OHSU Department of Orthopaedics and Rehabilitation

Rotation Specific Objectives for Resident Education

Rotation: Trauma Resident year-in-training: PGY1, PGY2, PGY5

Attending Physicians:

1. **Darin Friess, M.D.**
   Orthopedic Surgeon, ABOS Board Certified
   Fellowship: Trauma

2. **Zachary Working, M.D.**
   Orthopaedic Surgeon, ABOS Board Eligible
   Fellowship: Trauma

3. **Adam Mirarchi, M.D.**
   Orthopaedic Surgeon, ABOS Board Certified
   Fellowship: Hand & Upper Extremity Surgery
   Certificate of Added Qualification (CAQ) Hand

4. **James Meeker, M.D.**
   Orthopaedic Surgeon, ABOS Board Certified
   Fellowship: Foot & Ankle; Trauma

Primary Objective:
Surgical and medical training related to orthopedic trauma. This is to include, but not be limited to, the initial work-up and triage of patients with acute injuries from trauma and post trauma sequelae. At the end of the rotation, the trainee will be able to conduct a history and physical in the initial evaluation of urgent orthopaedic trauma and manage these patients on the ward in the peri-operative period. In addition, the trainee will understand post trauma and post operative sequelae including nonunion and malunion of fractures.

Educational Philosophy:
The principal goal of the orthopaedic trauma service at OHSU is to familiarize orthopaedic residents with the management of orthopaedic injuries from acute trauma. Most often this trauma is secondary to motor vehicle crashes and gunshot wounds. An understanding of which injuries need surgical management and an understanding of appropriate nonoperative management of other injuries is mandatory. Furthermore, the resident should understand varying methods of failure (infection, nonunion, malunion, loosening, etc) and appropriate algorithms of management.

Rotation Expectations and Opportunities

The Orthopaedic Residents will work primarily with a Traumatologist. They will also spend time with an upper extremity surgeon and a foot and ankle surgeon. The PGY1 is primarily responsible for ED and floor consults from 6am to 6pm, ***and should make every effort to come to the OR as often as time allows***. One PGY2 is on night float, Sunday night through Thursday night 6pm-6am. The other PGY2 and the PGY5 will be primarily in the OR or in clinic. On average, there will be 3-4 OR days per week, 1 day of clinic per week, and ½ day of educational activity / self study (preparing for conferences, review of upcoming cases, independent study).

PGY2 and PGY5

Monday OR with Friess
Tuesday Clinic with Friess/Working vs. OR with Meeker (as service needs dictate)
Wednesday OR with Working
Thursday OR with Mirarchi
Friday OR with Friess/Working (every other week swap hot trauma vs elective day)

Conferences:

- Every morning at 6am, there is a fracture rounds signout. The consults from the day before are presented followed by a discussion of appropriate treatment plan.
- Trauma Journal club is held Tuesdays from 6:45am-7:30am & there will be assigned articles each week
- Residents are expected to attend formal conferences on Thursday AM from 6:30-7:30AM (first week of every month: Foot & Ankle Conference; all other Thursdays: Fracture Conference)

Generalized Rotation Goals & Mechanisms:

Didactic:

- Weekly trauma journal club on Tuesday mornings
- 3-4x monthly Fracture Conference on Thursday Mornings
- Pre-, and post-rotation meetings to assess expectations and progress of residents.
- Journal Club 2-3x / year to discuss important literature on trauma. This journal club is combined with the Legacy Emanuel orthopaedic trauma group.

Patient Care

- Manage all aspects of acute trauma seen in patients of all ages. This includes appropriate non-operative treatment modalities along with varying surgical treatment options. The resident is responsible for learning and understanding indications of operative fixation for fractures.
- Attain competence in performing a comprehensive evaluation and examination of new patients seen through the ED. Comprehensive and concise history,

physical examination, and diagnostic test ordering and interpretation are emphasized.

- ☐ Thorough and concise management of post-operative patients during their inpatient stay.

