

Pediatric Foot & Ankle Deformity Management with Serial Casting: Why & How



Instructor: Beverly Cusick, PT, MS, COF

A TUTORIAL FOR 6 CLINICIANS IN SENSATIONAL TELLURIDE, COLORADO

Course Description

LEVEL: INTERMEDIATE – Pre-course readings and review materials are assigned in order to open more contact time for labs and videotaped cases. Enrollees are expected to arrive prepared.

TARGET AUDIENCE: This course is designed for the practitioner who has experience in working with children with CNS neuromotor dysfunction, including physical therapists, orthotists, pediatric orthopedists, and physical medicine and rehabilitation physicians. We believe that team education fosters more effective teamwork.

The content covered in this program includes the following topics:

- § The emerging sciences of postural control acquisition and maintenance, including the role of the somatosensory system as it is currently understood in relation to load-bearing alignment of the torso, lower limbs, and feet.
- § Foot and ankle functional anatomy, biomechanics, development, and pathomechanics in relation to body weight orientation over the base of support and to designing orthotic modifications to optimize foot development and function.
- § Postural control deficits and body weight distribution on the foot in standing and walking as causative factors in contracture formation.
- § Muscle and soft-tissue adaptation to chronic use of compensatory postural control mechanisms.
- § An update on the role of spasticity in equinus deformity development.
- § A review of conservative strategies for contracture reduction and management.
- § The kinesiology and pathokinesiology related to - and in support of - the safe and effective use of below-knee casts and a variety of orthotic interventions designed to improve postural alignment and control and to reduce developmental, flexible foot and ankle deformities that commonly develop in the presence of central nervous system dysfunction, hypotonia, and ligament laxity in childhood. Discussion of orthotic options includes principles drawn from Elaine Owen's AFO/Footwear Combinations, heel lifting and weight-line training, orthotic posting and foot packaging principles and strategies, positioning, resting splints, stretching, and serial casting.

Common developmental foot deformities are identified and described in terms of plane-based anatomical components. Musculoskeletal assessment procedures are reviewed as the findings lead the clinician to a systematic clinical decision-making process regarding orthotic design in terms of desired load-bearing foot and limb joint alignment, magnitude of segment enclosure, degrees of freedom provided or restrained, and posting options. Soft-tissue extensibility findings are also used in the documentation of the effects of assorted orthotic intervention strategies.

Lab sessions feature closely-supervised trials of several ankle and foot assessment procedures, with findings applied to orthotic posting and design. Materials will be provided for an introductory practice lab on undertaking on-site posting trials to preview effects of proposed orthotic modifications, and for a day of training in fabrication of 3 types of below-knee cast: plaster and SoftCast combination, John Russell's FlexCast® or the same in fiberglass, and a removable footboard-FlexCast combination.

BONUS: Tutorial attendees are welcome to undergo TheraTogs Fitter Certification training after hours at no additional cost. This training is optional.

Course Objectives

Participants completing the *seminar portion* of this course are expected to be able to:

- Describe, in plane-based terminology, the motions of the joints and various bones of the foot in the open and closed kinetic/kinematic chains.
- Discuss the relationship between joint alignment and related muscle function in terms of joint axis inclination, muscle and loading force vectors, lever arms, and resultant moments.
- Describe the role of the foot and ankle sensory receptors and weight distribution on the foot in the achievement and maintenance of postural control in standing and gait.
- Relate body weight distribution on the foot to ankle and foot joint function and development.
- Explain the clinical rationale for using specific assessment techniques to identify features of soft tissue extensibility, joint mobility, and structural alignment in the ankle and foot.
- Discuss the reported reliability and validity of common clinical tests for spasticity.
- Distinguish between spasticity, connective-tissue contractility, and soft-tissue transformation, and discuss management implications.
- Discuss the physiology and functional significance of R1 (first-catch) end range of motion.
- Explain the physiologic and structural changes that are known to occur in chronically over-recruited muscle and surrounding tissues following a history of recruitment for maintenance of verticality.
- Distinguish between dominance and strength within a muscle force couple.
- Upon discovering a dominant muscle, name 3 related areas of concern.
- Describe orthotic posting in sagittal and frontal planes, and discuss posting objectives.
- Discuss the purposes of weight line training in foot and ankle deformity management re proprioception and muscle recruitment strategies used for postural control.
- Name 5 features that identify a sound developing foot.
- Identify the deformities of the foot and ankle that occur most commonly in children or adults with CNS upper neuromotor dysfunction, and describe the components of illustrated deformities at each joint in plane-based terms.
- Determine whether a deformity meets the criteria for intervention with heel-posting in ankle plantarflexion, serial casting, an R-wrap® orthosis, stretch splinting, and/or positioning.

