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REHABILITATION PROTOCOL: Open reduction Internal Fixation (ORIF) Upper Extremity and Lower Extremity

FRACTURE	INITIAL THERAPY PROGRAM	ADVANCED THERAPY PROGRAM
<u>Acetabulum</u>: **Fixation:** ➢ Lag screws, reconstruction plates **Mobility/weight bearing Precautions** ➢ Kocher-Langenbeck approach: (posterior), avoid active hip extension, rotation. ➢ Ilioinguinal approach: (anterior), avoid active hip flexion, vigorous trunk and abdominal flexion. ➢ Extended iliofemoral approach: (posterolateral), no active hip abduction 6-8 weeks; weight bearing TDWB-WOL 8-12 weeks; positioning ROM; posterior wall involvement-no hip flexion greater than 60° for 6 weeks.	➢ Day 1 post- operative: immediate CPM (hip flexion, abduction.) ➢ Days 2-5: initiate bilateral UE strengthening; AROM knee, ankle, quad, hamstring isometrics, TKE; early mobilization initiated (exercise instruction, bed mobility, transfer, ambulation training;) hip PROM within ROM limitations; lying prone is encouraged in patients with hip flexion precaution to avoid contracture (2-3x/day, 20 min intervals). ➢ Weeks 2-5: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precautions ➢ Weeks 6-11: Add AROM-AAROM hip; hip abductor isometrics.	➢ Weeks 12-14; WBAT, wean from crutches/walker, gait retraining; strengthen quads, hamstring, abductors, flexors, extensors, and lower trunk muscles; initiate balance/ proprioceptive awareness training; aerobic/ fitness training; rehabilitation is tailored to the surgical approach (i.e., extended iliofemoral approach requires more extensive hip abductor strengthening).

Pelvis- anterior ring (pubic symphysis, rami) **Fixation:** ➢ Plating, external fixation, lag screws **Mobility/weight bearing Precautions:** ➢ TDWB-WBAT 10-12 weeks post injury (depends on associated posterior ring involvement).	➢ Day's 1-7 post stabilization: bilateral UE strengthening; PROM hip joint as fracture stability/pattern allows; quad hamstring sets, terminal knee extension; AROM knee, ankle. ➢ Weeks 2-11: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precautions	Weeks 12-14: WBAT, wean from crutches/walker, gait retraining; strengthen quads, hamstring, hip adductors, flexors, extensors, and lower trunk muscles;
FRACTURE	**INITIAL THERAPY PROGRAM**	**ADVANCED THERAPY PROGRAM**
Pelvis- posterior ring (sacrum, SI fracture/ dislocation, iliac wing) **Fixation:** ➢ Screws, plating **Mobility Precautions:** ➢ TDWB-WOLWB 10-12 weeks	➢ Day's 1-7 post stabilization: bilateral UE strengthening; PROM hip joint as fracture stability/pattern allows; quad/hamstring sets, terminal knee extension; AROM knee, ankle. ➢ Weeks 2-11: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Weeks 12-14: WBAT, wean from crutches/walker, gait retraining; strengthen quads, hamstrings, hip adductors, flexors, extensors, and lower trunk muscles; initiate balance/proprioceptive awareness training; aerobic/fitness training.
Femoral head **Fixation:** ➢ Screw fixation,	➢ Days 1-7 post stabilization: bilateral UE strengthening; quad/hamstrings isometrics, TKE; gentle AAROM hip; involved extremity	➢ Weeks 8-12: WBAT, wean from crutches/walker, gait retraining ➢ Week 12: strengthen quads, hamstring and hip

