ACPOC
Association of Children's Prosthetic-Orthotic Clinics

2021 Virtual Meeting
April 22–24, 2021

Program Book

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

1. To 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. To examine the indications, techniques and results of various surgical procedures; and describe the management of children's orthopaedic problems.
3. To examine the latest prosthetic-orthotic equipment.
4. To present the latest in physical and occupational therapy, rehabilitation, adaptive equipment, and techniques.

Target Audience

New and established orthopaedic surgeons, pediatricians, rehabilitation physicians, nurses, orthotists, prosthetists, physical and occupational therapists, other health professionals who care for children with orthopaedic or related disabilities, and educators from within the US and Canada, or in practice outside the US and Canada.

Disclaimer Information

The material presented at the 2018 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.

CME Information

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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

Ciné-Med designates this live activity for a maximum of 17.25 A*MA PRA Category 1 Credit(s)*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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.

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.

ABCOP Credits
The ACPOC Virtual Meeting has been awarded continuing education credits by the American Board for Certification in Orthotics, Prosthetics and Pedorthics. Category 1 will be awarded as follows:

Day 1 = 3.75 possible credits, Day 2 = 5.00 possible credits, Day 3 = 6.50 possible credits. Total = 15.25

OPC Credits
The ACPOC 2021 Virtual Meeting has been awarded continuing education credits by the Orthotics Prosthetics Canada (OPC) for a total of 17.25 MCEs (Reference #: 2021-010).

Certificates
To claim your certificate of credit, complete the online Credit and Evaluation form using the following URL: **https://cine-med.com/certificate.php?redirect=acpoc2021.** Participants will be able to download or print a certificate once the form has been submitted.

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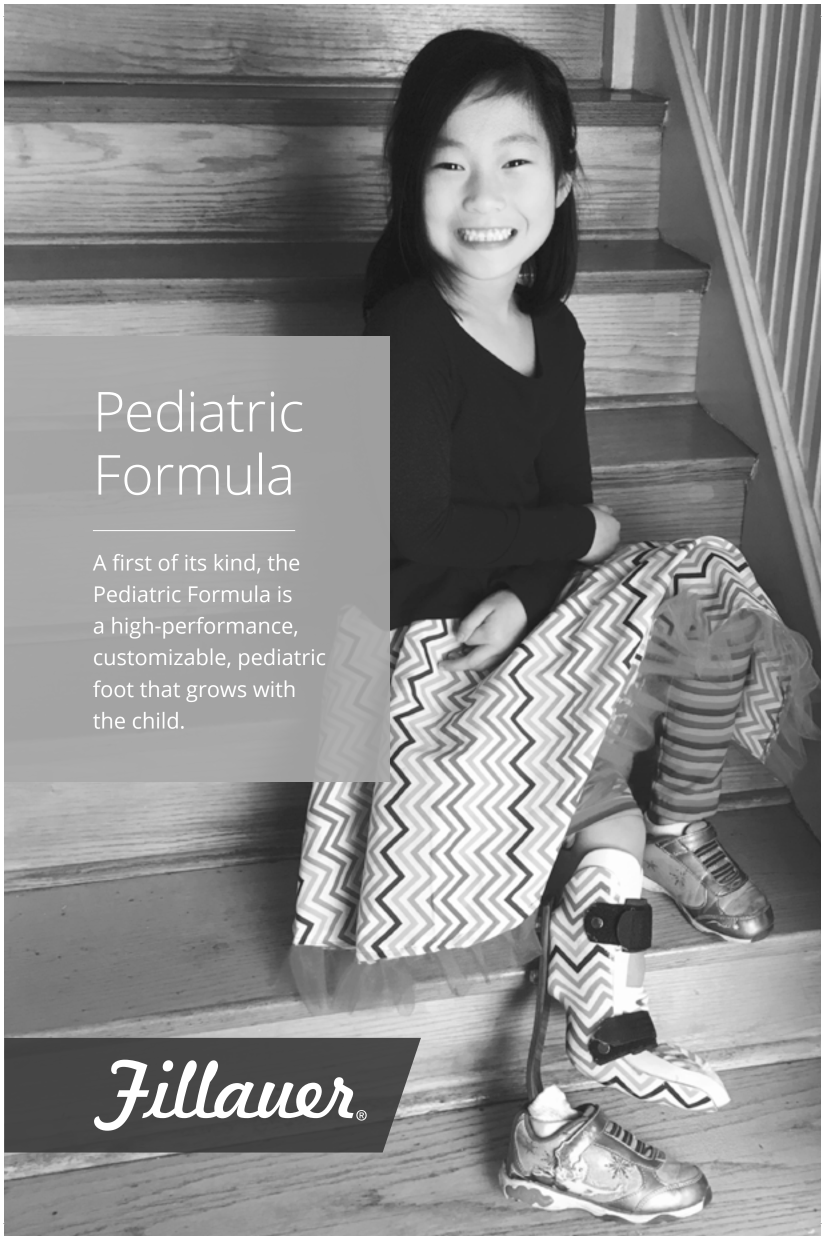

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ACPOC
Association of Children's
Prosthetic-Orthotic Clinics

2021 VIRTUAL MEETING
April 22nd–24th

2021 Annual Meeting Program

Virtual Meeting | April 22–24, 2021 (all times listed are EST)

(Presentation titles and times are subject to change without prior notice)

Thursday, April 22nd

11:30am–6:15pm	**Technical Workshops**
11:30am–12:15pm	**Unlimited Tomorrow, Inc.**
12:30–1:15pm	**Boston O&P Dynamic Movement Orthosis Updates**
1:30–2:15pm	**Surestep**
2:30–3:15pm	**Fabtech Systems**
4:30–5:15pm	**Össur Americas**
	ACPOC is not advocating any technology or methods by providing time for workshops
6:30–8:30pm	**Members Meeting and Social Gathering**

Friday, April 23rd

9:30–10:00am	**Exhibit Hall Open**
10:00–10:10am	**Welcome** Anna Vergun, MD — ACPOC President
10:10–11:00am	**Session I – Surgical** (Moderator: Jorge Fabregas)
10:10–10:20am	**Online Video as an Information Source for Treatment of Fibula Deficiency** David Westberry, MD; Lisa Carson; Dave Reich; and Connor Provost
10:20–10:30am	**Management of Severe Lumbar Lordosis** Joseph Ivan Krajbich, MD
10:30–10:40am	**Exo Corporal Evaluation of Magnetic Spinal Growth Rods (MSGR) in Patients Treated by the Protocol of Frequent Small Increments Lengthening** Joseph Ivan Krajbich, MD; Michell Welborn; and Daniel Bouton
10:40–10:50am	**Pre-operative Education for Pediatric Patients and their Families When Anticipating Amputation: A Review of Literature and Systems** Vivian Yip, OTD, MA, OTR/L
10:50–11:00am	**Discussion**

Friday, April 23rd

11:00am–12:00pm	**Session II – Outcomes** (Moderator: Kelly Jeans)
11:00–11:10am	**Challenges to Success and Support in the Pediatric Limb Loss/Limb Difference Population: An Interdisciplinary Research Collaboration** Anna Vergun, MD; Chinmay Paranjape, MD, MHSc; Janet Panoch; and Melanie Miller
11:10–11:20am	**Goal Setting: How do we Measure Success?** Megan Smith, CO
11:20–11:30am	**Evidenced-based Clinical Implementation of Digitally Made Pediatric Prostheses** Calvin Ngan, PhD Candidate; Harry Sivasambu; Sandra Ramdial, CP; Elaine Ouellette; Neil Ready; Kerri Kelland; and Jan Andrysek
11:30–11:40am	**Patient Reported PROMIS Assessment in Pediatric Patients with Tibial Deficiency, Fibular Deficiency, and Proximal Focal Femoral Deficiency - A Multicenter Study** Vanna Rocchi, DO; Joel Lerman, MD; Nina Cung, BA, BS; Jeffrey Fine, MPH; Janet Walker, MD, Jeffrey Ackman, MD; David Westberry, MD; and Sarah Nossov
11:40am–12:00pm	**Discussion**
12:00–12:30pm	**Break — Sponsored Content**
12:30–1:30pm	**Presidential Guest Speaker** Unni Narayanan, MBBS, MSc, FRCS(C)
1:30–2:50pm	**Clinician Guided Forum**

Friday, April 23rd

2:50–3:50pm	**Session III – Lower Extremity Prosthetics** (Moderator: David Westberry)
2:50–3:00pm	**Running-Based Anaerobic Performance of Dutch Children Using Lower Limb Prosthesis** Anka Michielsen, MSc, PT
3:00–3:10pm	**Assessment of Agility in Children Using the Fillauer Posterior Mount Prosthetic Feet** Kelly Jeans, MS; Wilshaw Stevens; Cristina Lopez; and Donald Cummings
3:10–3:20pm	**Early Knee Protocol in Children with Bilateral High-Level Amputations** Rebecca Hernandez, CPO, LPO; Brian Giavendoni, CP; Colleen Coulter, PT, DPT, PhD, PCS; Michael Schmitz, MD; and Joshua Murphy, MD
3:20–3:30pm	**Case Study: Unique Design Changes for Lawnmower Injury Over a Six Year Period of Growth** Rebecca Spragg, MSPO, CPO
3:30–3:50pm	**Discussion**
3:50–6:00pm	**Session IV – Rehabilitation** (Moderator: Rebecca Spragg)
3:50–4:00pm	**Challenging Case: Growing Up Means Getting up From the Floor** Janet Walker, MD; Hank White; and Eric Miller
4:00–4:10pm	**Orthotic Management of a Child with Lower Extremity POK3CA-Related Overgrowth Spectrum** Rachel Fergus, CPO; Elyse Zanghi, CO; and Ana-Marie Rojas, MD
4:10–4:20pm	**Preventing Obesity in Children with Limb Difference** Phoebe Scott-Wyard, DO
4:20–4:35pm	**Discussion**
4:35–4:50pm	**Break — Sponsored Content**
4:50–5:45pm	**Mirror Therapy: A Review of the Literature and Case Presentations** Phoebe Scott-Wyard, DO and Vivian Yip, OTD, MA, OTR/L
5:45–6:00pm	**Discussion/Adjourn**

Saturday, April 24th

9:30–10:00am	**Exhibit Hall Open**
10:00–10:50am	**Session V – New Investigator Awards** (Moderator: Phoebe Scott-Wyard)
10:00–10:20am	**Differences in Running Performance in Children Using a Lower Limb Prosthesis Compared to their Peers** Matthijs Schakel, PT, MSc; Anka Michielsen, MSc, PT; Han Houdijk; Olaf Verschuren, PhD; and Iris Van Wijk
10:20–10:40am	**Consensus in Defining and Treating Idiopathic Toe Walking** Alexandria Daniels, MSPO; Jessica Hovestol, MSPO; and Rebecca Spragg, MSPO, CPO
10:40–10:50am	**Discussion**
10:50am–12:10pm	**Session VI – Orthotics and Prosthetics** (Moderator: James Kallen)
10:50–11:10am	**Heavy Feet: A Key That Helps Children with CP to Walk** Temrah Okonski, PT and Marlies Cabell, CPO
11:10–11:20am	**The Role of Wheelchair prescriptions in Children with Limb Differences** Elizabeth Koczur, MPT, PCS, CBIS; Denise Peischl, BSBME; Eileen Shieh, MD
11:20–11:30am	**Identifying Challenges and Facilitators to the Implementation of Digital Technology in the Field of Orthotics & Prosthetics: A Qualitative Study** Calvin Ngan, PhD Candidate; Harry Sivasambu; Sandra Ramdial, CP; Elaine Ouellette; Neil Ready; Kerri Kelland; and Jan Andrysek
11:30–11:40am	**Discussion**
11:40–11:50am	**Possible Clinical Implications of Recent Research on Central Pattern, Rhythm and Alternation Neural Generation Research** Nancy Hylton, PT, LO
11:50am–12:00pm	**Case Study: Dynamic Orthotic Management of Chronic Pain Related to Familial Biomechanical Variations in an Active Adult with Congenital Hemiparesis** Nancy Hylton, PT, LO
12:00–12:10am	**Discussion**
12:10–12:40pm	**Break — Sponsored Content**