Medical Knowledge

- For each location discussed (list below), the resident should understand the relevant fracture pattern, mechanism of injury, anatomy, and appropriate history and physical exam. Discussion from staff will focus on a case – based learning approach as patients are treated. Questions and answers will most often be covered by simple review textbooks supplemented by the reading list below.
    - Clavicle
    - Proximal humerus
    - Humeral shaft
    - Distal humerus
    - Fractures about the elbow (terrible triad, radial head, olecranon)
    - Forearm shaft
    - Distal radius
    - Scaphoid, carpal instability, phalangeal, metacarpal
    - Pelvic ring
    - Acetabulum
    - Proximal femur
    - Femoral shaft
    - Distal femur
    - Tibial plateau
    - Tibial shaft
    - Distal tibia/pilon
    - Ankle
    - Calcaneus, talus
    - Lisfranc, Metatarsal

- For each location discussed, the resident will list the relevant radiographic classification scheme for the fracture.

Practice-Based Learning and Improvement

- By the end of the rotation, each PGY1, PGY2 and PGY5 resident should be comfortable and confident with the following non-operative skills:
    1. clinical assessment
    2. Upper Extremity Exam
    3. Lower Extremity Exam
    4. Evaluation and comprehension of x-rays for each fracture pattern
    5. An understanding of the psychosocial issues that are relative to trauma
    6. Basic procedures performed in the ED with direct supervision:
        - closed reductions of fractures and dislocations: distal radius, ankle, shoulder and elbow dislocations
        - arthrograms and injections of knee, ankle, wrist, elbow, shoulder

- traction pin placement in femur and tibia

7. In addition, the PGY2 resident should be comfortable without direct supervision performing the procedures listed above. They should also be familiar with closed reductions of hip dislocations and fracture-dislocations
8. In addition, the PGY5 resident should be comfortable with evaluation and comprehension of CT and MRI for each fracture pattern. The PGY5 resident should also be comfortable in the counseling of nonoperative management of various fracture patterns.

- Participate as an assistant in surgical procedures and as primary surgeon where level of skill makes this appropriate. Develop the planning and technical skills to the level that participation as primary surgeon is appropriate <u>on most surgical cases.</u>
- Demonstrate ability to effectively perform preoperative planning for surgical procedures, even complex cases.
- Set up an operating room for surgery, including surgical instruments, implants, patient positioning, need for fluoroscopy, etc.
- Understand and direct the role/limitations of Operating personnel: Scrubs, Nurses, Charge nurse, Company representatives, Schedulers, and Surgeons.
- Identify and clearly communicate the indication for every operation prior to scrubbing, to the attending and students as indicated.
- Know the algorithm for several techniques for each indication:
  -Be prepared in advance to complete the operation
  -Understand the choices for anesthesia and indications
  -Be ready to describe how to change course mid-operation, if needed
- Direct and perform the following procedures at the PGY2 level:
  1. safe positioning of the patient in surgery
  2. identification and initial management of postoperative complications
  3. approach and fixation of basic fracture patterns including hip, ankle, and long bone shaft, and distal radius.
  4. Placement of external fixation

☐ Direct and perform the following procedures at the PGY5 level (in addition to those listed above):

5. analysis and management of postoperative complications
6. approach and fixation of periarticular fractures
7. approach to acetabulum and pelvic ring

Professionalism

- Learn to organize patient clinic practice while participating in more advance patient evaluation and management activities.
- Actively and competently participate in supervising the educational and clinical activities of the junior level residents (for PGY5s) or medical students (for PGY3s and 5s).
- Model appropriate professional values and behaviors for peers, faculty, and staff.
- Mature in the development of patient care, considering the cost, quality, outcomes, and impact on patient and healthcare system as essential variables in the equation.

- Demonstrate ability to engage in supportive, clear, and compassionate communication with patients and family members.
- Answer requests in a timely, cordial manner.

Interpersonal and Communication Skills

- The resident is expected on this rotation and all others to interact as a professional and team member with all the other staff and services within the hospital.
- The demeanor and tone of the resident in both verbal and nonverbal communication is expected to be exemplary.
- The same communication skills above are expected to be used with the patients and families.