- Explain the rationale for instituting strengthening and range-maintenance measures after restoring soft tissue extensibility.
- Discuss the limitations of stretching exercise as a deformity management tool.

Lab participants are expected to be able to:

- Demonstrate novice skill level in the musculoskeletal assessment of the ankle and foot in the open and closed chains.
- Bring the principles of orthotic posting to the findings obtained in assessment lab and formulate an orthotic modifications design plan.
- Demonstrate novice skill level in the fabrication and posting of 2 types of below-knee cast used for contracture reduction.

Program Schedule

The course will proceed on the assumption that assigned pre-course materials have been reviewed in full.

Day One – Seminar – Monday Afternoon – 12:30 PM start		
Start	Description	Contact Hours
12:15	Arrive, sign in, settle in	---
12:30	Introduction	.25
12:45	Review of Functional Anatomy & Closed-Chain Function of the Subtalar & Midtarsal Joints Using Plane-Based Terminology	.75
1:30	Standing Lab	.25
1:45	Contributions of Functioning Alignment to Foot Development and Function	.50
2:15	Short break – 15 min	---
2:30	Ideal Ankle & Foot Function in Gait: Significance of Tibial Deceleration, Foot Joint Congruency, Ankle Plantarflexion, & the Torque Generator	.75
3:15	Postural Control Deficits & Equinus Deformity in Diplegic CP: Are They Related?	.50
3:45	Discussion of Prereading – Muscle Pathophysiology	.50
4:15	Short Break – 15 min	---
4:30	Name That Foot Deformity!	.50
5:00	Questions & Discussion	.25
5:15	Adjourn -	---

Homework:

Didactic contact hours: 4.25

Please read Section 18 – Hypoextensibility Management

DAY 2 – Seminar & LAB - Tuesday (Please come with lab clothes to change into each day.)

Start	Description	Contact Hours
8:15	Arrive, sign in, settle in	---
8:30	Implications of Movement Systems Analysis for Foot Deformity Management in Children	.75
9:15	Ankle Dorsiflexion ROM: Development & Assessment – Significance of R1 End Range	1.00
10:15	Short Break – 15 min	---
10:30	Serial Casting Principles	.50
11:00	Sagittal Plane Posting: Principles & Strategies	.75
11:45	Videotaped Cases	.50
12:15	Lunch	---
1:15	Frontal-Plane Posting Principles & Strategies for Postural Alignment	.50
1:45	Orthotic Design Review: Keys to Optimizing Effectiveness for Neuromotor Re-Ed	1.00
2:45	Short Break – 15 min.	---
3:00	Review of Open Kinematic/Kinetic Chain (OKC) Foot Assessment Procedures	.75
3:45	DEMO & LAB: Land-marking for Open Kinetic Chain (OKC) Foot Assessments	.75
4:15	Demo & LAB: Finding and Measuring the Congruent Foot	.75
5:00	Adjourn	---

“ ” **6:00 – 7:30: Optional Lab: TheraTogs Fitter Certification – Level I • Garments and Trunk Extension Strapping** ” “

Didactic contact hours: 5.75
Lab contact hours: 1.50

Day 3 – Seminar & LAB - Wednesday (Please come with lab clothes to change into.)