Saturday, April 24th

12:40–2:15pm	**Session VII – Upper Extremity Prosthetics** (Moderator: Robert Lipschutz)
12:40–12:50pm	**Upper Limb Prosthetic Management of a Three-Year-Old Presenting with VACTERL Association** Brian Emling, MSPO, CPO, LPO; Colleen Coulter, PT, DPT, PhD, PCS; Richard Welling Jr. MSPO, CPO; and Joshua Ratner
12:50–1:00pm	**Targeted Muscle Reinnervation in a Pediatric Patient with a Forequarter Amputation: A Case Report** Matthew Severson, MD; Amy Rabatin, MD; Peter Rose, MD; Steven Moran, MD; and Karen Andrews, MD
1:00–1:10pm	**Innovation or Imitation: Design Challenges and Successes in Upper Extremity Prosthetics** Richard Welling Jr. MSPO, CPO; Colleen Coulter, PT, DPT, PhD, PCS; Brian Emling, MSPO, CPO, LPO; and Allan Peljovich
1:10–1:20pm	**“Lost in time”: Updating the Content and Clinical Accessibility of the Prosthetic Upper Limb Functional Index (the PUFI)** Lisa Artero, MSc (OT), OT Reg(Ont); Ashley Ogilvie, OT Reg(Ont); Sandra Ramdial, CP; Carleen Ginter; Gloria Lee; and Virginia Wright
1:20–1:40pm	**The Experiences of Adults with an Upper Limb Loss/Difference** Miriam Daneff, MAHSR; Edmund Biden, PhD; Wendy Hill, BScOT; and Catherine Aquino-Russell, PhD
1:40–1:55pm	**Discussion**
1:55–2:15pm	**Break — Sponsored Content**

Saturday, April 24th

2:15–5:30pm	**Session VIII – Psychosocial/Emotional** (Moderator: Colleen Coulter)
2:15–3:15pm	**Hector Kay Lecturer: Adverse Childhood Effects** Stan Sonu, MD, MPH
3:15–3:45pm	**Bullying, Discrimination, and Unconscious Bias: Effects on Children With and Without Physical Disabilities** Jada Bussey-Jones, MD, FACP
3:45–4:45pm	**Panel: Walking in the Shoes of Children with Physical Differences Who Wear Prosthetic or Orthotic Devices** Colleen Coulter, PT, DPT, PhD, PCS
4:45–4:55pm	**Pink or Blue? What to expect with Transgender and Gender-Fluid Children in Your Clinic** Anna Vergun, MD
4:55–5:15pm	**Discussion**
5:15–5:30pm	**Adjourn Reflections from ACPOC President**

Speaker Information

Alexandria Daniels, MSPO, is a 2020 graduate of Eastern Michigan University with a Master of Science in Orthotics and Prosthetics. Prior to that she attended Baker college for degrees in Health Service Administration and Orthotic and Prosthetic Technology. She is currently at Becker Orthopedic in Grand Blanc, MI for her Orthotic Residency.

She became involved with orthotics and prosthetics through a mentorship as a high school student and fell in love with the field after working as a tech for 4 years. During that time she was able to develop relationships with patients that would last for years. She saw the difference orthotists and prosthetists could make in someone's life and has been passionate about the field ever since.

Ana-Marie Rojas, MD, is an active member of the American Academy of Cerebral Palsy and Developmental Medicine, the Association of Academic Physiatrists, and the American Academy of Physical Medicine and Rehabilitation. She is the co-author of several chapters in the fields of stroke, limb deficiency, and spinal cord pathology. Dr. Rojas collaborates with neurosurgeons, orthopedic surgeons, engineers, therapists, and other clinicians to develop innovative treatments in the field of Pediatric Rehabilitation. She is fluent in Spanish and English.

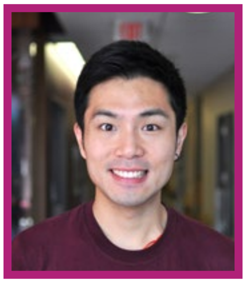
Anka Michielsen, PT, MSc, was born in 1963 in The Netherlands. She received her physiotherapy degree in 1988. She started her working career in paediatric rehabilitation medicine in Rehabilitation Centre De Hoogstraat in Utrecht (The Netherlands) in 1989 after a nine month general rehabilitation experience in Spaulding Rehabilitation Hospital in Boston USA. In 1992 she received her post-master degree in paediatric physical therapy. She returned to Boston to join the team of Early Childhood Services in East-Boston to assess and monitor children with motor development problems. Before returning home she travelled through South and East Africa where she volunteered for a month in a rehabilitation centre in South-Africa. After returning home in 1999 she picked up her job as a paediatric physical therapist in Rehabilitation centre de Hoogstraat and started her specialisation in children with orthopaedic conditions, especially congenital lower limb deficiencies. In 2009 she earned her master degree in Physiotherapy at Utrecht University with a thesis titled "Participation and Quality of life of Dutch children and adolescents with lower limb deficiencies". With the presentation of the results of the thesis at ACPOC meeting in 2010 she received the New Investigators Research award. She visited ACPOC meetings several times with presentation of results on different subjects in children with lower limb deficiencies. In 2015, together with her rehab team and dr Sakkers, orthopaedic surgeon, they initiated the European Network ChiLD (Children with Limb Deficiencies), in which they operate in close cooperation with the American/Canadian Association for Children's Prosthetics an Orthotic Clinics (ACPOC). She is a member of the board of a parent support group for Dutch parents with limb deficient children. Her work as a master in research focusses mainly on functional abilities (like running), sports and prosthetics in children with lower limb deficiencies.

Anna 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.

Speaker Information

Ashley Ogilvie, Ot Reg(ONT), is a registered Occupational Therapist in Ontario, Canada. She works as part of a multidisciplinary team in the Orthopaedic and Amputee Rehabilitation program at Providence Healthcare. As an Occupational Therapist, Ashley works with clients with lower limb amputations learning to use transtibial and transfemoral prostheses in their daily activities. She is also a Research Assistant working with a multidisciplinary team at Holland Bloorview Kids Rehabilitation Hospital to update the content and clinical accessibility of the Prosthetic Upper Limb Functional Index. Ashley began working with the team as a graduate student at the University of Toronto. She presented at the Thelma Cardwell Research Day and was awarded the Health Services Award for the research project.

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. Since printing began in 2018, 31 models have been printed for orthopedic operative planning purposes. Brian attends a multidisciplinary Cerebral Palsy Clinic and serves on the Children's Healthcare of Atlanta Cerebral Palsy Conference Planning Committee. 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.



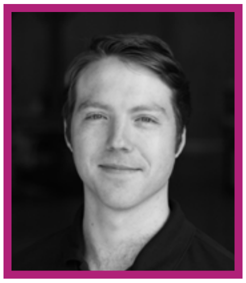
Calvin Ngan, PhD Candidate is a PhD candidate from the University of Toronto with a background in mechanical and biomedical engineering. His research focus is on the design and development of prosthesis and the implementation of digital technology in the field of O&P.

Colleen Coulter, Pt, DPT, PhD, PCS, is a Board Certified Pediatric Clinical Specialist through the APTA practicing in the field of pediatrics for 46 years. For the past 36 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.

Speaker Information

David Westberry, MD, Medical Staff (Pediatric Orthopaedic Surgery), Shriners Hospital for Children, Greenville, SC; Medical Director, Limb Deficiency Clinic, Shriners Hospital for Children, Greenville, SC; Director, Motion Analysis Center, Shriners Hospital for Children, Greenville, SC

Denise Peischl, BSBME is a rehabilitation engineer who received her degree in Biomedical Engineering from the Catholic University of America. She has been working at the Nemours/A.I. DuPont Hospital for Children in Wilmington, Delaware for the past 27 years. She coordinates the wheelchair seating and mobility clinic. Her areas of interest include Cerebral Palsy, Spina Bifida, Muscular Dystrophy, Traumatic Brain Injury, Spinal Cord Injuries, and Prosthetics and Orthotics. She has co-authored chapters in the book, “Pediatric Rehabilitation” (3rd Edition).



Easton LaChappelle is the Founder and CEO of Unlimited Tomorrow. His passion is centered around patient outcomes for the pediatric population with limb differences.

Edmund Biden, DPhil, FCSME, grew up in New Brunswick, Canada. He did his doctoral studies at Oxford before moving to San Diego to work with the Motion Analysis Lab at Children’s Hospital under the direction of Dr. David Sutherland. In 1987 he moved back to Canada and became active with the Institute of Biomedical Engineering (IBME) and its prosthetics program. He was Director of the Institute from 1990 to 1999. Ed joined ACPOC in 1990 and it has been his favourite meeting since.

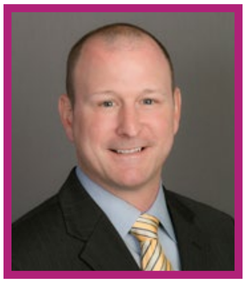
In 2000 Ed was involved in the development of a multi-university program in Health Services Research which has challenged him to understand the world of qualitative research. Miriam Daneff is the most recent graduate student in that program to work with the prosthetics program at IBME.

Eileen Shieh, MD is a pediatric physiatrist who is fortunate to work with the prosthetic team at Nemours Hospital in Wilmington, DE. She obtained her undergraduate education at Pennsylvania State University and medical education at Sidney Kimmel Medical College (formerly Thomas Jefferson University) in Philadelphia, PA. She went on to complete her combined Pediatrics / PM&R residency at Thomas Jefferson University Hospital and joined as faculty upon graduating. She has tremendous love for medical education, prosthetics, gait, her family, and her cats.

Speaker Information

Elizabeth Koczur, MPT, PCS, CBIS, is a senior staff physical therapist who received her Masters in Physical Therapy from Temple University. She has been a PT at the Nemours/A.I. DuPont Hospital for Children in Wilmington, Delaware for the past 28 years. Her areas of interest include seating and mobility, prosthetics and orthotics and brain injury. She has co-authored chapters in the book, "Pediatric Rehabilitation" (3rd Edition).

Elyse Zanghi, CO, has been a certified Orthotist working at the Shirley Ryan AbilityLab since 2011 where she specializes in upper and lower extremity pediatrics and also serves as a research orthotist involving stance and swing phase control orthoses. Elyse received her bachelor's degree in Kinesiology from the University of Illinois at Chicago and later completed her Certificate in Orthotics at Northwestern University.



Greg Brauntz is an ABC Certified Prosthetist and Engineer who received his prosthetics degree from Northwestern Univ. He spent six years in Clinical practice in Denver, CO where he often worked directly in the OR with Limb Salvage, Vascular and Plastic Surgeons as well as Physiatrists and PT's to help enhance patient outcomes. He joined Össur in 2018 supporting the Western US/ Canada and continues to enhance education efforts throughout.

Greg Mattson, is CEO & President of Fabtech Systems LLC, an Industry leading Prosthetic Orthotic company, specializing in custom composite brace manufacturing, engineered product manufacturing, materials distribution and product development located in the Pacific Northwest.

Hank White, PT, PhD is a physical therapist with over twenty-five 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.

Speaker Information

Jada Bussey-Jones, MD, FACP, is a Professor of Medicine in the Department of Medicine of Emory University's School of Medicine. She received her BS in Sociology and later her MD from Emory University. She currently serves as the Chief of Grady General Medicine and Geriatrics, the Vice Chair for Diversity, Equity, and Inclusion for the Department of Medicine, and the Assistant Dean for Professional Development for Emory at Grady. Dr. Bussey-Jones has nationally recognized educational expertise in the areas of minority health, health equity, as well as patient and provider education. She has developed several program initiatives addressing health promotion and disease prevention for vulnerable populations. She developed and directed curricula on cultural competence, disparities, and social determinants of health for students, residents and faculty and was recognized with an Educational Innovation Award for this work. She has also chaired the National Disparities Education Task Force for the Society of General Internal Medicine organization and served as editor for a special issue of the Journal of General Internal Medicine dedicated to disparities education. In this role, her leadership resulted in an award winning national disparities course, web based educational modules, and two national symposia on disparities at both the Society of General Internal Medicine and at the American Association of Medical Colleges.

