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.

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

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

The content covered in this program spans a range of topics related to foot function and development; postural control acquisition and influence on foot development; gait development and gait pathology related to foot pathomechanics; physiologic adaptation of lower limb muscle to routine use – both ideal and pathologic; and the contribution of postural control deficits to equinus deformity development.

A review of musculoskeletal assessment procedures prepares participants for training in lab sessions. The assessment findings serve as outcome data and lead to a systematic clinical decision-making process regarding optimizing orthotic design.

Bill applies these sciences to a review of strategies for optimizing body weight loading on - and somatosensory input from - the feet, using customized and specialized cast boots and orthoses.

Lab sessions feature supervised trials of several ankle and foot assessment procedures, with findings applied to the fabrication and biomechanical optimization of three types of below-knee cast and of the participant's own shoes. The three types of casts offer various influences on foot joint alignment, standing balance and the gait cycle while participants make casts with the client positioned in prone and sitting positions. All three casts are made to be removed without a motorized cutter, even when reinforced with fiberglass cast tape.

BONUS: Tutorial attendees are invited attend an optional lab after hours to seek TheraTogs Fitter Certification-Level I at no additional cost.

CEU's: Course completion accumulates a total of 42.16 contact hours: 17.5 didactic and 25.66 lab. Our application for Physical Therapist CEUs is in process via the Accreditation Commission for Continuing Education in Physical Therapy (ACCE-PT). For a list of states that accept these CEUs and information about obtaining them in those that do not, please see https://www.redefinehealthed.com/whereweareapproved.

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 kinematic chains.
- Discuss the kinesiologic benefits of optimizing functioning alignment.
- Describe the verticality drive and its role in lower extremity (LE) deformity development in ambulatory children with bilateral CP.
- Describe the role of the foot and ankle load receptors in the achievement and maintenance of postural control in standing and gait.

- Describe the location of the whole-body center of gravity (COG) in infants and adults.
- Relate body weight distribution on the foot to ankle and foot joint function and development.
- Relate body weight acceleration to gait development – typical and pathologic.
- Discuss the vertical tibia period in typical gait development.
- Describe the connection between excessive pronation and equinus deformity development.
- Discuss the validity of the prevailing presumption that spasticity causes equinus deformity.
- Discuss the growing evidence of muscle tissue pathology resulting from any Botox-A injection.
- Discuss the physiology and functional significance of R1 (first-catch) end range of motion in the gastrocnemius and soleus muscles.
- Discuss the evidence that R1 end range indicates the presence of spasticity.
- Explain the physiologic and structural changes that are known to occur in LE muscles and surrounding tissues following a history of routine, tonic recruitment for stability.
- Distinguish between dominance and strength within an unbalanced muscle couple.
- Upon discovering a dominant gastrocnemius muscle, name 3 related areas of concern.
- Discuss the evidence of the effectiveness of manual stretching in equinus deformity management.
- Explain the process of progressively casting an equinus deformity by beginning with the ankle plantarflexed and the heel supported, vs. setting the ankle in dorsiflexion in the initial casts.
- Describe orthotic posting in sagittal and frontal planes.
- Name 3 objectives of posting below-knee casts and orthoses.
- Explain the biomechanical rationale for modifying a post-casting AFO with extreme varus posting.
- Discuss the purposes of weight line training in equinus deformity management.
- Name 5 features that identify excessive foot pronation in the closed chain.
- Identify the deformities of the foot and ankle that occur most commonly in children with CNS dysfunction and describe the segments of illustrated deformities in plane-based terms.
- Explain the clinical relevance of undertaking specific assessments to identify features of soft tissue extensibility, joint mobility, and structural alignment in the ankle and foot.
- Determine whether an equinus deformity meets the criteria for intervention with heel-posting orthoses made in ankle plantarflexion or with serial casting,
- Explain the rationale for instituting strengthening and range-maintenance measures after restoring soft tissue extensibility to the ankle.

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

- Demonstrate novice-level skill in the musculoskeletal assessment of the ankle and foot in the open and closed chains.
- Bring the findings obtained in foot and ankle assessment labs to the planning and posting of a shoe insole.
- Demonstrate novice-level skill in the effective use of a variety of casting materials, including plaster, semi-rigid cast tape, and rigid fiberglass cast tape.
- Demonstrate novice-level skill in the fabrication and posting of three types of below-knee cast used for equinus contracture reduction.
- Explain the criteria that apply to the three cast designs.

Program Schedule

Please stand if you get tired of sitting.

