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PT01: Intramuscular iliopsoas lengthening at the pelvic brim

Indication: Iliopsoas contracture with positive Ely test, positive Thomas test and decreased hip extension with anterior pelvic tilt

Procedure: Iliopsoas tendon is released at the anterior inferior iliac spine

Casting: No cast, weight bearing as tolerated. Patient should spend the majority of the day prone to stretch the hip flexors including the proximal rectus femoris for the first 3 weeks

Healing Time: Approximately 3 weeks.

Precautions:

- Do not allow the patient to spend many hours sitting over the course of the day. This flexed posture allows the hip flexors to shorten and heal in this position.
- Make special arrangements for the patient to spend the majority of time in prone while at school.
- When the child is placed in prone, do not place pillows under their torso/hips, avoid flexion at the hips.
- The patient will be uncomfortable due to post-operative pain. A full body cast is a pain management option but is cumbersome and not required.

Contraindications:

- Avoid active, forceful hip flexion for the first 3 weeks post-op
- Avoid impact activities for the first 3 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues
-encourage prone lying for the majority of the 24 hour day
-gentle PROM, AAROM of the involved hip, knee, ankle in all planes of motion
-isometric contraction of the glut max, quads, hamstrings

Criteria to progress:

- safe mobility for ADL completion
- able to demonstrate understanding of home exercises and precautions
- home exercises to include prone lying, isometric contraction of the gluts, quads and hamstrings

Phase 2: Post-op day 8-21

Goals: -improve abdominal strength to reduce anterior pelvic tilt, avoid substitution by the hip flexors, do not secure/ stabilize the legs when working on abdominal strengthening
-passive, active assistive motion to 10° of hip extension
-begin gait training with emphasis on **quality** of gait pattern, OK to try slow treadmill walking

Criteria to progress:

- uneventful healing of surgical tissues

Phase 3: Post-op day 22 to completion of PT care

Goals: -surgical incision scar mobility once good wound closure has occurred (Approx. 4-6 weeks)
-improve hip extensor strength with exercises such as bridging, step ups, stair climbing, etc.
-attain a trailing limb posture at terminal stance and improve knee extension at terminal swing and initial contact when walking
-anticipate return to full pre-op activity level at ~ 3 months post-op
-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT02: Adductor tendon lengthening

Indication: Hip adductor contracture and scissor gait pattern

Procedure: Small percutaneous incisions into the origin of the adductor longus, gracilis and occasionally, the adductor brevis

Casting: Long leg casts with spreader bar or abduction pillow for 3 weeks, weight bearing as tolerated with wide stance, do not allow scissoring to occur

Healing Time: Approximately 3 weeks

Precautions:

- Avoid windswept posturing during the healing, can use a hip spica cast to prevent the windswept position but the patient will not be able to sit with the cast donned
- If a cast is not used, an abduction pillow is needed to stretch the adductors during healing
- The patient should sleep and spend the majority of the day with the abduction pillow between their legs. It should only be removed for personal hygiene, toileting and PT

Contraindications:

- Avoid active, forceful adduction and flexion for the first 3 weeks
- Avoid impact activities for the first 3 weeks post-op

Phase 1: Post-op day 1-7

- Goals:
- protect the surgical site including the incision and underlying surgical tissues
 - encourage gravity assisted/ gravity eliminated hip abduction
 - avoid sitting with adduction
 - isometric contraction of the glut max, quads, hamstrings
 - PROM, AAROM, AROM of ankles

Criteria to progress:

- safe mobility for ADL completion
- able to demonstrate understanding of home exercises and precautions
- home exercises to include positioning with the legs abducted, isometrics, ROM of the knees, ankles

Phase 2: Post-op day 8-21

- Goals:
- initiate gait training with wide-based posture, avoid adduction or scissoring
 - initiate side stepping with the assistance of the wall, bar, table, etc
 - try treadmill walking at a slow speed to work on **quality** of gait pattern

Criteria to progress:

- uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

- Goals:
- surgical scar mobility once good wound closure has occurred (Approx. 4-6 weeks)
 - improve hip abductor strength, improve total leg strength
 - attain quality gait pattern, avoid scissoring
 - anticipate return to full pre-op activity level at ~ 3 months post-op
 - independent management with home exercises, important to stretch daily, consistently, avoid sitting with adduction

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT03: Rectus femoris transfer to medial hamstrings

Indication: Stiff knee gait with consistent rectus femoris activity during swing phases, reduced knee flexion slope below 160°/sec. (norm value 240°/sec), delayed peak knee flexion, (+) Ely test

Procedure: Distal rectus femoris insertion is dissected from quadriceps and transferred medially to the semitendinosus

Casting: Long leg or cylinder cast with knee flexed to 20° for 4-6 weeks, non weight bearing
****The surgeon may elect to use a CPM immediately post-op instead of long leg casts to minimize surgical tissue scarring. The CPM can be used in 2-4 hour intervals with a goal of 6-8 hours per leg per day. If this procedure is completed bilaterally, one CPM can be alternated between both legs.

Healing Time: Approximately 6 weeks

Precautions:

-12-15% resulting reduction of quadriceps strength

Contraindications:

-No forceful, resisted muscular contraction of the quads for 6 weeks post-op

-Avoid impact activities for the first 6 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues
-long sitting while in the casts or with the knee immobilizers to stretch the hamstrings
-safe transfers and mobility for ADL completion
-begin isometric contraction of the gluts, hamstrings, begin AROM ankle dorsiflexion/ plantar flexion

Criteria to Progress:

-safe mobility for ADL completion

-able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

Goals: -begin sub maximal (< 50% effort) isometric quad contraction

-continued independence with ADLs

Criteria to Progress:

-uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -passive hip and knee ROM with PT once the casts are removed, work toward full knee flexion to minimize scarring within the extensor mass

-active ROM 2 weeks after cast removal

-try treadmill walking at a slow speed to work on **quality** of gait pattern

-achieve full knee extension at terminal swing, initial contact and terminal stance

-achieve a trailing limb posture and improved hip flexion velocity

-improve magnitude and timing of peak knee flexion in swing

-total leg strengthening exercises – emphasize quad strengthening, mini squats, SAQ, step ups with full knee EXT, backward step ups, heel walking, include hip flexion and extension strengthening exercises, OK to use Total Gym, theraband, sport cord ex's, open chain SLR all planes, **hip flexion SLR with no quad lag**, hamstring strengthening

-transverse soft tissue scar massage after incision healing (approx 4-6 weeks)

-independent management with home exercises including quad isometrics, hill walking, stair climbing, **SLR with no quad lag**, scar management

-anticipate return to full pre-op level at ~ 3 months post-op

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT04: Hamstring lengthening, Open z-plasty and Fractional

Indications: Hamstring contracture and crouch gait in the ambulatory patient

Procedure: Z-plasty lengthening of the gracilis and semitendinosus, fractional intramuscular lengthening of semimembranosus and biceps femoris if indicated.

Casting: Long leg or cylinder cast with the knee extended for 4-6 weeks, weight bearing as tolerated/ as specified by the MD

Healing Time: Approximately 6 weeks

Precautions:

- Protected weight bearing for 3-4 weeks post-op/ per MD recommendation
- recommend knee immobilizers at night after casts are removed
- possible post-op dysesthesia in the calf and foot which lasts for several months which may limit rehab, contact MD if this occurs

Contraindications:

- no forceful, resisted muscular contraction of the hamstrings for 6 weeks post-op
- no impact activities for 6 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues
-10 minutes of sustained/uninterrupted long sitting every hour the child is awake
-home exercise instruction including positioning, stretching, ADL function
-isometric contraction of the gluts, quads, AROM of ankles

Criteria to Progress:

- safe mobility for ADL completion
- able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

Goals: -begin sub maximal (<50%) isometric hamstring contraction if able
-begin SLR, all planes with assistance

Criteria to Progress:

- uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -surgical incision scar mobility once good wound closure has occurred (Approx. 4-6 weeks post-op)
-increase knee extension at terminal swing and initial contact when walking
-upright posture when walking, avoid crouch position, full knee extension at terminal stance
-increase hamstring flexibility
-improve total leg strength including the hip extensors, hamstrings, quads, calf
-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT05: Percutaneous hamstring lengthening

Indication: Hamstring contracture, crouch gait

Procedure: Percutaneous cuts through the insertion of the gracilis, semitendinosus and biceps femoris, through the tendinous portion of semimembranosus