James Kallen, CPO(c) is the owner of Precision Prosthetic / Orthotic Services Ltd. In Red Deer Alberta Canada and proud member of the ACPOC Calgary Alberta based clinic. His spare time sees him playing the saxophone, bass guitar, or piano, as well as training for Ironman based triathlons.

James Tarrant is the Orthotist responsible for treatment at Ability Orthotics a very small clinic on Vancouver Island, BC, Canada. Our focus is neuromuscular clients both adult and paediatric. We work in close collaboration with Physiotherapists who also focus on neuromuscular rehabilitation. James completed his orthotic training in New Zealand and received his Canadian certification in 2000. He was a clinical instructor in the Orthotics program at BCIT in Vancouver for more than 10 years. James has also been involved in the creation of a team based Adult Stroke Clinic, where people are seen and followed to monitor efficacy of Botox, Physiotherapy, Orthotic treatment, and gait function. James' pragmatic approach to orthotic practice leads to a constant search for optimal function relating each individual and their goals.

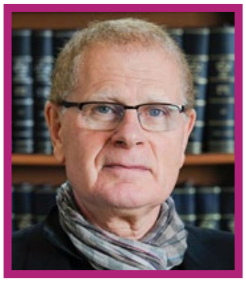
James Wynne is Vice President - Director of Education/Resident Director for Boston Orthotics and Prosthetics. He has been a certified orthotist/prosthetist since 1991 and has specialized in pediatric orthotic/prosthetics, since 1993. He lectures both nationally and internationally and has authored several book chapters and peer review articles on the non-operative treatment of scoliosis He is a past president of the American Board for Certification in Orthotics, Prosthetics and Pedorthics and is the current President Elect II for SOSORT, the International Society on Scoliosis Orthopedic and Rehabilitation Treatment.

Speaker Information

Janet Walker, MD is currently a pediatric orthopaedic surgeon at the Shriners Hospitals Medical Center in Lexington KY. She is affiliated with the University of Kentucky Department of Orthopaedic Surgery and Sports Medicine. Her clinical and research interests include clubfeet and lower extremity deformity, deficiency and amputations.

Jessica Hovestol, MSPO, is a 2020 graduate of Eastern Michigan University with a Master of Science in Orthotics and Prosthetics. She is currently doing her Orthotic Residency at Binson's in Livonia, MI with the plan of being a CPO in a few years time. Jessica grew up in a military family and has always had a passion for helping people achieve their goals and passions. She fell in love with the field of O&P the summer before her senior year of high school when she saw people making adaptive sports equipment. Jessica saw the potential to help people accomplish what they want in a tangible way. Jessica Hovestol and Ali Daniels presented a poster at the Academy in 2019 on a AFO casting stand.

Jorge Fabregas, MD, is a pediatric orthopaedic surgeon at Children's Healthcare of Atlanta at Scottish Rite. He has served on the ACPOC board for the past 12 years. He is currently the past president and program co chair. He is the division chief for the pediatric orthopaedic department at Atlanta Medical Center, as well as the director of resident education at Scottish Rite. He is also Co director of the Limb difference Program at CHOA. Jorge was born in Puerto Rico but completed his orthopaedic residency at Temple University Hospital in Philadelphia and his pediatric fellowship at Children's Hospital of Philadelphia. His practice focuses on musculoskeletal tumors, limb deficiency, and cerebral palsy and scoliosis. Twice a year he returns to Puerto Rico where, along with staff from the Shriner's Hospital of Philadelphia participates in a clinic benefitting the underserved population of his native country.



Joseph Ivan Krajbich, MD, is a pediatric orthopaedic surgeon practicing at Shriners hospital in Portland and long time member and past president of ACPOC.

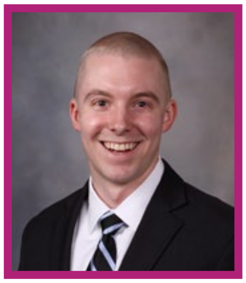
Kelly Jeans, MS, has 20+ years of experience working in the Movement Science Lab, running the clinical service and conducting research. Her project focus has been primarily on studying outcomes following nonoperative treatment for Clubfoot and gait patterns in the pediatric prosthetic population. She is currently an ACPOC board member at large.

Speaker Information

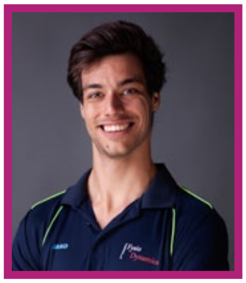
Lisa Artero, MSC (OT), OT Reg (Ont), is a registered Occupational Therapist in Ontario, Canada. She is the occupational therapist for the Prosthetics Program at Holland Bloorview Kids Rehabilitation Hospital where she works with a multidisciplinary team to provide prosthetic rehabilitation. Lisa has 15 years of experience in the prosthetics field at Holland Bloorview. She also has years of experience in Access Technologies and the Communication, Learning and Behaviour Service at Holland Bloorview. Lisa is involved in annual clinical teaching affiliated with the University of Toronto Occupational Therapy students and George Brown College prosthetic students. Lisa is involved in research and publications on upper limb prosthetic rehabilitation. She has presented research at the Association for Children's Prosthetic and Orthotic Clinics and the Japanese Society for Prosthetics and Orthotics Conference.

Martin Matthews is Chairman of the Board, Orthotic Clinical Specialist and Honorary Associate Professor at Plymouth University. He qualified in 1981 as an orthotist and specializes in pediatrics and scoliosis management. He has developed the Dynamic Movement Orthoses over the past 15 years. He lectures and has written numerous scientific papers and partners with a number of Universities to ensure continued innovation and development of the business. He is a keen skier and regularly competes in marathon kayak races.

Marlies Beerli Cabell, CPO, is an American Board Certified Prosthetist Orthotist. She is driven to improve patient outcomes by focusing on best technology and creative intervention. Join Marlies when she introduces her new orthotic design (patent pending), Heavy Feet: A key that helps children with CP to walk, during session VI: Orthotics and Prosthetics.



Matthew Severson, MD, is a 4th year PM&R Resident at Mayo Clinic in Rochester, MN. Following graduation this spring, he will be starting a two year fellowship in Pediatric Rehabilitation Medicine at Gillette Children's Specialty Healthcare in St. Paul, MN.



Matthijs Schakel, PT, MSc was already extremely interested in the musculoskeletal system from childhood on due to a fibular aplasia. So it was an easy choice for him to make to become a physical therapist and a human movement scientist and to research the participation of children with a limb deficiency.

Speaker Information

Megan Smith, CO, received a BS in Biomedical Engineering from Indiana University Purdue University at Indianapolis (IUPUI) in 2008 and then went on to receive her Certificate in Orthotics from Northwestern. She is currently the Director of Education & Research for Surestep. Her research focuses on pediatric development, orthotic solutions, new technology and gait analysis. Megan has spoken at several national conventions, including AOPA, APPTAC and ACPOC. She also presents to and educates orthotists and physical therapists across the country about pediatric development, gait deviations and orthotic solutions.

Some of her favorite accomplishments include working closely with patients, their families and care team to determine the best solution for each individual child. She also enjoys making connections between the scientific literature and the clinical setting. This allows her to help healthcare professionals discover the “so what” in each paper.

Miriam Daneff, MAHSR, is a Master of Applied Health Services Research candidate at the University of New Brunswick. Prior to this, she received her Combined Honours B.Sc. in Neuroscience from Carleton University. She has published an article in the Journal of Young Investigators.

Miriam’s present research was conducted within the Institute of Biomedical Engineering at UNB and in collaboration with the Atlantic Clinic for Upper Limb Prosthetics. This is Miriam’s first foray into qualitative research using Giorgi’s method.

Nancy Hylton, PT, LO, 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.

Natalia Rivera, OTD, OTR/L, is an occupational therapist from New York. She is currently working with Unlimited Tomorrow, Inc. on research and development projects surrounding their myoelectric upper limb prosthesis.

Speaker Information

Phoebe Scott-Wyardd, DO, is a rehabilitation medicine physician 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. She completed a combined residency in pediatrics and physical medicine and rehabilitation at Cincinnati Children's Hospital Medical Center and University of Cincinnati. 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 has been a proud member of ACPOC for more than 10 years.

Rachel Fergus, CPO, graduated from Eastern Michigan University with a Master of Science in Orthotics and Prosthetics and a BS in Kinesiology from Michigan State University. She has over five years of experience managing pediatric orthotics with a focus on cerebral palsy, neuromuscular and orthopedic disorders. At Shirley Ryan Ability Lab her primary focus is pediatric orthotics and provides care for several multi-disciplinary clinics. She is trained in advanced orthotic devices and has coordinated both adult and pediatric clinics for Functional Electrical Stem (FES). She has presented to O&P professionals at several industry conferences.

Rebecca Hernandez, CPO, LPO, is a Certified Prosthetist Orthotist. She is a member of the Limb Difference Program at Children's Healthcare of Atlanta, focusing primarily on prosthetic treatment of congenital lower extremity limb deficiencies.

Rebecca Spragg, MSPO, CPO, has been practicing pediatric orthotics and prosthetics for over 10 years. She currently practices part time while working as an assistant professor and program coordinator for the Eastern Michigan University Orthotics and Prosthetics Program.

Richard Welling Jr., MSPO, CPO, is the lead prosthetist for the Limb Deficiency Team at Children's Healthcare of Atlanta, where he has practiced for 15 year. He has previously presented at ACPOC, the Academy, as well as local universities O&P and PT programs. He is the liaison for Children's limb deficiency camp, Camp No Limb-itations. He lives in Marietta, GA with his wife and two children.

Speaker Information

Robert Lipschutz, CP, is a certified and licensed prosthetist working at the Shirley Ryan AbilityLab (formerly the Rehabilitation Institute of Chicago) in the Prosthetics & Orthotics Clinical Center. He is 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.

Ryan Berry, ATC, currently manages the Americas Össur Academy for Bracing & Supports. He joined Össur Americas in 2008 and has held a variety of positions while at Össur. Ryan completed his undergraduate and graduate coursework from the University of Wisconsin-Madison . He resides in Appleton Wisconsin with his wife and their two boys.

Hector Kay Lecturer

Stan Sonu, MD, MPH, is an assistant professor of internal medicine and pediatrics at the Emory University School of Medicine. He also serves as an associate program director for the Emory Internal Medicine Residency program. Dr. Sonu obtained his medical degree at the Medical College of Georgia, completed his residency in combined internal medicine/pediatrics at Rush University Medical Center in Chicago, IL, and did a fellowship at the Cook County Preventive Medicine and Public Health Program, during which he also obtained an MPH at Northwestern University. His research interests include addressing and preventing adverse childhood experiences and integration of trauma-informed care in clinical practice.

Temrah Okonski, PT, is a physical therapist. She has more than 30 years of experience and is passionate about maximizing a child's potential through comprehensive care and original orthotic intervention. Join Temrah when she introduces a new orthotic design (patent pending), Heavy Feet: A key that helps children with CP to walk, during session VI: Orthotics and Prosthetics

Hector Kay Lecturer

Unni Narayanan, MBBS, MSC, FRCS©, is a pediatric orthopaedic surgeon and Senior Associate Scientist at The Hospital for Sick Children and a Professor in the Departments of Surgery, Rehabilitation Sciences and the Institute of Health Policy, Management & Evaluation at the University of Toronto. His research program focuses on the development of meaningful patient reported outcome measures for pediatric musculoskeletal conditions and applying these in clinical trials. He is a Past President of the American Academy of Cerebral Palsy & Developmental Medicine and currently serves on the Board of the Pediatric Orthopaedic Society of North America.

Speaker Information

Vanna Rocchi, DO, is an active duty Pediatric Orthopaedic Surgeon at Naval Medical Center Portsmouth. Dr. Rocchi trained at Naval Medical Center San Diego for internship and residency (2013-2018), completed a utilization tour at Naval Hospital Okinawa (2018-2019), and then graduated from fellowship in 2020 from Shriners Hospitals for Children Northern California/UC Davis in 2020. She has a special interest in hip preservation and limb deformity correction.

