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New Pediatric Foot & Ankle Deformity Management Strategies with Serial Casting – Why & How

A 5-Day Program in 2 Parts

Part 1: Why (seminar): A 2.5-Day Program – Enrollment Unlimited

Part 2: How (labs): Assessments, Posting, and Below-Knee Cast Fabrication . A 2.5-Day Program - Enrollment is Limited to 12 Part I Attendees. (Option – add a half-day lab with children to the end of part 2)

Instructor: Beverly Cusick, PT, MS, COF/BOC, NDT

Course Description

LEVEL: INTERMEDIATE – Precourse readings and review materials are assigned – Enrollees are expected to arrive prepared.

TARGET AUDIENCE: This course is designed for the practitioner who has experience in working with children or adults 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 didactic content can be adapted for an audience that is concerned with an adult population, substituting live case presentations for videotaped cases.

The content covered in this program currently 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.
- Body weight distribution on the foot and through load-bearing joints as a causative factor in contracture formation, early onset of pain, and degenerative joint disease.
- Muscle physiology and pathophysiology in the presence of chronic use of compensatory postural control mechanisms while distinguishing spasticity from connective–tissue contractility and muscle transformation.
- Skeletal modeling mechanisms underlying the process of use-related ankle and foot development.
- Characteristics of and factors contributing to healthy foot development.
- Elements of gait development that relate to and support foot development.

- The kinesiology and pathokinesiology related to - and in support of - the safe and effective use of below-knee casts and 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 Elaine Owen's Tuned AFO/Footwear Combinations, heel lifting and weight-line training, orthotic posting and foot packaging principles and strategies.
- Hypoextensibility management is distinguished from the alteration of movement strategies, and includes discussions of interventions such as positioning, resting splints, manual stretching, neurolytics, 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.

Labs feature closely-supervised trials of several ankle and foot assessment procedures, with findings applied to orthotic posting and design. Materials will be provided for 1.5 days of training in fabrication of two types of below-knee casts, and for undertaking posting trials to preview effects of proposed orthotic modifications.

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.
- 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 R_1 (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.

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

- Demonstrate novice skill in 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 design plan.
- Demonstrate novice skill in undertaking an informed, targeted, temporary and exploratory posting trial.
- Demonstrate novice skill level in the fabrication, check-out, and posting of at least 2 types of below-knee cast used for contracture reduction and neuromotor re-education using a combination of plaster and fiberglass cast tape and a polymer “soft” cast tape.

Program Schedule

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

Day One – Seminar

Start	Description	Contact Hrs
8:00	Arrive, sign in, settle in	00
8:30	Introduction	.25
8:45	Review of Functional Anatomy & Closed-Chain Function of the Subtalar & Midtarsal Joints Using Plane-Based Terminology	.75
9:30	Ideal Ankle & Foot Function in Gait: Significance of Tibial Deceleration, Foot Joint Congruency, Ankle Plantarflexion, & the Torque Generator	.75
10:15	Short Break – 15 min	00
10:30	The Role of Spasticity in Equinus Deformity Development	.50
11:00	Postural Control Deficits and Contracture Formation and Management: Are They Related?	.75
11:45	Lunch	00
12:45	Discussion of Prereading handout – Muscle Pathophysiology	.25
1:00	Sahrmann’s Principles with Implications for Foot Deformity Management	.75
1:45	Name That Foot deformity!!!!	1.00
2:45	Short break – 15 min	00
3:00	Ankle Dorsiflexion ROM: Development & Assessment – Significance of R1 End Range	.75
3:45	Sagittal Plane Posting: Principles & Strategies	.75
4:30	Videotaped Cases	.50
5:00	Questions and Discussion	.25
5:15	Adjourn hours: Didactic contact	7.25

