

Adult Trauma Care Protocols

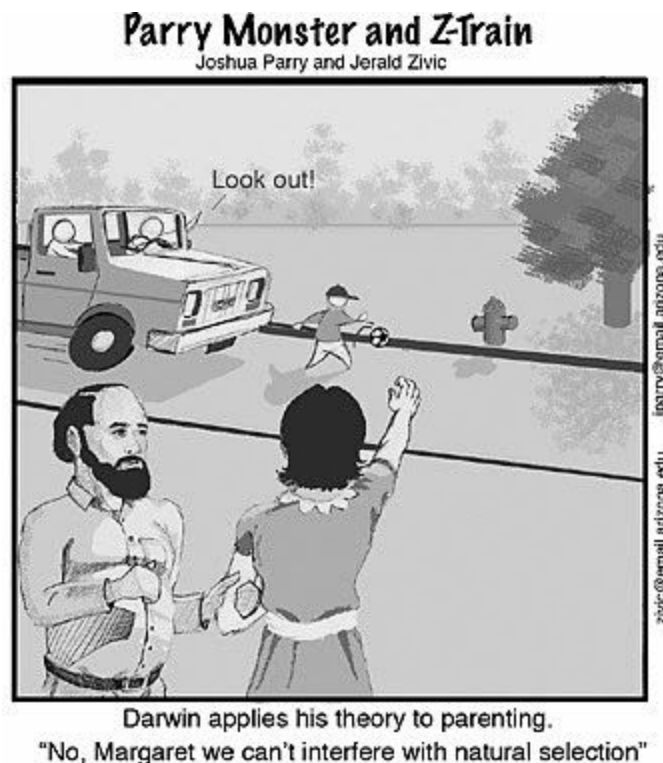
General Information	2
Pain Management	2
Antibiotics	2
Vitamin/Nutrition	2
Anticoagulation:	3
Follow Up	3
Outpatient Preferences	4
Surgical preferences	4
Injury Protocols	5
Clavicle Fractures	5
AC Joint Fracture-Dislocations	5
Scapula Fractures	5
Shoulder Dislocations	6
Proximal Humerus Fractures	6
Humeral Shaft Fractures	6
Distal Humerus Fractures	7
Olecranon Fractures	8
Radial Head Fractures	8
Elbow Fracture-Dislocations (Terrible triad, Coronoid etc.)	9
Radius/Ulna Shaft	9
Distal Radius	10
Pelvic Ring	10
Acetabular Fractures	11
Femoral Head Fractures/Hip Dislocations	12
Femoral Neck Fractures:	13
Intertrochanteric Fractures	13
Periprosthetic Proximal Femur Fractures	14
Femur Shaft Fractures	14
Distal Femur Fractures	15
Tibial Plateau Fractures	16
Quadriceps/Patellar Tendon Ruptures & Patella fractures	17
Tibial Shaft Fractures	17
Distal Tibia Pilon Fractures	18
Ankle Fractures:	19
Achilles Tendon Ruptures	20

Talus Fractures	20
Calcaneus Fractures	20
Midfoot Fracture-Dislocations	21
Metatarsal Fractures	22
Phalangeal Fractures	22
Below Knee Amputation	22
Above knee amputation	23

General Information

- **About this Document**

- Nothing is written in stone, this is a work in progress.
- Feel free to address things with me that seem peculiar (unwise) or edit things that are grossly in error.
- If you can find evidence-based guidelines or better care protocols please let me know as I am happy to adapt. Failure to evolve is death!



- **Pain Management**

- Postoperative:

- First line: Tylenol (1000 mg q6hr) + Oxycodone (5-10 mg q4hr).
Can consider PO dilaudid if Oxycodone is insufficient
 - PCA okay if needed, < 24 hours
 - Toradol okay as last resort, 15 mg IV q6hrs x 5 doses if CrCl okay.
- o Outpatient
 - Counsel patients that most patients are off narcotics by 2 weeks and that by 6 weeks we will not prescribe any further narcotics. If still requiring narcotics this must be handed off to a pain specialist if necessary
 - Tylenol 1000 mg q6hr until weaned off narcotics
 - Max prescription: #40 pills of 5 mg Oxycodone vs 2 mg Hydromorphone pills
 - At each refill request reiterate the above counseling
- **Antibiotics**
 - o Cefazolin per weight based protocol x 2 doses postop
 - o Clindamycin if allergic, send elective outpatients with history of allergy for skin testing (elective TKA/THA, non-unions only)
 - o Cefazolin and Vancomycin if known MRSA positive
 - o Antibiotics continue 24 hours after wound closure for open fracture cases
- **Vitamin/Nutrition**
 - o [All fracture patients \(operative and nonoperative\) get a prescription for 1 year of Vitamin D/Calcium 1600/1200 mg per day with recommendation to continue for life.](#)
 - o Hip fractures/malnourished/poor bone quality: add albumin, Vitamin D level first day post op
 - Follow up Vitamin D levels & replete if indicated
 - Initiate Vitamin D deficiency treatment and f/u with endocrinology if < 20
 - <12 ng/mL: Loading dose: Cholecalciferol 50,000 IU weekly x 8 weeks with maintenance PO dose
 - 13-19 ng/mL: Loading dose: Cholecalciferol 50,000 IU weekly x 5 weeks with maintenance PO dose
 - > 20 ng/mL: Maintenance PO dose
 - Low albumin: High protein diet and counseling
- **Anticoagulation:**
 - o Enteric Coated Aspirin 325 mg by mouth twice daily x 2 weeks if no hx of DVT, PE, Clotting disorder and one of the below diagnoses:
 - Nonoperative isolated upper/lower extremity fracture tx w/ immobilization
 - Primary uncomplicated THA/TKA
 - Surgically managed isolated UE or ankle/foot fracture

