Bachelor of Science degree from Boston University, a Master's degree in Developmental Disabilities from Long Island University, and Doctor of Physical Therapy and Doctor of Philosophy degrees from Rocky Mountain University of Allied Health Professions.

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Speaker Information



Corey Gill, MD, MA

Dr. Gill is a pediatric orthopedic surgeon at Scottish Rite Hospital primarily seeing patients at the new Frisco campus. His areas of emphasis include fractures, clubfoot and foor disorders, hip disorders, limb length differences and sports injuries. Dr. Gill graduated Summa Cum Laude from the University of Georgia with a B.S. in Microbiology and Psychology. He received his M.A. and M.D. from Washington University in St. Louis School of Medicine, including residencies in Orthepedic Surgery there and at Barnes-Jewish Hospital in St. Louis. Dr. Gill's first Scottish Rite Hospital tour was in 2012 as a Pediatric Orthopedic Fellow.

Dr. Gill returned to Scottish Rite Hospital in January of 2018. He is an Assistant Professor at The University of Texas Southwestern Medical Center Department of Orthopedic Surgery, a member of the American Academy of Orthopedic Surgeons, the Pediatric Orthopedic Society of North America and the Texas Medical Association.



David Westberry, MD

Pediatric Orthopaedic Surgeon at Shriners Hospitals for Children in Greenville, SC Medical Director Motion Analysis Laboratory Board member for ACPOC



Emily Marshall, BS

Emily Marshall is a second-year medical student at Sidney Kimmel Medical College at Thomas Jefferson University in Philadelphia, Pennsylvania. Emily attended the University of Miami where she graduated in 2020 with a Bachelor of Science in Neuroscience and Summa Cum Laude honors distinction. During her undergraduate, Emily completed a senior honors thesis and earned departmental honors in Neuroscience. She was also inducted into the Phi Beta Kappa National Honors society in 2019.

At this point in her medical education, Emily is interested in pursuing a career in pediatrics, especially within a subspecialty field such as physical medicine and rehabilitation, hematology and oncology, or neonatology. She is currently involved in pediatric research projects with Nemours Children's Health and the Children's Hospital of Philadelphia.



Gabrielle Nguyen, MD

I believe in a multi-disciplinary, collaborative approach to patients and value input from all members of the treatment team, especially the patient and family. It is my aim to help patients and families achieve their maximum functional potential and obtain their personal goals.

Clinical Interests: Electrodiagnostic Medicine, Neuromuscular conditions, Limb deficiency

Research Interests: Pediatric Electrodiagnostic Medicine, improving outcomes in brachial plexus injury

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Speaker Information



Gerald Stark, Ph.D, MSEM, CPO/L, FAAOP(D) is the Orthotics Manager for Ottobock Healthcare based in Austin, Texas. He has written and presented numerous topics in O & P nationally and internationally. In his 27-year career he has held various administrative positions in Engineering, Clinical Care, Product Development, and Education. As well as mechanical engineering degree and Masters of Engineering Management, he holds a Ph.D in Organizational Learning and Leadership from the University of Tennessee of Chattanooga. He currently serves as Chair of the Research Council for the American Academy of Orthotists and Prosthetists. He has been honored as "Outstanding Engineering Alumni, "Outstanding Doctoral Student" and "Outstanding Clinical Educator" by his affiliated universities and the Academy.



Hank White, PT, PhD is a physical therapist with over twenty-seven years of experience working at Lexington Shriners Hospitals for Children Medical Center Motion Analysis Center. During these years, Hank has performed clinical and research assessments for children with numerous diagnosis including cerebral palsy, brachial plexus palsy, clubfoot deformity, scoliosis and lower extremity amputations. As a physical therapist, Hank has always had an interest in promoting the use of motion capture technology to improve care and provide objective documentation of outcomes for patients.



Helenlyn Popescu, MPO

Helenlyn Popescu is an ABC certified orthotist. She has a BS in Bioengineering from Walla Walla University, and graduated with an MPO from University of Washington. Briefly after graduation she worked at the UW Center for Outcomes Research in Rehabilitation, helping conduct studies developing prosthetics and orthotics outcome measures. She completed her orthotics residency at Shirley Ryan AbilityLab in Chicago, IL, and is currently a prosthetics resident at Hanger Clinic in Chula Vista, CA.

One of her passions is the lifetime multidisciplinary care of childhood-onset conditions as it relates to prosthetics and orthotics. Her other psychosocial interest in the field is the healthcare disparities faced by people of color, especially as it relates to diabetes care and limb loss. In her day-to-day, she enjoys the challenge of KAFOs for spinal cord injuries and post-polio syndrome.



Hugh Sheridan

Hugh is a hugely experienced innovative leader within the Medical Technology industry and specifically the Medical disciplines of Orthotic & Prosthetics, Rehabilitation, Diabetic Foot Care & Medical Device 3D Printing. Over a 20 year career he was instrumental in driving Algeos to become the largest supplier in its field inspiring the sales, marketing, product, clinical education, financial, operations and customer service teams, leading record revenue and profit growth. As CEO, Algeos became one of the leading commercial players within the Global orthotics & prosthetics industry establishing subsidiaries and offices on five continents and building a large global network of clinical and commercial contacts. Whilst based in Dubai, Hugh implemented a hugely successful education strategy within the Asia Pacific & Middle East Region receiving both clinical and commercial recognition and investment in clinical education is something he feels passionately about today. Hugh joined Andiamo in June 2019 and has led the commercialisation strategy ever since, signing up Andiamo's first commercial customers, assembled an industry leading medical advisory board and promoted Andiamo as one of the leaders in the Medical 3D Printing as well as defining the company strategy focused on placing families first whilst maximising the patient and clinical experience.

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Speaker Information



James Benelli, CPO

Jamie, as VP, Director of Sales, is responsible for maintaining and developing current and potential customers custom orthotic and prosthetic needs.

Being a CPO, he has worked in the orthotic and prosthetic industry for the last 30 plus years treating patients and as a sales executive for O and P manufacturing companies. This combined experience is valuable in assisting customers with spinal, lower limb and helmet therapy products.

Jamie is a graduate of Northwestern University's Orthotic and Prosthetic program and became ABC certified in 1987. Jamie holds a B.S. degree from the University of Massachusetts, Amherst.

Living locally with his wife and three children, Jamie enjoys playing hockey and golf with friends.



James Del Bianco, CPO

James Del Bianco has a love for helping people and providing them with the prosthetic and orthotic care they need. He began his career in 2001 in a private practice setting working alongside experienced clinicians dedicated to patient care.

Following private practice, James spent three years at The University of North Carolina Hospitals. In this setting, James gained valuable experience treating patients of all ages and backgrounds. Opening Del Bianco Prosthetics and Orthotics was James' mission from his first day in the profession. He is committed to caring for the patients of Del Bianco P&O. James focuses on providing custom orthotic and prosthetic care in a specialized, individual way. His patients have appreciated his expertise and communication in the fitting of their custom devices.



James Wynne, CPO, FAAOP

Jim conducts national and international training seminars on the theory and practice of the Boston Brace System as well as other innovative products developed by Boston Orthotics & Prosthetics for the conservative management of spinal pathologies.

His in-house seminars and training programs are conducted to ensure each class understands the end goal—taking care of the patient.

An ABC-certified orthotist/prosthetist since 1991, Jim has been with Boston O&P since 1993. During his tenure he has served as Clinical Director, and Director of Prosthetics at Boston Children's Hospital clinic, where he specialized in pediatric prosthetics and scoliosis. He is a graduate of The Northwestern University Orthotic-Prosthetic Program, and holds a B.A. from The University of Vermont.

Jim enjoys skiing and time on the beach with his wife and two children.



Jennifer Brondon, MD

Dr. Brondon is originally from New Jersey and is a medical graduate of the State University of New York-Upstate. She did her pediatric residency and was chief resident at Brown University. She completed fellowships in Pediatric Hematology /Oncology (PHO) and Pediatric Blood and Marrow Transplantation at the University of North Carolina and Duke University, respectively, and joined the PHO faculty at UNC in 2019.

Her areas of focus are vascular anomalies, pre-disposition syndromes and stem cell transplant. She sees both children and adults with vascular anomalies in a multidisciplinary clinic at UNC and is currently CO-investigator for a Novartis-sponsored Phase II trial of alpelisib in patients with PIK3CA related overgrowth syndromes. She is also in the early stages of developing the first multispecialty cancer pre-disposition clinic for pediatric patients and their families in the state of North Carolina.

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Speaker Information



Jill Cannoy, PT, DPT, PCS



Jonathan Cook, CPO

Clinical Education Manager, College Park Industries

Jon joined College Park in 2017 after 20 years in clinical practice as an ABC certified practitioner. He is responsible for managing the Clinical Education team at College Park. He and the members of his team provide clinical documentation support as well as on-site and remote educational seminars to Prosthetists, Occupational and Physical Therapist, and distributors both domestic and international. The Clinical Education and Technical Service teams also participate in product development and beta testing at College Park and support the engineering team with information regarding industry trends and standards.



Jonathan Schofield, PhD

Dr. Schofield works to improve user acceptance and promote the seamless integration of humans and assistive medical devices, leveraging techniques in bio-robotic control and feedback, sensorymotor neural interfaces, and cognitive-perceptual neurosciences. The Schofield lab performs interdisciplinary research at the interface of mechanical and electrical engineering, neurosciences and rehabilitation medicine to address unmet clinical needs and understand how humans engage with intelligent technologies such as robotic prostheses, among many others.

Dr. Schofield is an assistant professor in Mechanical and Aerospace Engineering at the University of California, Davis. He received his B.Eng. in mechanical engineering at Lakehead University before returning to graduate school at the University of Alberta in Canada. There, he received his M.Sc. in Biomedical/Structural Engineering and his Ph.D. in Biomedical/Mechanical Engineering before coming to the U.S. for his postdoctoral work at the Cleveland Clinic.



Jorge Fabregas, MD

After completing his fellowship at Children's Hospital of Philadelphia, Jorge Fabregas, MD, came to Atlanta to focus on pediatric orthopedic surgery. Dr. Fabregas is Residency Director at Children's Healthcare of Atlanta. He also serves as President of the Association of Children's Prosthetics and Orthotics Clinics, and serves as a Board Member of the Georgia Pediatric Neuromuscular Care Committee.

Dr. Fabregas' ongoing research focuses on pathologic fractures following osteomyelitis and optimizing the function of physician extenders in the office setting. His professional interests include spinal deformity, tumors, trauma, limb deficiency and cerebral palsy. He is a native Spanish speaker and returns to his homeland of Puerto Rice twice a year to provide care to underprivileged children. Dr. Fabregas is a consulting associate for the Duke University Department of Orthopaedic Surgery.