Day 2 – Seminar

Start	Description	Contact Hrs
8:15	Sign in	00
8:30	Review of Open Kinematic/Kinetic Chain (OKC) Foot Assessment Procedures	.75
9:15	Review of Closed-Chain Foot Assessment Procedures	.50
9:45	Short break – 15 min	00
10:00	Foot Pathomechanics – Implications for Modifying the Orthotic Floor	1.00
11:00	Ideal Features of Foot Development (or, will (s)he outgrow that pronation?)	1.00
12:00	Lunch	00
1:00	Orthotic Design: Keys to Optimizing Effectiveness for Neuromotor Re-Ed	1.25
2:15	Short Break (15 min)	
2:30	Conservative Hypoextensibility Management Strategies	.50
3:00	Serial Casting Principles & Methods	1.00
4:00	Videotaped Case Presentation	.25
4:45	Questions & Discussion	.25
5:00	Adjourn	Didactic contact hours:
		6.50

Day 3 – Seminar (AM)

Start	Description	Contact Hrs
8:15	Sign in	00
8:30	<p>Working Session: Videotaped Cases - In 3 small groups, attendees:</p> <ul style="list-style-type: none"> • Sort recorded findings into orthopedic/management categories • Propose targeted management strategies, including orthotic design and modifications • Prioritize five management strategies 	1.50
10:00	Break	
10:30	Review Workshop Cases	1.00
11:30	Summary & Discussion	.50
12:00	<p>Part 1 attendees turn in course evals and adjourn.</p> <p>Part II attendees go to lunch.</p>	.00
		Total didactic contact hours:
		16.75

Day 3 – Seminar (PM) –Assessment Lab Sessions

Start	Description	Contact Hrs
2:00	LAB: Land-marking the Foot and Ankle for Open-Chain Assessments: Foot in Congruity, Foot Joint ROM, Ankle DFROM – Teams of 2 evaluate each other	1.50
3:30	Short Break	00
3:45	LAB: Resume OKC Assessments	1.75
5:30	Adjourn	
	Total lab contact hours:	3.25

Day 4 – Closed-Chain Assessments & Begin Cast Fabrication

Start	Description	Contact Hrs
8:15	Sign in	00
8:30	LAB: Closed-Chain Assessments on each other	1.00
9:30	Short Break – 15 min	00
9:45	Workshop: Generate a Posting Plan for Your New Partner (one foot)	.50
10:00	LAB: Post one insole for your new partner	1:50
11:30	DEMO: FlexCast Fabrication, Posting	00
12:00	Short Lunch (45 min)	00
12:45	LAB: FlexCast Fabrication, Posting, & Removal – <i>Teams of 2</i>	2.25
3:00	Short Break – 15 min.	00
3:15	DEMO & LAB: Footboard Fabrication	2.25
5:30	Clean up and adjourn	00
5:45	Adjourn Lab contact hours:	7.50

Day 5 –Cast Fabrication Lab – *take breaks as needed.*

Start	Description	Contact Hrs
8:15	Sign in – Breakfast	00
8:30	DEMO & LAB: Plaster & Fiberglass or SoftCast Combo – Fabrication, Posting	3.50
No formal breaks – graze at will.		
12:00	Lunch	00
1:00	Demo & LAB: Combination Cast Removal	1.00
2:00	Demo & LAB: Footboard Fabrication - <i>Teams of 2</i>	2.00
4:00	Demo & LAB: Footboard-FlexCast Fabrication	.50
5:15	Clean up – get ready for tomorrow’s labs	00
5:30	Adjourn	00
	Lab contact hours:	7.00
	Subtotal – Lab Hours	

Optional Day 6 – AM - Assessment & Posting Lab with Children with EQD

Start	Description	Contact Hrs
8:30	Set up for lab session, review case details	
No formal breaks – graze at will.		
9:00	Teams of 3 evaluate an ambulatory child with equinus deformity and CNS dysfunction (CP), with a focus on ankle and foot joint ROM and structure. Team members generate a management plan. This session involves orthotic assessment and a trial modifying an orthosis or shoe, if possible or feasible. .	2.5 hours
11:30	Close the session, clean up, complete course evals, receive certificates	
12:00	Adjourn	add 2.5 lab hours to contact hours total.