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 Empowering Human Potential

Continuing Education Series


Orthotic Applications in Sports Medicine

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Orthotic Treatment Programs

- Definition of an orthosis
- Support and align
- Prevent or correct deformity
- Substitute or enhance function
- Decrease pain or discomfort



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Learning Outcomes

- Describe the design principles of sport orthoses
- Compare and contrast the indications and contraindications for prefabricated, custom-fit and custom designed sport orthoses
- Identify various components and materials used in the fabrication of sport orthoses
- Explain the process of proper orthotic device delivery, fitting and regular follow-up for maintenance of proper device functioning

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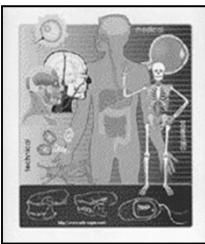
Orthotic Treatment Programs

- Goals
- Return to prior activities and activity levels
- Prevent further injury
- Protection of involved joints
- "Reminder" of previous injury



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Introduction

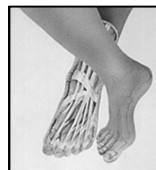


- Contributors to injury - intrinsic factors
 - Malalignment
 - Limb-length discrepancy
 - Decreased flexibility
 - Muscle imbalance
 - Muscle weakness
 - Kinetic chain dysfunction

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The Foot/Ankle

- Biomechanics
 - Approximately 30 joints of foot and ankle
 - Primary: Midtarsal, subtalar and talocrural
 - Joints of the foot/ankle function in synchrony
 - Compressive forces of the ankle



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The Foot/Ankle

- Common injuries
 - plantar fasciitis
 - tarsal tunnel
 - fractures
 - first MP joint sprain
 - hallux valgus
 - reflex sympathetic dystrophy
 - ankle sprains
 - forefoot valgus
 - forefoot varus
 - lindinilis
 - forefoot varus
 - stress fractures
 - pes cavus
 - metatarsalgia
 - rearfoot valgus
 - pes planus
 - shin splints
 - equinus foot
 - Morton's neuroma

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The Foot/Ankle

- Prefabricated designs

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The Foot/Ankle

- Patient evaluation
 - History: Description of current problem, mechanism of injury, area of discomfort, previous injuries...
 - Observational data:** Global assessment of standing and walking postures
 - Active and passive range of motion
- Orthotic design considerations
 - Height, weight, anticipated activity level, degree of deformity, degree of correction, diagnosis, prognosis, mobility requirements, stability requirements
 - Designing an appropriate orthosis to meet the patient's structural and functional needs.

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The Foot/Ankle

- Custom-fit designs

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Prescription Criteria

- Foot alignment and function
 - Supination
 - Pronation
 - Skeletal deviations (i.e. hallux valgus)

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Prefabricated, Custom-Fit and Custom

<ul style="list-style-type: none"> Prefabricated orthoses <ul style="list-style-type: none"> Mild involvements Temporary uses Diagnostic procedures Limited fit and function 	<ul style="list-style-type: none"> Custom orthoses <ul style="list-style-type: none"> Moderate to severe involvements Extended or permanent use Individual fit and maximum function
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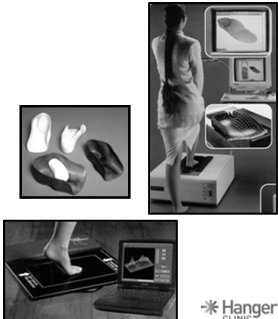
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The Foot/Ankle

- Custom designs
 - Morton's neuroma (interdigital nerve entrapment)
 - Forefoot and rearfoot disorders
 - Plantar forefoot neuritis (cyclists / stair climbers)





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Prefabricated, Custom-Fit and Custom

- Custom orthoses
 - Casting
 - Measurement
 - Negative mold
 - Positive model
 - Modification process
 - Fabrication process

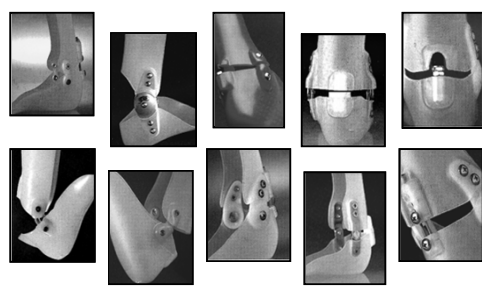



Components and Materials


- AFOs
 - Made of various materials
 - Different biomechanical functions
 - Adjustability

Motion: When and Why?