In his free time, he is an avid triathlete, runner and golfer.

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Speaker Information



Jorge Zuniga, PhD

Dr. Jorge M. Zuniga received Master of Science degree from the University of Nebraska at Omaha and Ph.D. from the University of Nebraska-Lincoln. Currently, Dr. Zuniga is a faculty at the Department of biomechanics at the University of Nebraska at Omaha (UNO). He is the co-director of the Biomechanical Rehabilitation and Manufacturing Initiative (BRMI) at UNO, a member of The Association of Children's Prosthetic-Orthotic Clinics. Dr. Zuniga main research interests include the development of low-cost 3D printed prostheses, 3D printed anatomical models for surgical planning, and development of new antimicrobial materials for 3D printing. Dr. Zuniga has been awarded several grants from NASA, The National Institute of Health (NIH), and several industry grants. Dr. Zuniga has authored and co-authored over 80 manuscripts published in peer-reviewed scientific journals. Dr. Zuniga developed a 3D printed prosthetic hand for children named Cyborg Beast (http://www.cyborgbeast.org). The Cyborg Beast was named one of the best 5 inventions of 2014 by MSN.com. Dr. Zuniga's active international collaboration and scholarly productivity led to his nomination as the 2018 "Runner Up" for the APEC (Asia-Pacific Economic Cooperation) Science Prize for Innovation, Research and Education ("ASPIRE") given by the U.S. Department of State.



Justina Appel, PhD

Dr. Appel has been involved in the O&P industry since 1986, she is currently the director of education and clinical support for Allard USA. She has served as Director of Orthotics and Prosthetics for Shriners Hospitals for Children in Shreveport Louisiana and has specialized in pediatrics for over 20 years. Dr. Appel is the current President and Education Program Coordinator for Louisiana Association of Orthotics and Prosthetics. She has conducted O&P seminars, lectures, and workshops throughout the country for various programs, and has also authored or co-authored several research and journal articles. Justina is passionate about sharing knowledge and strives to ensure dissemination of cutting-edge material as the world continues to change. It is her hope that she can incorporate her many years of experience not only in O&P but also in education to inspire future and fellow practitioners to remain focused on the continuous need to ensure compassionate quality care for our clients.



Kelly Jeans, MS

Kelly Jeans earned her Bachelor of Science degree from the University of Southern California in Exercise Science and her Masters of Science degree from California State University, Long Beach. After finishing her Master's Thesis, A Kinematic Analysis of Deep Water Running in Arthritic Individuals, she joined Scottish Rite for Children in 2001, to continue her passion for research. Over the last 20 years, she has collaborated with researchers interdepartmentally, including orthopedics, Orthotics and Prosthetics, therapy services and with outside organizations. Her career has focused on the study of movement patterns and cardiovascular fitness in clinical populations including clubfoot, lower extremity amputation, cerebral palsy, adolescent idiopathic scoliosis and early onset scoliosis. She also coordinates and manages the clinical service, the Movement Analysis Society (GCMAS) and the Association of Children's Prosthetic-Orthotic Clinics (ACPOC), where she serves on the board of directors.

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Speaker Information



Liz Selgrade, MSPO, CPO is a Prosthetist/Orthotist with Pediatric Orthotic and Prosthetics Services (POPS) Northeast and cares for patients at Shriners Children's in Springfield, MA. She earned her Master's degree from The Georgia Institute of Technology in 2012. Liz then completed her orthotics residency and worked as a Staff Orthotist at Children's Healthcare of Atlanta. In 2016, she joined the team at Beacon Prosthetics and Orthotics in Raleigh, NC, initially as a Prosthetics Resident and then ultimately as the Clinical Director. She joined the POPS team in 2019 and feels fortunate to be working every day at her "dream job."

With an undergraduate degree in Biomedical Engineering, Liz enjoys nuances of designing devices to help her patients achieve their goals. She formerly served on the Board of Directors for Prosthetic Hope International and hopes to use her O&P skills in international aid again soon.



Makenzie Papp, CFo, C.Ped.

Clinical Assistant & Amputee Care Coordinator

Makenzie graduated from the University of North Carolina at Chapel Hill with a Bachelor's degree in Exercise and Sport Science. She is an ABC certified Orthotic Fitter and Pedorthist. Makenzie is currently the patient liaison for all our amputees, coordinating care immediately after their surgery through the healing process until they can come in for a prosthesis.

Before coming to Del Bianco, Makenzie spent 5+ years providing care in physical therapy. She has a wide array of experience in orthopedic and neuromuscular physical therapy in outpatient, inpatient rehab, and inpatient acute care.



Mara L. Atherton, BS

Mara Atherton is a medical student at the University of Kentucky College of Medicine. There, she is an active member of the Class of 2024. She completed her Bachelor of Arts Degree in Biology from the University of Louisville in 2019. She has been conducting research formally through the Professional Student Mentored Research Fellowship and Helen Lemieux Internship. Her current research interests include investigating congenital limb length deficiencies in children and post-operative adjacent segment degeneration in adults undergoing lumbar spinal fusion.



Nancy Hylton, BS

Nancy is a Pediatric PT of 50+ years and a Licensed Orthotist in WA State for 20+ years, who did post-graduate study under Dr. and Berta Bobath, Mary Quinton and Dr. Kong and numerous other very skilled instructor/clinicians, including numerous diverse treatment approaches. She was involved in the development of Inhibitive Casting in the 1970s and Ultra-flexible Dynamic Orthotic systems from the early 1980s to present. She has taught extensively internationally and published in numerous journals and a text, Dynamic Orthotic Concepts, May 2000.

She co-founded Children's Therapy Center in Kent, WA, 1979 and is currently a PT and Orthotic Consultant there, semi-retired, and a Consultant for SPIO Compression. She has an adult son with Cerebral Palsy and continues to be very engaged in clinical applications of the most recent research in Neuro-physiology, soft-tissue and biomechanical systems. To that end, she has been in dialog with Dr. David Magnuson and Dr. Andrea Konig over the past year about new understandings of Central Pattern and Rhythm generation.

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Speaker Information



Ola Harrysson, PhD

Dr. Ola L. A. Harrysson joined the Industrial and Systems Engineering Department at NC State University in Raleigh, North Carolina in 2002 after receiving his Ph.D. in Industrial Engineering from the University of Central Florida in Orlando, Florida. Prior to attending UCF he was born and raised in Sweden and received his bachelor's degree in Mechanical Engineering from Dala University. He has been conducting research in Additive Manufacturing for over 25 years. His main areas of research are medical application of AM technologies, custom design and fabrication of orthopedic implants, medical device development, and materials development for Direct Metal AM technologies. Dr. Harrysson is the Director of the Center for Additive Manufacturing and Logistics at NCSU. Dr. Harrysson is the Edward P. Fitts Distinguished Professor in the Edward P. Fitts Department of Industrial Engineering. He has affiliated faculty appointments in the Departments of Biomedical Engineering and Material Science and Engineering.



Phoebe Scott-Wyard, DO

Dr. Phoebe Scott-Wyard is a rehabilitation medicine specialist at Rady Children's Hospital-San Diego and an assistant professor at UC San Diego School of Medicine. She is double board-certified in pediatrics and physical medicine and rehabilitation.

Originally from Maine, Dr. Scott-Wyard completed her undergraduate degree in behavioral biology at Johns Hopkins University before attending medical school at Western University of Health Sciences here in Southern California. She completed a combined residency in pediatrics and physical medicine and rehabilitation at Cincinnati Children's Hospital Medical Center and University of Cincinnati. She served two years as a Peace Corps volunteer in Ecuador and is fluent in Spanish.

Dr. Scott-Wyard is especially interested in treating children with limb differences. Before coming to Rady Children's, she served as the medical director of the Child Amputee Prosthetics Project clinic at Shriners Hospital in Los Angeles for six years. She is also a board member at large for the Association of Children's Prosthetic and Orthotic Clinics, the only professional organization for pediatric amputee care. She has served as a volunteer for the Challenged Athlete's Foundation and Angel City Games.



Rebecca Hernandez, CPO/LPO



Rebecca Spragg, MSPO, CPO

Becca joined EMU in 2017 following several years in the clinical field. Becca is an ABC certified prosthetist orthotist focusing on pediatric care. She specializes in the treatment of plagiocephaly, scoliosis and congenital limb differences and amputations. She continues to work in clinical care while teaching at EMU and enjoys the connections between patient care and education. Becca is a member of the American Academy of Orthotists Prosthetists and the Association of Children's Prosthetic-Orthotic Clinics.

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Speaker Information



Robert Hinson, BS

Robert Hinson is an MD-PhD candidate at the University of North Carolina at Chapel Hill currently pursuing his PhD in the lab of Dr. He (Helen) Huang in the UNC-NCSU Joint Department of Biomedical Engineering. He received his Bachelors of Science with Highest Honors in Applied Science and Mathematics from UNC in 2014.

His research interests include brain-machine interfaces, biomechanics, and musculoskeletal modeling and their applications to rehabilitation engineering. In particular, his research is focused on developing novel algorithms to accurately and continuously predict users' desired motion from electromyograms to provide more intuitive and functional control of upper limb prostheses. Additionally, his work aims to determine the relationship between offline analysis of these novel algorithms and predict user functionality in order to streamline the evaluation and development of promising candidates. He is interested in orthopedics, neurosurgery, plastic surgery, and physical medicine & rehabilitation as potential residencies to pursue upon graduation.



Robert Lipschutz, CP

I am a certified and licensed prosthetist working at the Shirley Ryan AbilityLab (formerly the Rehabilitation Institute of Chicago) in the Prosthetics & Orthotics Clinical Center. I am also an Assistant Professor in the Department of Physical Medicine and Rehabilitation, Feinberg School of Medicine and Clinical Instructor at the Northwestern University Prosthetics-Orthotics Center.



Sandra Ramdial, CP

Sandra Ramdial is a certified prosthetist and operations manager for the Orthotics and Prosthetics department at Holland Bloorview Kids Rehabilitation Hospital in Toronto, Canada and has direct involvement in client care for over 30 years.

Sandra has completed her post-graduate studies in Clinical Methods of Orthotics and Prosthetics as well as Prosthetic-Orthotic technician program at George Brown College. She has demonstrated evidence of high professional standing and is a Fellow with Orthotics Prosthetics Canada, past president of the Canadian Association of Prosthetics & Orthotics and the International Society for Prosthetics & Orthotics Canada and Secretary-Treasurer for the Association of Children's Prosthetic-Orthotic Clinics.