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hemiarthroplasty THA **Mobility /weight bearing** **Precautions:** ➢ Screw fixation- toe- touch weight bearing 8-12 weeks ➢ Hemiarthroplasty- no straight leg raises (SLR), TTWB, WBAT dependent on prosthesis/fixation (see femoral neck fracture)	knee, ankle AAROM; early mobilization/transfer and ambulation training. ➢ Weeks 2-11: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precautions	abductors; balance/ proprioceptive training; closed kinetic chain activities
<u>Femoral neck</u> **Fixation:** ➢ Screws, dynamic hip screw, endoprosthesis **Mobility/weight bearing** **Precautions:** ➢ Screws- TTWB involved side 8-12 weeks ➢ Dynamic hip screw, endoprosthesis- TTWB/WBAT as directed by M.D. ➢ <u>ROM precautions: anterior surgical approach</u>- avoid extreme hip extension, external rotation past neutral; no SLR 6-8 weeks. ➢ **<u>Posterior surgical approach</u>**- no hip flexion greater than 60°; avoid hip adduction, internal rotation past neutral; no SLR 6-8 weeks.	➢ Days 1-7 post stabilization: bilateral UE strengthening; knee, ankle AROM; quad/hamstring isometrics, TKE; gentle hip AAROM within precaution limitations; bed mobility, transfers, gait, body mechanics instructions. ➢ Weeks 2-5: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precautions ➢ Weeks 6-8: hip PROM; hip abductor isometrics.	➢ Week 8-12: WBAT, wean from crutches/walker, gait retraining ➢ Week 12: strengthen quads, hamstrings and hip abductors; balance/proprioceptive training; closed kinetic chain activities.

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FRACTURE	INITIAL THERAPY PROGRAM	ADVANCED THERAPY PROGRAM
Subtrochanteric femur **Intertrochanteric femur** **Fixation:** ➢ DHS, (Dynamic Hip Screw), blade plate, IM nail **Mobility Precautions:** ➢ DHS- TTWB; no SLR; no active hip abduction with blade-plate fixation	➢ Days 1-7: bilateral UE strengthening; knee, ankle AROM, quad/hamstring isometrics, TKE, gentle hip AAROM within precaution limitations, transfers, gait, body mechanics instructions ➢ Weeks 2-5: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precautions ➢ Weeks 6-8: hip PROM, hip abductor isometrics	➢ Weeks 8-12: WBAT, wean from crutches, gait retraining ➢ Week 12: strengthen quads, hamstrings and hip abductors, balance/ proprioceptive training, closed kinetic chain activities
Femoral shaft **Fixation:** ➢ IM nail ➢ dynamic vs. interlocked nail ➢ Nonlocked nail ➢ DCP **Mobility/weight bearing Precautions:** ➢ Interlocked nail/ plate TTWB 6-8 weeks ➢ Nonlocked nail-WBAT avoid hip internal and external rotation during mobilization ➢ Note: knee immobilizer,	➢ Preoperative: bilateral UE strengthening, unaffected LE strengthening, co-contraction quad/ hamstring sets on affected leg as fracture pattern/ soft tissue involvement allows, ankle AROM/ pumps bilaterally (especially affected leg) ➢ Day 1 postoperative: CPM (knee), quad sets, ankle pumps, IM nail exercise protocol ➢ Day 2 to discharge: increase CPM daily (10°-20°/day), goal: 90° ROM before D/C, quad/ hamstring sets, TKEs, SLR (progress to independent, encourage full knee extension), AAROM-AROM hip flexion, hip abductors/ adductors (gravity eliminated), AAROM, PROM	➢ Weeks 8-12: WBAT, wean from crutches, gait retraining ➢ Week 12: strengthen quads, hamstrings and hip abductors, balance/ proprioceptive training, closed kinetic chain activities

external support may be needed to allow early crutch training if quad control is slowly achieved; DCP fixation same as nail protocol	stretch to regain knee motion. ➢ Use of modalities (heat, ice). ➢ Weeks 2-8: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precautions	

FRACTURE	INITIAL THERAPY PROGRAM	ADVANCED THERAPY PROGRAM
Supracondylar, intracondylar femur **Fixation:** ➢ Condylar blade ➢ Condylar buttress plate ➢ Screws	➢ Day 1 post stabilization: bilateral UE strengthening, knee CPM, quad sets, hamstring sets, ankle AROM	➢ Weeks 8-12: WBAT, wean from crutches, gait retraining ➢ Week 12: strengthen quads, hamstrings and hip abductors, balance/ proprioception training, closed kinetic chain activities
Patella (non displaced, displaced) **Fixation:** ➢ Immobilization, cylinder cast, knee immobilizer ➢ Lag screws ➢ Tension band wiring	➢ Day 1: bilateral UE strengthening, ankle ROM, knee CPM post op if indicated ➢ Day 2 to discharge: quad /hamstring isometrics, knee AROM as fracture pattern allows, SLR (no active quads if quadriceps mechanisms involved or disrupted) ➢ Weeks 1-3: advance strengthening and mobility within limits of pain and weight bearing,	➢ Weeks 4-8: strengthening, progress knee AAROM, begin quad isometrics and SLR if there was quad mechanism involvement ➢ Week 8: WBAT, wean from crutches, concentrate on short arc/ end range, quadriceps strengthening, closed kinetic chain activities (i.e. cycling, partial squats, leg press), balance proprioceptive training

