Orthotic Management for Children with Cerebral Palsy
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Learning Objectives
• Inform audience of the general services provided through O&P department
• Discuss functional goals of orthotic options as they relate to patient’s GMFCS score
• Discuss foot and ankle positioning and the orthotic controls required to promote improved anatomical alignment

Locations
• 9 Locations
• Multidisciplinary offices
• Orthotics
• Prosthetics
Orthotic Goals

1) Correct, control and prevent deformity
2) Provide a stable base of support and distribute plantar pressures
3) Facilitate training in skills
4) Improve efficiency of gait

GMFCS – Snapshot

<table>
<thead>
<tr>
<th>GMFCS</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>Walks w/o limitations</td>
</tr>
<tr>
<td>II</td>
<td>Walks with limitations; possible wheeled mobility for community ambulation</td>
</tr>
<tr>
<td>III</td>
<td>Walks using a handheld mobility device; wheeled mobility for community ambulation</td>
</tr>
<tr>
<td>IV</td>
<td>Self-mobility with limitations; May use manually wheelchair or powered mobility</td>
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<tr>
<td>V</td>
<td>Transported in a manual wheelchair</td>
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GMFCS – Functional Goals

- Maintain range (night wear)
- Ambulatory needs; Positioning for upper extremity needs; Maintain range
- Contracture management; Trunk control
Evaluation

- Modified Tardieu Scale (Seated for UE; Supine for LE)
  - R1: Velocity dependent 1st catch; R2: Full passive ROM
  - Close R1 and R2 value: Fixed contracture
- Weight bearing versus non-weight bearing alignment
- Flexible versus rigid
- Current therapies
- Family involvement/caregivers
  - Orthotic history

Contracture Management

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Function; Pros/Cons</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Static</td>
<td>Maintains current range, easy to use, low cost; does not improve range</td>
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<tr>
<td>Static Progressive</td>
<td>Adjustable joint (ratchet and drop lock), increase in function; coordinate use with therapy; covered devices</td>
<td></td>
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<tr>
<td>Dynamic</td>
<td>Dynamic assist; low tension long duration optimal stretch; not covered by CMOs</td>
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Trunk Support – GMFCS IV & V

- Assess independent seated stability
- Observe seated position in wheelchair
  - Lateral lean or observed trunk rotation
  - CHOA Seating and Mobility
- Orthotic Considerations

<table>
<thead>
<tr>
<th>Stability during activities</th>
<th>Improved alignment/Scoliosis</th>
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Shank Terminology

- Shank to Vertical Angle (SVA): Angle of the line of the shank to perpendicular to the ground.
- Average inclination for proper function is 11° with usual range of 10-12°

Kinematic vs. Kinetics

- Kinematics: Branch of Mechanics concerned with the motion of the body
- Kinetics: Branch of mechanics concerned with forces applied to the body

Gait Cycle
Segmental motion

SVA 11.3°

Sagittal angle of ankle in the AFO

- Accommodate contractures - hip, knee, or ankles (dorsiflexion)
- Do not exceed 5° DF in casting.
- Evaluate R1 and R2 of gastroc. Cast in R2 or back off a few degrees toward plantarflexion
- Do not let the foot/ankle complex be compromised with poor alignment

“Big Ankle”
“Little ankle”

Knee and hip flexion contractures

- Increased SVA depending on the contracture - 15-19°
**Increased anterior support**

- **Stiff toe lever**
  - Extend plastic beyond toes (match proper foot length) with longer shoes
  - Double plastic on toe extension
  - Medial/ lateral extensions on toe extension (I-beam construction)
  - Carbon footplate (steel shank)
  - Longer rocker
  - Less SVA, if applicable

**Reduced anterior support**

- **Flexible toe lever**
  - Flexible proper fit shoe
  - Thin / flexible toe lever
  - No side support on toe extension = diving board
  - Sulcus length trimline
  - Rounded / short anterior rocker

**Shoe modifications**

- Posterior modifications to promote knee/ hip flexion or reduce knee/ hip flexion in first rocker
Anterior shoe modifications

- Anterior modifications to provide stability or promote smoother 3rd rocker
- Consider size and rigidity of the shoes to improve gait

GMFCS IV

AFO/ HKAFO combination
Thank You