DAY 1 – Seminar – SUNDAY Afternoon – 11:30 AM start after a late breakfast

Start	Description	Contact Minutes
11:15-11:29	Arrive, sign in, settle in	---
11:30	Introductions and Goals	15 min
11:45	Review of Functional Anatomy & Closed-Chain Function of the Subtalar & Midtarsal Joints Using Plane-Based Terminology	45
12:30	Standing Lab	15
12:45	Short break – 5 min	--
12:50	Contributions of Functioning Alignment to Foot Development and Function	40
1:30	Ideal Ankle & Foot Function in Gait: Significance of Tibial Deceleration, Foot Joint Congruency, Ankle Plantarflexion, & the Torque Generator	45
2:15	**Lunch break on premises – 30 min**	--
2:45	Postural Control Deficits & Equinus Deformity in Children with Bilateral CP and Habitual Toe-Walking	50
3:35	Short break – 5 min	--
3:40	Principles of Movement Systems Analysis in Pediatric Foot Deformity Management	30
4:10	Name That Foot Deformity!	35
4:45	Questions & Discussion	15
5:00	Adjourn - Total contact minutes:	290 min
	Didactic contact hours:	4.83

DAY 2 – Seminar & LAB - MONDAY (Please come with lab clothes to change into today. "Lab clothes" means we need to be able to see your knees.)

Please stand if you get tired of sitting.

Start	Description	Contact Min
8:15-8:29	Arrive, sign in, settle in	---
8:30	Development & Significance of R1 End Range (the "Catch")	30
9:00	Ankle Dorsiflexion ROM: Development & Assessment - Introducing R1A	60
10:00	Short Break – 10 min	---
10:10	Serial Casting Principles	45
10:55	Sagittal Plane Posting: Principles & Strategies	15

Start	Description	Contact Min
11:10	Short break – 5 min	
11:15	Resume Sagittal Plane Posting: Principles & Strategies & Videotaped Cases	45
12:00	Lunch – 60 min	---
1:00	Limb Lengths - Comparison and Management of Discrepancies	30
1:30	Orthotic Design Review**:** Keys to Optimizing Effectiveness for Neuromotor Re-Ed	30
2:00	Short Break – 10 min. *and please change into lab clothes.*	---
2:10	Resume Orthotic Design Review**:** Keys to Optimizing Effectiveness for Neuromotor Re-Ed	15
2:25	Review of Open Kinematic Chain (OKC) Foot Assessment - Landmarking Procedures	10
2:35	**DEMO & LAB:** Land-marking for Open Kinetic Chain (OKC) Foot Assessments	45
3:20	Short break – 5 min	--
3:25	**Demo & LAB:** Measuring the Congruent Hindfoot and ForeFoot	45
4:10	**Demo & Lab:** Assessing Limb Lengths in Prone Position	15
4:25	**Demo & Lab:** Assessing Length Difference between Metatarsals # 1 & #2	25
4:50	**LAB:** Repeat measuring congruent HF and FF on a new partner & compare findings.	10
4:50	Adjourn Didactic contact	280 min

5:30-6:30 Dinner on premises.
6:30 – 9:00PM: Optional Lab: TheraTogs Fitter Certification – Level I Garments and Torso Strapping

Didactic contact hours: 4.67
Lab contact hours (min): 2.33 (140 min)

DAY 3 – Seminar & LAB – TUESDAY (Please arrive in lab clothes today.)

Start	Description	Contact Min
8:15-8:29	Wearing your lab clothes, sign in.	---
8:30	**DEMO & LAB:** Measuring Foot Joint Mobility and Ankle DFROM - OKC	90
	Graze at will during these 2 labs. No formal break.	
10:00	**LAB:** Repeat OKC landmarking and assessments with a new partner	45
10:45	Ideal Features of Foot Development *("Will she outgrow that pronation, Doctor?")*	60
11:45	Lunch – 45 min	---
12:30	Review of Closed-Chain Foot Assessment Procedures	30
1:00	**DEMO & LAB:** Closed-Chain Foot Assessments	45
	Graze at will during lab sessions – no formal break.	
1:45	Foot Pathomechanics – Implications for Modifying the Orthotic Floor	60
2:45	Short break – 5 min	

Start	Description	Contact Min
2:55	Videotaped Case Study and Review of Videotaped Cases for Tonight's Workshop	50
3:45	Short break – 5 min	--
3:50	Workshop: Select a videotaped case & use assessment findings to build a deformity-management plan using casts, orthoses, and posting. *OK to work in teams of two.*	100
5:30	Adjourn	