Sandra has presented her work at various national and international conferences and has contributed to publications and review journals. She is a part-time instructor for the Clinical Methods in Orthotics and Prosthetics program at George Brown College. In addition to her extensive experience, she brings an even greater amount of enthusiasm and passion for research and development, and new technologies to the field.



Sean Zeller, CPO

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Speaker Information



Seth Cochrill, CO

Seth is a Certified Orthotist providing care for patients from the Madison Heights location. He began his career in the Orthotic & Prosthetic Field in 2006 as an assistant at Wright & Filippis RIM office. Seth attended Northwestern University receiving a certificate in Orthotics. He completed his residency with Wright & Filippis. Upon completion, Seth transitioned to the Port Huron office specializing in adult care. An out of state opportunity in 2013 with Transcend Orthotics and Prosthetics allowed him to specialize in Pediatrics. He enjoys working with children and also people with neurological and neuromuscular disorders. Seth values relationships with patients, therapists, and physicians to achieve a team approach for orthotic care. This team approach allows for successful outcomes and patients able to achieve personal goals. Outside of work, Seth enjoys spending time with his family and friends, hiking, traveling, reading books, and is an avid podcast listener.



Shanee Abouzaglo, BS, is currently a second-year medical student at the University of Texas Southwestern Medical Center. Originally from Dallas, Shanee graduated from Boston University with a Bachelor in Science in Health Science before returning to her hometown for medical school. Her research interests include pediatric orthopedics, global health, and health equity.



Sheila Mason, DNP, RN, PNP-PC



Stephanie Miller, DO

As a dually-trained rehabilitation medicine physician and pediatrician, my goal is to partner with my patients and their families to work towards achieving the best outcomes possible while working with a multidisciplinary team to assure all their needs are met. Every child has their own unique trajectory and background, and I strive to help them find the tools and skills they need to succeed.



Vinay K. Narotam, MD

Dr. Vinay K. Narotam is a pediatrician in Chapel Hill, North Carolina and is affiliated with University of North Carolina Hospitals. He received his medical degree from University of Washington School of Medicine and has been in practice between 11-20 years.

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Abstracts

Challenges to Success and Support in the Pediatric Limb Loss/Limb Difference Population: An Interdisciplinary Research Collaboration

Anna Vergun MD¹, Chinmay Paranjape MD, MHSc¹, Olivia De Araujo BS¹, Janet Panoch PhD², Melanie Miller MS³

¹University of North Carolina, Chapel Hill, NC, USA. ²Indiana University, Indianapolis, IN, USA. ³University of Tennessee, Knoxville, TN, USA

Abstract

This research highlights the collaborative efforts of Association of Children's Prosthetic-Orthotics Clinics, the Amputee Coalition, and the American Congress of Rehabilitation Medicine Limb Restoration Rehabilitation Networking Group to better define barriers to care & mobility limitations, knowledge gaps for parents, and unmet prosthetic needs for children with limb loss/differences. Six domains are explored in the questionnaire for families of children with limb loss/ differences: Demographics, Early Information, Surgery, Clinical Team, Social Support, Prothesis, and Physical Activities. The results of the survey will be presented with further discussion regarding how ACPOC members can better address the needs of families of children with limb loss/differences and what additional research is needed.

Arthrogryposis Contracture Management with HKAFO

Seth Cochrill CO

Wright & Filippis, Madison Heights, MI, USA

Abstract

A 2 year old child presents to clinic with multiple lower extremity contractures with a referral for hip/knee orthosis (dynamic). Upon initial evaluation there were concerns with donning, positioning, and use of the orthosis. After researching, and communicating with referring physician and treating physical therapist an orthotic solution was achieved to address concerns and achieve an optimal outcome.

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Sex and Racial Differences in Fibular and Femoral Deficiency

Mara L. Atherton BA¹, Hank D. White PT, PhD², Janet L. Walker MD^{2,3}

¹University of Kentucky College of Medicine, Lexington, KY, USA. ²Shriners Children's, Lexington, KY, USA. ³University of Kentucky Department of Orthopaedic Surgery and Sports Medicine, Lexington, KY, USA

Abstract

Introduction

Male sex predominance in fibular deficiency has been well documented.¹⁻³ Fibular and femoral deficiency (FFD) are frequently found together and are thought to represent a spectrum of the same defect in embryology.^{2,4} Lower limb amputation is a common treatment for severe forms of FFD.³

Except for those performed for tumors, men are more likely to have lower limb amputations than women are.⁵ However, women are more likely to have a trans-femoral amputation level for non-traumatic causes than are men.⁶ Minority races have higher rates of amputation for adult vascular⁷, diabetic⁸ and traumatic etiologies.⁹ Children with finger amputations are less likely to have digital replantation surgery if they are black or Hispanic.¹⁰ Our hypotheses are that there will be sex and racial differences in severity and amputation rates in children with FFD.

Methods

A retrospective review was performed of 340 children (424 limbs) with FFD treated at a single center. We recorded sex (assigned at birth), race/ethnicity (patient reported), diagnosis, laterality, number of foot rays, and associated hand anomalies. Limb deficiency severity was classified using Achterman+Kalamchi (Type I vs II) and Birch (Type 1A-C vs 1D and 2) systems for fibular deficiency and Aitken (Type A/B vs C/D) and Paley (Type 1+2 vs 3) systems for femoral deficiency. A subset of 217 children with unilateral FFD, who were ≥5 years old, were selected to assess early amputation rates relative to deficiency severity. Chi square analysis was used to compare variables.

Results

There were 211 males and 129 females. White, non-Hispanic race/ethnicity was reported by 294 patients, while 43 reported other races/ethnicities, and 3 were not recorded. There was no significant association between sex and race. (p=0.106) Fibular deficiency was found in 91% of males with FFD compared to 84% of females. (p=0.030) There was no difference in prevalence of fibular deficiency based on race/ethnicity. (p=0.601) Upper extremity anomalies were present in 19% of males with FFD compared to 10% of females (p=0.028) but no association was found of upper extremity anomalies with race/ethnicity. Proximal femoral focal deficiency or congenital femoral shortening (femoral>fibular limb shortening) was present in 54% of females and 63% of minorities with FFD, compared to 38% of males and 41% of those reporting majority race/ethnicity. (p=0.005 and p=0.008, respectively). FFD severity, based on unilateral vs bilateral involvement, number of foot rays, and classification systems, showed no association with race or sex. (p>0.05) Early amputation rates in unilateral FFD, by severity classifications, were not different based on sex or race.

Conclusions

FFD is overall more common in males and they have a higher rate of associated hand anomalies than females. Female sex and minority race were associated with a shift toward greater femoral contribution to the limb deficiency/ shortening. No differences in other severity parameters or early amputation rates were found. Studies with greater patient numbers, especially those reporting minority race/ethnicity, are needed to fully assess differences in amputation rates.

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Randomized trial of the effect of ankle foot orthoses on ambulation in pediatric patients with Charcot Marie Tooth disease

Phoebe Scott-Wyard DO¹, Abygaile Almoite MS², Andrew Skalsky MD³, Chamindra Konersman MD⁴

¹Rady Childrens Hospital/UCSD, San Diego, CA, USA. ²Rady Children's Hospital, San Diego, CA, USA. ³Rady Children's Hospital/UCSD, San Diego, CA, USA. ⁴UCSD, San Diego, CA, USA

Abstract

Introduction

Currently, there is little clinical evidence for the commonly prescribed ankle-foot orthoses (AFOs) in pediatric Charcot-Marie-Tooth (CMT) patients. The use of AFOs including its effect on walking distance in this population was studied.

Method

This is a 1:1 randomized controlled trial with 20 pediatric CMT patients. A control group and a treatment group consisted 10 randomized CMT patients each. The participant's baseline for the 6 minute-walk test (6MWT) distance was measured. For those in the treatment arm, a second set of a 6MWT was obtained while the subject was wearing an off the shelf carbon fiber ground reaction AFO. Those in the control arm were subjected to a second set of 6MWT without an AFO. The change in the distance covered for each group was compared and analyzed. The data from the treatment group were assessed to evaluate difference in performance before and after wearing an AFO. An exploratory analysis of both between groups and within groups comparison of patients with below and above 375-m 6MWT baseline analysis were performed.

Results

There is an improvement in walking distance with AFO intervention between control and treatment groups (n=11, p=0.01) as well as within treatment group comparison of (n=10, p=0.003) for participants with a 6MWT baseline below 375-m. A moderate relationship was also established between baseline 6MWT distance and percent difference with AFO use in the treatment group (R2 = 0.77).

Conclusions

These findings indicate that wearing AFOs may increase the ability of CMT patients to walk further, particularly in those who have a more advanced disease progression.

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What if we don't agree if a prosthesis fits?

Hank White PT, PhD¹, Joel Eastman MS¹, Sam Augsburger MS¹, Eric Miller L/CPO¹, Janet Walker MD^{1,2}

¹Shriners Hospitals for Children Medical Center, Lexington, KY, USA. ²University of Kentucky Department of Orthopaedic Surgery and Sports Medicine, Lexington, KY, USA

Abstract

Introduction

Prosthetic fit is determined based on the patient's report of discomfort and observational analysis of the patients gait pattern by the clinicians. Previous research has shown that a mal-aligned prosthesis can lead to asymmetry that causes pain and less efficiency when walking for children with amputations. Previously, we have reported motion analysis was sensitive to small changes in symmetry between correct and incorrect fitting prostheses that are not appreciated by direct visual observation by the clinicians.

The first objective of the study is to assess the longitudinal changes in gait (temporal-spatial and gait symmetry) for children and adolescents with unilateral amputations. The second objective is assess the agreement between the traditional fit assessment (by prosthetist and physician) with the propulsive force asymmetries measured in motion analysis laboratory. Additionally, the percentage of agreement between patient report and traditional fit assessment.

Methodology

This is a prospective IRB approved study was performed over three years. Forty-five participants were assessed over three year (152 visits). At each visit, participant's gait was first assessed in the motion analysis center motion capture system (twelve Vicon V16 Wide Optics Cameras collected with Nexus software and post-processed with Visual 3-D software). Participant's temporal-spatial data were measured while walking at self-selected walking speed with reflective markers placed on bilateral heels, toes and sacrum. Ground reaction forces were simultaneously measured with six AMTI force plates. Traditional fit based on physician's and prosthetist's assessments were based on clinical examination, radiographs and visual observation of gait per facility's standards of clinical care. Patient reported fit from Orthotics and Prosthetics Users' Survey (OPUS) question: "My prosthesis fits well."