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Prescription Criteria


- AFO provides **direct** support to the midtarsal, subtalar and talocrural joints
- AFO provides **indirect** support to the knee and hip joints

Components and Materials

- Thermoplastics
 - Chosen for specific materials characteristics
 - Rigidity or flexibility
 - Durability
- Laminates
 - Chosen for durability and rigidity
 - Reinforcement materials

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The Knee

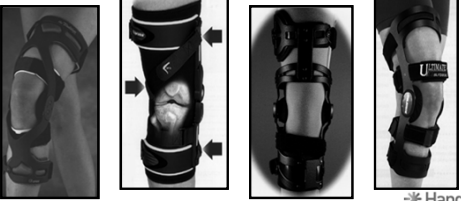
- Biomechanics
 - Tibiofemoral joint is loaded at 3x body weight in stance phase of gait and 4x body weight during stair climbing
 - Patellofemoral joint is loaded at .5x body weight during walking, 3.3x during stair climbing, and 7.6x during squatting
 - Range of 10° extension to 140° flexion




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The Knee

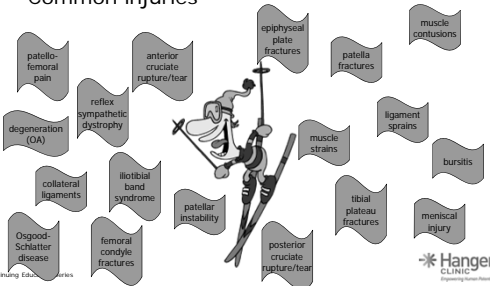
- Custom-fit designs
 - Subacute and chronic injuries




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The Knee


- Common injuries




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The Knee

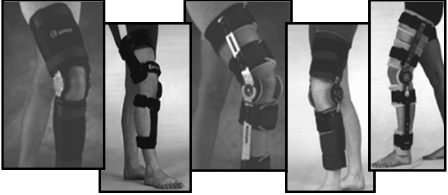
- Custom designs
 - Posterior cruciate ligament
 - Common injury mechanism involves anteriomedial blow to flexed knee
 - Posteriorly directed force at the proximal tibia
 - Often accompanied by tears of the MCL and arcuate ligament complex




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The Knee


- Prefabricated designs
 - Acute injuries




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The Knee

- Custom designs
 - Anterior cruciate ligament
 - Common injury mechanisms involves a combination of valgus and external rotation forces
 - Usually non-contact injuries



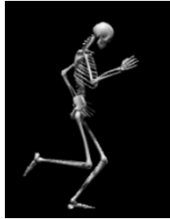
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Orthotic Fracture Management

- Protection of the injured area
- Immobilization of the injured area
 - Compression – Reduction
- Mobilization of the patient
 - ROM
 - Wolfe's Law



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Wrist Hand Orthoses

- Immobilization of effected joint
- Water Resistant



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Lower Extremity Fracture Orthoses



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Humeral Fractures




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Distal Radial or Ulnar Fractures Metacarpal Fractures

- Wrist hand orthosis
- Wrist hand finger orthosis
- Post-operative management
- Post-operative and post-cast rehabilitation

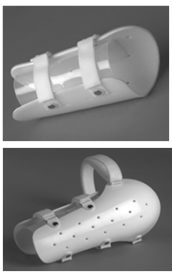


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Humeral Fracture Orthoses

- Shoulder Cap
- Standard
- Circumferential Compression
- Water Resistant



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The Elbow

- Prefabricated designs




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Orthotic Fitting and Follow-Up


- Adjustments and repairs
- Ongoing process
- Mechanical device needs mechanical maintenance
- Changes in patient model (atrophy or hypertrophy)
- Re-evaluation of functional abilities and needs

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The Elbow

- Custom designs
- Volkmann's ischemic contracture:
 - Incapacitating complication to follow a fracture or dislocation
 - Inflammatory reaction can lead to arterial ischemia or contracture
 - Often associated with supracondylar fractures
 - If impaired circulation in unrecognized, muscular fibrosis and atrophy develop



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Questions?




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The Shoulder

- Custom designs
 - Unique circumstances requiring custom design due to desired function or difficulty in fitting
 - Can also encourage or allow available joint motion in a controlled manner



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