Didactic hours (min): 5.00 (300 min)

Lab contact hours (min): 3.0 (180 min)

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

Start	Description	Contact Min.
8:15-8:29	Sign in	---
8:30	Review Case Studies (yesterday's workshop)	75 min
9:45	Short break – 5 min.	---
9:50	Highlights of Hypoextensibility Management Strategies Prereading	30
10:30	Below-Knee Serial Casting - Methods	45
11:15	Cast Fabrication and Posting Video	30
11:45	**Lunch – 1.25 hours**	---
1:00	**Demo & LAB:** FlexCast© Fabrication, Check-Out, Posting– *Teams of 2*	180
Graze at will during lab sessions – no formal break.		
4:00	**DEMO & LAB:** FlexCast© Removal	45
4:45	Clean up & Complete/submit didactic course evaluations	---
5:30 to 6:30 – Group Dinner in Room #303		
6:30	**LAB:** Post one insole for your new partner. **Instructor standing by to help.**	120
8:30	Adjourn	

Didactic contact hours (minutes): 3.00 (180 min)

Lab contact hours (minutes): 5.75 (345 min)

Day 5 – THURSDAY - Cast Fabrication Lab *(Take breaks as needed.)*

Start	Description	Contact Min
8:15-8:29	Sign in	---
8:30	**Demo & LAB:** Footboard Fabrication - *Teams of 2*	135
10:45	Reset the room for combo casting in prone; grab refreshment.	---
11:00	**DEMO:** Plaster & Soft Cast Combo – Fabrication, Check-Out, & Posting	60
12:00	Lunch	
1:00	**LAB:** Plaster & Soft-Cast Combo – Fabricate, Check-Out, & Post - *Teams of 3*	240

Start	Description	Contact Min
5:00	**Demo & LAB:** Combination Cast Removal	30
5:30	Clean up & Adjourn	--

Long hard day! Go play!

Lab contact hours (min): 7.75 (465 min)

Day 6 – FRIDAY – Footboard-Flexcast Fabrication Lab

Start	Description	Contact Min
8:15-8:29	Sign in *No formal breaks – graze at will.*	---
8:30	**DEMO & LAB:** Footboard Reinforcement	30
9:00	**DEMO & LAB:** Footboard-FlexCast Fabrication, Posting, & Removal	180
12:00	Lunch on premises	---
12:45	*BC: Set oven at 210°F for Turtlebrace AFS molding demo.*	
1:10	*BC: Place Turtlebrace AFS in the oven to soften.*	
12:30	**LAB:** Repeat applying the first roll of plaster in the combo cast - new partner - until you feel confident in securing a close fit and patient comfort. (Teams of 3)	60
1:30	**DEMO:** Turtlebrace AFS Night Splint padding & molding procedure. Reheat TB.	20
1:50	TheraTogs CTF Level I Certification – Finish Exams	30
2:00	TB is ready for 1 participant to try molding an AFS on another.	15
2:15	**LAB:** Repeat Landmarking Foot & Ankle DFROM-KE Assessment -new partner	60
2:45	*BC - Reheat the TB.*	
3:15	TB is ready for 1 participant to try molding an AFS on another. Reheat the TB.	15
3:30	Clean up, complete course evals	
5:30	Collect certificates and adjourn	---

Lab contact hours (min): 6.83 (410 min)

Total didactic contact hours: 17.50
Total lab contact hours: 25.66
Total contact hours: 42.16

Thank you for coming, and safe travels home!

Instructor – Beverly (Billi) Cusick, PT, MS, NDT, COF/BOC

Brief Professional Bio

Education:

1972 - BS in PT from Bouve College at Northeastern University (Boston) in 1972,

1988 - MS in Clinical and College Teaching for Allied Health Professionals - Univ 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: pp 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 Feat*ures (2000), a home study monograph _APTA's Orthopedic Section.
- *Serial Casting to Restore Soft Tissue Extensibility in the Ankle and Foot (2000), a monograph.*
- *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.

Webinars:

Available at the Cusick Center for Learning: www.gaitways.com/ccl:

- Developmental Orthopedics: A Review of Operating Processes with Implications for Management (Spring, 2022)
- The W-Sitting Controversy: Evidence and Science (2020)
- A Clinical Golden Rule for Managing Pediatric Orthopedic & Motor Development (2018)
    - Program 1: Early Acquisition of Postural Control
    - Program 2: Expanding Postural Control into Movement

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.