- Counsel patients on GI effects and prescribe Ranitidine 150 mg by mouth twice daily for GI prophylaxis
- o Lovenox 40 mg SQ once daily x 2 weeks
 - All patients with DVT risk factor (DVT, PE, Clotting disorder)
 - Isolated lower extremity fracture
 - Polytrauma (Two or more injured/immobilized limbs)
 - External fixation of lower extremity
- o Patients previously on oral anticoagulants (Warfarin, Eliquis):
 - Restart POD1
 - NO bridging with Lovenox unless Medical Service strongly recommends and this needs to be documented in chart
 - Use Orthopedic Warfarin protocol (goal INR 1.8-2.2) during hospitalization. May resume goal INR 2-3 at discharge

- **Follow Up**

- o Nonoperative fractures
 - Return for xrays at 2 weeks, 6 weeks, and 3 months, 6 months.
 - Most patients with immobilized fractures most will show sufficient healing at 6 weeks to d/c immobilization, however if there is minimal healing on xrays they should return at 9 weeks.
 - At 3 months if patient is healed and asymptomatic they may follow up as needed.
- o Operative fractures
 - Return at 2 weeks for suture removal only, then return for xrays at 6 weeks, 3 months, and 6 months. If healing and asymptomatic at 3 months may follow up as needed.
- o Elbows are the exception to the rule as they should return at 1 week to ensure immobilization is removed
- o Arthroplasties return at 2 weeks, skip the 6 week appt since no fx healing to assess, and return at 3 months, 1 year, and then need xrays reviewed every 5 years to monitor for implant loosening (along with outcome scores)
- o Outcome scores at 3 months, 6 months, 1 year, and 2 years
 - o Upper extremity: [Quick DASH](#)
 - o Pelvis Ring: [Majeed Pelvis Injury Score](#)
 - o Lower Extremity: [Lower Extremity Functional Scale](#)

- **Outpatient Preferences**

- o Documentation sufficient for level 3 coding for all patients, excluding those in the 90 day no-charge window postoperatively
- o Physical therapy
 - Resuming daily activities should be enough for most to restore motion/function over time.. PT prescriptions for home exercises for those struggling if patient has strong desire to do so.

- **Nonunion workup**
 - CBC with diff, Albumin, ESR/CRP, Vitamin D, TSH, PTH, Alk Phos, Calcium, Phosphorus

- **Surgical preferences**
 - No blocks for injuries at risk of compartment syndrome (forearm/tibia)
 - Tranexamic acid for all cases warranting postoperative hemoglobin (thus at risk of blood transfusion)
 - Suture
 - #0 Vicryl on fascia, 2-0 Vicryl subq, Staples
 - Exceptions:
 - 2-0 Nylons and steri-strips for Young females, open fracture wounds, Pilon, Calcaneus
 - PDS on infection wounds
 - #1 Ethibond for hip abductor reattachment, proximal humerus tuberosities

Injury Protocols

Clavicle Fractures

- **Workup:** Bilateral landscape view xrays to assess shortening
- **Operative Indications:** Open, at-risk skin/tenting, >2cm shortening in skeletally mature patients as measured on bilateral landscape view
- **Nonoperative**
 - *Motion:* Sling for comfort for no more than 2 weeks. Range of motion as tolerated
 - *Weight-bearing:* PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union
- **Operative**
 - *Case:*
 - 1 simple fracture line midshaft - Synthes superior clavicle plate
 - Any comminution, lateral fractures - Synthes distal locking clavicle plate
 - Supine on flat jackson
 - *Motion:* Sling for comfort for no more than 2 weeks. Range of motion as tolerated
 - *Weight-bearing:* PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union

AC Joint Fracture-Dislocations

- Same protocol as clavicle fractures
- Indications: Open, at-risk skin tenting, >100% displacement, irreducible dislocations (Type IV, V, VI)
- *Implant:* Synthes Hook Plate with removal at 6 months

Scapula Fractures

- **Workup:** CT with 3D recon for operative or questionable fractures
- **Operative Indications:** >4 mm glenoid articular displacement, > 20 degree deviation from anatomic glenopolar angle, severe scapular neck/body displacement >100% with concern for nonunion.
- **Nonoperative:** Vast majority treated nonoperatively.
 - *Motion:* Sling immobilization for 2 weeks then range of motion as tolerated
 - *Weight-bearing:* No heavy pushing/pulling/lifting until union
- **Operative:**
 - *Case:*
 - Synthes 2.7 Recon plates, Synthes mini frag plates
 - Lateral, bean bag, flat jackson
 - *Motion:* Sling immobilization for 2 weeks then range of motion as tolerated
 - *Weight-bearing:* PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union