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Mobility/weight bearing **Precautions:** ➢ Stable: WBAT ➢ Unstable: TTWB 4-8 weeks	movement and ROM precautions	
<u>Tibial plateau</u> **Fixation:** ➢ Buttress T-plate ➢ DCP ➢ Screws **Mobility/weightbearing** **Precautions:** ➢ TDWB 8-12 weeks ➢ No TKE exercise (avoid excessive end range anterior tibial glide	➢ Immediate: bilateral UE strengthening, knee CPM post op, ankle AROM ➢ Day 2 to discharge: quad, hamstring isometrics, SLR, hip, knee/ AAROM ➢ Weeks 1-5: advance strengthening and mobility within limits of pain and weight bearing, movement and ROM precaution ➢ Weeks 6-12: TKE initiated	➢ Week 12: WBAT, gait progression, strengthening
FRACTURE	**INITIAL THERAPY PROGRAM**	**ADVANCED THERAPY PROGRAM**
<u>Tibial shaft</u> **Fixation:** ➢ IM nail reamed and	➢ Immediate: bilateral UE strengthening, ankle AROM, quad/ hamstring isometrics ➢ Weeks 1-5: advance strengthening exercises and mobility within limits of pain and weight	➢ Weeks 6-8: IM nail fixation- strengthening initiated ➢ Weeks 10-12: plate, screws, external fixation, strengthening initiated

undreamed, plates and screws, external fixator **Mobility/weight bearing Precautions:** ➢ IM nail-TTWB 6-8 weeks; plates and screws-TDWB 8-12 weeks; external fixator-NWB 8-12 weeks	bearing, movement and ROM precautions ➢ Day to discharge: hip, knee AROM, SLR, TKE	
<u>Ankle: Pilon fracture</u> **Fixation:** ➢ Screws and plates **Mobility/weight bearing Precautions:** ➢ NWB 12 weeks	➢ Immediate post stabilization: bilateral UE strengthening, gluteal, quad/ hamstring isometrics ➢ Day 2 to discharge: hip, knee, toe AROM, SLR, TKE ➢ Week 2: ankle subtalar AROM, progressive hip and knee strengthening ➢ Weeks 3-11: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Week 12: PROM initiated, strengthening, balance/proprioceptive awareness training, WBAT, wean from crutches, closed kinetic chain program
<u>Medial malleolus, posterior malleolus, lateral malleolus</u> **Fixation:** ➢ Screws, plates and tension-	➢ Same as Pilon fracture	➢ Weeks 8-10: gait progression after fracture healing, AROM/PROM ankle and subtalar joints, balance/ proprioceptive awareness training

band wiring **Mobility/weight bearing** **Precautions:** ➢ TDWB/NWB 8-12 weeks		
FRACTURE	**INITIAL THERAPY PROGRAM**	**ADVANCED THERAPY PROGRAM**
<u>Foot: Calcaneus</u> **<u>Extraarticular</u>** **<u>Intraarticular</u>** **Fixation:** ➢ Calcaneus- reconstruction plate ➢ Extraarticular- H-plate, lag screw ➢ Intraarticular- K- wires Mobility/weight bearing Precautions: ➢ NWB 12 weeks	➢ Preoperative: UE strengthening, uninvolved extremity strengthening, involved extremity hip, knee isometrics, crutch/ walker training for short distance (primary elevation of extremity) ➢ Day 1: UE strengthening, uninvolved extremity AROM/strengthening, involved extremity hip/ knee isometric, AROM, toe AROM to tolerance ➢ Days 2-3: crutch/ walker training, NWB involved extremity (involved extremity (limited time in dependent position) ➢ Days 4-7: early ankle, subtalar AROM when surgical incision is sealed ➢ Week 1 to month 3: continue early AROM ankle, subtalar, toes, gentle PROM toe dorsiflexion and plantarflexion, progress involved extremity, hip-knee conditioning	➢ Month 3: gradually increase weight bearing starting at 20 lbs to FWB over 1 month; gradually wean from assistive device as patient tolerates; pool therapy if available, gait training, re-education, desensitization techniques as needed, ankle subtalar AAROM, isometrics, low impact endurance training ➢ Month 4-6: gait progression, advanced balance and proprioceptive activities, ankle-subtalar isometric, isotonic strengthening with tubing/ theraband, no free weights, soft tissue immobilization ➢ Month 6: ankle, subtalar PROM, joint mobilization, isokinetic assessment, strength-endurance training, advance balance, gait training as indicated
<u>Talus</u>	➢ Same as calcaneus	➢ Same as calcaneus