Systems Based Practice

- Develop methods of analyzing complex data and prioritizing principles and issues to solve complex and ill-defined problems related to orthopaedic patient care.
- Demonstrate appropriate judgment, particularly as related to indications for surgical treatment of patients, non-operative treatment options and algorithms.
- Understand the daily business of Medicine/Orthopedic Surgery.
- Become facile with billing and coding issues.
- Manage the patient and health system to manage a disease/injury in the context of the biopsycho-social model.

Literature Resources:

Pelvic ring injury

Pennal GF, Tile M, Waddell JP, Garside H. Pelvic disruption: assessment and classification. Clin Orthop 1980;151:12-21

Tile M. Pelvic ring fractures: Should they be fixed? J Bone Joint Surg 1988;70B:1-12.

Burgess, AR, et al. Pelvic ring disruptions: Effective classification system and treatment protocols J. Trauma 1990;30:848-856.

Denis F, Davis S, Comfort T. Sacral fractures: an important problem. Retrospective analysis of 236 cases. Clin Orthop 1988;227:67-81.

Latenser BA, et al. Improved outcome with early fixation of skeletally unstable pelvic fractures. J Trauma 1991;31:28-31.

Routt ML Jr, Simonian PT, Ballmer F. A rational approach to pelvic trauma. Resuscitation and early definitive stabilization. Clin Orthop 1995;318:61-74.

Routt ML Jr, Kregor PJ, Simonian PT, Mayo K. Early results of percutaneous iliosacral screws placed with the patient in the supine position. J Orthop Trauma 1995;9:207-214.

Dujardin FH, et al. Long-term functional prognosis of posterior injuries in high-energy pelvic disruption. J Orthop Trauma 1998;12:145-151.

Nork SE, Jones CB, Harding SP, Mirza SK, Routt ML Jr. Percutaneous stabilization of U-shaped sacral fractures using iliosacral screws: technique and early results. J Orthop Trauma 2001 May; 15(4):238-46.

Sagi HC, Coniglione FM, Stanford JH. Examination under anesthetic for occult pelvic ring instability. J Orthop Trauma 2011 Sep; 25(9):529-36.

Dalal SA, Burgess AR, Siegel JH, Young JW, et al. Pelvic fracture in multiple trauma: classification by mechanism is key to pattern of organ injury, resuscitative requirements, and outcome. J Trauma 1989 Jul; 29(7):981-1000.

Acetabular fracture

Judet R, Judet J, Letournel E. Fractures of the acetabulum. Classification and surgical approaches for open reduction. J Bone Joint Surg 1964;46A:1616-1646.

Brumback RJ, et al. Acetabular depression fractures accompanying posterior fracture dislocation of the hip. J Orthop Trauma 1990;4:42-48.

Olson SA, Matta JM. The computerized tomography subchondral arc: a new method of assessing acetabular articular incongruity after fracture (a preliminary report). J Orthop Trauma 1993;7:402-413.
Letournel E. The treatment of acetabular fractures through the ilioinguinal approach. Clin Orthop 1993;292:62-76.

Matta JM. Fractures of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. J Bone Joint Surg 1996;78A:1632-1645.

Moed BR, Willson Carr SE, Watson JT. Results of operative treatment of fracture of the posterior wall of the acetabulum. J Bone Joint Surg 2002;84A:752-758.

Dailey SK, Archdeacon MT. Open reduction and internal fixation of acetabulum fractures: does timing of surgery affect blood loss and OR time? J Orthop Trauma 2014 Sep; 28(9):497-501.

Hip dislocation

Thomas VP, Epstein HC. Traumatic dislocation of the hip: A survey of two hundred and four cases covering a period of twenty-one years. J Bone Joint Surg 1951;33A:746-778.

Stuart JM, Milford LW. Fracture-dislocation of the hip: An end result study. J Bone Joint Surg1954;36A:315-342.

Trueta J, Harrison MHM. The normal vascular anatomy of the femoral head in adult man. J Bone Joint Surg 1953;35B:442-461.