Casting: Long leg or cylinder cast with the knee extended 4-6 weeks, begin weight bearing as soon as tolerated/ as specified by MD

Healing Time: Approximately 6 weeks

Precautions: Begin weight bearing as soon as tolerated/ per MD recommendation

- Wear knee immobilizers at night after cast removal
- May develop painful dysesthesia in the calf and foot which may last for several months, if the pain related to this limits rehab progress, contact MD

Contraindications:

- Avoid forceful, resisted muscular contraction of the hamstrings for 6 weeks post-op
- Avoid impact activities for 6 weeks post-op

Phase 1: Post-op day 1-7

- Goals:
- protect the surgical site including the incision and underlying surgical tissues
 - 10 minutes of sustained/uninterrupted long sitting every hour the child is awake
 - home exercise instruction including positioning, stretching, ADL function
 - isometric contraction of the gluts, quads, AROM of ankles

Criteria to Progress:

- safe mobility for ADL completion
- able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

- Goals:
- begin sub maximal (<50%) isometric hamstring contraction if able
 - begin SLR, all planes with assistance

Criteria to Progress:

- uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

- Goals:
- surgical incision scar mobility once good wound closure has occurred (Approx. 4-6 weeks post-op)
 - increase knee extension at terminal swing, initial contact and terminal stance when walking
 - upright posture when walking, avoid crouch position
 - improve knee ROM
 - increase hamstring flexibility
 - improve total leg strength including the hip extensors, hamstrings, quads, calf
 - develop endurance strength before addition of resistance with weights
 - independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT06: Split posterior tibialis tendon transfer to the peroneus brevis

Indications: Equinovarus ankle/ foot deformity with out of phase posterior tibialis activity

Procedure: Transfer of the lateral ½ of the posterior tibialis insertion from the navicular to the peroneus brevis tendon, distal to the lateral malleolus. The tendon is split longitudinally up to the musculotendinous junction

Casting: Short leg cast for ~6 weeks total, 1st 3 weeks non weight bearing, 2nd 3 weeks weight bearing as tolerated

Healing Time: Approximately 6 weeks

Precautions: -Avoid activities that place the patient at risk for forceful inversion

Contraindications:

-Avoid forceful, resisted muscular contraction, avoid impact activities

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues
-home exercise instruction including positioning, stretching, ADL function
-isometric contraction of the gluts, quads, hamstrings

Criteria to Progress:

-safe mobility for ADL completion
-able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

Goals: -independent SLR all planes with cast donned
-begin weight bearing activities with cast at the end of post-op week 3

Criteria to Progress:

-uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -full ankle ROM, all planes
-weight bearing, balance activities
-neutral foot alignment during stance and swing phases of gait
-improve strength of the lower leg with emphasis on ankle dorsiflexion, gastroc-soleus, may use theraband for ankle inversion/eversion strengthening at 6 weeks post-op
-closed chain proprioception exercises
-Transverse friction massage to surgical scar to improve mobility once the incision is closed (Approx. 4-6 weeks)
-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT07: Split anterior tibial tendon transfer to the cuboid

Indications: Varus foot/ ankle position during stance and swing with over activity of the anterior tibialis

Procedure: Lateral ½ of tibialis tendon insertion is detached from the 1st cuneiform and re-attached to the cuboid, tendon is longitudinally split up to the musculotendinous junction

CASTING: Short leg cast for 6 weeks, 1st 3 weeks non weight bearing, 2nd 3 weeks are weight bearing as tolerated

Healing Time: Approximately 6-8 weeks

Precautions: -Avoid activities that place the patient at risk of forceful plantarflexion

Contraindications:

-Avoid forceful, resisted muscular contraction, avoid impact activities

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues
-home exercise instruction including positioning, stretching, ADL function
-isometric contraction of the gluts, quads, hamstrings

Criteria to Progress:

-safe mobility for ADL completion
-able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

Goals: -begin weight bearing activities with cast at the end of post-op week 3
-independent SLR all planes with cast donned

Criteria to Progress:

-uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -full ankle ROM, all planes
-neutral foot alignment during stance and swing phases of gait
-improve strength of the lower leg with emphasis on ankle dorsiflexion, gastroc-soleus, may use theraband for ankle inversion/eversion strengthening at 6 weeks post-op
-closed chain proprioception exercises, balance activities
-Transverse friction massage to surgical scar to improve mobility once the incision is closed (Approx. 4-6 weeks)
-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT08: Tendo-achilles lengthening (TAL) percutaneous

Indications: Achilles tendon contracture

Procedure: Three percutaneous incisions – 50% of the achilles tendon at musculotendinous junction, at the calcaneus insertion and at a mid way point between these two sites

Casting: short leg cast for 3 weeks, weight bearing as tolerated

Healing Time: Approximately 6 weeks

Precautions:

-Avoid activities that place the patient at risk of forceful dorsiflexion

Contraindications:

-Avoid forceful, resisted muscular contraction, avoid impact activities until 6-8 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues

-home exercise instruction including positioning, stretching, ADL function

-isometric contraction of the gluts, quads, hamstrings

-independent SLR all planes with cast donned

Criteria to Progress:

-safe mobility for ADL completion

-able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

Goals: -begin weight bearing activities with cast

-begin active assist/ active ankle dorsiflexion once the cast is removed, may use electrical stim to enhance neuro re-education and strengthening of the ankle dorsiflexors

Criteria to Progress:

-uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -full ankle ROM, all planes

-able to heel walk, active dorsiflexion in standing

-emphasize gastroc-soleus stretching to avoid tissue shortening

-neutral foot alignment during stance phases and sufficient DF in swing phases of gait

-gait training to achieve heel first initial contact position when walking

-improve strength of the lower leg with emphasis on ankle dorsiflexion, gastroc-soleus, may use theraband for ankle strengthening at ~6 weeks post-op

-closed chain proprioception exercises, balance activities

-Transverse friction massage to surgical scar to improve mobility once the incision is closed (Approx. 4-6 weeks)

-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT09: Strayer/ Volpius gastrocnemius/ soleus intramuscular lengthening

Indications: Achilles tendon contracture with weak triceps surae

Procedure: Distal gastrocnemius tendon/ fascia separated from the soleus and transected resulting in intramuscular lengthening

Casting: Short leg cast for 3-6 weeks, weight bearing as tolerated

Healing Time: Approximately 6 weeks

Precautions:

-Avoid post-op tissue tightness resulting in loss of dorsiflexion

Contraindications:

-Avoid forceful, resisted muscular contraction, avoid impact activities until ~6-8 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues

-home exercise instruction including positioning, stretching, ADL function

-isometric contraction of the gluts, quads, hamstrings

-independent SLR all planes with cast donned

Criteria to Progress:

-safe mobility for ADL completion

-able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

Goals: -begin weight bearing activities with cast

Criteria to Progress:

-uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -begin active assist/ active ankle dorsiflexion once the cast is removed, may use electrical stim to enhance strengthening of ankle dorsiflexors

-full ankle ROM, all planes

-able to heel walk, active dorsiflexion in standing

-emphasize gastroc-soleus stretching to avoid tissue shortening

-neutral foot alignment during stance phases and sufficient DF swing phases of gait

-gait training to achieve heel first initial contact position when walking

-improve strength of the lower leg with emphasis on ankle dorsiflexion, gastroc-soleus, may use theraband for ankle strengthening at 6 weeks post-op

-closed chain proprioception exercises, balance activities

-Transverse friction massage to surgical scar to improve mobility once the incision is closed (Approx. 4-6 weeks)

-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT10: Peroneus brevis fractional intramuscular lengthening

Indications: Valgus foot/ankle and peroneal ms. contracture

Procedure: Fractional intramuscular lengthening of peroneus brevis

Casting: Short leg cast for 6 weeks, weight bearing as tolerated

Healing Time: Approximately 6 weeks

Precautions:

-Avoid activities and situations that may result in forceful inversion/ eversion of the ankle

Contraindications:

-Avoid forceful, resisted muscular contraction, avoid impact activities until ~6-8 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues

-home exercise instruction including positioning, stretching, ADL function

-isometric contraction of the gluts, quads, hamstrings

-independent SLR all planes with cast donned

Criteria to Progress:

-safe mobility for ADL completion

-able to demonstrate understanding of home exercises and precautions

Phase 2: Post-op day 8-21

Goals: -weight bearing activities in the cast

Criteria to Progress:

-uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -begin AAROM, AROM once the cast is removed

-full AROM, all planes

-able to achieve heel first initial contact, maintain neutral foot position during all stance phases of gait