Shoulder Dislocations

Proximal Humerus Fractures

- **Workup:**
 - Grashey, Scapular Y, and Axillary view (Axillary view rules out dislocation).
 - CT scan with 3D recons for operative cases
- **Operative indications:**
 - Open
 - > 5 mm displacement of greater tuberosity
 - Head splits or irreducible dislocations
 - > 75% displacement or >45 degree varus angulation of proximal fragment
 - Consider in young person with less displacement to facilitate better motion/recovery
- **Nonoperative** - Most fractures treated nonoperatively
 - *Motion:* Shoulder Immobilizer for 6 weeks with daily pendulums then range of motion as tolerated
 - *Weight-bearing:* PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union
- **Operative**
 - *Case:*
 - Fixable
 - Synthes Proximal Humerus Locking Plate
 - Supine, flat jackson, radiolucent armboard folded up
 - Head splint/Unfixable in ELDERLY patients (70+)
 - Biomet Reverse Shoulder
 - Beach Chair
 - *Motion:* Shoulder Immobilizer for 6 weeks with daily pendulums then range of motion as tolerated
 - *Weight-bearing:* PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union

Humeral Shaft Fractures

- **Workup:** Document nerve status pre and post reduction
- **Operative Indications:**
 - Open
 - Contraindications for bracing (at-risk skin, no muscle tone in brachial plexus injuries or comatose)
 - Floating elbow
 - > 30 degrees malalignment in any plane after reduction
 - Bilateral UE injuries to facilitate ADLs
 - Lower extremity injury that could be mobilized with crutches/walker if humerus
- **Nonoperative**

- *Motion*: Function splint brace applied in ER ([instructions](#)) Collar and cuff for comfort for no more than 2 weeks. Instruct on weekly over-wrapping of bandage to keep snug. Range of motion as tolerated with no abduction past 90 degrees until union
- *Weight-bearing*: PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union
- **Operative**
 - *Case*:
 - Proximal third:
 - Synthes Proximal Humerus Locking plate through anterolateral approach
 - Supine, Flat Jackson, radiolucent armboard folded up
 - Middle third
 - Narrow 4.5 synthes plate through posterior lateral triceps sparing approach
 - Lateral on flat jackson, bean bag, overhead armboard
 - Distal third
 - Synthes J-plate through posterior lateral triceps sparing approach
 - Lateral on flat jackson, bean bag, overhead armboard
 - Ballistic Injuries/Pathologic fx
 - Stryker T2 Humeral Nail
 - Supine, Flat Jackson, radiolucent armboard folded up
 - *Motion*: Sling for comfort for no more than 2 weeks than range of motion as tolerated with no abduction past 90 degrees until union
 - *Weight-bearing*: PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union

Distal Humerus Fractures

- **Workup**:
 - Document nerve status pre/post reduction.
 - CT scan w/ 3D reformat for comminuted fx,
- **Operative Indications**:
 - Open, at-risk skin
 - > 2 mm joint displacement
 - >30 degree angulation in any plane post reduction
- **Nonoperative** - consider for nondisplaced, unfit for surgery, or unreconstructable
 - *Motion*: Sling for comfort for no more than 1 week than range of motion as tolerated with no abduction past 90 degrees until union
 - *Weight-bearing*: PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union
- **Operative**
 - *Case*:
 - 1 simple fracture line

- Synthes Distal Humerus Parallel Plating through Paratricipital approach
 - Two fracture lines or any comminution:
 - Synthes Distal Humerus Parallel Plating through Olecranon osteotomy, synthes olecranon plate vs 6.5 partially threaded screw w/ washer
 - Lateral on flat jackson, bean bag, overhead armboard
- *Motion*: Sling for 1 week for wound healing than range of motion as tolerated with no abduction past 90 degrees until union
- *Weight-bearing*: PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union

Olecranon Fractures

- **Workup:**
 - CT scan w/ 3D reformat for comminuted fx
 - Document nerve status pre/post reduction
- **Operative Indications:**
 - Open
 - > 2 mm joint displacement
- **Nonoperative**
 - *Motion*: Sling for comfort for no more than 1 week than range of motion as tolerated with no abduction past 90 degrees until union
 - *Weight-bearing*: PWB (coffee cup weight bearing) with no heavy pushing/pulling/lifting until union
- **Operative**
 - *Case*
 - Synthes olecranon plate with mini frag if comminuted, can consider 6.5 partially threaded screw if simple
 - Lateral on flat jackson, bean bag, overhead armboard
 - *Motion*: Sling for 1 week for wound healing than range of motion as tolerated with no abduction past 90 degrees until union
 - *Weight-bearing*: NWB until union

Radial Head Fractures

- **Workup:**
 - CT scan w/ 3D reformat for comminuted fx
 - Document nerve status
- **Operative Indications:**
 - Open
 - > 2 mm joint displacement
 - Catching/locking
- **Nonoperative**
 - *Motion*: Sling for comfort for no more than 1 week than range of motion as tolerated with no abduction past 90 degrees until union

- *Weight-bearing*: NWB until union
- **Operative**
 - *Case*
 - at least 2 pieces that can be reconstructed into a stable articulation: Synthes 2.4, 3.0 Headless compression screws, mini frag, Kaplan approach
 - 3 or more pieces: Skeletal dynamics radial head replacement
 - Supine, Standard OR table, radiolucent hand table
 - *Motion*: Sling for comfort for no more than 1 week then range of motion as tolerated with no abduction past 90 degrees until union
 - *Weight-bearing*: NWB until union

Elbow Fracture-Dislocations (Terrible triad, Coronoid etc.)