Start	Description	Contact Hours
8:15	Sign in	---
8:30	LAB: More Open-Chain Foot Assessments – Foot and Ankle Joint Mobility	1.25
9:45	Short Break – 15 min.	---
10:00	LAB: Repeat OKC assessments with a new partner	.75
10:45	Ideal Features of Foot Development (“ <i>Will she outgrow that pronation, Doctor?</i> ”)	1.00
11:45	Lunch – 1.25 hours today	---
1:00	Review of Closed-Chain Foot Assessment Procedures	.50
1:30	LAB: Closed-Chain Foot Assessments	1.25
<i>Graze at will during lab sessions – no formal break.</i>		

Day 3 – Seminar & LAB - Wednesday (Please come with lab clothes to change into.)

Start	Description	Contact Hours
2:45	Foot Pathomechanics – Implications for Modifying the Orthotic Floor	1.25
4:00	Case study and review of videotaped cases for workshop	1.00
5:00	Questions and Discussion	.25
5:15	Adjourn	---

Homework tonight: Case Studies – Apply assessment findings to Orthotic Design Selection and Posting Modifications

Didactic contact hours: 3.75

Lab contact hours: 3.25

- OK to work in groups •

Day 4 – Thursday - Seminar & FlexCast© Fabrication & Posting Lab

Start	Description	Contact Hours
8:15	Sign in	---
8:30	Review Case Studies – <i>(last night's assignment)</i>	1.25
9:45	Short break – 15 min.	---
10:00	Conservative Hypoextensibility Management Strategies	.50
10:30	Below-Knee Serial Casting – Principles	.50
11:00	Below-Knee Serial Casting - Methods	.75
11:45	Lunch – 1.25 hours	---
1:00	DEMO & LAB: FlexCast Fabrication, Check-Out, Posting– <i>Teams of 2</i>	3.00
<i>Graze at will during lab sessions – no formal break.</i>		
4:00	DEMO & LAB: FlexCast Removal	.75
4:45	Clean up	---
5:30	Adjourn	---

5:30 to 6:15 – Group Dinner in #303

Didactic contact hours: 3.00

Lab contact hours: 3.75

Optional LAB: Post one insole for your new partner. Instructor standing by to help.

Day 5 – Friday- Cast Fabrication Lab – take breaks as needed.

Start	Description	Contact Hours
8:15	Sign in – Breakfast	---
8:30	Demo & LAB: Footboard Fabrication - <i>Teams of 2</i>	2.00
10:30	Clean up and set up for combo casting lab	---
11:00	DEMO: Plaster & SoftCast Combo – Fabrication, Check-Out, & Posting	1.00
<i>No formal breaks – graze at will.</i>		
12:00	LAB: Plaster & SoftCast Combo – Fabrication, Check-Out, & Posting - <i>Teams of 3</i>	3.50
3:30	Demo & LAB: Combination Cast Removal	.75
4:15	Reinforce Plaster Footboards	.75
<i>No formal breaks – graze at will.</i>		
6:00	Clean up & Adjourn	---

Long hard day! Go play!

Lab contact hours: 8.75

Day 6 –Saturday – Cast Fabrication Lab

Start	Description	Contact Hours
8:45	Sign in – Breakfast	---
<i>No formal breaks – graze at will.</i>		
9:00	LAB: Repeat OKC and CKC Ankle and Foot Assessments - new partner	1.00
10:00	DEMO & LAB: Footboard-Reinforcement and Footboard-FlexCast Fabrication	2:00
12:00	Lunch on premises	---
12:30	LAB: Make the cast you have not yet fabricated, or repeat one that you want to practice with a new partner	3.00
<i>No formal breaks – graze at will.</i>		
3:30	Clean up	---
5:30	Complete evals and collect certificates	---
6:00	Adjourn	---

Lab contact hours: 6.00

6:15 to 7:30PM (or sooner if we’re done sooner) - Optional Lab: TheraTogs CTF Level I Certification – Finish Strapping Applications

Total didactic contact hours: 16.00

Total lab contact hours: 23.25

Total contact hours: 39.25

Thank you, and safe travels home!