-improve strength of the lower extremity, may use theraband for strengthening exercises at 6 weeks post-op

-closed chain proprioception exercises, balance activities

-Transverse friction massage to surgical scar to improve mobility once the incision is closed (Approx. 4-6 weeks)

-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT11: Proximal femoral Varus derotational osteotomy (VDRO)

Indications: Hip subluxation or dislocation

Procedure: Varus, derotation and shortening proximal femoral osteotomy in the intertrochanteric region of the femur with the distal fragment medially displaced and secured with plate fixation, iliopsoas tendon released from the lesser trochanter

Casting: Double hip spica cast for 6 weeks, non weight bearing

Healing Time: Approximately 6-8 weeks

Precautions:

- Child with spasticity may experience increased spasms/discomfort when cast removed and movement at the hip & knee is initiated. Also, spasticity may draw lower extremities into a "set" position (eg. flexion) and may make it difficult/painful to regain range/mobility in the opposite direction (eg. extension).
- Periodic use of a bivalved cast may be helpful during this transition (eg. nighttime, short times during day, etc.)
- Avoid aggressive/forceful range of motion initially
- Children who were non-weight bearing pre-op may be osteopenic and fixation of the surgical hardware may be limited. Special care must be taken during exercise and progressive weight bearing activities

Contraindications:

- No impact, torque or unprotected weight bearing for the first 6 weeks post-op
- Minimize risk for falling

Phase 1: Post-op day 1-7

- Goals:
- Protect surgical site, both skin incision and bony healing – **Non weight bearing**
 - Address splinting, bracing and equipment needs
 - Address and instruct patient and family in safe mobility and transfers for daily function and hygiene
 - Pain management which may include use of ice, heat, massage and/or electrical stimulation for pain modulation only
 - PROM, AAROM of the knees and ankles
 - isometric contraction of the gluts, quads and hamstrings
 - Patient and family are able to demonstrate understanding of post-op precautions and home exercise program

Criteria to Progress:

- safe mobility and transfers for completion of ADLs

Phase 2: Post-op day 8-21

Goals: -pain management as needed (may be a priority with spasticity)

Criteria to Progress:

- ongoing healing of surgical sites
- independent with transfers, ADLs and mobility

Phase 3: Post-op day 22 to end of post-op week 6

- Goals:
- avoid impact, torque and reduce risk for falling
 - re-evaluate splinting and bracing needs for assistance with gait efficiency at the end of post-op week 6 if weight bearing is allowed by MD

Criteria to Progress:

- ongoing healing of surgical site
- Weight bearing status and cast removal will be determined by the physician. This will be guided by the bone density and integrity, healing and x-ray findings**

PT12: Proximal femoral rotational osteotomy

Indications: Femoral anteversion or retroversion

Procedure: Femur is rotated below the lesser trochanter and fixed with internal fixation plate

Casting: Hip spica cast for 3-6 weeks, non weight bearing until cast is removed

Healing Time: Approximately 6-8 weeks

Precautions:

- Since patient will be in a cast for 6 weeks, weight bearing status will be determined by the MD (bony integrity and healing process, radiographs) once the cast has been removed.
- Child with spasticity may experience increased spasms/discomfort when cast removed and movement at the hip & knee is initiated. Also, spasticity may draw lower extremities into a "set" position (eg. flexion) and may make it difficult/painful to regain range/mobility in the opposite direction (eg. extension). Periodic use of the bivalved cast may be helpful during this transition (eg. Night time, short times during day, etc.)
- Avoid aggressive/forceful range of motion initially.
- Children who were non weight bearing pre-op may be osteopenic and fixation of the surgical hardware may be limited. Special care must be taken during exercise and progressive weight bearing activities.

Contraindications:

- No impact, torque or unprotected weight bearing for the first 3 weeks post-op
- Minimize risk for falling

Phase 1: Post-op day 1-7

- Goals:
- protect the surgical site, both skin incision and bony healing, **non weight bearing**
 - Pain management which may include use of ice, heat and/or electrical stimulation for pain modulation only
 - Patient and family demonstrate safe mobility and transfers for ADL completion
 - Patient and family demonstrate understanding of post-op precautions and home exercise program
 - Passive, active assistive and active range of motion of the knees and ankle joints
 - Isometric contraction of the gluts, quads, hamstrings
 - functional balance when standing for transfers, ADLs

Criteria to Progress:

- safe mobility and transfers for completion of ADLs

Phase 2: Post-op day 8-21

Goals: -pain management as needed – may be a priority with spasticity

Criteria to Progress:

- independent with transfers, ADLs and mobility

Phase 3: Post-op 22 to completion of PT care

- Goals:
- avoid impact, torque, reduce risk for falling
 - assess need for bracing, assistive devices
 - begin transverse friction massage/ scar mobility at ~ 6 weeks post-op/ when incision healing is complete
 - begin progressive weight bearing as advised by the referring physician
 - functional standing balance for safe transfers
 - lower extremity strengthening with emphasis on glut max, glut med, calf as well as quality of gait pattern
 - Return to pre-operative function and activity

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT13: Proximal femoral plate removal

Indications: Healed femoral osteotomy

Procedure: Internal fixation hardware removed from the femur

Casting: No casting, protected weight bearing for 6 weeks to allow femoral defect to heal

Healing Time: Approximately 6 weeks, risk of femoral fracture at surgical site with weight bearing, impact and rotational/ torque motions or falling for ~ 6 weeks.

Precautions:

- Protected weight bearing (out of cast) for up to 6 weeks until ossification at the pin/screw sites takes place, aggressiveness of initial exercise program and weight bearing status will need to be determined by the MD and guided by bony integrity & radiograph findings
- Child with spasticity may experience increased spasms/discomfort when movement at the hip & knee initiated. Also, spasticity may draw lower extremities into a "set" position (eg. flexion) and may make it difficult/painful to regain range/mobility in the opposite direction (eg. extension)
- Avoid aggressive/forceful range of motion/TORQUE at osteotomy site initially.
- Children who were non weight bearing pre-op may be osteopenic and fixation of the surgical hardware may be limited. Special care must be taken during exercise and progressive weight bearing activities.

Contraindications: see precautions

Phase 1: Post-op day 1-7

Goals: -begin PROM, AAROM, AROM as able, within mid ranges of motion

- progressive weight bearing activities
- address positioning, splinting, bracing and equipment needs to address ROM, stretching, pain control
- mobility training

Criteria to Progress:

- safe completion of ADLs, transfers, functional skills
- Patient and family understanding of post-op precautions and home exercise program

Phase 2: Post-op day 8-21

Goals: -functional balance activities

- full ROM of all lower extremity joints, all planes of motion
- endurance strengthening exercises, emphasize high repetition, low resistance

Criteria to Progress:

- ongoing bony healing, continued surgical scar healing

Phase 3: Post-op 22 to completion of PT care

Goals: -good surgical incision scar mobility, begin scar mobilization at ~4-6 weeks post-op

- return to pre surgical level of function
- independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.



CGMA

Center for Gait and Movement Analysis Physical Therapy Guidelines for Orthopedic Procedures

Phase 4: Post-op week 7 to completion of care

- Goals:
- Begin PROM, AAROM and AROM of all LE joints once casts are removed. Work toward full LE ROM in all planes
 - modify bracing needs to improve walking efficiency, working on **quality** of walking pattern
 - Return to pre-op functional mobility and independence (ie: bed mobility, transfers, gait, etc.)
 - improve total lower extremity endurance with high repetition exercises, then progress to strengthening exercises with mild resistance. E-stim may be used for muscle re-education/strengthening
 - functional balance training activities
 - transverse friction/ scar mobility once the surgical incision is closed (approx. 4-6 weeks post-op)

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

Revised 10/07

PT14: Chiari Pelvic Osteotomy (child with neurological impairment)

Indications: Hip subluxation or dislocation with acetabular dysplasia

Procedure: Periarticular pelvic osteotomy above acetabulum with entire acetabulum shifted medially and fixed with hardware

Casting: Hip spica cast 3-6 weeks, non weight bearing until cast is removed. Slow progression of weight bearing if safe with good control of the operative lower extremity with minimal risk for falling

Healing Time: Approximately 6-8 weeks

Precautions:

- Since patient will be in a cast for 3 - 6 weeks, weight bearing status will need to be determined by MD (bony integrity at time of surgery & radiographs) once cast has been removed
- Child with spasticity may experience increased spasms/discomfort when cast removed and movement at the hip & knee initiated. Also, spasticity may draw lower extremities into a "set" position (eg. flexion) and may make it difficult/painful to regain range/mobility in the opposite direction (eg. extension). Periodic use of the bivalved cast may be helpful during this transition (eg. nighttime, short times during day, etc.)
- Avoid aggressive/forceful range of motion initially.
- Children who were non weight bearing pre-op may be osteopenic and fixation of the surgical hardware may be limited. Special care must be taken during exercise and progressive weight bearing activities.