Yue JJ, Wilber JH, Lipuma JP, et al. Posterior hip dislocations: a cadaveric angiographic study. J Orthop Trauma 1996;10:447-454.

Femoral head fracture

Pipkin G. Treatment of grade IV fracture-dislocation of the hip: A review. J Bone Joint Surg 1957;39A:1027-1042.

Swiontkowski MF, Thorpe M, Seiler JG, et al. Operative management of displaced femoral head fractures: Case-matched comparison of anterior versus posterior approaches for Pipkin I and Pipkin II fractures. J Orthop Trauma 1992;6:437-442.

Hip fracture-low energy

Garden RS. Low-angle fixation in fractures of the femoral neck. J Bone Joint Surg 1961;43B:647-663.

Parker MJ, Khan RJK, Crawford J, et al. Hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures in the elderly. J Bone Joint Surg 2002;84B:1150-1155.

Calder SJ, Anderson GH, Jagger C, et al. Unipolar or bipolar prosthesis for displaced intracapsular hip fractures in octogenarians: A randomized prospective study. J Bone Joint Surg 1996;78B:391-394.

Baumgaertner MR, Curtin SL, Lindskog DM. The value of the tip-apex distance in predicting failure of fixation of peritrochanteric fractures of the hip. J Bone Joint Surg 1995;77A:1058-1064.

Adams CJ, Robinson CM, Court-Brown CM, McQueen MM. Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and side plate for intertrochanteric fractures of the femur. J Orthop Trauma 2001;15:394-400.

Aharonoff GB, Koval KJ, Skovron ML, et al. Hip fractures in the elderly: Predictors of one year mortality. J Orthop Trauma 1997;11:162-165.

Koval KJ, Skovron ML, Aharonoff GB, et al. Ambulatory ability after hip fracture: A prospective study in geriatric patients. Clin Orthop 1995;310:150-159.

Hip fracture-high energy

Swiontkowski MF, Winquist RA, Hansen ST Jr. Fractures of the femoral neck in patients between the ages of twelve and forty-nine years. J Bone Joint Surg 1984;66A:837-846.

Jain R, Koo M, Kreder HJ, Schemitsch EH, Davey JR, Mahomed NN. Comparison of early and delayed fixation of subcapital hip fractures in patients sixty years of age or less. J Bone Joint Surg 2002;84A:1605-1612.

Femoral neck fracture biomechanics

Blair B, Koval KJ, Kummer F, et al. Basicervical fractures of the proximal femur. A biomechanical study of 3 fixation techniques. Clin Orthop 1994;306:256-263.

Stankewich CJ, Chapman J, Muthusamy R, et al. Relationship of mechanical factors to the strength of proximal femur fractures fixed with cancellous screws. J Orthop Trauma 1996;10:248-257.

Baitner AC, Maurer SG, Hickey DG, et al. Vertical shear fractures of the femoral neck. A biomechanical study. Clin Orthop 1999;367:300-305.

Femur fracture

Winquist RA, Hansen ST Jr, Clawson DK. Closed intramedullary nailing of femoral fractures: A report of five hundred and twenty cases. J Bone Joint Surg 1984;66A:529-539.

Brumback RJ, Reilly JP, Poka A, et al. Intramedullary nailing of femoral shaft fractures: Part I. Decision-making errors with interlocking fixation. J Bone Joint Surg 1988;70A:1441-1452.

Brumback RJ, Uwagie-Ero S, Lakatos RP, et al. Intramedullary nailing of femoral shaft fractures; Part II. Fracture-healing with static interlocking fixation. J Bone Joint Surg 1988;70A:1453-1462.

Brumback RJ, Ellison TS, Poka A, et al. Intramedullary nailing of femoral shaft fractures: Part III. Long-term effects of static interlocking fixation. J Bone Joint Surg 1992;74A:106-112.

Brumback RJ, Ellison PS, Poka A, et al. Intramedullary nailing of open fractures of the femoral shaft. J Bone Joint Surg 1989;71A:1324-1331.
Bone LB, Johnson KD, Weigelt J, et al. Early versus delayed stabilization of femoral fractures: A prospective randomized study. J Bone Joint Surg 1989;71A:336-340.