- **Workup:**
 - Document nerve status
 - 3D CT recons for operative cases
- **Operative Indications:**
 - > 2 mm joint displacement
 - Unable to reduce
 - Losses reduction with range of motion
- **Nonoperative:**
 - *Motion*: Sling for comfort for no more than 1 week then range of motion as tolerated
 - *Weight-bearing*: NWB until union
- **Operative:**
 - *Case*:
 - For radial head/olecranon fractures see those sections
 - Coronoid fractures: Synthes small frag, mini frag
 - Suture anchors for lateral collateral ligament repair
 - Supine, Standard OR table, radiolucent hand table
 - *Motion*: Sling for comfort for no more than 1 week then range of motion as tolerated
 - *Weight-bearing*: NWB until union

Radius/Ulna Shaft

- **Workup:**
 - Document nerve status
- **Operative Indications:**
 - Open
 - Any displacement
- **Nonoperative**
 - *Motion*: Sugar-tong splint for two weeks then muenster cast until union.
 - *Weight-bearing*: NWB until union
- **Operative**
 - *Case*:

- Shaft fractures - Synthes 3.5 small frag
- Distal radial shaft - Synthes metadiaphyseal plate if unable to get three screws distal with standard LCP
- Distal Ulna - Synthes tapered metaphyseal plate if must plate to distal tip of ulna
- Supine, Standard OR table, radiolucent hand table, 12 inch C-arm so can assess radial bow/alignment
- *Motion*: Range of motion as tolerated in soft dressing
- *Weight-bearing*: NWB until union

Distal Radius

- **Workup:**
 - Check median nerve pre and post reduction/surgery
- **Indications:**
 - > 2 mm articular step off, 3 mm shortening, 10 degrees or more of dorsal tilt after reduction
- **Nonoperative**
 - *Motion*: Volar splint for 2 weeks then short arm cast until union
 - *Weight-bearing*: NWB until union
- **Operative**
 - *Implant*:
 - Synthes Volar Locking Plate for a majority. Must be able to get two screws in each fragment. Synthes dorsal bridge plate otherwise (to 2 MC)
 - If open and grossly contaminated consider Stryker Small External Fixator
 - Supine, Standard OR table, radiolucent hand table
 - *Motion*: Volar splint for 2 weeks then range of motion as tolerated
 - *Weight-bearing*: NWB until union

Pelvic Ring

- **Workup:**
 - Pelvic Binder for displaced APCs
 - Apply 15 lbs traction if vertical instability present (skin traction if operating in 24 hours, distal femur skeletal traction if it will be delayed > 24 hours)
 - CT 3D recons
 - Urine analysis in all patients. If RBC > 25 they need a CT cystogram to rule out bladder injury as this guides whether or not we put hardware inside
 - Stable-appearing APC 1/LC1/LC2 injuries require stress exams
 - Attempt awake stress exam if patient can tolerate it otherwise they need an exam under anesthesia
 - Exception - LC1 injuries with [incomplete sacral fractures \(in either sagittal or coronal plane\) with unilateral rami fractures do not need stress exam as these should not displace](#)

- Considered unstable if > 1 cm displacement on stress
- **Operative Indications:**
 - o Open
 - o Rotationally and vertically unstable injuries
- **Nonoperative:**
 - o *Motion:* As tolerated
 - o *Weight-bearing:*
 - APC - TWB
 - LC w/ complete sacral fracture- TWB
 - LC w/ incomplete sacral fracture - WBAT
- **Operative:**
 - o *Case:*
 - LC
 - Synthes External fixator and cannulated 6.5/7.3 partially threaded screws in transiliac transsacral mode
 - If patient has more than 10 cm (knuckle deep) of fat between the outside world and the AILS (whether it be on CT or exam) - Medtronic Infix
 - APC
 - Synthes four hole pubic symphysis plate and cannulated 6.5/7.3 partially threaded screws in SI mode
 - If bladder injury present will need synthes ex fix instead of plates to avoid infection
 - Damage control
 - Synthes External fixator
 - As a general rule - 1 screw posteriorly if rotationally unstable, 2 if vertically
 - Supine, Flat Jackson, 12 inch C-arm
 - o Postoperative CT scan
 - o *Motion:* As tolerated. Ex fix off at 6 weeks
 - o *Weight-bearing:* TWB on injured side until union. If bilateral injuries they must be NWB

Acetabular Fractures

- **Workup:**
 - o Document nerve status
 - o 3D CT scan
 - o Nearly all OPERATIVE acetabular fractures should be placed into distal femoral traction with a 5/64th Steinmann pin (skinny wire) and traction bow. Skin traction okay if going to OR within 24 hours. Post-traction xrays to confirm traction is sufficient.
 - o Post reduction CT scan if joint reduction performed
- **Operative Indications:**
 - o Open
 - o Unstable or incongruent hip joint
 - o Intraarticular loose bodies on CT
 - o > 2 mm joint displacement

- If elderly, frail, or preexisting hip arthritis as long as the femoral head is relatively stable in the space below the hip this can be managed conservatively with a delayed THA after it has healed
- **Nonoperative**
 - *Motion:* As tolerated
 - *Weight-bearing:* TWB for 12 weeks
- **Operative**
 - *Case:*
 - Posterior wall, column, or transverse
 - Two Synthes Pelvic Recon plates, small frag for small lateral wall pieces
 - Kocher approach in lateral position, bean bag, flat jackson, Cell Saver, Blood
 - Anterior column/PHT, both column
 - Stryker suprapectineal plate, pelvic recon plates, Stryker cannulated 6.5 / 8.0 partially threaded screws
 - Supine on flat jackson, head lamps, Cell Saver, Blood, Anterior intrapelvic approach +/- lateral window
 - Postoperative CT scan to ensure no intraarticular hardware or loose bodies
 - Radiation HO prophylaxis within 72 hour for kocher approach in men and those with head trauma
 - *Motion:* As tolerated
 - *Weight-bearing:* TWB for 12 weeks