Contraindications:

- Non weight bearing for 3-6 weeks** – initiation of weight bearing will depend on bony healing, bone density, radiograph findings – this will be guided by the MD

Phase 1: Post-op day 1-7

Goals: -address splinting, positioning and assistive device needs for ADLs

- mobility and transfer training for completion of ADLs, hygiene
- pain management during treatment sessions – may include cold packs, heat application, massage, modalities
- balance training for safe completion of transfers, mobility

Criteria to Progress:

- safe mobility and transfers for completion of ADLs
- parent and patient understanding of post-op precautions and home exercise program

Phase 2: Post-op day 8-21

Goals: -pain management as needed

Criteria to Progress:

- safe mobility and transfers
- parent and patient understanding of post-op precautions and home exercise program

Phase 3: Post-op 22 to completion of PT care

Goals: -Avoid impact, torque activities, reduce risk of falling

- full AROM all joints with good active control of the lower extremities
- return to pre-op functional mobility including transfers, gait
- functional balance
- parent and patient education in home exercises
- total LE endurance and strengthening exercises with emphasis on abdominals, gluts, calf
- assess bracing needs for upright posture during walking
- begin transverse friction massage/ scar mobility if surgical scars are well-healed

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT15: San Diego/ Degas Pelvic Osteotomy

(child with neurological impairment)

Indications: Hip subluxation or dislocation with acetabular dysplasia

Procedure: Periarticular pelvic osteotomy above the acetabulum into tri-radiate cartilage with the roof of the acetabulum shifted laterally and distally using iliac or femoral interpositional bone graft and hardware fixation if needed

Casting: Hip spica cast for 3-6 weeks, **non weight bearing** until cast removal, progressive touch down weight bearing if safe and with good active control of the operative extremity

Healing Time: Approximately 6-8 weeks

Precautions:

- Since patient will be in a cast for 3 - 6 weeks, weight bearing status will need to be determined by MD (bony integrity at time of surgery & radiographs) once cast has been removed.
- Child with spasticity may experience increased spasms/discomfort when cast is removed and movement at the hip & knee initiated. Spasticity may draw lower extremities into a "set" position (eg. flexion) and may make it difficult/painful to regain range/mobility in the opposite direction (eg. extension). Periodic use of the bivalved cast may be helpful during this transition (eg. Night time, short times during day, etc.)
- Avoid aggressive/forceful range of motion initially.
- Children who were non weight bearing pre-op may be osteopenic and fixation of the surgical hardware may be limited. Special care must be taken during exercise and progressive weight bearing activities.

Contraindications:

- non weight bearing for 3-6 weeks** until good bony healing. Initiation of weight bearing will vary based on bony healing, bone density, radiograph findings – this will be guided by the MD

Phase 1: Post-op day 1-7

Goals: -address splinting, positioning and assistive device needs for ADLs

- mobility and transfer training for completion of ADLs, hygiene
- pain management during treatment sessions – may include cold packs, heat application, massage, modalities
- balance training for safe completion of transfers, mobility

Criteria to Progress:

- safe mobility and transfers for completion of ADLs
- parent and patient understanding of post-op precautions and home exercise program

Phase 2: Post-op day 8-21

Goals: -pain management as needed

Criteria to Progress:

- safe mobility and transfers
- parent and patient understanding of post-op precautions and home exercise program

Phase 3: Post-op 22 to completion of PT care

- Goals:
- Avoid impact, torque activities, reduce risk of falling
 - full AROM all joints with good active control of the lower extremities
 - return to pre-op functional mobility including transfers, gait
 - functional balance
 - parent and patient education in home exercises
 - total LE endurance and strengthening exercises with emphasis on abdominals, gluts, calf
 - assess bracing needs for upright posture during walking
 - begin transverse friction massage/ scar mobility if surgical scars are well-healed

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

Revised 10/07

PT16: Distal femoral rotational osteotomy

Indications: Femoral anteversion or retroversion

Procedure: Femur is rotated at the distal femoral metaphysis and fixed with internal hardware, either plates or wires

Casting: Long leg or cylinder cast with derotation spreader bar or abduction pillow for 3 weeks, then new long leg casts for 3 additional weeks with partial weight bearing if sufficient bony healing after the first 3 weeks

Healing Time: Approximately 6-8 weeks

Precautions:

- If child is in long leg casts with a spreader bar, do **not** lift child by holding onto the spreader bar.
- Child with spasticity may experience increased spasms / discomfort when cast is removed and movement at the knee is initiated. Periodic use of a knee immobilizer or bivalved cast may be helpful as the child is weaned from support.
- Avoid aggressive / forceful range of motion initially.
- If adequate healing is noted 3 weeks post op, MD may allow partial weight bearing during weeks 3 - 6 while wearing cylinder or long leg casts. At 6 weeks post op, check with MD if full weight bearing can be resumed.

Contraindications:

- No impact, torque or unprotected weight bearing for the first 3 weeks post-op
- Minimize risk for falling

Phase 1: Post-op day 1-7

- Goals:
- protect the surgical site, both skin incision and bony healing, non weight bearing
 - Pain management which may include use of ice, heat and/or electrical stimulation for pain modulation only
 - Patient and family demonstrate safe mobility and transfers for ADL completion
 - Patient and family demonstrate understanding of post-op precautions and home exercise program
 - Passive, active assistive and active range of motion of the hips and ankles
 - Isometric contraction of the gluts, quads, hamstrings
 - functional balance when standing for transfers, ADLs

Criteria to Progress:

- safe mobility and transfers for completion of ADLs

Phase 2: Post-op day 8-21

Goals: -pain management as needed – may be a priority with spasticity

Criteria to Progress:

- independent with transfers, ADLs and mobility

Phase 3: Post-op 22 to completion of PT care

- Goals:
- avoid impact, torque, reduce risk for falling
 - assess need for bracing, assistive devices
 - begin transverse friction massage/ scar mobility at ~ 6 weeks post-op/ when incision healing is complete
 - begin progressive weight bearing as advised by the referring physician
 - functional standing balance for safe transfers
 - full ROM bilateral lower extremities, all planes, all joints
 - lower extremity strengthening with emphasis on glut max, glut med, calf as well as **quality** of gait pattern
 - Return to pre-operative function and activity

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT17: Distal tibial rotational osteotomy

Indications: Internal or external tibial torsion

Procedure: Rotational tibial and fibular osteotomy with internal hardware fixation

Casting: Short leg cast for 6 weeks total, non weight bearing for week 1-3, weight bearing as tolerated for week 4-6

Healing Time: Approximately 6-8 weeks

Precautions:

- Child will be in a short leg cast for 3 weeks post op followed by weight bearing as tolerated after the 3rd week.
- Child with spasticity may experience increased spasms / discomfort when cast is removed and movement at the ankle / foot is initiated.
- Avoid aggressive / forceful range of motion initially.

Contraindications:

- No impact, torque or unprotected weight bearing for the first 3 weeks post-op
- Minimize risk for falling

Phase 1: Post-op day 1-7

- Goals:
- protect the surgical site, both skin incision and bony healing, non weight bearing for the 1st 3 weeks post-op
 - Pain management may include use of ice, heat and/or electrical stimulation for pain modulation only
 - Patient and family demonstrate safe mobility and transfers for ADL completion
 - Patient and family demonstrate understanding of post-op precautions and home exercise program
 - Passive, active assistive and active range of motion of the hips and knees
 - Isometric contraction of the gluts, quads, hamstrings
 - functional balance when standing for transfers, ADLs

Criteria to Progress:

- safe mobility and transfers for completion of ADLs

Phase 2: Post-op day 8-21

Goals: -pain management as needed – may be a priority with spasticity

Criteria to Progress:

- independent with transfers, ADLs and mobility

Phase 3: Post-op 22 to completion of PT care

- Goals:
- begin progressive weight bearing as advised by the referring physician
 - functional standing balance for safe transfers
 - avoid impact, torque, reduce the risk for falling
 - assess need for bracing, assistive devices
 - begin transverse friction massage/scar mobility at ~ 6 weeks post-op/ when incision healing is complete
 - full ROM bilateral lower extremities, all planes, all joints
 - lower extremity strengthening with emphasis on glut max, glut med, calf as well as **quality** of gait pattern
 - Return to pre-operative function and activity

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT18: Evans calcaneal lengthening

Indications: Plano-valgus foot deformity with midfoot break and talo-navicular subluxation

Procedure: Calcaneal osteotomy between the anterior and middle facets with interposition of the tri-cortical iliac crest allograft or donor graft. May require internal fixation

Casting: Short leg cast for 6 weeks. **Non weight bearing** for the 1st 3 weeks, weight bearing as tolerated for the 2nd 3 weeks

Healing Time: Approximately 6-8 weeks, UCB orthosis (custom shoe insert) for 1 year post-op

Precautions:

-Child will be non weight bearing in a short leg cast for 3 weeks and weight bearing as tolerated weeks 4 - 6 using a walker or crutches. Once cast is removed, child should wear a UCB for 1 year post op.