Vivian Yip, OTD, MA, OTR/L, has been a member of ACPOC since 2006. She has presented various topics pertaining to limb difference and prostheitcs at ACPOC as well as MEC, AOTA, OTAC, Skills For Life, and AOPA. She has been an occupational therapist for the Child Amputee Prosthetics Project at SHC-LA since 2006 working with a comprehensive team to provide care for children with limb difference. She now spends more time as an OT for UCLA- Orthopaedic Hospital and continues to work with individuals with limb differences. She is a clinical instructor and invited guest lecturer for various MOT programs. Completion of her doctorate included qualitative research of individuals with congenital limb difference and their relationship with their prosthesis. She has various publications including a co-authored chapter in the Atlas of Amputation and Limb Deficiencies and Pediatric Rehabilitation text book. She has been active with Camp No Limits, Challenged Athletes Foundation, and Angel City Sports. She is also a member of AOTA & OTAC. Vivian is very enthusiastic about comprehensive care for children with limb and mobility differences and the reason why she continues to be active with ACPOC.

Abstract Report

Challenging Case: Growing Up Means Getting Up Off the Floor

Janet L. Walker, Hank White, Eric Miller

Shriners Hospitals for Children-Lexington, University of Kentucky Department of Orthopaedic Surgery and Sports Medicine, Lexington, KY, USA; Shriners Hospitals for Children-Lexington, Lexington, KY, USA

Abstract

An 11 year old male, adopted from China at age 3 years, presents with lower limb anomalies and difficulty with mobility. He walks on his knees in the house or uses a scooter propelled by his foot. In the community, he uses a wheelchair. His clinical diagnosis has been defined as unknown skeletal dysplasia with 3 known cases. His lower extremities have bilateral dislocated hips with limited flexion to 50 and 70 degrees. The knees are dislocated anteriorly and hyperextended to 90 degrees. He has no active knee extension. The lower limb segments have both tibia and fibula but measure only 11 cm. They are externally rotated 90 degrees to the body. The feet have 5 rays and are fixed in equinovarus and cavus. His upper extremities have good function but have mild elbow flexion deformities due to radial head dislocations.

He was fitted with prosthoses attached to his residual limbs. In these, he was able to walk with a walker but the externally rotated limbs required a very wide walker. They also presented difficulties for clothes. While they were not practical for community walking, they did give him a sense of walking with his peers.

At age 13, he spent 6-12 months researching amputations, watching videos, and talking to other amputees. He returned to talk about amputation to facilitate prosthetic fitting. Since he already walked on his knees, we performed bilateral knee disarticulations and patellectomies. He was fitted with extension prostheses and gradually increased in height.

While he was able to walk with a walker, these prostheses without knees were not practical at school with stairs or riding in the car. After much discussion, his bilateral condition and dysplastic hips were deciding factors in our recommendation for bilateral microprocessor knees. A 2-week trial of microprocessor knees in his current prostheses, and aggressive physical therapy, demonstrated significant improvements in his mobility such that, permanent components were obtained.

We will present our team’s approach, demonstrating the video and motion analysis documentation, throughout this patient’s transformation. We assessed walking on level ground at more than one speed, walking up and down an incline, AMP and L-test.

Abstract Report

Patient Reported Promis Assessment In Pediatric Patients With Tibial Deficiency, Fibular Deficiency, And Proximal Focal Femoral Deficiency - A Multicenter Study

Vanna Rocchi, Joel Lerman, Nina Cung, Jeffrey Fine, Janet Walker, Jeffrey Ackman, David Westberry, Sarah Nossov

Shriners Hospitals for Children Northern California, Sacramento, CA, USA; UC Davis, Sacramento, CA, USA; Shriners Hospitals for Children-Lexington, Lexington, KY, USA; University of Kentucky Dept of Ortho Surgery and Sports Med, Lexington, KY, USA; Shriners Hospitals for Children, Chicago, IL, USA; Shriners Hospitals for Children Greenville, Greenville, SC, USA; Shriners Hospitals for Children, Philadelphia, PA, USA

Abstract

Purpose: The objective of this study was to characterize Patient-Reported Outcomes Measurement Information System (PROMIS) scores among pediatric lower limb deficient patients clinically treated as amputees and evaluate differences in these scores across specific diagnosis type and severity within each diagnosis.

Methods: This IRB-approved, multicenter study reviewed PROMIS scores obtained from 138 patients (ages 6 – 18 years) with lower extremity deficiencies. Patients had one of three congenital deficiencies: proximal femoral focal deficiency (PFFD, n=48), fibular deficiency (FD, n=56) or tibial deficiency (TD, n=34), with severity approximated using a common classification within each group (Aitken, Achterman & Kalamchi, and Jones, respectively). Data were collected in four PROMIS domains: Mobility, Pain Interference (PI), Peer-Relationship (PR), and Upper Extremity (UE). Kruskal-Wallis and Wilcoxon's Rank Sum Test were performed to evaluate differences.

Results: PROMIS Mobility scores differed between diagnoses. FD patients reported better median Mobility score than TD or PFFD patients (52 vs 44.4/43.7) (p=0.0036). There was a trend towards lower PI score in patients with FD compared to TD or PFFD (39.7 vs 45.8/47.6) (p=0.21). PROMIS Mobility scores did not differ by severity within diagnoses. PROMIS Mobility and PI scores were affected by bilaterality in FD, with unilateral patients demonstrating better Mobility (median 52 vs 36, p=0.0008) and lower PI scores (median 38.6 vs 56.9, p<0.0001). Bilaterality also affected PROMIS Mobility scores in TD (median 46 vs 39, p=0.0077). PFFD PROMIS scores were not affected by the presence or absence of knee fusion.

Conclusion: Median PROMIS Mobility scores are rated "normal" in patients with FD and "mild impairment" in children with PFFD or TD. There is a trend towards better PI scores in FD patients, but median values for all diagnoses scored "normal". The severity of disease was not associated with PROMIS score changes, and interpretation of scores was normal for almost every category, with exceptions all in the "mild impairment" range. Bilateral FD/TD patients reported significantly lower PROMIS Mobility score averages; interpreted in the "moderate impairment" range. Bilateral FD patients had worse PI scores. Presence or absence of knee fusion did not affect PROMIS scores, though small numbers for analysis limit interpretation of this data (25 knee fusions, 11 no fusion). PROMIS PI, PR & UE score averages were consistently within the normal range, consistent with overall lack of pain complaints. Domains may be influenced by factors other than diagnosis, bilaterality, or severity.

Significance: PROMIS Mobility scores appear to distinguish functional differences among lower extremity deficient children and adolescents.

Abstract Report

Online Video as an Information Source for Treatment of Fibular Deficiency: A Quality Analysis of Video Content

David Westberry, Lisa Carson, Dave Reich, Connor Provost

Shriners Hospital for Children: Greenville, Greenville, SC, USA; USC School of Medicine: Greenville, Greenville, SC, USA

Abstract

Fibular deficiency represents a spectrum of anomalies ranging from shortening of the fibula to complete absence of the fibula. Treatment options for fibular deficiency include amputation and use of a prosthesis versus limb reconstruction. The internet is a common educational resource for health information to the public. The reliability and accuracy of medical advice obtained on the internet is unknown. Tools for the rating of online health information have been constructed to evaluate the caliber and validity of medical internet sites (DISCERN and JAMA Benchmark). The purpose of this study was to evaluate and describe the quality of online videos as a medical information source for treatment of fibular deficiency using these tools.

This project was undertaken as a quality improvement initiative and was not formally supervised by an Institutional Review Board. An online search of videos related to “fibular deficiency” was performed utilizing the four following websites: YouTube, Vimeo, VuMedi, and Global Health. A research specialist, medical student, and orthopaedic physician assistant reviewed and scored each video for quality utilizing the DISCERN and JAMA benchmark. Videos were also categorized based on source of content and whether a treatment bias was present.

Fifty-one videos published between 2010-2020 met inclusion criteria. Source of content included Patient/Parent Experiences (39), Physician Education (8), and Medical Industry (4). Eighty percent of videos were published in the latter half of the review period, with the majority (71%) originating in the United States. Total number of views for each video averaged 170,382, with a range of 88 - 5,000,000+ views. Frequency of views did not correlate with quality of video. Of the 51 videos, approximately half (51%) demonstrated bias toward amputation, 35% toward limb reconstruction, and 14% with a balanced recommendation of both treatment methods. The mean Modified DISCERN score calculated from all reviews was 2.1 (range, 0-5) and the mean JAMA benchmark was 2.3 (range, 0-4) indicating average overall quality for the videos. On average, physician directed and medical industry videos were rated higher (3.0) than patient/parent experience videos (1.8).

Patients and parents often utilize the internet as an educational source. When facing challenging treatment decisions regarding fibular deficiency, families need to be aware of bias that may exist in online video content.

Patients should consult with their providers about information that is viewed on the internet. All strategies for fibular deficiency should be presented and discussed prior to a decision for treatment.

Abstract Report

Upper Limb Prosthetic Management Of A Three Year Old Presenting With VACTERL Association

Brian Emling, Colleen Coulter, Richard Welling, Joshua Ratner

Childrens Healthcare of Atlanta, Atlanta, GA, USA; Hand and Upper Extremity Center of GA, Atlanta, GA, USA

Abstract

Born prematurely with multiple congenital anomalies including imperforate anus, sacral spine anomalies, torticollis, a feeding disorder, and bilateral radial deficiency, with a particularly severe phenotype of the left, the patient was evaluated for orthotic and prosthetic options to support the child's interest in achieving independence with activities of daily living. The left upper extremity is profoundly underdeveloped. The patient has a small, unstable scapula, deficient periscapular stabilizing muscle, a hypoplastic clavicle, and humeral hypoplasia. There is failure of formation of the forearm and a hypoplastic monodactylous hand. The unstable shoulder girdle has limited humeral flexion and abduction which he uses right lateral trunk shift to achieve greater left shoulder abduction. At what is presumed to be the elbow, he demonstrates flexion and extension of the mass which includes the hypoplastic forearm and single digit. Palpable muscle activation is present in the forearm and digit.

While the right arm and hand have undergone multiple centralization surgeries the left extremity is primarily reserved for positioning objects using the digit as a hook or for compressing objects in opposition to the body. The right extremity, which remains in a cast following a centralization surgery continues to be the dominant arm for functional activities. The Limb Deficiency Team believes the subtle activation of the left forearm and digit can be strengthened if a device can create opposition to the digit. Opposition would allow for fine motor skills development of the left upper extremity, strengthening of the shoulder, and bimanual handling of objects away from the body. Improving the function of the left should support his goals of gaining greater independence with ADLs.

The prosthetics team utilized traditional fabrication techniques in conjunction with CAD CAM to generate a prototype self-suspending socket and terminal device. The first prototype was a self-suspending socket incorporating a custom flexible inner socket to ease donning and prevent impingement during flexion of the digit. The size of the socket (less than 2" in longitudinal length and circumference) benefited from additive manufacturing to generate a design that was robust yet lightweight. The second prototype was generated using a Stratasys PolyJet printer to generate one seamless socket with variable durometers which further reduces bulk and weight. The child will trial the second prototype in November with the goal of beginning daily use. At the time of the presentation, it is our belief that the child will be using the prosthesis daily.

The creative solution utilizes traditional fabrication along with CAD CAM technology for a child that is seeking greater function. The shoulder girdle stability and overall weakness of the left side required careful consideration of materials and design. If strengthening of the shoulder can occur the prosthetics team believes there may be benefit to subsequent designs incorporating myoelectric controls. CAD models, pictures and videos will accompany the presentation with detailed information on CAD process to encourage others to explore the benefits of CAD CAM in their practice.

Abstract Report

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

Anna Vergun, Chinmay Paranjape, Janet Panoch, Melanie Miller

University of North Carolina, Chapel Hill, NC, USA; Univeristy of Iowa, Iowa City, IA, USA; Amputee Coalition, 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.

ACPOC
Association of Children's Prosthetic-Orthotic Clinics

2021 VIRTUAL MEETING
April 22nd–24th

Abstract Report

Targeted Muscle Reinnervation In A Pediatric Patient With A Forequarter Amputation: A Case Report

Matthew Severson, Amy Rabatin, Peter Rose, Steven Moran, Karen Andrews

Mayo Clinic, Rochester, MN, USA

Abstract

An 11 year old right-handed girl underwent a left forequarter amputation with targeted muscle reinnervation (TMR) involving the left brachial plexus for treatment of clear cell sarcoma of the left elbow.