The percentage of observed agreement and κ coefficients were used to determine the absolute agreement between the traditional fit assessment and propulsive force asymmetries and between traditional fit assessment and patient report. Repeated measures ANOVA were used to assess participant's mean change over time in temporal-spatial and ground reaction forces while walking.

Results

Twenty-one of the participants were assessed four times over two years. The average time between visits was 6 months. Fourteen males and seven females with primary amputation types of Boyd secondary to fibular or tibial hemimelia (n=10), proximal focal femoral deficiency status post knee fusion and Boyd amputation (n=5), transtibial amputations (n=5) and one knee disarticulation amputation. Participant's ages ranged from four to eighteen years.

Over the two years, on average, there were non-significant changes in temporal-spatial data (velocity, cadence) and gait symmetry (stance, swing, weight acceptance). Agreement between the traditional fit assessment (by prosthetist and physician) with the propulsive force asymmetries range from poor to almost perfect agreement. Agreement between the traditional fit assessment (by prosthetist and physician) with patient report was range from poor to slight agreement.

Conclusions:

Results of this study demonstrate there was not a consistent agreement between traditional fit assessment and propulsive force asymmetries. More importantly, for the four visits, the patient reported fit of prosthesis was not in agreement with traditional fit assessment by physician and prosthetist.

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Brain Lateralization in Children with Upper-limb Reduction Deficiency

Jorge Zuniga Ph.D.¹, Rakesh Srivastava CPO²

¹University of Nebraska at Omaha, Omaha, Nebraska, USA. ²Innovative Prosthetics & Orthotics, Omaha, Nebraska, USA

Abstract

Introduction

For children with Upper-limb Reduction Deficiency (ULD), the use of prostheses is directly related to the success of rehabilitation outcomes including development of motor skills, performance of activities of daily living and recreational activities, as well as improvements in self-esteem.¹ However, increasing prosthetic use and reducing rejection and abandonment in the pediatric population remain challenging, with up to 58% rejection rate.² previous literature suggests the involvement of specific neural control mechanisms that limit the functional use of these devices. The purpose of the current study was to determine the influence of upper-limb prostheses on brain activity and gross dexterity in children with congenital ULD compared to typically developing children (TD).

Method

All children were admitted to the study following informed assents or parental written consent as approved by the Institutional Review Board of the University of Nebraska Medical Center.

Subjects: Five children with ULD (3 boys, 2 girls, 8.76 ± 3.37 years of age) and five age- and sex-matched TD children (3 boys, 2 girls, 8.96 ± 3.23 years of age) performed a gross manual dexterity task (Box & Block Test) while measuring brain activity (Functional Near-Infrared Spectroscopy; fNIRS). Children with ULD used a partial hand prosthesis or trans-radial device. TD children used a prosthetic simulator to control for device use matching the experimental group device.

Data Analysis: A two-way repeated measures ANOVA [2 x 2; hand (non-preferred side with device versus preferred side) x group (ULD versus TD)] was used to test hand x group interactions.

Results

There were no significant differences in gross dexterity performance between the ULD group with prosthesis (7.23 \pm 3.37 blocks per minute) and TD group with the prosthetic simulator (7.63 \pm 5.61 blocks per minute). However, there was a significant (p = 0.001) difference in Laterality Index (LI) between the ULD group with prosthesis (LI = -0.2888 \pm 0.0205) and TD group with simulator (LI =0.0504 \pm 0.0296) showing in a significant ipsilateral control for the ULD group. Thus, the major finding of the present investigation was that children with ULD, unlike the control group, showed significant activation in the ipsilateral motor cortex on the non-preferred side using a prosthesis during a gross manual dexterity task.

Discussion

The major finding of the present investigation was that children with ULD, unlike the control group, showed significant activation in the ipsilateral motor cortex while performing a gross manual dexterity task using a prosthesis.

Conclusion

This ipsilateral response may be a compensation strategy in which the existing cortical representations of the nonaffected (preferred) side are used by the affected (non-preferred) side to operate the prosthesis. This study is the first to report altered lateralization in children with ULD while using a prosthesis.

Clinical Applications

Early prosthetic intervention in children with limb reductions, such as prosthetic fitting and use, may lead to an enlargement of the primary neuronal networks located in the contralateral motor cortices of the affected limb improving function and prosthetic acceptance.

References

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April 6–9th | Clearwater, FL

Does Use of Ankle Foot Orthoses affect Dynamic Motor Control during Walking?

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Abstract

Purpose

The Dynamic Motor Control (DMC) index during walking is a measure of complexity of muscle activation derived from electromyography (EMG) data of lower extremity muscles. Better DMC index has been associated with better treatment outcomes in cerebral palsy patients 1. Ankle Foot Orthoses (AFO) are frequently used to improve the gait of children with Cerebral Palsy (CP) as well as Idiopathic Toe Walking (ITW). The purpose of this study is to assess the change in DMC index secondary to AFO use. Our hypothesis is that the DMC index will be higher with AFO compared to Barefoot (BF) walking condition.

Methods

Subjects with gait analysis data (kinematics and EMG data for BF and AFO condition) collected between 01/01/2017 and 9/21/2021 were included in this study. For each subject, DMC Index1 and Gait Deviation Index2 (GDI) were computed for BF and AFO condition. Subjects were divided among groups by diagnosis and the type of AFO utilized. DMC and GDI data were analyzed by paired t-test for each group.

Results

There were 285 subjects (CP: 240, ITW: 45) included in the study. Four types of AFO's were used by CP subjects and two types by ITW subjects. For CP subjects, only SAFO group had significant improvement in both DMC and GDI. For ITW subjects, relatively large improvements were observed for both DMC and GDI for both SAFO and PLSO groups.

Table 1: Average (AFO - BF) and Standard Deviation (SD) of difference between AFO and BF condition in DMC Index and GDI value. The resultant p-value of paired t-test have been highlighted when p < 0.05.

Diagnosis: CP							
Type of AFO	Number of Subjects	DMC			GDI		
		AFO - BF	SD	p-value	AFO - BF	SD	p- value
Solid [SAFO]	92	2.43	8.8	0.010	1.77	8.1	0.037
Floor Reaction [FRAFO]	23	1.38	9.1	0.473	2.13	5.2	0.060
Posterior Leaf Spring [PLSO]	67	1.53	8.7	0.153	0.49	8.0	0.617
Articulating [AAFO]	58	-1.44	9.7	0.266	4.12	10.4	0.004
Diagnosis- ITW							
	Number of Subjects	DMC		GDI			
Type of AFO		AFO - BF	SD	p-value	AFO - BF	SD	p- value
Solid [SAFO]	18	9.59	15.4	0.017	10.87	9.4	0.000
Posterior Leaf Spring [PLSO]	27	11.06	11.7	0.000	9.19	11.3	0.000

Conclusion

For CP subjects, modest improvements in DMC with SAFO indicate that for some subjects, Solid AFOs can assist in overcoming the plantar flexor spasticity or tone and improve their walking patterns. The change in GDI was relatively small indicating the limitation of GDI in identifying subtle changes in walking pattern. A detailed analysis of sagittal ankle and knee kinematics may reveal more clinically relevant improvements.

The DMC Index in BF condition was expectedly larger in ITW group (85 ±18)

compared to CP group (69 \pm 16). ITW group also achieved larger (~10 points) improvement in DMC index by AFO use and achieved typically developing DMC index values (95 \pm 19) with the use of an AFO. ITW subjects were able to demonstrate improved and more complex motor control with AFOs that resulted in (~10 GDI points) improvements in their walking pattern.

April 6–9th | Clearwater, FL

A Study on the Effectiveness and Compliance of Pectus Orthoses

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Abstract

Introduction

Pectus carinatum is a chest wall deformity characterized by a convex protrusion of the sternum and ribs. Patients currently have two options for correction: surgical repair and orthotic management.

The purpose of this study was to examine the effectiveness and compliance of pectus carinatum orthoses and the relationships of effectiveness and compliance to age of the patient and the number of clinical follow ups.

Materials/Methods

The guardians of patients that received a pectus carinatum orthosis from the Del Bianco clinic 2010-2020 were asked to participate in this study. Participants completed two five-point rating scale questions about the effectiveness and self-reported compliance with wearing the brace. They also answered questions related to demographics and surgical considerations. Data was also pulled from the patient's chart regarding appointment information.

Results

Of the 326 eligible to participate, 86 consented to and completed the survey: age at delivery: 12.8 ± 2.59 years, 84.9% male. The average effectiveness of pectus bracing was reported at 3.97/5 and the average compliance was reported at 4.02/5. Half of participants reported they would have chosen surgery had bracing not been an option.

Of the participants, 59 (68%) reported a 4/5 or higher effectiveness rating and 64 (74%) reported a 4/5 or higher compliance rating. For the purposes of this study, we determined that a 4/5 or 5/5 level of self-reporting form the test subjects/parents/guardian would distinguish the orthosis as an "effective" treatment or a "compliant" patient. Of the 64 reported compliant patients, 50 patients (78%) reported also having an effective brace.

Those that reported having an effective orthosis were examined to see how many follow up appointments were completed. It was found that 7% did not return for a follow up, 42% had one to two appointments, 27% had three to four, 12% five to six, and 8% had seven to eight. The same was repeated for those reporting compliance: 9% had zero, 42% had one to two, 22% had three to four, 14% had five to six, and 9% had seven to eight.

In relation to age, the % reported effective orthotic management and % reported compliance are as follows: 3-4 years old (2 participants) 100% & 50%, 5-6 years old (1 participant) 100% & 100%, 7-8 years old (3 participants) 33% & 33%, 9-10 years old (5 participants) 60% and 100%, 11-12 years old (22 participants) 77% & 59%, 13-14 years old (38 participants) 71% & 61%, 15-16 years old (10 participants) 70% & 60%, 17-18 years old (5 participants) 20% & 80%.

Conclusion

If patients are compliant, the orthotic treatment is an effective treatment used to correct a pectus carinatum defect. Our research shows a 78% reported level of effectiveness when subjects reported 4/5 or 5/5 level of compliance.

Our study showed a significant increase in % reported effectiveness and compliance from those patients who reported coming to at least 1-2 follow up visits compared to those who did not attend any follow up visits. There was approximately a 35 % increase in effectiveness and compliance scores from those Pts who reported following up.