Contraindications:

-Avoid impact activities until 8 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site, both skin incision and bony healing, non weight bearing for the 1st 3 weeks post-op
-Pain management may include use of ice, heat and/or electrical stimulation for pain modulation only
-Patient and family demonstrate safe mobility and transfers for ADL completion
-Patient and family demonstrate understanding of post-op precautions and home exercise program
-Passive, active assistive and active range of motion of the hips and knees
-Isometric contraction of the gluts, quads, hamstrings
-functional balance when standing for transfers, ADLs

Criteria to Progress:

-safe mobility and transfers for completion of ADLs

Phase 2: Post-op day 8-21

Goals: -pain management as needed – may be a priority with spasticity

Criteria to Progress:

-independent with transfers, ADLs and mobility

Phase 3: Post-op 22 to completion of PT care

Goals: -begin progressive weight bearing as advised by the referring physician
-functional standing balance for safe transfers
-avoid impact, torque, reduce the risk of falling
-assess need for bracing, assistive devices
-begin transverse friction massage/scar mobility at ~ 6 weeks post-op/ when incision healing is complete
-full ROM bilateral lower extremities, all planes, all joints
-lower extremity strengthening with emphasis on glut max, glut med, calf as well as **quality** of gait pattern
-Return to pre-operative function and activity

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT19: Triple arthrodesis

Indications: Severe foot deformity, including plano-valgus, equino-valgus, equino-varus or cavo-varus deformity

Procedure: Arthrodesis of subtalar, calcaneo-cuboid and talo-navicular joints. Fixation maintained with internal hardware

Casting: Short leg cast for 6 weeks, 1st 3 weeks are **non weight bearing**, 2nd 3 weeks are weight bearing as tolerated

Healing Time: Approximately 6-8 weeks

Precautions:

-Child will be non-weight bearing in a short leg cast for 3 weeks using a walker or crutches, weight bearing as tolerated post-op weeks 4 - 6.

Contraindications:

-Avoid impact activities until 8 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site, both skin incision and bony healing, **non weight bearing** for the 1st 3 weeks post-op
-Pain management may include use of ice, heat and/or electrical stimulation for pain modulation only
-Patient and family demonstrate safe mobility and transfers for ADL completion
-Patient and family demonstrate understanding of post-op precautions and home exercise program
-Passive, active assistive and active range of motion of the hips and knees
-Isometric contraction of the gluts, quads, hamstrings
-functional balance when standing for transfers, ADLs

Criteria to Progress:

-safe mobility and transfers for completion of ADLs

Phase 2: Post-op day 8-21

Goals: -pain management as needed – may be a priority with spasticity

Criteria to Progress:

-independent with transfers, ADLs and mobility

Phase 3: Post-op 22 to completion of PT care

Goals: -begin progressive weight bearing as advised by the referring physician
-functional standing balance for safe transfers
-avoid impact, torque, reduce the risk for falling
-assess need for bracing, assistive devices
-begin transverse friction massage/scar mobility at ~ 6 weeks post-op/ when incision healing is complete
-full ROM bilateral lower extremities, all planes, all joints
-lower extremity strengthening with emphasis on glut max, glut med, calf as well as **quality** of gait pattern
-Return to pre-operative function and activity

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT20: Botulinum toxin injection (Botox) Lower extremity

Indications: A muscle or muscle group with dynamic posturing/tone but good passive range of motion. Botox can also be used to relax muscles for positioning during serial casting when a muscle contracture exists. This may increase the benefits of casting.

Procedure: Intramuscular injection of Botulinum Toxin Type A (Botox) or Botulinum Toxin Type B (Myoblock) into spastic and/or dystonic muscles. Localization of the correct muscle may require use of electrical stimulation to the selected muscle. This stimulation may be slightly uncomfortable.

Casting: Casting may be a component of Botox treatment. If there is an inadequate response to an injection of the toxin alone, casting may be applied 1-2 weeks after the toxin has been injected and will last approximately 2-3 weeks with cast changes every 7-10 days. Children with significant contractures may be casted for 3-6 weeks with frequent cast changes. In cases where it appears the contracture is severe and will extend past 4 weeks, it may be beneficial to start the casting prior to Botox and continue after the injection. This sequence may maximize the affects of Botox and encourage strengthening of the antagonist muscle following casting.

Expected Duration of effect: Approximately 2-4 months

Frequency of Treatment: Initially at three month intervals for two treatments, then at six to nine month intervals thereafter, or as established by the physician.

Precautions: Since the onset of affect occurs over the course of several days, the risk of muscle pulls following injection is low. Normal activities may be resumed on the day of the procedure.

Contraindications:

-sensitivity to injected medications

Physical Therapy Goals:

1. Improve quality of movement patterns with decreased tone and improved flexibility.
2. Increase range of motion of the affected joints and strengthen in the injected muscle.
3. Increase strength and endurance of the antagonist muscles.
4. Improve balance during stance and ambulation.
5. Improve orthotic wear and seating/positioning.

Physical Therapy Goals:

1. Maximize quality of movement with appropriate use of surrounding muscles utilizing neuromuscular retraining to minimize compensations. In the ambulatory population, begin gait training focusing on improved foot position, stride length, velocity and foot progression angle. Correct seating position and adapt transfer techniques for individuals who are non-ambulatory.
2. Passive stretching of injected muscles and strengthening in new ranges or arcs of motion.
3. Therapeutic exercise addressing hypertonicity, co-contraction, dexterity, weakness and endurance. Motor control, range of motion, strength and endurance are focuses of treatment.
4. Balance training activities encouraging ankle strategies with new available range of motion, while also stretching other muscles affecting step and stride length (e.g. hamstrings)
5. Treatment may include surface EMG biofeedback to improve motor and functional movement patterns of several muscles at once or Functional Electrical Stimulation to improve gait patterns in patients with significant muscle weakness, especially of the antagonist muscle.
6. Evaluate need for assistive devices, positioning relative to orthotics and seating equipment. Make recommendations for alterations if indicated.
7. Functional training in activities of daily living promoting maximal independence in mobility including stairs.
8. Since stride length is also affected by hips and hamstrings, these need to be assessed and treated as well.

Physical Therapy Home Exercise Program:

1. Passive, active assistive and resistive lower extremity range of motion and strengthening of injected muscles as well as the antagonists, capitalizing on effects of reduced spasticity and the potential for gains in motor performance.
2. Increase endurance of muscles by increasing ambulation distances.
3. Balance activities such as standing on pillow, walking on uneven surfaces and practicing ankle sway strategies in a corner.
4. Practice walking with heel-toe pattern along a straight line with appropriate stride length.
5. Positioning to increase stretching and use of splints, bivalved casts, immobilizers, etc., as indicated.

Special Considerations:

- Occasionally there is an initial decrease in function due to a period of adaptation to decreased tone. This is an initial safety issue, but is also an opportunity for retraining of functional skills. Discomfort at the injection site may last 24-48 hours. Check with MD if discomfort persists. Interventions will vary depending on the mobility level of child. More mobile children are more likely to benefit from patient/client-related instruction and direct intervention.

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT21: Phenol injection

Indications: A large proximal muscle or muscle group with a high degree of spasticity that interferes with function, comfort, care or has the potential to lead to skeletal deformity.

Procedure: Intramuscular injection of Phenol into spastic and dystonic muscles at either the motor point or the motor nerve. Identification of the desired muscle requires electrical stimulation of the selected muscle or nerve. This may be slightly uncomfortable.