She initially presented four months prior for evaluation of acute left elbow pain and swelling. Radiographs obtained in the local emergency department were negative. Ultrasound of the left elbow revealed a heterogeneous soft tissue mass. Magnetic Resonance Imaging (MRI) revealed a 3.0 x 2.0 x 5.0 cm mass along the posterolateral aspect of the left elbow without apparent osseous involvement. Biopsy of the lesion showed pathology consistent with clear cell sarcoma with an EWSR1-ATF1 gene fusion. Repeat MRI one month later showed extension of the tumor into the olecranon with additional involvement of the ulnar nerve, common flexor tendon, anconeus and extensor carpi ulnaris. Lymph node dissection subsequently revealed tumor spread to left axillary lymph nodes.

Orthopedic Surgery and Plastic Surgery performed her operation. Strategic anastomoses within the brachial plexus and with targeted muscle groups were performed to enable future prosthesis function capability. This included transferring C5-C6 to the pectoral nerves and long thoracic nerve, C7 to the long thoracic and thoracodorsal nerve, and C8-T1 to the latissimus dorsi, subscapularis, trapezius, intercostals, and a portion of devascularized muscle attached to the skin to serve as a regenerative peripheral nerve interface.

She underwent proton beam radiation therapy following surgery and received 57 Gy to the left chest. She did not receive chemotherapy. She saw Physical Medicine and Rehabilitation to discuss prosthetic fitting. She initially received a custom left shoulder filler. At two months post-op, she saw occupational therapy to begin preparation for future fitting with a myoelectric prosthesis. The therapy plan has included graded motor imagery beginning with left-right discrimination tasks to optimize pattern recognition, mirror therapy to minimize phantom limb pain, and education on the role of TMR in controlling a prosthesis.

To our knowledge, the use of TMR has not been previously reported in a pediatric patient undergoing forequarter amputation. TMR is a surgical technique that transfers transected peripheral nerves to new muscle targets in the setting of an amputation. This creates additional and amplified electromyographic recording sites and enables preservation of existing cortical motor pathways that would otherwise be lost. The myoelectric prosthesis can then be paired with pattern recognition of muscle activation to allow for an increased number of prosthetic functions, a more intuitive user experience, and improved performance when compared with direct control. TMR also has been shown to reduce post-operative neuroma-related residual limb pain and phantom limb pain.

Rejection rates for upper limb prostheses in children are high. However, the ability to intuitively use a myoelectric device could have a significant impact on this child's upper extremity function and independence in daily living skills. This approach warrants consideration and further study in these patients given their relative risk of phantom limb pain and the potential for improved prosthetic function and quality of life.

Abstract Report

Goal Setting: How Do We Measure Success?

Megan Smith

Surestep, South Bend, IN, USA

Abstract

What is success? Parents, patients, physicians, therapists and orthotists come to the table with a different definition of success.

Some definitions are clear – increase range of motion for a patient with a contracture or decrease severity of a scoliosis curve. But not all definitions of successful outcomes are clear and vary from patient to patient.

Many orthotic goals are biomechanical, structural or about optimizing gait. These can be difficult to create, measure and quantify consistently. This makes it difficult to aggregate data to analyze how we are doing to meet our goals as a whole organization, as “optimal” can vary between patients and devices.

Documentation of goals and outcomes consistently is standard practice. But many tests, like gait evaluations or the TUG, either come with multiple outcome measures and/or one “optimal” outcome. These tests can also be difficult to administer based on space available or the child’s temperament on a given day.

The Goal Attainment Scale (GAS) is a valid and reliable tool to measure progress toward goal attainment. The goals are personal to each patient and allow us to aggregate data. The GAS has been shown to reflect patient/parent goals and may be as relevant as post-intervention kinematic or kinetic outcomes in patients with Cerebral Palsy. While the GAS is not been used at a high level in research, it has been shown to be responsive to change in pediatric rehabilitation.

The GAS works on a 5-point scale:

Score	Outcome
-2	Regression from current skill level
-1	Current skill level
0	Expected outcome/goal
+1	Greater than expected level
+2	Much greater than expectd level

Our objective is to investigate the reality of implementing the GAS into patient charting and having routine follow up for assessment of goals. Our clinics would benefit from using the GAS as a tool to reliably report on how orthotic interventions are helping patients and their families meet goals.

We currently have scored 13 patients with 3-month follow up data on orthotic goals with an average score of +1. We have one person recording and following up on goals to ensure consistency while we pilot this program. Ideally, we would create a library of goal templates that are stepped appropriately to allow our clinicians to be consistent and reliably set goals.

Because these can be open goals, they can be evaluated by the families at home, which removes some of the restraints of other tests. For instance, can our interventions help the child gain function so they can move up to the next class in daycare or walk around the block with their family? There are many goals that are important to the family that might outweigh our orthotic goals. I recognize that biomechanical goals are important, but given the difficulty of analyzing how our interventions are meeting those goals, could we use the GAS, along with other relevant patient information to aggregate individual data and determine how we, as a practice and manufacturer, are doing to meet patient goals?

Abstract Report

Mirror Therapy: A Review Of The Literature And Case Presentations

Phoebe Scott-Wyard, Vivian Yip

Rady Children's Hospital/UCSD, San Diego, CA, USA; UCLA, Los Angeles, CA, USA

Abstract

Objectives:

1. Review of the pathophysiology of phantom pain and phantom sensation in limb loss, including typical treatment modalities
2. Review current literature regarding the use of mirror therapy in amputees
3. Typical treatment protocols for mirror therapy will be presented
4. Case presentations of patients who received mirror therapy will be discussed

The phenomena of phantom pain and sensation, while more common in adult patients with limb loss, can be extremely disturbing and disruptive for children with limb loss. The pathophysiology of phantom pain and sensation will be presented, as well as common and emerging treatment modalities. A review of current research on mirror therapy as a treatment modality for phantom sensation and pain will be described. Typical treatment protocols for mirror therapy, and case presentations of patients undergoing mirror therapy will be depicted.

Abstract Report

Preventing Obesity in Children with Limb Difference

Phoebe Scott-Wyard

Rady Children's Hospital/UCSD, San Diego, CA, USA

Abstract

Objectives:

1. Review the current obesity epidemic in children in the United States
2. Examine health implications of obesity in children with limb difference
3. Assess challenges in measuring weight in children with limb differences
4. List strategies for managing weight and diet in children
5. Review the importance of activity and adaptive sports for children with limb difference

As we face another decade with a childhood obesity epidemic in the United States, our patients with limb difference are at an increased risk of obesity for a myriad of reasons. This can have a multitude of long- term health effects, and impede their participation in daily activities as well as cause lifelong increase in morbidity. It is often challenging to estimate goal weight in children with limb difference due to lack of appropriate growth curves. The clinician can help by promoting strategies to help with weight management and healthy diet, as well as active lifestyle and sport participation.

ACPOC
Association of Children's Prosthetic-Orthotic Clinics

2021 VIRTUAL MEETING
April 22nd–24th

Abstract Report

“Lost In Time”: Updating The Content And Clinical Accessibility Of The Prosthetic Upper Limb Functional Index (The PUFI)

Lisa Artero, Sandra Ramdial, Ashley Ogilvie, Carleen Ginter, Gloria Lee, Virginia Wright

Holland Bloorview Kids Rehabilitation Hospital, Toronto, Ontario, Canada; University of Toronto, Toronto, Ontario, Canada

Abstract

Introduction. The Prosthetic Upper Limb Functional Index (PUFI) is a child- and parent-report questionnaire that evaluates function in a range of bimanual daily activities in children using prostheses. For each of its bimanual items, response options evaluate: a) actual use (yes/no/unable), b) usual method of performance (two handed/prosthesis active or passive/one handed/with help/unable), c) ease of performance with or without prosthesis (no difficulty/some difficulty/great difficulty/with help/unable), and d) usefulness of prosthesis (not useful, somewhat useful, very useful). The PUFI was created and validated by our team 20 years ago however its clinical use has declined due to software incompatibility and outdated content. We have recently updated both its content and software (now on REDCap).

Objectives. A pilot test of the new PUFI-2 was conducted to explore users’ experiences and develop recommendations for further revision. Methods. In this mixed methods measurement study, three older children (over age 7) with a unilateral upper limb prosthesis (UULP), one parent of a younger child, and two parents of older children with a UULP were recruited via purposeful, convenience sampling (additional interviews/content analysis in progress). Participants completed the PUFI-2 and a cognitive interview administered by two occupational therapy (OT) students via Zoom video-conferencing. Primary coding was done after each interview by the OT students. The team came together after the third and sixth interviews to review coding, identify and explore themes related to PUFI-2 functionality.

Results. Two theme categories with subthemes have emerged from the interviews: 1) Factors affecting response accuracy are captured within issues related to user interpretation of activity performance (“Do you usually do the activity?” and “How does your child usually do the activity?”); user comprehension and need for clarity of response options and terminology; and the need for brain breaks and reminders, and 2) Enablers/Facilitators of PUFI-2 administration include the following: User friendly format that is easy to follow, age appropriate activities are represented, use of real-world pictures with kids at home are helpful in answering questions. Discussion. Recommended changes include: (1) Remove “usually” and “am too young to do it” from the initial question “do you do this activity”, (2) Include option for “never tried the activity/imagine what performance would look like if attempted”, (3) Bold response option keywords and label pictures to improve clarity and comprehension, (4) Simplify terminology, refine broad items and include video at the beginning of the PUFI-2 demonstrating the difference between active and passive action, and (5) PUFI-2 completion via computer is recommended over tablet or smartphone. These results will be updated for the conference to include the remaining study participants. We anticipate needing at least 2 more interviews to achieve informational saturation.

Conclusion. Involvement of children and parents in evaluating the PUFI-2’s content and format brought forward reality-grounded ideas from users’ perspectives on changes needed to the PUFI-2’s look and feel. Larger scale testing with children/parents and clinicians is needed to re-evaluate clinical utility after these changes are made. We are rolling out the PUFI-2 to international pediatric partners for this evaluation in 2021.

Abstract Report

Consensus in Defining and Treating Idiopathic Toe Walking

Jessica Hovestol, Alexandria Daniels

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Abstract

Idiopathic toe walking (ITW) has been researched since 19671, however the defining characteristics of the condition have varied since that original study. The inconsistency in defining ITW has created a gap in the understanding of optimal treatment plans, leading to ambiguous results on the effectiveness of various treatments. This research project focused on uncovering areas of agreement in the definition of pediatric ITW among a group of practicing clinicians. Further, the project sought to generate consensus on the treatments for ITW. The study consisted of a multi-round electronic survey utilizing the Delphi method. The Delphi method is made up of three participant-driven rounds. The participants included 13 experienced healthcare professionals (CO/CPOs, PTs, PMR Physicians) who work with pediatric idiopathic toe walkers.

The results showed a wide variation in how individual clinicians treat and define ITW but throughout the surveys, there was a level of agreement on the defining characteristics of ITW and acceptable treatments for ITW. There were several discrepancies in the subjects' responses that reflected discrepancies in the literature. This emphasizes the need for consensus in defining and treating ITW in order to effectively incorporate evidence-based practices.

In conclusion, this research provides current clinicians with a snapshot of where a selected group of orthotists, physical therapists, and physicians agree and disagree about the definition and treatment of idiopathic toe walking. As well as providing researchers with current practices and direction for future research.

Abstract Report

The Role of Wheelchair Prescriptions in Children with Limb Differences

Elizabeth Koczur, Denise Peischl, Eileen Shieh

Nemours / AI duPont Hospital for Children, Wilmington, DE, USA; Thomas Jefferson University Hospital, Philadelphia, PA, USA

Abstract

Introduction: A 28-month-old female with bilateral tibial hemimelia status post knee disarticulations at 23 months old was seen in our multidisciplinary prosthetic clinic. Developmentally, she had no fine motor impairment but had gross motor, speech, cognitive, and social delays. She attended daycare and was eager to interact with other children. The patient was independently mobile at home with crawling or using bilateral AK prostheses at a supervision to minimum assistance level on even surfaces with a posterior walker. She required assistance to transition to sitting. She was dependent for mobility in environments with multiple obstacles, uneven terrain, long-distance community settings, and daycare when caregivers could not provide the level of attention required for safe prosthetic use.