April 6–9th | Clearwater, FL

Suspension Considerations for Bilateral Congenital Amputee

Aaron Fitzsimmons CP

Amputee Blade Runners, Nashville, TN, USA

Abstract

Problem

A thirty year old married mother presented with congenital conditions from Russian thalidomide exposure resulting in quadrilateral limb deficiency with two fingers on each hand. She presents with an ankle disarticulation on the left side and a very short below knee amputation on the right that had functionally been fit as a knee disarticulation for over 20 years. She has ambulated with her knee bent at a 90 degree angle on her right side in all previous sockets and had a one time fitting as short transtibial prosthesis and this went poorly and she was not open to this idea. The patient is a well known high-profile athlete and worked in the prosthetic field for 8 years. She had never been educated on alternative prosthetic suspension options and has English as a second language as a barrier to care. The sockets on both limbs were previously suspended through use of a gel liner. The socket alone weighed 5.5lbs on the right side. On the left side she is extremely bulbous, with a 10 centimeter circumferential difference between the biggest and smallest sections. The existing socket on the left side was suspended solely with the aid of socks and a trap door that had caused chronic bursitis with infections for over 18 months. She has limited digits, making donning and doffing an additional challenge. She has completed several full marathons over the course of her athletic life prior to assessment and runs 30 miles per week, lifts 4 times/week, and swims 2/week.

Solution

The goal was to reduce weight, increase ease of donning and projected longevity of the system. She was casted directly over the skin on both limbs. On the right side she flexed and extended her knee during casting to ensure sufficient room within the socket. A 3/16th" flex inner was used due to its gripping ability and it being more hygienic than foam. The carbon pulled on hamstring, a is common for those with true knee disarticulations. In this case, it is really a very short transtibial amputation. The back of the carbon frame was cut out and the flexible inner was thinned to 1/8th" to allow her to flex and move that portion of her leg in the posterior distal position. Donning is now achieved through use of a powder lotion to allow her to slide into the socket. This requires less dexterity than rolling on a gel liner. The weight of the socket dropped from 5.5lbs to 1.8lbs. This socket can be used with both a running knee/blade and a walking knee/foot.

On her ankle disarticulation side, Pelite was stove-piped and its ears reinforced. The goal was still to create a certain amount of room for fluctuation in volume. A high activity foot was mounted posteriorly. This mold was duplicated to create a separate leg for running.

April 6-9th | Clearwater, FL

Boys to Men: High Activity Prosthesis For a Young Man with Fibular Hemimelia

Aaron Fitzsimmons CP

Amputee Blade Runners, Nashville, TN, USA

Abstract

Problem

A young adult male presents with fibular hemimelia and a desire to set the Fastest Known Time on a 350 mile hike through a national forest. He had an ankle disarticulation performed at age 18 months which appears to be a modified Boyd, with the "talcanius" still in place distally. He has an underdeveloped acetabulum, femur, patella and lower limb. He has a positive anterior drawer test, indicating lack of ACL. There is little valgus and hyperextension present. His current prosthesis weighs 7.6lbs. He is 6'2 and weighs 175lbs. Suspension was achieved through use of a gel liner and 30 ply of socks. A distal mount carbon alternative foot was mounted to the socket. This young man is accustomed to stopping every 3 miles to remove his prosthesis to adjust fit and deal with sweat. Each step on the downhills feels like "mini-earthquakes." He has approximately 3" of clearance and prefers to be short on his prosthetic side due to the lack of vertical translation of stiff feet.

Solution

This patient is very lean and his residual limb in particular is quite mature and bony. I casted him directly over the skin and used pelite as the new interface. Stove-piping the pelite was paramount due to his bony anatomy, particularly due to the dramatic change in circumference just below the knee. Though he has marked underdevelopment in various areas on his residual limb he has very strong quadriceps and hamstrings. This allowed for slightly lower than standard trim lines. Attached to the posterior aspect of the socket is a carbon fiber multi-axial foot. The overall weight of the leg was reduced by more half. By removing gel liner, this socket, combined with a sweat-wicking sock, enables the patient to cover far more ground without stopping to adjust his fit. He also reports that the leg feels more like a leg than a prosthetic.

The Pen (Cap) Is Mightier

Aaron Fitzsimmons CP

Amputee Blade Runners, Nashville, TN, USA

Abstract

I recently had the opportunity to treat a 5 year old girl with a unique residual limb. She was born with amniotic band syndrome resulting in a residual limb that terminated below the knee with approximately 3" length of tibia that had bone spike overgrowth 1^{1/2}" long and was smaller in circumference than the felt tip of a marker encased in a minimal amount of tissue. She has had no surgical revision to the limb and at this juncture her parents are not interested in surgery. She is very active and wants to be able to continue to engage in all normal activities for a child her age. The distal end of her leg is quite sensitive and she is unable to bear weight any weight and only minimal pressure.

As I was modifying her mold I wanted to be able to extend the length of the mold to allow her to drop down into the socket without bumping the distal end of the residual limb. However, the circumference of the limb was so small at that point that the plaster would not hold. After conferring with my technician, I elected to take the cap of pen I had used to create an additional build up on the mold. We were successfully able to use this mold and achieved suspension through supracondylar suspension.

April 6–9th | Clearwater, FL

Vascular anomalies and limb differences: management strategies across disciplines and case discussions

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Abstract

This symposium will serve as an adjunct to the presidential guest speaker who is discussing vascular malformations. Each discipline (physical and occupational therapy, orthotics, prosthetics, orthopedic surgery) will discuss their approach to the child with a vascular malformation. What are the treatment considerations and potential effective strategies? Several cases will be discussed by the panel.

April 6-9th | Clearwater, FL

Epidemiology of International Patients with Lower Limb Deficiencies Treated at a United States-Based Pediatric Prosthesis Clinic

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Abstract

Purpose

Congenital and acquired lower limb deficiencies (LD) in pediatric patients often lead to significant morbidity requiring prosthetic use.1,2 Limited research exists describing care of pediatric LD patients born outside the United States (US). The purpose of this study was to define epidemiological and clinical data in a cohort of international patients treated at a US-based pediatric orthopedic hospital. We hypothesized that international patients would comprise a significant portion of the LD population, and that epidemiologic and clinical variables would differ between adopted and non-adopted international patients.

Methods

Retrospective chart review was performed on pediatric patients born outside the US who presented to a multidisciplinary prosthesis clinic at a US-based, tertiary orthopedic hospital between 1995-2020. Patients were divided into groups based on country of residence and adoption status. Data on demographics, medical history, prostheses, and surgeries were collected, and statistical analyses were performed using a chi-square or Fisher exact test for categorical variables and student's t-test for continuous variables.

Results

111/579 (19.2%) of LD patients were born outside the US, with 39.6% adopted. Of the non-adoptees, 53.7% lived abroad throughout their clinical care, while 46.3% moved to the US prior to or during treatment. Geographically, patients represented 32 countries (5 continents), with the highest percentage born in Russia (25.2%), Mexico (19.8%), and China (19.8%). 96.4% were born in lower- or middle-income countries (LMIC). The most common causes of LD were congenital malformations (72.1%), trauma (17.1%), and tumor (5.4%). 54.1% presented with existing surgical or congenital amputation, while 42.3% had a surgical amputation after initial presentation. Syme was the most common amputation level (26.6%), followed by knee disarticulation (23.7%) and transtibial (18.7%). Significant differences were noted in sex (p=0.0018) and race (p<0.0001) between non-adoptees (68.7% male, 52.2% White) and adoptees (38.6% male, 40.9% Asian). Congenital diagnoses were more frequent in adoptees (93.1 vs 58.2%), while non-adoptees often had trauma (25.4%) or tumor (9.0%) as amputation cause (p=0.0003).

Conclusion

Pediatric LD patients presenting to US-based hospitals are often born outside the US, most commonly in LMIC. Demographic and clinical variables differ significantly between adopted and non-adopted international patients.

Significance

Clinicians providing care to LD patients should be aware of the unique presentation and challenges associated with treatment of international patients. Additional research and collaboration with organizations outside the US may identify and eliminate potential barriers to care of LD patients born in LMIC.

April 6-9th | Clearwater, FL

Challenging Case presentation- Clinical Presentation and Challenges of Treating a Child Diagnosed with Meningococcemia: a multidisciplinary team approach

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¹Children's Healthcare of Atlanta, Atlanta, GA, USA. ²Hand and Upper Extremity Center of Georgia, Atlanta, GA, USA

Abstract

Problem

Meningococcemia is a rare infectious disease characterized by upper respiratory tract infection, fever, skin rash and lesions, and possibly a sudden state of extreme physical depression (shock) and organ shut down which may be lifethreatening without appropriate medical care. Individuals who survive this devastating disease may have lifelong challenges including those that effect their musculoskeletal system with possible amputations and damage to growth plates. Meningococcemia is most prevalent in persons twenty years of age or younger and half of these cases are in children under five years of age. In the United States 1.2 cases per 100,000 occur annually

This is a case of a now 6-year-old active boy who presented at 13 months of age on 8/19/16 diagnosed with meningococcemia. He was initially seen in an outside hospital and transferred to Children's Healthcare of Atlanta, CHOA, where he was immediately admitted to the PIC on 8/19/16 for respiratory failure and septic shock due. Once stabilized, he was then transferred to inpatient rehabilitation on 9/9/16. Due to necrosis of left foot and part of his right foot, along with fingers on left hand and finger tips of right hand, he was referred to a burn/trauma center for wound closures with the goal to save as much of his limbs as possible. The necrotic areas demarcated and eventually auto amputated. Following discharge from the burn center, scar bands and contractures developed especially on the right foot, ankle and fingers restricted mobility and function. On 3/7/2017 patient had a right Symes amputation due to progressing contractures, poor skin closure, and pain during walking and revision of the left residual limb due to overgrowth. A pediatric hand specialist was consulted. No surgical interventions were recommended just scar management and bimanual functional fine motor activities.

Growing children who contract meningococcemia, face lifelong concerns for bone growth and development due to possible damage of growth plates that may include the extremities, bones of the ears, and teeth. This case is representative of these challenges with developing deformities in the upper and lower extremities.

Solution

CHOA Limb Difference Program offers a family centered multidisciplinary team approach to the management of children in our care. The patient in this case had distal bony overgrowth of both fibulae requiring surgical revisions on 8/14/18. Ongoing is scar and soft tissue management of daily scar massage and silicone liners. Currently, the patient is developing significant angular deformity of the left residual limb and shortening of both upper extremities with bowing on the left. This case will outline the surgical, prosthetic, orthotic, and therapy interventions and discuss the future challenges that he and other children may face as they grow and develop.

Outcome:

Child's care is ongoing due to developing overgrowth and angular deformities of the left residual limb and both upper extremities. In spite of these challenges, he continues to do very well, active and playful. The goals are for age appropriate development and activities supported by surgical and scar revisions, prosthetic management, and therapy.

