Lower Extremity Orthoses: Overview

**Goal:** Choose appropriate orthosis given patient's clinical picture and/or impairments.

**Patient Population:** Persons with neurological impairments who require orthoses to ambulate or to perform upright functional activities

In addition to the impairments indicated, before ordering orthoses, factors should be considered such as whether the patient has:

- Sufficient ROM in Lower Extremity joints to align segments
- The ability (including cognition) and desire to meet ambulation goals
- Adequate cardiovascular endurance and adequate Upper Extremity (UE) and Lower Extremity (LE) strength for the intended activity, i.e. ambulation
- Sufficient strength to advance the limb

**References:**

**Patient has:**
Significant gait deviations\(^1\), lower extremity weakness, impaired proprioception at the knee or ankle, or ankle plantar flexor spasticity / varus

**Patient has:**
< 3+/5 quadriceps strength and/or impaired/absent proprioception on test limb?

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Goal: Choose appropriate orthosis given patient's clinical picture and/or impairments.

Patient Population: Persons with neurological impairments who require orthoses to ambulate or to perform upright functional activities

In addition to the impairments indicated, before ordering Knee Ankle Foot Orthoses (KAFO) or Reciprocating Gait Orthoses (RGO), other factors should be considered such as whether the patient has:

-- Sufficient ROM in Lower Extremity joints to align segments
-- The ability (including cognition) and desire to meet ambulation goals
-- Adequate cardiovascular endurance and adequate Upper Extremity (UE) and Lower Extremity (LE) strength for the intended activity, i.e. ambulation

### AMBULATION TRIAL

**BILAT KAFO/RGO**

**Participation Criteria**
1. No contractures in hip flexors, knee flexors, or ankle plantar flexors
2. SLR 0-110 degrees
3. Independent in all transfers including wheelchair in parallel bars
4. Max VO2 is \( \geq 20 \text{ ml/kg/min} \)
5. 50 continuous full dips in parallel bars

**Completion Criteria**
1. Come to stand with assistive device, independently (3 sessions)
2. Stand and walk through parallel bars with open hands, independently (1 session)
3. Walk with assistive device 20 continuous steps, with supervision only (2 sessions)

**Decision-Making Algorithm**

1. Patient has < 3+/5 quadriceps strength **bilat**?
   - Yes: Order bilateral KAFO/RGO
   - No: Proprioception intact at test knee?

2. Patient meets Participation Criteria
   - Yes: Patient successfully meets Completion Criteria
   - No: Order bilateral KAFO or RGO

3. Patient has < 3+/5 quad strength in test side and \( \geq 3+/5 \) quad strength in contralateral limb?
   - Yes: Can use unlocked KAFO on test side
   - No: Patient has knee hyperextension ROM?

4. Locked knee joint is indicated (refer to a)

5. Select type of knee joint and materials (Refer to table at right)

6. Select orthotic ankle components (See AFO Algorithm)

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**LONG LEG ORTHOSIS COMPONENTS**

<table>
<thead>
<tr>
<th>Type of knee joint</th>
<th>Materials for thigh component</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Locks (Drop or Bail)</td>
<td>a) Metal uprights with leather at knee/thigh</td>
</tr>
<tr>
<td>b) Offset knee joint</td>
<td>b) Metal uprights with plastic at knee/thigh</td>
</tr>
<tr>
<td>c) Free Knee</td>
<td>c) Free Knee -- best for mediolateral control or extreme valgus/varus -- may be used when patient has adequate sagittal stability</td>
</tr>
</tbody>
</table>

**Footnotes:**
1. Person may not require a KAFO even with quadriceps strength < 3+/5 if hip extensor muscle strength is \( \geq 3+/5 \), and he/she has full knee extension ROM, or quadriceps tone, or proprioception intact.
2. Person with knee pain may require either locked or unlocked knee joint for KAFO.
3. Ambulation with bilateral KAFO and RGO results in high energy cost (VO2 / kg / min).
4. RGO is a linked bilateral KAFO system, consisting of an additional pelvic band and cables that allow a reciprocating gait pattern. Velocity may be slower than with unlinked bilateral KAFOs.

Note: Hip flexor muscle strength of \( > 2/5 \) is required to advance the swing leg. Increased hip flexion muscle strength is needed to advance the leg with an orthosis. A 2# ankle weight can be used to simulate the weight of a polypropylene KAFO.

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Goal: Choose appropriate AFO given patient’s clinical picture and/or impairments.

Patient Population: Persons with neurological impairments who require AFO to ambulate or to perform upright functional activities.

In addition to the impairments indicated, other factors should be considered before ordering AFO:
1) Sufficient ROM in LE joints to align lower extremity segments
2) Patient’s ability (including cognition) and desire to meet goals
3) Adequate cardiovascular endurance and adequate UE/LE strength for the intended activity, (e.g., ambulation)

See information on materials on attached sheet

GROUP A:
1. Rigid polypropylene AFO
2. Metal AFO with double-adjustable ankle joint (DAAJ) and poly footplate, locked
3. Metal AFO with DAAJ, locked.

GROUP B:
1. Polyarticulating AFO with dorsiflexion (DF) stop.
2. Metal AFO with DAAJ and poly footplate, DF stop.
3. Metal AFO with DAAJ, dorsiflexion stop

GROUP C:
1. Leaf spring AFO
2. Polyarticulating AFO with dorsiflexion assist. Select type of joint (see attached)
3. Metal AFO with DAAJ and poly footplate, DF assist
4. Metal AFO with DAAJ, dorsiflexion assist

GROUP D:
1. Polyarticulating AFO with plantar flexion (PF) stop.
2. Metal AFO with DAAJ and poly footplate, PF stop.
3. Metal AFO with DAAJ, PF stop

DISCLAIMER STATEMENT
"The algorithm/care described in this document does not represent the only medically acceptable approach. Each clinician caring for the patient is responsible for determining the most appropriate care."

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MEC Approved 12/16/05
Lower Extremity Orthoses: Patient Involvement in Decision About Intervention

**Goal:** Include patient in the decision about use of a lower extremity orthosis

**Patient Population:** Ambulatory adult patients at RLANRC

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**Patient has significant gait deviations** and lower extremity orthosis(es) recommended per AFO or Long Leg Orthoses Algorithms

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Discuss with the patient (and family) plan to consider an orthosis, including:

1. Benefits and drawbacks of orthoses
2. Other treatment options
3. Patient preferences

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Patient agrees to a trial with temporary orthosis?

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Institute trial with appropriate temporary orthosis

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Patient acknowledges benefit of the orthosis and agrees to wear it.

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Write prescription for orthosis*

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Orthosis not ordered. Consideration given to other treatment options

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**References:**


*Prescription is reviewed and initialed by clinical manager or designee.

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