Casting: None. May be used as an adjunctive intervention

Expected Duration of Effect: Approximately 3-6 months

Precautions: Avoid aggressive stretching during first week after injection to avoid muscle pulls. There is a risk of reduced sensation if a sensory nerve is affected by injection.

Contraindications:

-sensitivity to injected medications

Physical Therapy Goals:

1. Improve flexibility of the injected muscle working toward carry over to posture and gait.
2. Increase strength and endurance in the antagonist muscles.
3. Improve motor patterns with improved flexibility, increased joint range of motion and changes in motor unit activation.
4. Improve balance during stance and ambulation.
5. Improve orthotic wear and seating/positioning.

Physical Therapy Treatment:

6. Intensive stretching of injected muscles after the first week.
7. Neuromuscular re-education for more efficient movement patterns.
8. Strength and endurance training of antagonist muscles using active assistive, active and progressive resistive exercise. Consider using electrical stimulation for strengthening.
9. In the ambulatory patient, gait training focusing on improved foot position, stride length, velocity and foot progression angle. Correct seating position and adapt transfer techniques for non-ambulatory patients.
10. Balance training activities to accommodate to new muscle tone.
11. Treatment may include surface EMG to improve motor and functional movement patterns by controlling amplitude control of several muscles at once.
12. Treatment may include Functional Electrical Stimulation to improve gait patterns in patients with significant muscle weakness.
13. Evaluate positioning in orthotics and seating equipment and make recommendations for alterations if appropriate.
14. Functional training in activities of daily living including mobility training, gait training, and stairs training.
15. Biofeedback training to increase firing of some muscles and inhibit firing in others.

Physical Therapy Home Exercise Program:

16. Passive, active assistive and active lower extremity range of motion. Strengthening of injected muscles and antagonists.
17. Mobility training capitalizing on improved muscle tone addressing current functional limitations.
18. Practice walking with upright posture, neutral pelvis and with full knee extension at terminal swing.
19. Positioning to work on stretching and use of splints and bivalved casts as indicated.
20. Use of adaptive equipment especially immobilizers and wedges to increase range of motion.



CGMA

Center for Gait and Movement Analysis Physical Therapy Guidelines for Orthopedic Procedures

Special Considerations:

- Occasionally there is an initial decrease in function due to a period of adaptation to new muscle length. Function generally improves when the child accommodates to the new muscle length.
- Discomfort at the injection site may last for 24-48 hours. Check with referring MD for specifics.
- Interventions will vary with level of mobility of the child. More mobile children are more likely to benefit from patient/client-related instruction and direct intervention.

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

Revised 10/07

PT22: Intramuscular rectus femoris lengthening

Indications: Rectus femoris contracture with positive Thomas and Ely test. During walking, increased hip flexion with anterior pelvic tilt

Procedure: Rectus femoris tendon is lengthened or released at the anterior inferior iliac spine

Casting: No cast, weight bearing as tolerated. Patient should spend the majority of time in prone to stretch the hip flexors for the first 3 weeks post-op to minimize tissue shortening and increased hip flexion
-Weight bearing is allowed as tolerated

Healing Time: Approximately 3 weeks

Precautions:

- Do not allow the patient to spend many hours in a seated position. This will encourage tissue shortening and scarring in this flexed position
- Make special arrangements for the patient to spend the majority of time in prone while at school
- Do not allow pillows under the torso/ hips when in prone. This allows hip flexion and tissue shortening/ scarring to occur
- Anticipate post-op discomfort and pain, a full body cast would minimize this but it is cumbersome and not necessary unless the pain is intolerable.

Contraindications:

- Avoid active, forceful hip flexion for the first 3 weeks post-op
- Avoid impact activities for the first 3 weeks post-op

Phase 1: Post-op day 1-7

Goals: -protect the surgical site including the incision and underlying surgical tissues
-encourage prone lying for the majority of the 24 hour day
-gentle PROM, AAROM of the involved hip, knee, ankle in all planes of motion
-isometric contraction of the glut max, quads, hamstrings

Criteria to Progress:

- safe mobility for ADL completion
- able to demonstrate understanding of home exercises and precautions
- home exercises to include prone lying, isometric contraction of the gluts

Phase 2: Post-op day 8-21

Goals: -improve abdominal strength to reduce anterior pelvic tilt, avoid substitution by the hip flexors, do not secure/ stabilize the legs when working on abdominal strengthening
-passive, active assistive motion to 10° of hip extension
-begin gait training with emphasis on **quality** of gait pattern, OK to try slow treadmill walking

Criteria to Progress:

- uneventful healing of surgical tissues

Phase 3: Post-op 22 to completion of PT care

Goals: -surgical incision scar mobility once good wound closure has occurred (Approx. 4-6 weeks)
-improve hip extensor strength with exercises such as bridging, step ups, stair climbing, therapy ball ex's, etc.
-improve abdominal strength, avoid overuse/ substitution of the hip flexors
-attain a trailing limb posture at terminal stance and improve knee extension at terminal swing and initial contact when walking
-decrease anterior pelvic tilt in both standing and walking
-anticipate return to full pre-op activity level at ~ 3 months post-op
-independent management with home exercises

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT23: DISTAL FEMORAL EXTENSION OSTEOTOMY

Indications: Fixed knee flexion contractures and inability to extend at the knee during gait. The goal of the procedure is to improve knee extension range by altering the distal femur bony anatomy.

Procedure: Anterior femoral wedge is removed from the distal femoral metaphysis and fixed with a blade plate and side screws

Immobilization: Long leg cylinder casts or leg immobilizers for 6 weeks with partial weight bearing if adequate healing after 1st 3 weeks or aggressive protocol without casting and the use of a CPM machine. **Non-weight bearing for 3 weeks**

****The surgeon may elect to use a CPM immediately post-op instead of long leg casts to minimize surgical tissue scarring. The CPM can be used in 2-4 hour intervals with a goal of 6-8 hours per leg per day. If this procedure is completed bilaterally, one CPM can be alternated between both legs.

Healing time: Approximately 6 - 8 weeks.

CONTRAINDICATIONS:

- No impact, torque or unprotected weight bearing for the first 3 weeks post-op
- Minimize risk for falling

PRECAUTIONS:

1. Child with spasticity may experience increased spasms / discomfort when cast is removed and movement at the knee is initiated. Periodic use of a knee immobilizer or bivalved cast may be helpful as the child is weaned from immobilization support. The aggressive protocol decreases the spasticity response and discomfort associated with joint motion.
2. Avoid flexion beyond 90° for the first 3 weeks post-op.

PHASE 1: Post-op day 1-7

PRECAUTIONS/ CONTRAINDICATIONS:

- Protect surgical site, both skin incision and bony healing – **Non-weight bearing**
- If the child is not casted, they are able to weight-bear for assisted transfers only with knee immobilizers donned during the first 3 weeks if the parent/ care provider cannot lift them for dependent transfers

GOALS:

- Pain management which may include use of ice, heat and/or electrical stimulation for pain modulation only
- Patient and family demonstrate safe mobility and transfers for completion of ADLs
- If using the CPM according to the aggressive protocol, may gradually increase range of motion to full range if tolerated
- Passive, active assistive and active range of motion of the hip and ankle joints.
- Isometric contraction of the gluteus maximus, quadriceps, hamstrings
- Patient and family are able to demonstrate understanding of post-op precautions and home exercise program
- Functional sitting balance for ADLs
- While in the cylinder or long leg casts or knee immobilizers, instruct the patient and parents in safe mobility and transfers. If the patient is not casted, transfers and mobility are completed with the knee immobilizers donned

CRITERIA TO PROGRESS:

- safe mobility and transfers for completion of ADLs

PHASE 2: Post-op day 8- end of post-op week 3

PRECAUTIONS/ CONTRAINDICATIONS:

- avoid knee flexion beyond 90° if patient is not casted

GOALS:

- Obtain full passive knee extension** if the patient is not casted
- Obtain knee flexion to 90°, either PROM, AAROM, AROM if the patient is not casted
- Pain management as needed (may be a priority with spasticity)

CRITERIA TO PROGRESS:

- active, muscular control of available range of motion
- independent with transfers, ADLs, mobility

PHASE 3: Post-op day 21 – end of post-op week 6

PRECAUTIONS:

- avoid impact, torque, forceful/ resistive quadriceps contraction, avoid falling

GOALS:

- assess bracing needs, consider ground reaction AFOs to encourage full knee extension during stance phases of gait, for safe transfers (*splinting, orthotic and equipment needs will need to be authorized by the MD*)
- begin transverse friction massage to surgical scars if well-healed
- begin progressive weight bearing as advised by the referring physician
- Obtain full knee ROM once casts are removed
- Functional standing balance for safe transfers, minimize opportunities for the knee to flex/ collapse suddenly, minimize risk for falling
- E-stim may be indicated post-operatively for muscle re-education

CRITERIA TO PROGRESS:

- full active and passive knee range of motion over full arc of motion

PHASE 4: Post-op week 7-completion of PT care

PRECAUTIONS:

- none

GOALS:

- modify bracing needs, continue using ground reaction AFOs to encourage full knee extension during stance phases if needed, may consider fixed AFOs if full knee extension is achieved during gait
- Gait re-training with emphasis on knee extension at terminal swing / initial contact and full knee extension at mid – terminal stance phases of gait. Goal is **quality** of gait not quantity/ distances of gait for the first 6 months.
- Full range of motion at the hips, knees and ankle joints
- Strengthening exercises once casts are removed. E-Stim may be indicated post-op for muscle re-education / strengthening.
- Lower extremity strengthening exercises with emphasis on the gluteus maximii, quadriceps, and calf musculature.
- Functional balance to return to pre-operative level of function
- Return to pre-operative function and activity

***When multiple surgical procedures are performed, guidelines must be adapted/ adjusted accordingly. To protect the surgical tissues, the PT care needs to default to the most conservative guidelines.**

PT24: PATELLA ADVANCEMENT

Indications: Patella alta due to spasticity of the quadriceps. This results in reduced force generation of the quadriceps and extensor lag.

Procedure: If the patient is **skeletally mature**, the tibial tubercle is excised by a "V" wedge from the proximal tibia and secured at a more distal position with hardware. This procedure is a more secure fixation and needs to be protected for ~3 weeks/ or per MD recommendation.

If the patient is **skeletally immature**, a portion of the patella tendon is removed and sutured in a shortened position resulting in re-alignment of the patella. The remaining tendon is re-attached via sutures passed through the inferior pole of the patella and interwoven through the body of the patella tendon. This procedure requires more attention to post-op protection for ~6 weeks/ or per MD recommendation.

Immobilization: Long leg/cylinder cast, knee flexed to ~20° for 3-6 weeks, protected weight bearing for 3-6 weeks. If the tibial tubercle is advanced, the patient is allowed weight bearing at an earlier stage compared to the patella tendon shortening procedure.

****The surgeon may elect to use a CPM immediately post-op instead of long leg casts to minimize surgical tissue scarring. The CPM can be used in 2-4 hour intervals with a goal of 6-8 hours per leg per day. If this procedure is completed bilaterally, one CPM can be alternated between both legs.

Healing Time: Approximately 6 weeks

Precautions:

- Child with spasticity may experience increased spasms/ discomfort when the cast is removed and motion at the knee joint is initiated. Periodic use of a knee immobilizer or bi-valved cast may be helpful as the child is weaned from casting support.
- Using a CPM may reduce the spasms and discomfort associated with the protected phase of healing
- The skeletally immature surgical procedure requires more protection of the healing tissue compared to the bone to bone union**

Contraindications: No forceful quadriceps contraction, no resistive knee extension minimize risk of falling for 6 weeks post-op/ until advised by the MD

Phase 1: Post-op day 1-7

PRECAUTIONS/ CONTRAINDICATIONS:

All range of motion (PROM, AAROM) is limited to 0-30° of knee flexion including ROM provided by the CPM

GOALS:

- Long leg sitting while immobilized to stretch the hamstrings
- Pain management, this may include use of modalities. Please clear use of modalities with MD
- Mid range passive, active assistive and active range of motion at the hip and ankle joints
- Isometric contraction of the gluteus maximii, hamstrings, sub maximal isometric contraction of the quadriceps
- Development of home exercise program – including isometrics, ankle pumps, ADL skills

CRITERIA TO PROGRESS:

- Safe mobility and non weight-bearing transfers with knee immobilizers for completion of ADLs
- Able to demonstrate understanding of home exercises and contra-indications

Phase 2: Post-op day 8-21

PRECAUTIONS/ CONTRAINDICATIONS:

- Range of motion 0-60° of knee flexion at post-op week 2
- Range of motion increased to 0-90° of knee flexion at post-op week 3

-No resistive quadriceps contraction

GOALS:

- Increase knee range of motion to 0-60° at the end of post-op week 2. Begin AAROM through 0-60° range of motion
- Increase knee range of motion to 0-90° at the end of post-op week 3. Continue AAROM through 0-90° range of motion, begin AROM 0-90°
- Independent mobility of operative limb for independent transfers and protected mobility with knee immobilizer donned
- Progression of home exercise program

CRITERIA TO PROGRESS:

- Active range of motion 0-90°
- No quad lag with active knee extension throughout 0-90°

Phase 3: Post-op week 3- completion of PT care

PRECAUTIONS/ CONTRAINDICATIONS:

- Avoid impact, sudden, forceful contraction of the quadriceps

GOALS:

- Improve scar mobility by cross fiber friction massage once good incisional healing and closure is achieved (Approx 4-6 weeks)
- Improved knee extension during stance phases of gait
- Full knee extension at terminal swing, initial contact during gait
- Improved knee extension endurance, strength and power. Work toward no quad lag with active contraction, manual muscle test of 3+/5 or greater of all lower extremity groups
- Anticipate return to full activity ~ 3 months post-op

***When multiple surgical procedures are performed, guidelines must be adapted/ adjusted accordingly. To protect the surgical tissues, the PT care needs to default to the most conservative guidelines.**

PT25: RECTUS FEMORIS TRANSFER WITH DISTAL FEMORAL EXTENSION OSTEOTOMY

Indications: Stiff knee gait with consistent rectus femoris activity during swing phases, reduced knee flexion slope below 160°/sec. (norm value 240°/sec), delayed peak knee flexion, (+) Ely test, fixed knee flexion contracture and inability to extend at the knee during gait. The goal of the procedure is to improve knee extension range by altering the distal femur bony anatomy.

Procedure: Distal rectus femoris insertion is dissected from quadriceps and transferred medially to the semitendinosus. Anterior femoral wedge is removed from the distal femoral metaphysis and fixed with a blade plate and side screws

Casting: Long leg cylinder casts or leg immobilizers for 6 weeks with partial weight bearing if adequate healing after 1st 3 weeks or aggressive protocol without casting and the use of a CPM machine. **Non-weight bearing for 3 weeks**

****The surgeon may elect to use a CPM immediately post-op instead of long leg casts to minimize surgical tissue scarring. The CPM can be used in 2-4 hour intervals with a goal of 6-8 hours per leg per day. If this procedure is completed bilaterally, one CPM can be alternated between both legs.

Healing Time: Approximately 6 - 8 weeks.

Precautions:

- 12-15% resulting reduction of quadriceps strength
- Child with spasticity may experience increased spasms / discomfort when cast is removed and movement at the knee is initiated. Periodic use of a knee immobilizer or bivalved cast may be helpful as the child is weaned from immobilization support. The aggressive protocol decreases the spasticity response and discomfort associated with joint motion.
- Avoid flexion beyond 90° for the first 3 weeks post-op.