Concern: Though the patient was making gains in prosthetic training, exclusive prosthetic use was not meeting the patient’s comprehensive functional needs. The team identified needs to improve her independent mobility in classroom and community settings that might be addressed with a secondary device (wheelchair). Her mobility needed to be optimized with and without her prostheses in place. The objectives for prescribing the wheelchair included promotion of independence in multiple settings, energy conservation, joint protection, and usage as a back-up device in the event of prosthetic dysfunction.

Specifications: In determining the appropriate specifications for her wheelchair, the team prioritized independent transfers in/out of seating device with/without prostheses, ease for use by caregiver for transportation, safety measures, and a “growable” seating system. Unique wheelchair specifications included: a low seat-to-floor height based on wheel selection, optimal center of gravity to account for long-leg sitting during wheel propulsion, a width that would accommodate wearing bilateral AK prostheses and simultaneously allow access to wheels, and frame growth to account for physical growth and changes in seating and positioning.

Results: Our patient trialed an ultra-lightweight manual wheelchair of appropriate size and specifications. After minimal instruction, she independently propelled forward and backward, transitioned to standing with her prostheses with contact guard assist, and scooted back into her chair with minimal assistance. Her mother reported that the patient could more readily participate in daycare and community activities. She began ambulating with close supervision on even surfaces at 32-months-old and is weaning the use of her wheelchair in the classroom and community settings.

Discussion: Some might assume that early introduction of a wheelchair may hinder or even prevent prosthetic use. In reality, the addition of an appropriately prescribed wheelchair may in fact aid in prosthetic acceptance, especially for patients who are slower to gain independence with prosthetic use. It may also promote developmental progress across multiple domains by increasing access to different environments and age-appropriate activities.

Conclusion: Children will benefit from a mobility device evaluation at grossly 18-24 months. The addition of a wheelchair as a mobility device may promote independence in multiple areas of the child’s life, improve quality of life and safety, allow for cognitive growth for spatial awareness, and encourage self-care. Crucial specifications related to the wheelchair frame and seating are imperative to maximizing patients’ self-propulsion success.

Abstract Report

The Experiences of Adults with an Upper Limb Loss/Difference

Miriam Daneff, Edmund Biden, Wendy Hill, Catherine Aquino-Russell

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Abstract

Living with a congenital upper limb difference or an acquired upper limb loss is a complex and challenging experience. Physical, psychological, social, and economic barriers can lead to decreased quality of life and well-being. To understand the challenges faced by those living with an upper limb loss/difference (ULLD) and subsequently improve their quality of life, the perspectives of these individuals must be explored. Thus, the purpose of this research study was to describe the essence or meaning of everyday life for persons with an ULLD.

Five participants shared their experiences of living with an ULLD with the researcher. Qualitative data descriptions were collected through four unstructured interviews and one written submission. Approval from the Research Ethics Board was obtained prior to the recruitment of participants. Descriptions were analyzed according to Giorgi's descriptive phenomenological method as described by Giorgi & Giorgi (2003) and Aquino-Russell (2006). The Canadian Model of Occupational Performance and Engagement was utilized as the theoretical framework (Polatajko, Townsend, & Craik, 2007).

The core finding of the study was: Accepting oneself as a person with an ULLD is marked by cognitive well-being and indicates a shift in spirituality. The environment influences acceptance, with the capacity to bolster the well-being of individuals. In contrast, the stereotypes entrenched in society's perceptions present challenges to spirituality and cognitive well-being. Smashing through stereotypes, however, imparts a high sense of accomplishment and pride. Peer support is desired among persons with an ULLD but is found wanting. Although an ULLD renders certain occupations increasingly difficult, individuals demonstrate that anything is achievable through modification and determination. The prosthesis is meaningful to adults with an ULLD and is viewed as either part of the person, part of the environment, or a combination of both; thus, the prosthesis exists on a spectrum. Finally, aging introduces new concerns for some individuals with an ULLD.

Findings from this qualitative research study offer insight into the experiences of individuals with an ULLD and ensure that the perspectives of these persons are shared. Additionally, the results of this study provide health care professionals with valuable information to expand understanding and inform future practices, ultimately increasing the quality of life for individuals with an ULLD.

Abstract Report

Orthotic/ Prosthetic Management Of A Child With Spina Bifida And Acquired Transtibial Amputation

Rachel Fergus CPO, Vari Mcpherson CPO, Ana-Marie Rojas, MD Shirley Ryan

Ability Lab, Chicago, IL, USA

Abstract

This is a challenging orthotic/ prosthetic case who presented to clinic for follow up. He was not seen for more than a year with a lapse in care due to follow up non-compliance. He was referred by Dr. Rojas to Shirley Ryan Ability lab to be seen in our pediatric clinic for Orthotic/ Prosthetic services. The case involves a 12 year old male with a diagnosis of Spina Bifida Lumbar level with hydrocephalus . He presents with insensate lower limbs along with an acquired amputation below the knee on the right side. He acquired amputation after a dog bite while asleep requiring surgical revision resulting in below the knee amputation. Patient has had a previous reciprocating gait orthosis (RGO) and right transtibial prosthesis accommodating for knee flexion contractures which was delivered in 2016. Due to growth and increase in knee flexion contracture, both devices are ill-fitting and have been unable to be worn for the past year. He was previously using the RGO in the home for standing.

The physical examination of patient reveals he has two very different presentations. On the right side he has a traumatic transtibial amputation with a 20 degree knee flexion contracture. On the left side he has a 40 degree knee flexion contracture with noted forefoot supination. MMT on the right: quadriceps 0/5, knee flexion 2/5, and hip extensors 5/5. MMT on the Left: quadriceps 0/5, dorsiflexion 0/5, plantarflexion 0/5, knee flexion 2/5 and hip extensors 5/5. He is insensate below the knees bilaterally. Skin was intact. No hip flexion contractures on exam. He is independent at a wheelchair level and active in wheelchair basketball.

The challenge of this case is that patient's diagnosis of Spina Bifida result in significant weakness of his lower extremities along with knee flexion contractures. Not only is the prosthetic fitting going to be difficult as we need to accommodate patients significant knee flexion contractures but we also anticipated challenges combining the RGO with the prosthesis. Our primary concern was how patient would be able to don independently. His past device included a below the knee prosthesis which had c custom AFO fabricated over it which is how it connected to the RGO. This resulted in difficulties in donning and increased bulkiness making it difficult to fit in shoes. We needed to find an alternative solution that would better meet patients' goals. At this time we are recommending attaching his prosthesis to his RGO directly.

We are currently in the early stages of evaluation and treatment plan. We have not done a fitting yet for his new RGO or prosthesis but anticipate having to overcome several challenge with this prosthetic and orthotic case.

Abstract Report

Identifying Challenges and Facilitators to the Implementation of Digital Technology in the Field of Orthotics & Prosthetics: A Qualitative Study

Sandra Ramdial, Calvin Ngan, Harry Sivasambu, Elaine Ouellette, Neil Ready, Kerri Kelland, Jan Andrysek

Holland Bloorview Kids Rehab Hospital, Toronto, Ontario, Canada; Bloorview Research Institute, Toronto, Ontario, Canada; University of Toronto, Toronto, Ontario, Canada

Abstract

As part of pediatric and adult rehabilitation, advancements in digital technology and additive manufacturing have the potential to transform the design and fabrication processes of prostheses and orthoses. For instance, an optical scanner can capture the shape of a residual limb quickly, accurately, and reliably without physical contact with the client. Digital rectification of the scanned image is also a more quantitative approach than the traditional plaster-based methods allowing for the possibility of automation of certain components and compensating for growth which is important in pediatric care. Additive manufacturing (AM), also known as 3-D printing, can be used to quickly fabricate complex socket and device shapes. The introduction of digital technology to orthotics and prosthetics (O&P) has been slow. Proposed reasons include: lack of clinical and design interface for digital systems, uneconomic throughput and material cost, and limited material strength. Despite these issues, the Canadian certified prosthetists and orthotists have come to the consensus that the use of CAD/CAM systems and 3D printing will continue to grow and become more prevalent within the O&P industry. That said, literature on the use of digital technology is fragmented with most comprehensive reviews suggesting that there is much work to be done before widespread clinical implementation is possible. Therefore, there is a need to understand the ways in which digital technology are being used in O&P practice.

This study aimed to identify the motivations, challenges and facilitators affecting the implementation of digital technology in O&P by interviewing O&P professionals having prior experience using digital technology. Interviews were conducted via video conference and followed a semi-structured interview guide created for the study. Participants were recruited from O&P professional organizations to ensure a diverse representation. All interviews were audio recorded and transcribed. Emerging themes related to the aims of the study are described in the results to analyze and identify key themes in the data. Nine participants were recruited for the study. Preliminary results suggest that the biggest motivations for clinics to implement digital technology into their practice would be to increase efficiency and improve patient outcomes. However, limitations of modelling software, cumbersome workflows, and incompatibility with certain patient groups are significant technical challenges. In some cases, clinical implementation was resisted by staff citing steep learning curves, and lack of or poor reference materials and training. Findings from this investigation will yield detailed recommendations for the research and clinical community to improve the likelihood of successfully implementing digital technology.

Abstract Report

Evidenced-based Clinical Implementation of Digitally-made Paediatric Prostheses

Sandra Ramdial, Harry Sivasambu, Calvin Ngan, Elaine Ouellette, Neil Ready, Kerri Kelland, Jan Andrysek

Holland Bloorview Kids Rehab Hospital, Toronto, Ontario, Canada; Bloorview Research Institute, Toronto, Ontario, Canada; University of Toronto, Toronto, Ontario, Canada

Abstract

The implementation of digital workflows in prosthetic and orthotic care of children and adults is increasing throughout healthcare and improving patient outcomes and efficiency of services. Within prosthetic care, digital fabrication of prostheses is emerging as an enabler of cost and time efficient fabrication of customized devices for individuals with limb absence. However, there exist challenges and technical barriers hindering the full adoption of digital workflows, especially for the paediatric population. Amongst others, these include difficulty capturing smaller residual limbs, steep learning curves for design software, and limitations of the materials used in the digital fabrication process. Moreover, research involving digital workflows has been primarily focused on the lower limbs and adult patients.

However, access to well-fitting upper limb prostheses is particularly important in the paediatric setting as children rapidly grow and develop. Hence, the goal of this project is to develop the workflows and a standard of practice for utilizing digital processes (scanning, model rectification, additive manufacturing, or CAD/CAM fabrication) for paediatric upper limb prostheses.

A team of researchers, engineers and certified prosthetists and orthotists at Holland Bloorview Kids Rehabilitation Hospital has been investigating the feasibility of implementing digital and additive technologies as routine practice for transradial prosthetic management. This presentation includes the development and testing of a clinical process for digital shape capture, design, and fabrication of paediatric transradial residual limbs. To support the transition away from hand casting and manual rectification we developed a novel analytical process to quantify aspects of the traditional design process including soft tissue deformation occurring during casting, and reductions and build-ups applied through manual rectification. The process will allow for the quantification of socket designs, and hence the simplification and automation of the digital process to address existing challenges in the usability of these digital tools. We have also developed a process and guidelines for the scanning, digital modeling, and fabrication of transradial pediatric sockets based on our experiences with select clients with that will be shared as part of this presentation. Findings from this investigation have the potential to transform clinical practices beyond the scope of paediatric transradial prostheses to other prosthetic and orthotic types in paediatric and adult settings.

Abstract Report

Possible Clinical Implications of Recent Research on Central Pattern, Rhythm and Alternation Neural Generation Research

Nancy Hylton

Children's Therapy Center, Kent, Washington, USA

Abstract

My introduction to highly complex spinal reflex systems came from Dr. Karl Bobath in the early 1970s, as he attempted to explain the neurologic basis for Berta Bobath's therapeutic interventions, now known as NDT. He cited the research, by Magnusson, on de-cerebrate cat, treadmill walking, from the late 1800s. I was privileged to learn the NDT treatment approach from Berta Bobath, Mary Quinton and numerous other very skilled clinicians in the 1970s and 80s.