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Fixation: ➢ Lag screws ➢ K- wires (rare) **Mobility Precautions:** ➢ NWB 12 weeks		
<u>Metatarsals and phalanx</u> **Fixation:** ➢ Screws, wires and pins **Mobility/weight bearing Precautions:** ➢ Closed reduction immobilization ➢ <u>(need to clarify with orthopedic surgeon):</u>	➢ Day 1 post-stabilization: bilateral UE strengthening, hip, knee, AROM, isometrics, ankle, subtalar, toe AROM as fracture pattern allows ➢ Weeks 1to 7: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Weeks 8-12: WBAT, wean from walker/ crutches, proprioceptive/ balance training, closed kinetic chain activities.
FRACTURE	**INITIAL THERAPY PROGRAM**	**ADVANCED THERAPY PROGRAM**
<u>Scapula- scapular body, acromion process, coracoid process, glenoid neck, glenoid fossa</u> **Fixation:** ➢ Reconstruction plates ➢ Tubular plates	➢ Days 1-5: shoulder pendulum exercises; elbow, forearm, wrist, hand AROM; grip strengthening ➢ Weeks 2-3: gentle PROM-AAROM shoulder; deltoid, rotator cuff isometrics ➢ Weeks 4-5: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions ➢ Weeks 6-8: AROM shoulder joint	➢ Stable- PROM/ strengthening as tolerated ➢ Unstable- strengthening at 3 months; progress to isometrics, surgical tubing and free weights.

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➢ Mini T-plates **Mobility/weight bearing** **<u>Precautions (need to clarify with orthopedic surgeon):</u>** ➢ Stable- WBAT ➢ Unstable- protected weight-bearing 2-3 months; no deltoid isometrics until 6 weeks post-stabilization; sling mobilization as needed	**If stable fracture pattern**: shoulder PROM-AAROM initiated 1 week post injury, ROM, strengthening progressed to tolerance	
FRACTURE	**INITIAL THERAPY PROGRAM**	**ADVANCED THERAPY PROGRAM**
<u>Proximal fractures- greater tuberosity, lesser tuberosity, surgical neck, anatomic neck</u> **Fixation:** ➢ Plate, wires (tension-band, K-wire), 2.5-mm Schanz pins, screws, external fixation, hemiarthroplasty (elderly patient) **Mobility/weight bearing**	➢ Day 1 post-stabilization: elbow, forearm, wrist, hand AROM; grip strengthening ➢ Days 2-5: pendulum shoulder exercises ➢ Weeks 1-3: early gentle AAROM shoulder joint mobility limitations; deltoid, biceps, triceps isometrics ➢ Weeks 3-6: AROM, gentle PROM shoulder ➢ Weeks 7-11: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Week 12: begin strenthening; progress to isometrics, free weights, isokinetics; scapular stabilization exercises are important.