Femoral Head Fractures/Hip Dislocations

- **Workup:**
 - 3D CT scan
 - Nearly all OPERATIVE fractures should be placed into distal femoral traction with a 5/64th Steinmann pin (skinny wire) and traction bow. Skin traction okay if going to OR within 24 hours. Post-traction xrays to confirm traction is sufficient.
 - Post reduction CT scan if joint reduction performed
- **Operative Indications:**
 - Open
 - Unstable or incongruent hip joint
 - Intraarticular loose bodies on CT
 - > 2 mm joint displacement
 - If elderly, frail, or preexisting hip arthritis as long as the femoral head is relatively stable in the space below the hip this can be managed conservatively with a delayed THA after it has healed
- **Nonoperative:**
 - *Motion:* As tolerated
 - *Weight-bearing:* TWB for 12 weeks
- **Operative:**
 - *Case:*
 - Synthes 4.5, 6.5 headless compression screws.

- Consider 2.4, 3.0 headless compression for smaller pieces.
 - Supine on flat jackson. Smith-pete anterior approach
- *Motion*: As tolerated
- *Weight-bearing*: TWB for 12 weeks

Femoral Neck Fractures:

- **Workup:**
- **Operative Indications:**
 - incomplete or complete fracture in someone medically fit for surgery
- **Nonoperative:**
 - *Motion*: As tolerated
 - *Weight-bearing*: TWB for 12 weeks
- **Operative:**
 - *Case*:
 - Nondisplaced
 - Synthes 7.3 Cannulated Screws, 6.5 if small stature requires it
 - Supine, Fracture Table, Consider dual c-arms if available
 - High energy, high pauwels angle in young/middle aged
 - [Synthes 7.3 Cannulated Screws, Small frag 2.7 medial buttress plate](#) ([strongest](#) construct)
 - Supine, Flat Jackson, anterior approach
 - Displaced femoral neck > 55 years
 - Lucid community ambulators get THA, otherwise hemiarthroplasty
 - Zimmer Advocate cemented collared stem for Dorr C femurs
 - Zimmer Avenir uncemented stems and Dorr A/B
 - Lateral, Pegboard, Regular OR table, anterolateral harding approach
 - *Motion*: As tolerated
 - *Weight-bearing*: TWB for ORIF until union, WBAT for arthroplasty

Intertrochanteric Fractures

- **Workup:**
 - isolated greater trochanter fracture need a CT scan. high incidence of of fractures extending into neck/basicervical region
- **Operative Indications:**
 - Incomplete or complete fracture in someone medically fit for surgery
- **Nonoperative:** (mostly reserved for isolated greater trochanter fx and the medically unfit)
 - *Motion*: As tolerated
 - *Weight-bearing*: TWB
- **Operative:**
 - *Case*:
 - Minimally displaced stable intertrochs - Synthes DHS 2 hole
 - Most displaced intertrochs - Short gamma nail
 - 3 cm or more of extension below lesser troch - Long nail

- Supine, fracture table
- *Motion*: As tolerated
- *Weight-bearing*: WBAT

Periprosthetic Proximal Femur Fractures

- **Workup:**
 - CT
- **Operative Indications:**
 - Isolated GT fracture > 2 cm displacement
 - Vancouver B/C fractures in patient medically stable for surgery
- **Nonoperative:** (mostly reserved for isolated greater/less trochanter fx and the medically unfit)
 - *Motion*: As tolerated
 - *Weight-bearing*: TWB until union
- **Operative:**
 - *Case*:
 - Isolated GT > 2 cm displaced
 - [Synthes greater trochanter claw](#)
 - Lateral, Bean bag
 - Fracture around or below stable stem (Van B1, C)
 - Synthes 4.5 curved LCP plate vs 4.5 condylar plate if need to extend distally, Synthes cables
 - Lateral, Bean bag, cell saver, blood
 - Fracture around unstable stem
 - Biomet Arcos Fluted Tapered Modular Stem, Cables, Posterior approach
 - If insufficient diaphyseal bone stock - Stryker GMRS proximal femur replacement
 - Lateral, peg board, flat jackson, C-arm, cell saver, blood available
 - *Motion*: As tolerated
 - *Weight-bearing*: TWB for 6 weeks

Femur Shaft Fractures

- **Workup:**
 - Evaluate CT for femoral neck fracture!
 - Lactate < 2.5 or trending down
- **Operative Indications:**
 - Fracture in patient medically stable for surgery
- **Nonoperative:**
 - *Motion*: As tolerated
 - *Weight-bearing*: WBAT
- **Operative:**
 - *Case*:
 - Fracture two cortical diameters below lesser trochanter
 - Retrograde Stryker T2
 - Supine, Flat Jackson, Triangle, 2 interlocks proximal/distal