My reintroduction to the powerful clinical implications of CPG research came in 2000 in a course "The Neurology of Walking." I was also privileged to meet Dr. Hesse in Berlin and discuss his clinical intervention and studies on CPGs. This new aspect of neurophysiology impacted on my clinical practice and problem-solving immensely and I have continued to be fascinated with on-going research and its deep clinical applications.

In Fall 2019, I was introduced to Dr.David Lloyd, Neuro-researcher, by a friend of a close friend and colleague, Dr. Andrea Konig, Richmond, VA, over a lively dinner conversation, on the clinical implications of CPG research. He was able to connect us with his colleague and friend, Dr. David Magnuson, who is actively involved in Central Pattern, Rhythm and Alternation Neural Generation research. Via several Zoom discussions, we have explored both the current edge of his research and possible clinical implications.

This presentation will share basic knowledge of the present state of understanding of these hard– wired neural mechanisms that are of foundational importance to postural control, typical movement synergies, and active balance; including the importance of very specific afferent input from somato- receptors on the foot sole, around the pelvis, as well as, trunk and neck; interactions and specific postural and movement functions of the Central Pattern Generator (CPG), Rhythm Generator for control of posture, active stability and balance, and the Alternation generation function, which Dr. Magnuson now believes is a third separate generator layer for right/left side coordination (rather than being a part of the other 2 components.) These components are also strongly influenced by cortical systems, due to what is termed "context dependency," so that perceived instability or apprehension can super-cede the pattern generation function and dramatically alter movement control and efficiency, especially in persons with neuro-motor deficits.

Understanding these neural systems and their requirements for activation, permits supports creative intervention strategies that facilitate easier, and more successful movement control and motor learning. Support systems that do not permit some amount of tri- plane motion, can disrupt necessary afferent input for the function of these mechanisms. Sometimes, very simple but specific therapist cueing can allow transformative activation of these mechanisms, as well, in persons with moderate to severe deficits. Some case examples of these will be shared as well. I believe this information also better informs the mechanisms behind

Abstract Report

Case Study: Dynamic Orthotic Management of Chronic Pain Related to Familial Biomechanical Variations in an Active Adult with Congenital Hemiparesis

Nancy Hylton

Children's Therapy Center, Kent, Washington, USA

Abstract

As a Pediatric PT for many years, I have watched many children musculo-skeletal disorders become teenagers and adults. There aging is often accompanied by increasing, back, leg, foot, neck, pain, etc and I have found that much of the dynamic orthotic intervention we have applied to children can to helpful for adults as well.

This case is about an active 57 y.o. woman with congenital right spastic hemiparesis, whom I met through a mutual friend. She was extremely frustrated with her right AFO bracing and dealing with rapidly increasing, foot, knee, hip and back pain which was increasingly disrupting her daily functional activities. She had an active childhood and early adulthood, but due to extreme pain and foot/ankle instability had received right split posterior tibialis transfer surgery at 32 years of age and found this very successful and helpful for about 20 years. She had a right knee replacement at 52 y.o. to manage pain and joint deterioration and starting about 2 years ago had slowly increasing problems with stripping over her right foot, falling and increasing pain. Multiple types of AFOs were tried with limited success, the last custom molded brace being fabricated about 18 months ago.

At our introduction, her gait with brace on was slow and tentative, with protective shoulder hunching and significant side to side trunk sway with each step. She had major pain in her right foot focused at the cuboid, and swelling and pain under/behind the lateral malleolus, which had been diagnosed as tendonitis 6 months prior. She also had debilitating pain in her left hip, which appeared to be focused at TFL and behind in abductors and down IT Band. Having had 2 hip replacements myself, I assured her that this was probably soft tissue, rather than joint related, as she believed. She was also having increasing left foot pain focus at the mid-tarsal joint and to lateral boarder

An interesting piece of the puzzle was that she had felt "off kilter" (being forced toward her left side) since her right knee replacement. In addition, she had a very large forefoot valgus/plantarflexed 1st ray familial biomechanical variation bilaterally, which had not been addressed in any of her previous bracing. With her permission, temporary biomechanical modifications were made to her left insole and the soft inner liner of her AFO to better manage ground forces. A plan was initiated for her get a custom molded new right Dynamic AFO #4 SMO type and a custom molded maximum control left Dynamic FO, both with specific extrinsic forefoot valgus posting and neutral rearfoot stabilization, after returning to her doctor for an Rx.

Her text message to me the next morning was "I have ½ the pain getting up this morning! Very pleased!" and the following night "Tonight – pain free and walking with a much longer stride. It's a miracle." Her situation is not unique.

Abstract Report

Management Of Severe Lumbar Lordosis

Joseph Ivan Krajbich

Shriners Hospital for Children, Portland, Oregon, USA

Abstract

Severe disabling lumbar lordosis is a rare condition secondary to underlying spinal pathology. Either spinal boney pathology, intratheacal pathology or a combination of two can be a culprit.

We report on three patients presenting with severe lumbar sacral lordosis and their management. Two patients were wheelchair ambulator spina bifida with meningomyelocele patient and one patient with severe reactive lumbar arachnoiditis secondary to a shunt insertion. He was otherwise neurologically normal. All patients had over 90 degrees lumbosacral lordosis and significant symptomatology.

With no guidance from the literature we developed a treatment protocol allowing for deformity correction, restoration of sagittal spinal balance and preservation of the neurological status quo.

First stage of the treatment is anterior vertebrectomy at the lumbosacral junction by retroperitoneal approach. Usually most of the L5 vertebra and cephalad ¼ of the S1 vertebra is removed. After the wound closure skeletal traction pins are inserted through the distal femoral metaphysis bilaterally. 90/90 lower extremity traction is then set up. The traction is then gradually increased over the next several days/weeks until satisfactory correction is achieved.

Once that is accomplished the fusion across the osteotomy site can be achieved by additional period of immobilization either in ongoing traction or pantaloon cast / orthosis immobilization or by posterior instrumented fusion.

The condition of the patient with most severe deformity was complicated by additional severe fixed flexion deformity of her hips, malnutrition and urinary tract issues. She required additional proximal femoral osteotomies and application of an pelvic external fixator for traction augmentation to allow for desired correction.

Successful correction was achieved in all patients.

In conclusion we believe that our protocol for treatment of this rare deformity is safe and can be applied to even most severe deformities.

Abstract Report

Exo Corporal Evaluation Of Magnetic Spinal Growth Rods (MSGR) In Patients Treated By The Protocol Of Frequent Small Increments Lengthenings

Joseph Ivan Krajbich, Michell Wellborn, Daniel Bouton

Shriners Hospital for Children, Portland, Oregon, USA

Abstract

Summary: Direct examination of removed MSGR rod reveals consistent lengthening at the preset small increments. Average lengthening of the concave side rod was 2.00 mm and of the convex rod 1.89 mm. No statistical difference was found between the early lengthening and late lengthening

Hypothesis: Assessment of protocol of small increment lengthenings on efficacy of MSGRs by direct measurement of explanted rods

Intro: Direct visual examination of MSGRs removed from patients who underwent lengthening allows accurate assessment of the rods function under the lengthening protocol. Each lengthening leaves an obvious mark on the surface of the rod being lengthen. The number of marks and the distances between them can be accurately measured . Process similar to counting annual growth rings on a tree stump.

Results of the measurements can then be compared to the lengthening protocol.

Methods: MSGR rods were retrieved from patients who underwent their removal for one of the three reasons 1) rods replaced as they reached their maximum length, 2) revised to final instrumentation and fusion due to skeletal maturity, 3) rods failing to lengthen after three unsuccessful attempts. Rods were then carefully measured for overall length achieved, number of lengthening marks (rings) on the rod and the length of first three and last three rings lengthenings. Number of lengthening attempts were recorded from the medical records. All patient were lengthened per protocol of 2mm Q 6 weeks.

Results: 24 rods were retrieved from 12 patients. Lengthening achieved ranged from 5.5 mm to 49.0 mm. Average 24 mm. The average per lengthening was 2.00mm for the concave rods and 1.89mm for the convex rods. Only minimal difference (6.2 v. 5.8 mm) not statistically significant was found between the first three and the last three lengthenings.

Conclusions: The MSGRs perform well according to lengthening protocol with no significant decay until the end point as confirmed by direct measurements.

Significance: Small more frequent lengthening of MSGR may facilitate their more dependable function with potential fewer complications. This can be potentially explained by less trauma to the soft tissues and metal bone interface.

ACPOC
Association of Children's Prosthetic-Orthotic Clinics

2021 VIRTUAL MEETING
April 22nd–24th

Abstract Report

Heavy Feet: A Key That Helps Children With CP To Walk

Temrah Okonski

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Abstract

500,000 children in the USA have Cerebral Palsy (CP) and these children are a large percentage of a pediatric practitioners' caseload.

Some children with CP walk better when physical therapists (PT) add weight to the child's leg(s). Adding weight to a patient's leg(s) helps with foot-to-floor contact, controls the swing phase of gait, and improves a patient body awareness in space. Physical therapists add weight to a patient's leg during gait training either by applying pressure through a patient's pelvis or by securing a cuff weight to a patient's leg(s).

Pediatric physical therapists currently have no easy way to apply weights to a patient outside the clinic setting other than sending a child home with an ankle cuff weight. Cuff weights do not allow for nominal weight additions nor do they allow for weight to be incrementally decreased. Furthermore, cuff weights are bulky and slide around making them awkward to wear. When treating children with gait abnormalities, it is imperative to think of family-friendly, creative, orthotic interventions that advance a child's ambulatory function.

To resolve this unmet need, authors of this abstract designed a creative, orthotic solution called the "Click & Play Jetpack." This unique, patent-pending AFO accessory allows physical therapists to easily add weight to a preexisting AFO or a new AFO, while a caregiver simply clicks the jetpack on and off the child's orthotic. The Click & Play Jetpack can also be added to supramalleolar orthoses (SMO) with posterior extensions.

Thus far, we have identified three patient populations that have demonstrated an improved gait pattern with a weighted compared to a non-weighted AFO. These populations are (1) children with spastic CP and a crouch gait pattern status post tendon lengthening; (2) children with hemiplegic CP; and (3) children with movement disorders such as dystonic CP and ataxic CP. Children wearing weighed AFOs have demonstrated improvements in balance, heel strike, weight shift, and stepping pattern.

The Click & Play Jetpack is in the development stage. The John's Hopkins Whiting School of Engineering is fine tuning the Click & Play Jetpack prototype. Authors are also currently exploring how to add an accelerometer to this orthosis.

This topic is important because a large percentage of the children pediatric practioners treat are diagnosed with conditions that may benefit from a weighted AFO:

- 350,000 children are diagnosed with spastic CP. Half of these 350,000 children (187,500) present with a crouch gait pattern.
- 190,000 children are affected by one sided weakness and movement disorders (115,000 present with hemiplegia. 50,000 present with dystonia. 25,000 present with ataxia).

Join this presentation to learn about our exciting journey and to understand:

- How poor body awareness in space and involuntary movements impede gait progression.
- Why adding weight improves gait patterns
- How to assess what is the optimal amount of weight to add.
- Why some patients may only need additional weight temporarily whereas others may benefit from long term additional weight use.

Abstract Report

Case Study: Unique Design Changes for Lawnmower Injury Over a Six Year Period of Growth

Rebecca Spragg

Eastern Michigan University, Ypsilanti, Michigan, USA

Abstract

Over 200,000 children are injured in a lawn mower accident each year in the United States. These injuries are highly variable, including burns, lacerations, fractures, and amputations. This variability results in unique presentations and challenges for the healthcare team, including the orthotist. Further, as the child grows, design alterations must be made to accommodate for changes in size and activity. This case study follows one patient over a six year period, from age 10 to 16. The patient had a left foot and ankle injury at age 4 secondary to a lawn mower accident. Initial treatment focused on limb salvage over a 6 month period, including skin grafting, wound vacuum, and eventual arthrodesis. The patient was subsequently fit with an AFO to stabilize the limb. At the age of 10, she presented to the author’s clinic for a new AFO. This case will review the design considerations and changes made throughout the six year period, including successes, failures, and what we learned along the way.