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Precautions: ➢ NWB 8-12 weeks ➢ Immobilization with sling, abduction pillow, and splint 8-12 weeks		
<u>Humeral shaft</u> **Fixation:** ➢ DCP, locked IM nail **Mobility/weight bearing** **Precautions:** ➢ NWB 6-8 weeks ➢ Sling, splint, plaster immobilization ➢ NWB-WBAT as fracture pattern dictates	➢ Day 1 post stabilization: elbow, forearm, wrist, hand AROM, grip strengthening ➢ Days 2-5: pendulum shoulder exercises ➢ Weeks 1-3: early gentle AAROM shoulder joint within mobility limitations; deltoid, biceps, triceps isometrics ➢ Weeks 4-5: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions ➢ Weeks -6-9: add AROM, gentle PROM shoulder	➢ Weeks 10-12: strengthening ➢ Week 12: progression the same as for the proximal humerus
<u>Distal Humerus</u> **Fixation:** ➢ Reconstruction plates ➢ Tubular plates ➢ Screws ➢ Tension-band wire for olecranon osteotomy **Mobility/weight bearing** **Precautions:** ➢ NWB 8-12 weeks ➢ Plaster, splint immobilization	➢ Day 1 post stabilization: shoulder AAROM-AROM, wrist, hand AROM- CPM (elbow) as M.D. indicates ➢ Days 2-5: gentle elbow, forearm AROM; deltoid isometrics; grip strenthening ➢ Weeks2-7: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions ➢ Weeks 8-10: gentle PROM-AAROM elbow, forearm	➢ Weeks 10-12: strengthening ➢ Week 12: isokinetics

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FRACTURE	**INITIAL THERAPY PROGRAM**	**ADVANCED THERAPY PROGRAM**
Radius and Ulna- Olecranon **Fixation:** ➢ Tension-band wiring ➢ Screw, wire fixation **Mobility/weightbearing** **Precautions:** ➢ Protective plaster splinting 6 weeks ➢ NWB	➢ Days 1-7 post stabilization: early gentle AAROM-AROM forearm, elbow (initiated after 2-3 days); shoulder, wrist, hand AROM; grip strenthening ➢ Weeks 2-9: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Weeks 10-12: PROM; strengthening
Radial head **Fixation:** ➢ Closed reduction ➢ Mini-fragment screws ➢ Mini T-plates **Mobility/weightbearing** **Precautions:** ➢ Cast, splint, sling immobilization ➢ NWB	➢ Days 1-7 post stabilization: early elbow AROM, shoulder, wrist, hand AROM; grip strengthening ➢ Weeks 2-9: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Weeks 10-12: PROM; strengthening
Forearm- isolated radius,	➢ Days 1-5 post stabilization: immediate	➢ Weeks 10-12: PROM

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ulna-both bones, Monteggia Galeazzi **Fixation:** ➢ Closed reduction ➢ Plates ➢ Screws (rare) ➢ IM nail (rare) **Mobility/weightbearing** **Precautions:** ➢ Immobilization 8-12 weeks (cast splint) ➢ NWB 8-12 weeks	shoulder, hand AROM; early gentle AAROM forearm, elbow, wrist as fracture stability allows; grip strengthening ➢ Weeks 2-11: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Week 12: strengthening
FRACTURE	**INITIAL THERAPY PROGRAM**	**ADVANCED THERAPY PROGRAM**
Distal radius **Fixation:** ➢ Closed reduction ➢ External fixation ➢ ORIF **Mobility/weightbearing** **Precautions:** ➢ Immobilization 8-12 weeks (cast, removable splint) ➢ NWB 8-12 weeks	➢ Days 1-5 post stabilization: immediate AROM shoulder, elbow, fingers, initiation of gentle wrist AROM as immobilization allows (after cast removal then splint); grip strengthening ➢ Weeks 2-7: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Weeks 8-10: PROM; light activity ➢ Weeks 10-12: strengthening

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Wrist and Hand- carpal, MC, phalanx **Fixation:** ➢ Closed reduction ➢ Wires ➢ Mini plates **Mobility/weightbearing Precautions:** ➢ Cast, splint immobilization ➢ NWB-PWB **(weight limit specified by M.D.)** 8-12 weeks	➢ Days 1-5 post stabilization: early AROM-AAROM fingers, wrist, forearm as fracture and stabilization allow; elbow, shoulder AROM; fine motor control, desensitization techniques as indicated ➢ Weeks 2-7: advance strengthening exercises and mobility within limits of pain and weight bearing, movement and ROM precautions	➢ Weeks 8-10: PROM; light activity ➢ Weeks 10-12: strengthening

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This ORIF Protocol was peer reviewed and approved by the 2012 HTS orthopedic committee.

Jeff Baxter, PTA

Shaleen Bhatnagar, OTR

Lisa Jongkind, PT

Emily King, OTR

Irisa Kubala, PT

Kristina Matthews, PT

Dustin Patton, DPT

Lori Schlichter, PTA