Contraindications:

- No forceful, resisted muscular contraction of the quads for 6 weeks post-op
- Avoid impact activities for the first 6 weeks post-op
- Minimize risk for falling

PHASE 1: Post-op day 1-7

PRECAUTIONS/ CONTRAINDICATIONS:

- Protect surgical site, both skin incision and bony healing – **Non-weight bearing**
- If the child is not casted, they are able to weight-bear for assisted transfers only with knee immobilizers donned during the first 3 weeks if the parent/ care provider cannot lift them for dependent transfers

GOALS:

- Pain management which may include use of ice, heat and/or electrical stimulation for pain modulation only
- Patient and family demonstrate safe mobility and transfers for completion of ADLs
- If using the CPM according to the aggressive protocol, may gradually increase range of motion to 90° of flexion if tolerated
- Passive, active assistive and active range of motion of the hip and ankle joints.
- Isometric contraction of the gluteus maximus, quadriceps, hamstrings
- Patient and family are able to demonstrate understanding of post-op precautions and home exercise program
- Functional sitting balance for ADLs
- While in the cylinder or long leg casts or knee immobilizers, instruct the patient and parents in safe mobility and transfers. If the patient is not casted, transfers and mobility are completed with the knee immobilizers donned

CRITERIA TO PROGRESS:

- safe mobility and transfers for completion of ADLs

PHASE 2: Post-op day 8- end of post-op week 3

PRECAUTIONS/ CONTRAINDICATIONS:

- avoid knee flexion beyond 90° if patient is not casted

GOALS:

- Obtain full passive knee extension** if the patient is not casted
- Obtain knee flexion to 90°, either PROM, AAROM, AROM if the patient is not casted
- Pain management as needed (may be a priority with spasticity)

CRITERIA TO PROGRESS:

- active, muscular control of available range of motion
- independent with transfers, ADLs, mobility

PHASE 3: Post-op day 21 – end of post-op week 6

PRECAUTIONS:

- avoid impact, torque, forceful/ resistive quadriceps contraction, avoid falling

GOALS:

- assess bracing needs, consider ground reaction AFOs to encourage full knee extension during stance phases of gait, for safe transfers (*splinting, orthotic and equipment needs will need to be authorized by the MD*)
- begin transverse friction massage to surgical scars if well-healed
- begin progressive weight bearing as advised by the referring physician
- Obtain full knee ROM once casts are removed
- Functional standing balance for safe transfers, minimize opportunities for the knee to flex/ collapse suddenly, minimize risk for falling
- E-stim may be indicated post-operatively for muscle re-education

CRITERIA TO PROGRESS:

- full active and passive knee range of motion over full arc of motion

PHASE 4: Post-op week 7-completion of PT care

PRECAUTIONS:

- none

GOALS:

- modify bracing needs, continue using ground reaction AFOs to encourage full knee extension during stance phases if needed, may consider fixed AFOs if full knee extension is achieved during gait
- Gait re-training with emphasis on knee extension at terminal swing / initial contact and full knee extension at mid – terminal stance phases of gait. Goal is **quality** of gait not quantity/ distances of gait for the first 6 months.
- Full range of motion at the hips, knees and ankle joints
- total leg strengthening exercises – emphasize quad strengthening, mini squats, SAQ, step ups with full knee EXT, backward step ups, heel walking, include hip flexion and extension strengthening exercises, OK to use Total Gym, theraband, sport cord ex's, open chain SLR all planes, **hip flexion SLR with no quad lag**, hamstring strengthening
- Lower extremity strengthening exercises with emphasis on the gluteus maximii, quadriceps, and calf musculature.
- Functional balance to return to pre-operative level of function
- Return to pre-operative function and activity

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.

PT26: PATELLA ADVANCEMENT WITH DISTAL FEMORAL EXTENSION OSTEOTOMY

Indications: Patella alta due to spasticity of the quadriceps. This results in reduced force generation of the quadriceps and extensor lag. Fixed knee flexion contractures and inability to extend at the knee during gait. The goal of the procedure is to improve knee extension range by altering the distal femur bony anatomy.

Procedure: If the patient is **skeletally mature**, the tibial tubercle is excised by a "V" wedge from the proximal tibia and secured at a more distal position with hardware. This procedure is a more secure fixation and needs to be protected for ~3 weeks/ or per MD recommendation.

If the patient is **skeletally immature**, a portion of the patella tendon is removed and sutured in a shortened position resulting in re-alignment of the patella. The remaining tendon is re-attached via sutures passed through the inferior pole of the patella and interwoven through the body of the patella tendon. This procedure requires more attention to post-op protection for ~6 weeks/ or per MD recommendation.

Anterior femoral wedge is removed from the distal femoral metaphysis and fixed with a blade plate and side screws

Immobilization: Long leg/cylinder cast, knee flexed to ~20° for 3-6 weeks, protected weight bearing for 3-6 weeks. If the tibial tubercle is advanced, the patient is allowed weight bearing at an earlier stage compared to the patella tendon shortening procedure.

****The surgeon may elect to use a CPM immediately post-op instead of long leg casts to minimize surgical tissue scarring. The CPM can be used in 2-4 hour intervals with a goal of 6-8 hours per leg per day. If this procedure is completed bilaterally, one CPM can be alternated between both legs.

Healing Time: Approximately 6-8 weeks

Precautions:

-Child with spasticity may experience increased spasms/ discomfort when the cast is removed and motion at the knee joint is initiated. Periodic use of a knee immobilizer or bi-valved cast may be helpful as the child is weaned from casting support.

-Using a CPM may reduce the spasms and discomfort associated with the protected phase of healing

-The skeletally immature surgical procedure requires more protection of the healing tissue compared to the bone to bone union

-Protect surgical site, both skin incision and bony healing – **Non-weight bearing**

-If the child is not casted, they are able to weight-bear for assisted transfers only with knee immobilizers donned during the first 3 weeks if the parent/ care provider cannot lift them for dependent transfers

Contraindications: No forceful quadriceps contraction, no resistive knee extension minimize risk of falling for 6 weeks post-op/ until advised by the MD

Phase 1: Post-op day 1-7

PRECAUTIONS/ CONTRAINDICATIONS:

All range of motion (PROM, AAROM) is limited to 0-30° of knee flexion including ROM provided by the CPM

GOALS:

- Long leg sitting while immobilized to stretch the hamstrings
- Pain management, this may include use of modalities. Please clear use of modalities with MD
- Mid range passive, active assistive and active range of motion at the hip and ankle joints
- Isometric contraction of the gluteus maximii, hamstrings, sub maximal isometric contraction of the quadriceps
- Development of home exercise program – including isometrics, ankle pumps, ADL skills

CRITERIA TO PROGRESS:

- Safe mobility and non weight-bearing transfers with knee immobilizers for completion of ADLs
- Able to demonstrate understanding of home exercises and contra-indications

Phase 2: Post-op day 8-21

PRECAUTIONS/ CONTRAINDICATIONS:

- Range of motion 0-60° of knee flexion at post-op week 2
- Range of motion increased to 0-90° of knee flexion at post-op week 3
- No resistive quadriceps contraction**

GOALS:

- Increase knee range of motion to 0-60° at the end of post-op week 2. Begin AAROM through 0-60° range of motion
- Increase knee range of motion to 0-90° at the end of post-op week 3. Continue AAROM through 0-90° range of motion, begin AROM 0-90°
- Independent mobility of operative limb for independent transfers and protected mobility with knee immobilizer donned
- Progression of home exercise program

CRITERIA TO PROGRESS:

- Active range of motion 0-90°
- No quad lag with active knee extension throughout 0-90°

Phase 3: Post-op week 3- completion of PT care

PRECAUTIONS/ CONTRAINDICATIONS:

- Avoid impact, sudden, forceful contraction of the quadriceps

GOALS:

- Improve scar mobility by cross fiber friction massage once good incisional healing and closure is achieved (Approx 4-6 weeks)
- Improved knee extension during stance phases of gait
- Full knee extension at terminal swing, initial contact during gait
- Improved knee extension endurance, strength and power. Work toward no quad lag with active contraction, manual muscle test of 3+/5 or greater of all lower extremity groups
- Anticipate return to full activity ~ 3 months post-op
 - assess bracing needs, consider ground reaction AFOs to encourage full knee extension during stance phases of gait, for safe transfers (*splinting, orthotic and equipment needs will need to be authorized by the MD*)
- begin transverse friction massage to surgical scars if well-healed
- begin progressive weight bearing as advised by the referring physician
- Obtain full knee ROM once casts are removed
- Functional standing balance for safe transfers, minimize opportunities for the knee to flex/ collapse suddenly, minimize risk for falling
- E-stim may be indicated post-operatively for muscle re-education

CRITERIA TO PROGRESS:

- full active and passive knee range of motion over full arc of motion

PHASE 4: Post-op week 7-completion of PT care

PRECAUTIONS:

- none

GOALS:

- modify bracing needs, continue using ground reaction AFOs to encourage full knee extension during stance phases if needed, may consider fixed AFOs if full knee extension is achieved during gait
- Gait re-training with emphasis on knee extension at terminal swing / initial contact and full knee extension at mid – terminal stance phases of gait. Goal is **quality** of gait not quantity/ distances of gait for the first 6 months.
- Full range of motion at the hips, knees and ankle joints
- Strengthening exercises once casts are removed. E-Stim may be indicated post-op for muscle re-education / strengthening.
- Lower extremity strengthening exercises with emphasis on the gluteus maximii, quadriceps, and calf musculature.
- Functional balance to return to pre-operative level of function
- Return to pre-operative function and activity

When multiple procedures are performed at the same surgical event, the post-op physical therapy care needs to default to the most conservative time frames and guidelines.