Instructor Bio - Beverly (Billi) Cusick, PT, MS, NDT, COF



Education:

1972 - BS in PT from Bouve College at Northeastern University (Boston) in 1972, summa cum laude.

1988 - MS in Clinical and College Teaching for Allied Health Professionals - University of Kentucky.

Work experience:

- “ 1 year – PT staff at (now) Spaulding Rehabilitation Center, Boston, MA
- “ 3 years – PT staff and Director for UCP Center, Lawrence, MA
- “ 9 years - PT staff at Children's Rehab. Center (now, Kluge Center), Charlottesville, VA.
- “ 3 years - PT Education faculty, College of Health Related Professions at MUSC, Charleston, SC, and Director of PT Services for the Div. Of Developmental Disabilities at MUSC.
- “ 1 year, consultant, Cardinal Hill Hospital's Head Trauma & Pediatrics teams – Lexington, KY.
- “ 4 years, assisting in the PT Department at Children’s Hospital at Stanford, Palo Alto, CA.
- “ 24 years in private practice.

Publications:

- “ Help Patients Manage Equinus Deformity. *O&P Business News*, 2011; April: 74-77.
- “ Orthotic Management of Low-Toned Children: The Earlier the Better. (Co-author). *O&P Edge*. 2011; Apr: 24-29.
- “ *Serial Casting and Other Equinus Deformity Management Strategies for Children and Adults with CNS Dysfunction* (2010) by Beverly Cusick, published by GaitWays.
- “ *Foot Talk* (2009), a 2-hour lecture on functional foot anatomy and closed chain biomechanics, accompanied by a set of Power Point handouts of the same lecture.
- “ *Serial Casting for the Restoration of Soft Tissue Extensibility in the Ankle and Foot (2007 and 2009)*.
- “ *Legs & Feet: A Review of Musculoskeletal Assessments* (1997, revised 2005) (video/DVD).
- “ *Lower Extremity Developmental Features* (2000), a home study monograph for the APTA's Orthopedic Section.
- “ *Serial Casting to Restore Soft Tissue Extensibility in the Ankle and Foot* (2000), a monograph.
- “ *Cast Fabrication Techniques #1: The FlexCast Preparatory AFO* (2000), a videotape & manual.
- “ *Progressive Casting and Splinting for Lower Extremity Deformity in Children with Neuromotor Dysfunction* (1990), a full-length text.
- “ *Serial Casts: Their Use in the Management of Spasticity-Induced Foot Deformity* (1990).

- “ Several textbook chapters, articles for journals, conference proceedings, and professional newsletters, including a series (2006 and 2007) on Pediatric Orthopedics for the NDTA Network.

Clinical Teaching:

Guest lecturer for annual conferences of the APTA, the NDTA, and the American Academy of CP and Developmental Medicine, in the US and Canada; the ISPO Consensus Conference for Orthotics in CP; the British Association of Prosthetists and Orthotists; and the American Academy of Orthotics and Prosthetics.

Instructor of more than 460 courses by invitation only in 19 countries.

Associate Professor (on call) for the Rocky Mountain University of Health Professions – Pediatrics Program – Provo, Utah starting in 2006 to present.

Since 1993 Ms. Cusick has been consulting and practicing privately in or near Telluride, Colorado. There, she maintains a private practice, devoting most of her professional effort to generating literature and educational materials, to teaching, and to developing therapeutic products, including her invention, TheraTogs orthotic systems. A curriculum vita is available upon request.