April 6–9th | Clearwater, FL

Transition experiences of young adults with complex health care needs: a qualitative study

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Abstract

Background

Many people with childhood-onset conditions have complex healthcare needs which require coordinated interdisciplinary care. These patients are effectively served in pediatric settings, where they have easy access to a wide variety of healthcare specialties in one location. However, when they transition to adult care settings their healthcare becomes more fragmented, creating a high risk for a decline in health and independent function.

Objective

The purpose of this study was to qualitatively investigate factors which lead to independence in adulthood for people with childhood-onset conditions. An additional goal of the study was to better understand the experiences of people with complex health care needs to better inform clinicians in the future.

Methods

Twenty-four individuals with childhood-onset conditions ages 21-75 completed phone interviews exploring their experiences during and following transition to adulthood, including specific questions about healthcare, health insurance, education, and personal relationships.

Results

Participants overwhelmingly described achieving independence in mobility and developing strong self-advocacy skills as being instrumental in their success in taking on adult responsibilities. Challenges discussed included intimacy, identity, mental health, and adapting to more demanding transportation needs.

Conclusion

This population would benefit from increased access and awareness to resources which would help them confidently navigate challenges associated with aging and assuming independence. Clinicians and caregivers should encourage adolescents to articulate and advocate their goals early on to help prepare them for independently advocating for their needs as an adult.

April 6–9th | Clearwater, FL

"Please, Let's Define Function"

Colleen Coulter PT, DPT, PhD, PCS¹, Jorge Fabregas MD¹, Rebecca Hernandez CPO/LPO¹, Anna Vergun MD²

¹Children's Healthcare of Atlanta, Atlanta, Georgia, USA. ²University of North Carolina, Chapel Hill, North Carolina, USA

Abstract

Background

In 2001 the World Health Organization (WHO) developed "The International Classification of Functioning, Disability and Health" (ICF) derived from the original 1980 WHO's "The International Classification of Impairments, Disabilities, and Handicaps" (ICIDH). The revised classification of function, ICF model, addresses health and health-related domains taking into account individual's environmental and personal factors. Realizing that a child's function was different, "The International Classification of Functioning, Disability and Health for Children and Youth" (ICF-CY) was developed to address the specific growth and developmental needs of children. The ICF-CY is a classification by which the functioning of children and youth can be described in detail from different perspectives, such as body functions, anatomical characteristics, activities and participation.



Problem

It became apparent during a patient care team conference that there were discrepancies on how function was defined and viewed by members of the team. When asked to define function, each member expressed views and opinions from their perspective based on personal experiences, discipline, training, beliefs, and values. As healthcare professionals, we address and are very comfortable in the domain of Body Function and Structure and less so of Activity and Participation as they are greatly influenced by personal and environmental factors that are out of "our hands".

Solution

The purpose of this symposium is to discuss the meaning of function from the perspectives of different disciplines and attempt to develop an algorithm to educate children and families on surgical, prosthetic, and rehabilitation interventions that could impact functional outcomes. A multidisciplinary panel will present how each defines function relating to their clinical practice based on the framework of the ICF and ICF-CY. Case presentations will follow inviting audience to participate in lively discussions and debates centered around function and functional outcomes. To guide the discussion and debate, the cases presented will have surgical options that may impact prosthetic, orthotic, and rehabilitation interventions and ultimately the patient's function. Members of the panel will be assigned to represent a surgical, prosthetic, and rehabilitation point of views. Most important will be a discussion on creating an algorithm to educate patients and families to help guide surgical, prosthetic, and rehabilitation interventions.

Goals

- 1. To introduce the ICF and ICF-CY to ACPOC participants
- 2. To discuss how our personal experiences, training, beliefs, and values can influence patient care
- 3. To discuss the feasibility of developing an algorithm to assist patients and families on surgical, prosthetic, and rehabilitation interventions

Objectives

Following the symposium the participants should be able to:

- 1. Identify the 5 domains of the ICF and ICF-CY
- 2. Understand how environmental and personal factors can influence patient care
- 3. Reflect their own definition and perception of function
- 4. Develop interventions and goals based on the patient and family's beliefs and wishes within the framework of the ICF and ICF-CY domains

April 6–9th | Clearwater, FL

Craniosynostosis and Ocular Manifestations - Multidisciplinary Management

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Abstract

Craniosynostosis occurs in approximately 1 in 2000-2500 live births and is caused by a premature fusion of one or more of the cranial sutures. Patients with craniosynostosis require a multidisciplinary care approach including specialists in craniofacial plastic surgery, neurosurgery, orthotics, and eye care professionals. Ocular manifestations are present in both syndromic and non-syndromic forms of craniosynostosis, however, they are far more common when a patient presents with a syndromic form of the condition. Possible ophthalmic manifestations include: optic disc edema and atrophy, strabismus, amblyopia, refractive error, exorbitism, and exposure keratopathy 1. Proper ocular examinations and follow-up care is required to minimize the risk of long-lasting ocular side effects, including permanent loss of vision 2. Further, management strategies for vision deficits may require coordination with the orthotic team to accommodate for treatment modalities.

Goals

This symposium will provide information on craniosynostosis and ocular manifestations associated with synostosis. Attendees will learn the importance of ophthalmic evaluations in both syndromic and non-syndromic cases of craniosynostosis. The management and follow-up care specific to vision concerns will be reviewed.

Learning Objectives

Upon completion of this symposium, learners will be able to:

- 1. Identify the structural and ocular characteristics of craniosynostosis.
- 2. Recognize the common signs and symptoms of ophthalmic concerns to determine when return to an eye care specialist is necessary.
- 3. Summarize the follow-up care necessary for patients with ocular complications of craniosynostosis
- 4. Describe possible modifications to a cranial orthosis to accommodate for ocular treatments.

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April 6-9th | Clearwater, FL

Maintaining clubfoot correction while treating hip and/or knee dislocation: The thermoplastic splint experience at University of North Carolina, Chapel Hill

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Abstract

Purpose

Children with spina bifida and other neuromuscular or genetic conditions can have numerous concomitant lower extremity deformities including hip dislocation(s), knee dislocation(s), clubfeet and congenital vertical talus to name a few. Much of these deformities must be treated during infancy to optimize success and prevent future disability or need for future surgical intervention. Unfortunately, the serial casts and orthoses most often used to treat or maintain correction of these deformities are not compatible with simultaneous wear. For example, a Pavlik harness cannot be worn at the same time as a typical Ponseti-style foot abduction orthosis. We sought out a way to simultaneously treat hip dislocation in a Pavlik harness while maintaining clubfoot correction given inability to wear standard foot abduction orthosis. We are proposing a <u>creative solution</u> to treat hip dislocation with Pavlik harness while maintaining clubfoot correction with custom thermoplastic AFOs created by our experienced occupational therapist.

Methods

We reviewed the medical records of three cases in which children each had a hip dislocation, knee dislocation, and clubfoot treated initially with serial casting THEN thermoplastic AFO(s) to maintain clubfoot correction in combination with Pavlik harness to treat hip dislocation. We made note of any mention of recurrence of clubfoot deformity that required additional intervention with repeat casting or surgery. We also looked for any mention of issues with thermoplastic splint wear, such as development of pressure sores.

Results/Conclusion

Use of thermoplastic splints inside of Pavlik harness after serial casting provided a means of maintaining clubfoot correction while treating hip dislocation in Pavlik harness.

April 6-9th | Clearwater, FL

Implementation of Mental Health Screening in the Pediatric Lower Limb Deficiency (LLD) Population

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Abstract

Objectives:

Pediatric lower limb deficiency (LLD) is a relatively common and significant condition in the pediatric physical medicine and rehabilitation space^{1,2}. While the medical and surgical care guidelines for pediatric LLD have been wellestablished, guidelines for psychosocial care in this population are much less defined^{3,4,5}. In order to help providers identify and address the psychological difficulties of patients with LLD, we evaluated two mental health screening tools and developed a psychosocial screening process to serve as a guideline. In this study, we aim to 1) describe the implementation of a mental health screening process in a multidisciplinary prosthetics clinic, and 2) report on the results of this screening procedure during the first two years of implementation.

Methods:

Participants included all pediatric LLD patients that were seen at a monthly multidisciplinary prosthetics clinic between September 2019 and September 2021 (n = 45). It is important to note that the COVID-19 pandemic prevented providers from seeing patients from March-July of 2020, and therefore these months were excluded. Psychosocial screening is performed as a part of this clinic using the PROMIS pediatric proxy survey and the Strengths and Difficulties Questionnaire (SDQ)⁶⁷. These tools are designed to assess patient-reported quality of life (QoL) and psychological functioning, respectively. Individual patient charts were reviewed to examine: (1) if psychosocial screening was completed, and (2) the results of those screenings. We used descriptive statistics to determine the proportion of patients that endorsed clinically significant concerns on the questionnaires. Clinical significance was defined by T scores for the PROMIS (+/- 1 SD of the population mean) and by SDQ total and subscale scores at or above the 90th percentile^{6,7}.

Results:

Of the 45 patients seen in clinic during this 2-year time frame, 22 (42%) completed psychosocial screeners. In the last 5 months of the study (May-September 2021), there was an increase to a consistent 100% screening rate.

The patient cohort included children ages 3 to 16, with a mean age of 10.4 ± 4.6 SD. There was a predominance of white, non-Hispanic males (73% male, 67% white, 82% non-Hispanic). Within this cohort, 17 (77%) completed the PROMIS and 22 (100%) completed the SDQ.

In terms of patient QoL, the most commonly endorsed concerns on the PROMIS were physical mobility issues (43%) and upper extremity function issues (22%). The SDQ revealed that a majority (68%) of the screened patients had an overall score above the clinical cutoff, indicating psychosocial distress in more than one area. The most commonly reported psychological concerns were peer problems (64%), emotional problems (23%), general conduct concerns (18%), and hyperactivity (18%).

Conclusions:

Although a screening rate of 42% is suboptimal, recent data suggests that a 100% screening rate is consistently achievable when psychological care is incorporated into pediatric clinics. Many youth with LLD reported significant psychological concerns, indicating the need to address this aspect of patients' well-being in conjunction with their medical care and rehabilitation. Routine psychosocial screening is critical in order to identify mental health problems early on, and facilitate access to evidence-based psychological interventions.