- Faster than antegrade (no fracture table setup) and for subtrochs the reduction is easier
- Fracture within two diameters of lesser trochanter
 - Antegrade Stryker T2 in recon mode in young patients with good bone, Gamma in the elderly or osteoporotic,
 - Recon mode screws can be time consuming, gamma is straight forward but in good bone can cause heat necrosis from larger diameter screw
 - Supine, fracture table, 2 interlocks distally
- Fracture with ipsilateral femoral neck
 - Antegrade Stryker T2 in recon mode, Stryker 6.5, 8.0 Partially threaded cannulated screws, 2.7 plate
 - If neck is displaced - sloppy lateral, flat jackson, direct anterior approach for reduction
 - If neck nondisplaced - supine, fracture table
 - 2 interlocks distally
- Intraop must double check: Femoral neck on internal rotation view, knee stability, length, rotation
- *Motion*: As tolerated
- *Weight-bearing*: WBAT. For neck/shaft - TWB until neck union

Distal Femur Fractures

- **Workup:**
 - 3D CT, must rule out hofa fracture
- **Operative Indications:**
 - Displaced fractures
 - Intraarticular displacement > 2mm
 - If they have severe knee arthritis or non ambulatory consider nonop
- **Nonoperative:**
 - *Motion*: As tolerated. If unstable hinged knee brace for 6 weeks
 - *Weight-bearing*: NWB for 12 weeks if joint involvement, otherwise until union
- **Operative:**
 - *Case*:
 - Able to reconstruct stable articular block with lag screws allowing at least two distal interlocks
 - Stryker T2 Supracondylar Nail, 6.5 and 4.0 partially threaded cannulated screws
 - Supine, Flat jackson, Triangle, if open reduction necessary through [Swashbuckler approach](#)
 - Unable to reconstruct with lag screws
 - Synthes distal femur variable angle plate (10 hole for most distal femurs)
 - Supine, Flat jackson, bone foam ramp, Swashbuckler approach
 - Periprosthetic fracture with stable implant, open box, and able to get at least two distal interlocks
 - Stryker T2 SCN nail, metal cutting burr

- Supine, Flat jackson, Triangle, Swashbuckler approach if open reduction needed
 - o the midline incision is helpful if implant turns out to be loose and revision arthroplasty necessary
- Periprosthetic fracture with stable implant and closed box or too distal for two interlocks through nail
 - Synthes distal femur variable angle plate (10 hole for most distal femurs)
 - Supine, Flat jackson, bone foam ramp, Minimally invasive plate osteosynthesis through small lateral incision if open reduction not necessary otherwise swashbuckler approach
- Periprosthetic fracture with unstable implant in a well functioning ambulatory edlerly patient
 - Zimmer segmental system Distal Femur Replacement
 - Supine, flat jackson, sand bag, medial parapatellar approach
- o Examine knee stability postop
- o *Motion:* As tolerated. If unstable, hinged knee brace for 6 weeks
- o *Weight-bearing:*
 - NWB for 12 weeks for ORIF of articular surface
 - TWB until union for extrarticular ORIF or nailing
 - WBAT for DFR

Tibial Plateau Fractures

- **Workup:**
 - o 3D CT scan
 - o If concern for compartment syndrome needs serial exams
- **Operative Indications:**
 - o Unicondylar plateau fractures with > 3 mm articular displacement, > 5mm condylar widening, or varus/valgus instability
 - o Displaced Medial/Bicondylar Plateaus
- **Nonoperative:**
 - o *Motion:* As tolerated
 - o *Weight-bearing:* NWB for 12 weeks
- **Operative:**
 - o *Case:*
 - Significant swelling, bruising in operative fracture
 - Stryker Hoffman knee spanning external fixator with definitive fixation at 2 weeks
 - Dual fasciotomies if concern for compartment syndrome with placement of wound vac. Return at day 5-7 for closure of medial side, skin grafting of lateral side if unable to close
 - Supine, flat jackson, bone foam ramp
 - Unicondylar or bicondylar where all proximal raft screws will purchase medial fragment
 - Synthes Lateral Proximal Tibia Variable Angle Plate
 - Supine, flat jackson, hip bump, bone foam ramp
 - Medial condylar fragments requiring open reduction and/or unable to be fixed with lateral plate

- Synthes posteromedial proximal tibial plate vs 4.0 partially threaded cannulated screws
 - Supine, flat jackson, No hip bump, bone foam ramp
- Isolated large medial column fractures with lateral extension
 - Synthes posteromedial proximal tibial plate
 - Prone, flat jackson
- Get contralateral tibial plateau xray prior to prepping for comparison purposes
- o *Motion*: As tolerated. If less than 90 degrees of flexion at 6 weeks consider MUA
- o *Weight-bearing*: NWB for 12 weeks

Quadriceps/Patellar Tendon Ruptures & Patella fractures

- **Workup**:
 - o Document if extensor mechanism is intact (unable to extend knee from flexed position)
- **Operative Indications**:
 - o Disrupted extensor mechanism
- **Nonoperative**:
 - o *Motion*: Hinged knee brace locked in extension for 2 weeks then non-weight bearing range of motion from 0-90 degrees until 6 weeks postop. If not at 90 degrees by 6 weeks may consider MUA.
 - o *Weight-bearing*: WBAT with knee brace locked in extension for 6 weeks.
- **Operative**:
 - o *Case*:
 - Quadricep Tendon
 - 2.5 drill, #5 Fiberwire, suture passer, hinged knee brace
 - Supine, flat jackson, bone foam ramp
 - Patella fractures
 - Synthes 4.0 partially threaded cannulated screws, Suture passer, [#5 Fiberwire for tension band with modified wagoners knot](#)
 - If unable to reconstruct proximal 50% of patella with 4.0 screws have synthes mini frag plates available.
 - If unable to reconstruct distal 50% of patella with 4.0 screws perform partial patellectomy
 - Supine, flat jackson, bone foam ramp
 - Patellar tendon
 - 2.5 drill, #5 fiberwire, suture passer, hinged knee brace
 - Supine, flat jackson, bone foam ramp
 - o *Motion*: Hinged knee brace locked in extension for 2 weeks for wound healing then may work on non-weight bearing range of motion from 0-90 degrees with no active extension for 6 weeks postop. If not at 90 degrees by 6 weeks may consider MUA.
 - o *Weight-bearing*: WBAT with knee brace locked in extension for 6 weeks.