Abstract Report

Assessment of Agility in Children using the Fillauer Posterior Mounted Foot

Kelly Jeans, Wilshaw Stevens, Cristina Lopez, Donald Cummings

Scottish Rite for Children, Dallas, TX, USA

Abstract

Children with below knee amputations, can be very active (K3 or K4 level) and interested in participating not only in play activities, but sporting activities as well. Many sports (ie. soccer, football, volleyball, baseball, etc.) require the ability for the player to change directions quickly and to move not only in the sagittal plane, but also laterally (Edgren, 1932). In children using a lower extremity prosthesis, the prosthetic foot component is an integral part in this requirement.

Many times, to meet this higher functioning demand, a child will be fit with a secondary “sport specific” prosthesis, which can be costly. In the growing child, consideration must be made to the frequency in which a new prosthesis is needed and the practicality of providing 2 prostheses each time since sport legs can be untraditional and not designed to be used with a shoe.

In 2014, our lab embarked on developing and validating a tool that evaluates motion commonly experienced in sport. This tool, the Pedi-Champ (modified version of the CHAMP), is a 4-part evaluation, including 1) single leg stance, 2) Edgen side-step test, 3) “L” test and 4) the Illinois agility test (Gailey et al, 2013). Assessment includes timed metrics of completion, and repeated measures up to 3 trials to complete and improve ones’ score. Our lab has recently included Actigraph GT3X accelerometers (sampling at 100Hz) data collection to the test, thereby allowing us to evaluate a child’s ability to plant and change direction (Stevens et al, 2020).

As part of a larger IRB approved study, a subset of unilateral, below knee pediatric prosthetic patients fit with a Fillauer posterior mounted prosthetic foot, will be invited to participate. Data collection for this study, includes PediChamp performance, while wearing an accelerometer just above the lateral malleolus of each ankle and self-reported participation on the PediFabs activity questionnaire. For this abstract, we will focus our initial analysis on the Edgren Side-Step Test, which evaluates lateral coordination, speed and agility. Data points include split times between the 3 passes and lag times which represents the transition time needed at each end-line. We will be looking at side to side differences in the ability to execute directional change while using a Fillauer posterior mounted prosthetic foot and the relationship of these findings to their Pedi-Fabs score.

Abstract Report

Pink Or Blue?: What To Expect With Transgender And Gender-Fluid Children In Your Clinic

Anna Vergun

University of North Carolina, Chapel Hill, NC, USA

Abstract

This session will explore what providers should know and can expect when caring for their transgender and gender-fluid children and adolescents. There is increasing awareness and acceptance of these differences at younger ages and we are seeing an increasing population with needs we don't fully understand. This session will be part of a symposium (sessions submitted separately) on awareness of differences in children and provider bias.

Pre-operative Education for Pediatric Patients and their Families When Anticipating Amputation: A Review of Literature and Systems

Vivian Yip

UCLA, Santa Monica, Ca, USA

Abstract

There are many challenges and feelings a family encounters when their child is diagnosed with cancer. When an amputation is required there are often more emotions, concerns, questions from the family.

Amputation due to cancer is different than trauma where there was unanticipated loss or congenital limb differences and often requires additional support when learning that amputation may be needed in order to save the child's life. Literature and various ways support is provided to these patients and their families will be explored.

Abstract Report

Clinical Presentation And Challenges Of Treating A Child Diagnosed With Meningococcemia: A Multidisciplinary Team Approach

Colleen Coulter, Rebecca Hernandez, Michael Schmitz, Alan Peljovich

Children's Healthcare of Atlanta, Atlanta, GA, USA; Hand and Upper Extremity Treatment Center of GA, 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 life-threatening without appropriate medical care. Individuals who survive this devasting disease may have life long challenges including those that effect their musculoskeletal system with possible amputations.

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 5-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. Patient 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 surgery to convert the auto amputation levels of right partial foot to a Symes and revision of the left trans tibia and fibula. Patient was being followed by pediatric hand and upper extremity specialist. No surgical revisions were recommended just scar management and bimanual functional fine motor activities.

Growing children who contract meningococcemia, face life long concerns for bone growth and development due to possible damage of growth plates that may include the extremities, bones of the ears, and teeth.

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. The CHOA team is trying strategies with prosthetic, range of motion, and contracture management to try to hold off another surgery until absolutely necessary. This case will outline the surgical, prosthetic, orthotic, and therapy interventions for this patient and discuss the future challenges that this patient and other child may face as they grow and develop.

Outcome: Child's care is ongoing due to developing overgrowth and angular deformity of the left residual limb. He is very playful and active with bilateral prosthetic management. The goal is to "operate on the prostheses" and postpone surgical revisions of the involved extremities until absolutely necessary.

Abstract Report

Bullying, Discrimination, and Unconscious Bias: Effects on Children With and Without Physical Disabilities

Stan Sonu, Colleen Coulter, Rebecca Hernandez

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Abstract

Bullying, unconscious bias, and discrimination in children are defined and described in the literature mainly in children without physical disabilities. Research in this area is limited for children with disabilities. However, children with physical disabilities may encounter psychosocial, and emotional challenges above and beyond the expected physical and environmental barriers.

Bullying is defined as seeking harm, intimidate, or coerce others who are weaker or perceived as vulnerable. Discrimination is the act of treating people badly or without respect because of their age, color of their skin, race, or sexual orientation. Implicit or unconscious bias is defined as “the process of associating stereotypes or attitudes toward categories of people without our conscious awareness.” Children who wear prosthetic or orthotic devices may be perceived by others as being different therefore, unjustly treated differently.

This symposium is divided in 2 parts. In the first part, Dr. Stan Sonu will define and describe bullying, unconscious bias, and discrimination in children with and without physical disabilities. Dr. Sonu will then explore the adverse effects of bullying, unconscious bias, and discrimination focusing on children with physical disabilities.

In part 2, three high school females with orthopedic physical challenges along with their parents will tell their stories and experiences facing bullying, unconscious bias, and discrimination followed by a question and answer panel discussion.

Early Knee Protocol in Children with High Level Amputations

Rebecca Hernandez, Brian Giavendoni, Colleen Coulter, Michael Schmitz, Joshua Murphy

Children’s Healthcare of Atlanta, Atlanta, GA, USA

Abstract

The use of articulating knees in above knee prostheses for infants and young toddlers is often debated. Though recent research indicates benefit to the patient, many centers are using a locked knee or monolithic design. The research has focused on patients with unilateral amputations. This presentation highlights one clinic’s experience in treating two children with bilateral knee disarticulation amputations, each three years or younger, with articulating knees from their first prostheses. Prosthetic design, components and timing, along with physical therapy treatment will be presented. Also discussed will be weighing the benefits of early knee protocol to promote a sound gait pattern while minimizing deviations.

Abstract Report

Innovation or Imitation: Design Challenges and Successes in Upper Extremity Prosthetics

Richard Welling, Colleen Coulter, Brian Emling, Allan Peljovich

CHOA, Atlanta, GA, USA; HUE, Atlanta, GA, USA

Abstract

Patients with upper extremity deficiencies present a prosthetic team with unique challenges. Variations in anatomical presentation and functional outcome goals can lead to new designs. But where do the ideas for new designs come from? Three cases will be presented of patients with upper extremity deficiencies who required unorthodox solutions to achieve the functional goals that the they desired.

The first patient is a 22 year old male with a left radial limb deficiency. He was fit with a myoelectric prosthesis as a child, however, it required a unique design due to space limitations. He returned as an adult, working in the automotive industry, requiring a prosthesis to advance his career. His atypical limb shape required an unusual socket design that was developed during a class held by prosthetic vendor.

The second patient is a 15 year old male with a very short congenital transradial amputation. He had not worn a prosthesis for many years. His goal for the new prosthesis was to be able to lift weights with his friends; however, given the limited length of his residual limb, a traditional transradial prosthesis with a weight lifting terminal device would have not been successful. A review of the internet led to another unusual design for the prosthesis.

The last patient is a 5 year old male with a long congenital transradial amputation. His limb had a non-functional thumb that blocked a typical transradial fit, but could provide sensation outside the prosthesis. Further, the family desired a prosthesis that the patient could don himself. The answer came from an AFO design used for children with cerebral palsy.

When presented with patients whose limb deficiencies don’t fall into the norm, prosthetists need to be creative. New ideas can come from a variety of sources. Where is the line between new innovation and imitating another clinicians design for your own purpose? How do clinicians feel about other prosthetists reaching out to them to use designs that they developed or just copy their design without asking? How do we advance the field without collaboration?

Abstract Report

Differences In Running Performance In Children Using A Lower Limb Prosthesis Compared To Their Peers

Matthijs Schakel, Anka Michielsen, Han Houdijk, Olaf Verschuren, Iris van Wijk

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Abstract

Background: Children with a lower limb prosthesis are at risk of participating less frequent in high intensity locomotor activities, like running.

Objectives: To determine if there is a difference between children with and without a lower limb prosthesis in running performance and how a difference is affected by the level of prosthesis. In addition, differences in hip muscle strength and general motors skills that could relate to the differences in running performance were assessed.

Methods: Seventeen children with a unilateral below knee prosthesis or above knee prosthesis and seventeen age- and gender matched able-bodied peers were tested on running performance, using the Muscle Power Sprint Test, Illinois Agility Test and Shuttle Run Test. Muscle strength was measured using a hand-held dynamometer and general motor skills were tested using the Crossover Hop test and parts of the Movement ABC.

Results: Children with a lower limb prosthesis were significantly slower on all running tests ($p= <0.001$). A significant interaction effect between level of prosthesis and running performance was found in the Illinois Agility Test ($p= 0.017$). No main effects were found between having a prosthesis and hip muscle strength. Although, a significant interaction effect revealed that children with an above knee prosthesis did demonstrate lower hip flexor muscle strength ($p= 0.008$). No main or interaction effects were found in general motor skill tests.

Conclusion: Children with a lower limb prosthesis have reduced performance on high intensity locomotor activities compared to their peers. A trend is seen towards lower performance in children with an above knee prosthesis compared to children with a below knee prosthesis. These performance differences were not reflected in difference in hip muscle strength and general motor skills.

Abstract Report

Running-Based Anaerobic Performance Of Dutch Children Using Lower Limb Prosthesis

Anka Michielsen

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Abstract

Background: In the Netherlands about 500-600 children (< 18 years) use a lower limb prosthesis. To be able to participate in active play and sports, children need to alternate between high and low intensity movements which requires an optimal anaerobic performance (1). An important determinant of anaerobic performance is the ability to produce repeated sprint efforts. No data are available on the anaerobic performance of children using a lower limb prosthesis and to what extend they can compete with their peers.

Purpose: to describe anaerobic performance of Dutch children using a lower limb prosthesis in comparison with typically developing children and to explore the differences in anaerobic performance between the various degrees of limb loss.

Method: Anaerobic performance is assessed with the Muscle Power Sprint Test (MPST) in children and adolescents using a lower limb prosthesis, aged 6-18 years. The MPST is a running-based anaerobic test which requires the child to undertake six 15-m sprints at maximum pace with 10-seconds recovery between each sprint. Speed, acceleration, peak power and mean power of the lower extremities can be calculated. For the MPST normative values have been established for typically developing children of 6- 18 years of age. The MPST is a valid and reliable test for measuring anaerobic performance and can be used as an evaluation tool in children and adolescents (2).

Results: Results of 106 children (age range 6-18 years; 68 boys, 38 girls) with various degrees of limb loss depending on different kind of prostheses indicate that running-based anaerobic performance of Dutch children and adolescents differs from healthy peers. Most children (75%) perform at or below the 3rd percentile range of healthy peers. Fifteen children with unilateral Below-knee prosthesis (N=54), five children with extension prosthesis (N=19), four children with a unilateral sports prosthesis (blade) (N= 10), one child with unilateral Above-Knee prosthesis (N=14) and one child with rotationplasty (N=9) ran within the regular anaerobic performance of typically developing children.

Conclusion and clinical implications: Children and adolescents using a lower limb prosthesis perform less than their healthy peers on the running based anaerobic performance test (MPST). Their anaerobic- running performance seems limited by the prosthesis they depend on, although some children’s anaerobic performance is comparable to their peers.