April 6–9th | Clearwater, FL

Hypertrophic Scars and Keloids: Challenges of Managing Contractures and Deformities

Colleen Coulter PT, DPT, PhD, PCS, Rebecca Hernandez CPO/LPO, Richard Welling CPO/LPO, Colin Brady MD

Children's Healthcare of Atlanta, Atlanta, Georgia, USA

Abstract

Challenge

No matter the cause- trauma, illness, vascular insult, or local control due to solid tumors, wound healing is always a concern. Most wounds heal with minimal scaring if provided with appropriate post-operative management. However, there are situations where hypertrophic scars and keloids can form that can cause secondary contractures and deformities further impacting the patient's function. Keloids and hypertrophic scars both generate excessive scar formation. Keloids present as thick scars formed beyond the borders of the original wound, but hypertrophic scars are contained within the borders of the incision.

Two patient cases will be presented representing the difference between hypertrophic scar formation and keloids. Important to note is the location and size of the original wound. Crossing joints and the extent of the injury as well as possible underlying collagen and genetic co-morbidities may be contributing factors leading to contractures, deformities, restrictive function, and range of motion

Case 1.

FF !6-year-old female diagnosed at birth with a rare condition, thyroglossal duct cyst (TGDC), She developed a thick keloid on the neck and anterior chest following surgery to remove the cyst. Attempts to revise the initial keloid resulted in formation of multiple keloid formation. FF has had 43 surgeries from 2009 to present. Surgical records from 2005 – 2009 are not available. Currently FF has significant keloids causing deformities on her neck and anterior chest wall. FF also presents with hyper joint extensibility making the team question the presence of an underlying collagen condition contributing to the significant disfiguring keloid formation.

Case 2.

RD is a 15-year-old male who sustained a traumatic amputation of the left 3rd, 4th, and 5th, digits following ATV accident July 2021. Attempts to salvage the fingers failed requiring amputation. Initial interventions included wound vac, integra, venous graft, amputations of the 3rd, 4th, and 5th digits, and finally skin graft for closure. RD presents with significant hypertrophic scar formation crossing the wrist, MCP, PIP, MP, and DIP of the 2nd digit. The 2nd digit is drifting to the ulnar side with decreased active and passive ROM of wrist and 2nd finger active and passive range of motion, ROM

Solutions

Teams were formed comprised of the patients' plastic surgeon, certified orthotist/prosthetist, and therapist. Interventions addressing wound healing, scar management, active and passive ROM, and orthotic and prosthetic management will be presented. Specific challenges and conditions will be presented for each case.

April 6-9th | Clearwater, FL

Characterization of Patellofemoral Instability in Pediatric Patients after Below-Knee Amputation

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Abstract

Background and Purpose:

Patellofemoral instability (PFI) is a known complication that may develop after below-knee amputation (BKA) in pediatric patients. The etiology of PFI in these patients is unclear, and may be related to factors such as patellofemoral dysplasia, altered knee biomechanics in the amputated limb, or abnormal forces applied to the extensor mechanism in patellar-tendon-bearing below-knee prostheses. The primary purpose of this study was to better define the epidemiology, incidence, and treatment of PFI after BKA in patients followed longitudinally in a pediatric prosthesis clinic. Additionally, we examined risk factors that may predispose pediatric patients to development of patellar instability following BKA.

Methods:

A retrospective chart review was conducted on pediatric patients (< 19 years old) with a prior BKA treated at a multidisciplinary prosthesis orthopaedic clinic at a single institution. Patients who underwent a Syme or knee disarticulation amputation were excluded. PFI was determined by either a frank dislocation or symptomatic patellar instability. Demographic, medical history, clinical exam, radiographs, and prosthesis were reviewed and documented. Patients were divided into two groups based on presence or absence of PFI after amputation. Statistical analyses were performed using a chi-square or Fisher exact test for categorical variables and student's t-test for continuous variables.

Results:

Overall, 20/136 (15%) of patients who underwent a BKA developed ipsilateral PFI at a mean of 9.21 years after the index amputation. Those who underwent a BKA due to a congenital diagnosis were more likely to eventually develop PFI compared to those with an acquired condition (23% vs. 4%; p=0.001). Mean age at time of BKA was 2.64 years in PFI patients compared to 7.26 years in patients without patellar instability (p = 0.0001). Clinically, many of the PFI patients had a range of exam findings consistent with PFI, including a positive J-sign (58%), increased lateral translation of the patella (45%), genu valgum (33%), and quadriceps atrophy (20%). Regarding treatment, six patients were managed conservatively with observation or physical therapy. Ten patients had improvement of symptoms after prosthesis modification, while four patients ultimately required surgical MPFL reconstruction due to recurrent symptoms.

Conclusion:

Patellar instability may occur following BKA in pediatric patients, especially those treated at a younger age for a congenital condition. Further studies are needed to optimize management of current pediatric amputees with PFI. Additionally, new clinical and prosthetic design strategies should be investigated to prevent development of PFI in high risk patients with congenital diagnoses leading to BKA or amputation at a young age.

April 6-9th | Clearwater, FL

Predicting Virtual Hand Posture Matching Performance with Continuous Myoelectric Control: A Pilot Study

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Abstract

While surface electromyography (EMG) has been used to control upper extremity prostheses for decades, commercially available control schemes remain limited to direct, proportional myoelectric control (DC)¹ and pattern recognition (PR)²⁻⁴. While reliable and simple to understand, DC is slow and unintuitive due to the sequential movement of multiple joints with a single pair of agonist-antagonist muscles. Pattern recognition allows users to contract their muscles as they would to perform a motion with a healthy, intact limb and uses machine learning to determine the desired motion. However, PR classifies EMG patterns into discrete motions and accuracy degrades as more motions are added, resulting in a limited functional task space with a finite set of motions. To address these shortcomings, researchers have focused on developing algorithms for continuous motion prediction from EMG⁵⁻¹¹. While PR algorithms are easy to evaluate using classification accuracy, no consensus on informative metrics for continuous myoelectric control exists. An informative metric with one-to-one relations of offline prediction capability to real-time performance will greatly aid researchers in streamlining evaluation of continuous controllers designed for myoelectric upper-limb prostheses. This pilot study seeks to implement a method for evaluating continuous myoelectric controllers using the metric coefficient of determination (R2) and relate offline evaluation to real-time user performance.

The experimental protocol was approved by the University of North Carolina at Chapel Hill Institutional Review Board. Two able-bodied (AB) participants (1 male, age 31 years; 1 female, age 26 years; both right hand dominant) provided informed consent before participating. Each subject had bipolar surface EMG electrodes placed over the *extensor carpi radialis longus, extensor digitorum communis, flexor carpi radialis, and flexor digitorum superficialis* muscles. Thirteen reflective markers were placed on the upper extremity to measure wrist flexion/extension and metacarpophalangeal (MCP) flexion/extension angles5. Subjects performed isolated flexion/extension of the wrist and MCP joints, as well as simultaneous motion of both joints. Recorded EMG and joint angle data were used to train artificial neural networks (ANNs) to predict joint angles from EMG data¹². The ANNs were trained to have R² values of 0.4, 0.6, and 0.8. Subjects were given control of a virtual hand using each ANN and were instructed to match 36 target postures within ±5 degrees for both joints. A controller with an R² of 1.0 was simulated via the user's joint angles calculated in real-time from the marker data.

Posture matching success rates (Figure 1) and completion times (Figure 2) were strongly correlated with R² (r=0.96 and r=0.92, respectively). The strong relationship between higher R² and improved task performance suggests it is a strong candidate for an evaluation metric of continuous myoelectric decoders. This pilot study shows coefficient of determination to be a promising metric to help researchers streamline the evaluation of continuous myoelectric decoders and will be explored with additional able-bodied and amputee participants.





Figure 1. Posture matching completion percentage is strongly correlated with R².

Figure 2. Posture matching total task (36 postures) completion time is strongly correlated with R².

April 6–9th | Clearwater, FL

COVID-19 Related Pediatric Amputations- A Case Series

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Abstract

Pediatric acquired amputations typically occur in the setting of trauma or malignancy, or less commonly vascular related issues. Thus prosthetic fitting and rehabilitation, while challenging, tend to follow a somewhat predictable trajectory. COVID-19 related amputations however, have presented a new set of obstacles with many unexpected and unprecedented complicating factors. In pediatric COVID- 19 infections one of the more rare complications is Multisystem Inflammatory Syndrome in Children (MIS-C). These children have increased risk of more serious complications and ICU admission than general COVID-19 infections, with cases requiring more aggressive interventions such as more invasive respiratory support and ECMO.

This case series will highlight 3 teenage patients who developed COVID-19 and sequentially MIS-C with the unfortunate additional complication of lower extremity amputations, due mainly to thrombotic events. Each case had a different level of lower extremity amputation, and one was a bilateral amputee. MIS-C treatments also varied with ECMO, CRRT/HD, and thrombectomies/embolectomies, all of which impacted medical stability and prolonged acute hospital stays prior to transition to inpatient rehabilitation. Each patient's inpatient rehabilitation course, pre-prosthetic and prosthetic training challenges, wound healing complications, and their outcomes at the current time will be discussed.

Finally, many note that the pandemic has seemingly "magnified existing disparities" in healthcare, and nothing highlights this quite as well as our difficulties obtaining adequate access to care for these new amputees. From navigating telehealth visits and attempts at virtual based amputee care to difficulties obtaining mental health treatment we welcome an open discussion on how we can best address this new group of children with amputations.

The IMPLICATIONS of TYPICAL and PRECISE SOMATO-SENSORY INFORMATION in SUCCESSFUL ORTHOTIC and WEAR

Nancy Hylton BS Physical Therapy

Children's Therapy Center of Kent, Kent, Washington, USA

Abstract

As our understanding of Central Pattern Generation function continues to increase, one major one factor which requires greater consideration is the necessity for highly specific somato-sensory input connected to functional movement which is a critical component for activation of these neural systems. Persons with Cerebral Palsy and other neuro-motor disorders have varying somato-sensory deficits which impact their functional movement control, active stability, balance, and tone control.

Biomechanical organization and function is also based on micro changes in synergistic tri-planar joints which interact throughout the biomechanical chain and change joint position, soft tissue tension, muscle tension and position, all impacting the function of somato-sensory receptors. Active biomechanical stability in transitional movement control depends on these very specific micro changes in position and pressure, which intron depends on very precise and rapidly adjusting somato-sensory input.

This presentation will address the importance of orthotic fabrication, including intimate, volume critical fit, flexibility and memory return of fabrication materials. It will also address how this impacts the ability to activate the Central Pattern Generator neural mechanism for more typical postural activation and functional movement control with practical examples of how different orthotic devices can be combined with other simultaneous sensory inputs to assist function performance, active stability and balance.