Tibial Shaft Fractures

- **Workup**:

- o If concern for compartment syndrome needs serial exams
- **Operative Indications:**
 - o Displaced fracture in patients fit for surgery
- **Nonoperative:** (nondisplaced fractures, medically unfit, nonambulator)
 - o *Motion:* Long leg splint for 2 weeks followed by patellar tendon functional brace until union
 - o *Weight-bearing:* NWB until union
- **Operative:**
 - o *Case:*
 - Suprapatellar Stryker T2 Tibial Nail
 - Two medial interlocks proximally/distally
 - Periprosthetic tibial shaft fractures or fractures too proximal or distal for two interlocks
 - More proximal - MIPO with synthes lateral proximal tibial variable angle plate
 - More distal - MIPO with synthes medial distal tibia variable angle plate
 - o *Motion:* As tolerated
 - o *Weight-bearing:* WBAT for nail, TWB until union for ORIF

Distal Tibia Pilon Fractures

- **Workup:**
 - o CT
- **Operative Indications:**
 - o Unstable - shortened, angulated, or displaced
 - o > 2mm articular displacement
- **Nonoperative:** (consider in nondisplaced, medically unfit, or patients with high risk of skin complications: diabetes/vasculopathies/smokers/lymphedema)
 - o *Motion:* Short leg splint for 2 weeks then short leg cast until union
 - o *Weight-bearing:* NWB for 12 weeks for articular involvement, TWB until union for extraarticular
- **Operative:**
 - o *Case:*
 - Significant swelling of skin bruising in length unstable fracture that require open reduction
 - Ankle spanning fixator with Stryker Hoffman external fixator x 2 weeks then fixation
 - Does not require open reduction and able to get two distal interlocks
 - Stryker suprapatellar T2 tibial nail and 4.0 partially threaded cannulated screws
 - Requires open reduction
 - Synthes distal tibia plates, anatomic distal fibula plate
 - Unreconstructable (> 50% of joint unreconstructable)
 - [Synthes Anterior Ankle Fusion Plate](#), Synthes 6.5 partially threaded cannulated screws
 - Stryker T2 Hindfoot Nail for Low demand / diabetic / neuropathic/ unable to comply with NWB

- Supine, radiolucent end table, bone foam ramp (block for hindfoot nails)
- *Motion*: Short leg splint for 2 weeks then begin non-weight bearing range of motion. Cam-boot when ambulating until 6 weeks
- *Weight-bearing*: NWB for 12 weeks

Ankle Fractures:

- **Workup:**
- Gravity or manual stress xray in ER or at first appointment
- If stable → Okay to WBAT in CAM boot
- If unstable → reduction, splint, f/u in clinic (If reduction is stable and skin at risk need urgent surgery)
- **Operative Indications:**
 - Displaced medial malleolus
 - Unreduced mortise
 - Any lateral talar shift
 - > 2 mm articular step off at posterior malleolus or posterior subluxation talus
- **Nonoperative:** (consider in very elderly/unfit/at-risk of wound healing -smokers/diabetics/vasculopaths/lymphedema)
 - *Nondisplaced/Good soft tissue* - WBAT in camboot until union
 - *Displacement/Poor soft tissue* - NWB in Short leg splint for two weeks than short leg cast total contact cast until union.
- **Operative:**
 - *Case:*
 - Medial Malleolus
 - Synthes 4.0 partially threaded cannulated screws
 - Synthes 1/3 tubular antiglide plate for vertical shear patterns
 - Lateral Malleolus
 - Synthes distal fibular locking plate for distal fractures
 - Two quadricortical syndesmotic screws for syndesmotic injuries
 - If syndesmotic injury without fibular fracture, place screws through a 2-hole 1/3 tubular plate of fibula
 - This helps centralize screws on fibula, preventing cutting out of cortex by being too anterior or posterior
 - Supine, bone foam block, hip bump, get contralateral mortise and stress prior to prepping xrays
 - Posterior malleolus
 - In ankle fracture-dislocations where the talus dislocated posteriorly with associated displaced posterior malleolus fracture like to fix. I think this avoids the need for syndesmotic screws as it fixes PITFL
 - Synthes small frag T-plate
 - Prone, radiolucent diving board table, get contralateral mortise and stress xrays prior to flipping
 - *Motion*: Short leg cast for 2 weeks then begin non-weight bearing range of motion and Cam walker boot for ambulating for 6 weeks

- *Weight-bearing*: NWB for 6 weeks. Continue for 12 weeks in diabetics/neuropathics

Achilles Tendon Ruptures

- **Workup:**
- **Operative Indications:**
 - Open
- **Nonoperative:** Nearly all be treated nonoperative, especially smokers/diabetics/frail/elderly
 - *Protocol:*
 - Initial - Non-weight bearing in Cam walker boot with 2 cm heel lift (20 degree plantarflexion) at all times
 - 2 weeks - Protected weight bearing with crutches. May remove boot for range of motion as tolerated with no resistance when not ambulating
 - 6 weeks - Heel lift removed from boot, weight bearing as tolerated, progressive range of motion against resistance
 - 3 months - Cam boot is discontinued.
 - 6 months - Return to full activities at 6 months once full strength and motion return.
- **Operative:**
 - *Case:*
 - Prone, radiolucent end table,
 - #2 fiberwire [giftbox technique](#)
 - Same protocol as nonoperative management

Talus Fractures

- **Workup:**
 - 3D CT
- **Operative Indications:**
 - > 2 mm displacement
- **Nonoperative:**
 - *Motion*: Short leg splint for 2 weeks, then short leg cast until union
 - *Weight-bearing*: Non-weight bearing until union then WBAT
- **Operative:**
 - *Case:*
 - [Styker Talus Plate, 4.0 headless compression cannulated screws](#)
 - Supine, radiolucent end table, bone foam block, med/lateral approaches
 - *Motion*: Short leg splint for 2 weeks then cam walker boot until 6 weeks. Range of motion with no resistance begins at 2 weeks
 - *Weight-bearing*: NWB until union then WBAT

Calcaneus Fractures

- **Workup:**
 - Displaced tongue type fractures put the skin at risk and are an orthopaedic emergency

- o 3D CT
- **Operative Indications:**
 - o Displaced Tongue-type fractures
 - o >2 mm articular displacement
 - o Contraindications to ORIF -
Smokers/Diabetics/Neuropaths/Nonambulatory/Medically unfit
- **Nonoperative:**
 - o NWB in short leg splint for 2 weeks then short leg cast for 3 months for articular involvement, until union for nonarticular involvement.
- **Operative:**
 - o Significant swelling or bruising requires 2 weeks of immobilization in short leg splint prior to surgery
 - o Case
 - Tongue type
 - Synthes 6.5 partially threaded cannulated screws
 - Supine, radiolucent end table, bone foam block
 - Sanders Type 2
 - Synthes Sinus tarsi plates, 4.5 and 6.5 headless compression screws
 - Lateral, bean bag, Supine, radiolucent end table, calcaneus bone foam block, Sinus Tarsi approach
 - Reconstructable Sanders Type 3
 - [Synthes calcaneal 2.7 variable angle plate](#), 4.5 and 6.5 headless compression screws
 - Lateral, bean bag, Supine, radiolucent end table, calcaneus bone foam block, Lateral extensile approach
 - Unreconstructable or Sander Type 4
 - Synthes Sinus tarsi plates, 4.5 and 6.5 headless compression screws
 - Lateral, bean bag, Supine, radiolucent end table, calcaneus bone foam block, Sinus Tarsi approach for acute fusion
 - o *Postoperative:*
 - Short leg splint for 2 weeks followed by a Cam walker boot until 12 weeks. Range of motion starts at 2 weeks
 - NWB for 12 weeks

Midfoot Fracture-Dislocations

- **Workup:**
 - o 3D CT
 - o Weight bearing stress photos if concern for Lis Franc injury
- **Operative Indications:**
 - o Open
 - o Unstable fracture-dislocations
 - o >2mm on stress exam
 - o > 2 mm articular displacement
- **Nonoperative:**

- NWB in short leg splint for 2 weeks then short leg cast for 3 months for articular involvement or ligamentous instability, or until union for nonarticular stable fractures.
- **Operative:**
 - **Case**
 - Synthes 4.5 headless compression screws
 - If too comminuted to be stabilized by multiple screws - Synthes variable angle 2.4/2.7 midfoot plates
 - Supine, radiolucent end table, radiolucent triangle
 - **Postoperative:**
 - Short leg splint for 2 weeks followed by a Cam walker boot until 12 weeks. Range of motion starts at 2 weeks
 - NWB for 12 weeks

Metatarsal Fractures

- **Workup:**
- **Operative Indications:**
 - Open fractures
 - Displaced 1st MT
 - Multiple displaced lesser MT fractures
 - > 2mm articular displacement
 - Irreducible MTP joints
- **Nonoperative:**
 - NWB in hard-sole postop shoe until union then WBAT
- **Operative:**
 - **Case**
 - K-wires. Synthes forefoot plates if extensive comminution
 - 4.5 headless compression screws for Jones fracture
 - Supine, radiolucent end table, radiolucent triangle
 - NWB in hard-sole postop shoe until union then wires pulled and WBAT.

Phalangeal Fractures

- **Workup:**
- **Operative Indications:**
 - Open fracture
 - > 2mm intra-articular displacement
 - Irreducible dislocations
 - Malrotation/angulation of 1st PP
- **Nonoperative:**
 - NWB in hard-sole postop shoe until union then WBAT
- **Operative:**
 - **Case**
 - K-wires. Synthes mini frag
 - Supine, radiolucent end table, radiolucent triangle
 - NWB in hard-sole postop shoe until union then wires pulled and WBAT.

Below Knee Amputation

- Postop Splint for 2 weeks, return to clinic, remove sutures if okay, if not follow up in 2 more weeks for removal. Shrinker stump socks start after suture removal. Set up PMR appointment
- 6 weeks - Return for wound exam, prescription to see prosthetist/PM

Above knee amputation