April 6-9th | Clearwater, FL

Deja Vu All Over Again - Posterior Mount Feet for Bilateral Fibular Hemimelia

Aaron Fitzsimmons CP

Amputee Blade Runners, Nashville, TN, USA

Abstract

The Problem

At the last in person ACPOC conference I presented on posterior mount high activity feet for a young child with bilateral fibular hemimelia. Little did I know that I would soon have the opportunity to attempt this again on a boy approximately the same age who lives in the same town. This boy, age five at the time of fitting, underwent bilateral Syme's amputation secondary to fibular hemimelia when he was 1 year old. The older of two boys, he is highly active and stated a desire to run and play soccer. The prostheses he wore when he arrived required sleeves which rolled up and caused him to become frustrated. The prostheses were heavy and difficult for him to maneuver. Consequently, he had never been able to jump, and circumducted when he wanted to increase speed. These legs utilized keasy cone, which did not stay true to his leg shape.

The Solution

I took a cast directly over the skin on each leg. The sockets include pelite liners, which have a better memory than keasy cone. His left leg required what I envision will be a short term model with both distal and proximal suspension. His right leg had a few more involved and complex needs due to a shorter femur, lack of heel pad, an a tendonus 12-14° hip flexion contracture with no bony lock. Supracondylar suspension was used to keep the right prosthesis attached. Two layers of plastazote pads were incorporated into the distal end, allowing for eventual longitudinal growth. The pelite was slit at a 45° angle to allow for easier donning and doffing while reducing the chance for the skin to be pinched.

Attached to these sockets were posterior mount high activity feet. Custom crepe covers were made instead of foot shells. By doing so I was able to increase the overall length of the carbon footplate by approximately 2 centimeters, which in turn increased his ability to run and jump. The upper pylon was slotted in each foot, which will allow him to be raised approximately 2" in height as he continues longitudinal growth. I am always looking for a paradigm shift in how a new patient foresees his future mobility. This young boy had that the moment I mounted the foot to the new socket. He was able to bounce on one foot while waiting for the second foot to be mounted. He shifted from someone who hoped for something better for himself to someone confident his prospects had changed.

April 6-9th | Clearwater, FL

What The Flip? Transfemoral Socket Design for Pediatric Dancer/Gymnast

Aaron Fitzsimmons CP

Amputee Blade Runners, Nashville, TN, USA

Abstract

The Problem

A ten year old girl recently presented in the office with a left transfemoral amputation. Several years ago strep entered her bloodstream and necrotizing fasciitis took over 30% of her body. Between amputation and skin grafting procedures, she underwent more than a dozen surgeries. In addition to the more delicate skin of a skin graft, her residual limb has significant invaginations. Socket suspension was previously achieved with gel liners and a pin lock. She competes at a high level in dance and tumbling and goes through six to eight liners, which is a large financial burden on her family.

The Solution

The patient and her family really wanted to try skin fit suspension. ABR applicants are vetted through a series of interviews with practitioners, other families, and prosthetic users with similar amputation levels. At every stage our team cautioned that her leg may not tolerate the skin fit approach. I determined that it was worth the effort, even if it was unsuccessful. She is of Italian descent and has a somewhat darker skin complexion meaning the top layer is tougher and more mature. I casted directly over the skin with the patient wearing spandex underwear. It took three test sockets to find the right fit. To ensure the skin grafts would not get irritated, a friction rub was applied before donning her socket. She also has a sensitive spot on her leg. By putting more pressure on it, looseness and gapping cannot occur which would further irritate that sensitive spot.

Comfort flex is often the flexible inner of choice for this type of suspension, but in this instance I elected to use foam to provide more padding for the delicate tissue. A dial and adjustable panels were integrated into the skin fit socket and attached to a pediatric polycentric hydraulic knee and high activity sports foot. She was immediately able to turn back handsprings with far more ease and confidence before, and can do several in a row without discomfort or fear that the leg will come off. It has now been 6 months since the original fitting. In her previous socket she would have gone through 2-3 liners at this point, a problem that does not occur with the more durable skin fit design.

April 6-9th | Clearwater, FL

Targeted Muscle Reinnervation (TMR) and Pain Control: The Utilization of TMR for Pain Control in Pediatric Sarcoma Patients

Jill Cannoy PT, DPT, PCS¹, Dell McLaughlin MD¹, Allan Peljovich MD², Colleen Coulter PT, DPT, PhD, PCS², Richard Welling MSPO, CPO¹

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Abstract

As of 2020, there are approximately 2 million amputees currently living in the United States with approximately 185,000 major limb amputations being performed each year, with 18,000 of these amputations being related to cancer diagnoses^{1,2}. Phantom limb pain and residual limb pain are commonly reported following amputation; with reports of up to 85% of amputees reporting experience with phantom limb pain². Oncology patients reportedly experience similar, if not higher, rates of phantom limb pain when compared to the general amputee population, with 90% of pediatric sarcoma survivors reporting a history of phantom limb pain².

Recent evidence has shown that symptomatic neuromas are responsible for chronic localized residual limb nerve pain in approximately 30% of major limb amputees². Additionally, 40-50% of major limb amputations require secondary surgery(ies), with neuromas being the second most common reason for reoperation¹. In this regard, targeted muscle reinnervation (TMR) offers a new approach to the management and prevention of neuroma development that is commonly associated with major limb amputation.

TMR is a surgical technique by which the cut, distal end of a mixed motor and sensory nerve, or a pure sensory nerve, is transferred to the motor nerve of a nearby muscle target³. This technique was initially designed to improve prosthetic function following upper extremity amputation, by innervating remaining muscles to create additional electromyographic signals for improved myoelectric prosthetic use1. In recent years there has been emerging evidence to indicate that the utilization of TMR at the initial time of amputation, or during a secondary surgery, is effective in the treatment and prevention of amputation related pain^{3,4,5}.

In this case presentation, we will review the utilization of TMR at the time of amputation in two pediatric sarcoma patients, with an overview of surgical procedure, post-operative medical, rehabilitative, and prosthetic care, post-operative and current pain reports, as well as, post-operative and current functional mobility measures.

April 6-9th | Clearwater, FL

Challenges associated in identifying and designing functional devices for patients with congenital upper extremity deficiencies

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Abstract

Challenges

Patients with congenital upper extremity deficiencies present with unique challenges relating to structure (bone), power (strength), alignment (position), and length (limb length). These challenges when combined, can further influence the child's function by having hypermobility or insufficient mobility. Children with congenital limb deficiencies often present with associated multi-limb deficiencies and other medical and orthopedic co-morbidities. These challenges coupled with pediatric component sizing limitations requires the clinical team to consider use of traditional devices in nontraditional ways or the use of traditional devices with unconventional mounting orientation to create functional grasp patterns. To date, there have been limited options for these patients.

Solution

The presentation will utilize case studies to discuss these challenges while discussing alternative solutions for clinicians to consider. CAD CAM models, pictures and videos will be used to aid in the understanding of the patients and devices provided.

The patients selected have challenges of varying degrees with structure, power, alignment, and length.

Presented with each patient:

- Review of the patient's medical record and co-morbidities
- Evaluation of posture
- Characteristics of the extremities,
- · Alignment of the involved extremity
- Structure
- Power

April 6–9th | Clearwater, FL

Assessing the control of residual muscles in children with congenital upper limb deficiencies

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Abstract

Recently, ultrasound imaging coupled with machine learning has been used to quantify spatiotemporal tissue deformation patterns of the residual muscles in adults with below-the-elbow upper limb deficiencies (ULDs). However, it is unknown to what extent these methods can be applied to the pediatric population. Furthermore, there is a lack of understanding on the extent to which patients can volitionally contract residual muscles to a desired state, at will and repeatedly. This includes both static states (e.g., power grasp or index pinch) and proportional control where the hand is partially closed.

We investigated the sensorimotor control capabilities of residual muscles in children with unilateral congenital belowthe-elbow ULDs. We examined whether their control was sufficiently robust and reliable for a machine learning algorithm to accurately classify multiple tissue deformation patterns when children attempted to perform distinct hand or wrist movements. Patients performed a minimum of 5 trials of six hand or wrist motions with both their affected and unaffected limb. A K nearest neighbors (KNN) algorithm was used to classify the spatiotemporal tissue deformation patterns. We found that all patients were able to execute unique tissue deformation patterns with some reliability (classification accuracy > 60%) when simultaneously classifying 4 grasp patterns, and some were able to reliably perform all six motions. To further study the extent of patients' motor control, we examined the intra-grasp variability by comparing the similarity of spatiotemporal tissue deformation patterns within each motion. This enabled us to examine in depth the variability of executed tissue deformation patterns. Interestingly, we found that intra-grasp variance did not correlate with grasp classification accuracy in most patients. Collectively, these results suggest that children with congenital below-the-elbow ULDs have significant control of their residual muscles. Future systems that fully utilize this control could provide prostheses with greater functionality than current pediatric interfaces.

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April 6–9th | Clearwater, FL

Orthotic Intervention Considerations for Children on the Autism Spectrum with Sensory Dysfunction Disorders

Justina Appel PhD

Allard USA, Rockaway, NJ, USA

Abstract

Improving functional outcomes of pediatric orthotic patients on the autism spectrum with sensory dysfunction involvement can at times be challenging. Objective evaluation data along with patient/parent communication and information collected from the healthcare team will provide selection of orthotic intervention that will increase positive outcomes. This paper provides information from the review of literature for collecting objective data and utilizing this information for maximizing patient outcomes within this population. Evaluation techniques using established tools for optimizing the selection, fit and function of pediatric AFO's will be discussed.

Shriners Children's Experience with Pediatric Myoelectric Prostheses Utilizing CAD/CAM

Liz Selgrade MSPO

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Abstract

Across the Shriners Children's network, we frequently encounter patients who are limited by the function of their body powered transradial prostheses and who desire to use myoelectric, externally powered prostheses to expand their independence in ADLs. However, many prosthetic options are ill-suited for pediatric patients, due to using heavy, adult-sized componentry, being complicated to operate, lacking durability, and not providing necessary grips to complete goals. Affordability and access further preclude provision of appropriate myoelectric prostheses to some patients.

One solution is an externally powered prosthesis that merges traditional prosthetic processes and new technology, including CAD and 3D printing – the Hero Arm by Open Bionics. To date, Shriners Children's has fit approximately 20 Hero Arms across the nation.

This talk will discuss patient selection, evaluation, the fitting process, fabrication, delivery, and follow-up. We will present mini case studies of patients who are using the Hero Arm as well as reports from a patient and parent feedback survey to demonstrate the appropriateness of this technology as a new clinical solution.