Schwartz JT Jr. Brumback RJ, Lakatos R, et al. Acute compartment syndrome of the thigh: A spectrum of injury. J Bone Joint Surg 1989;71A:392-400.

Bone LB, Babikian G, Stegemann PM. Femoral canal reaming in the polytrauma patient with chest injury. A clinical perspective. Clin Orthop 1995;318:91-94.

Bosse MJ, MacKenzie EJ, Reimer BL, et al. Adult respiratory distress syndrome, pneumonia, and mortality following thoracic injury and a femoral fracture treated either with intramedullary nailing with reaming or a plate: A comparative study. J Bone Joint Surg 1997;79A:799-809.

Starr AJ, Hunt JL, Chason DP, et al. Treatment of femur fracture with associated head injury. J Orthop Trauma 1998;12:38-45.

Bhandari M, Guyatt GH, Khera V, et al. Operative management of lower extremity fractures in patients with head injuries. CORR 2003; 407:187-198.

Ostrum RF, Agarwal A, Lakatos R, et al. Prospective comparison of retrograde and antegrade femoral intramedullary nailing. J Orthop Trauma 2000;14:496-501.

Pape HC, Hildebrand F, Pertschy S, et al. Changes in the Management of Femoral Shaft Fractures in Polytrauma Patients: From Early Total Care to Damage Control Orthopaedic Surgery. J Trauma 2002 Sep; 53(3):452-61.

Distal femur fracture

Bolhofner BR, Carmen B, Clifford P. The results of open reduction and internal fixation of distal femur fractures using a biologic (indirect) reduction technique. J Orthop Trauma 1996;10:372-377.

Krettek C, Schandelmaier P, Miclau T, et al. Minimally invasive percutaneous plate osteosynthesis (MIPPO) using the DCS in proximal and distal femoral fractures. Injury 1997;28 Suppl 1:A20-30.

Kregor PJ, Stannard JA, Zlowodzki M, Cole PA. Treatment of distal femur fractures using the less invasive stabilization system: surgical experience and early clinical results in 103 fractures. J Orthop Trauma 2004 Sep; 18(8):509-20.

Patella fracture

Smith ST, Cramer KE, Karges DE, et al. Early complications in the operative treatment of patellar fractures. J Orthop Trauma 1997;11:183-187.

Carpenter JE, Kasman RA, Patel N, Lee MA, Goldstein SA. Biomechanical evaluation of current patellar fracture fixation techniques. J Orthop Trauma 1997;11:351-356.

LeBrun CT, Langford JR, Sagi HC. Functional outcomes after operatively treated patella fractures. J Orthop Trauma 2012 Jul; 26(7):422-6.

Knee dislocation

Green NE, Allen BL. Vascular injuries associated with dislocation of the knee. J Bone Joint Surg 1977;59A:236-241.

Johansen K, Lynch K, Paun M, Copass M. Noninvasive vascular tests reliably exclude occult arterial trauma in injured extremities. J Trauma 1991;31:515-522.

Mills WJ, Tejwani N. Knee dislocation, heterotopic ossification after knee dislocation: the predictive value of the injury severity score. J Orthop Trauma 17:338-345, 2004.

Tibial plateau fracture
Schatzker J, McBroom R, Bruce D. The tibial plateau fracture. The Toronto experience 1968-1975. Clin Orthop 1979;138:94-104.

Benirschke SK, Agnew SG, Mayo KA, et al. Immediate internal fixation of open, complex, tibial plateau fractures: treatment by a standard protocol. J Orthop Trauma 1992;6:78-86.

Barei DP, Nork SE, Mills WJ, Henley MB, Benirschke SK. Complications associated with internal fixation of high-energy bicondylar tibial plateau fractures utilizing a two-incision technique. J Orthop Trauma 2004;18:649-657.

Tibial shaft fracture
Sarmiento A, Sharpe FE, Ebramzadeh, et al. Factors influencing the outcome of closed tibial fractures treated with functional bracing. Clin Orthop 1995;315:8-24.

McQueen MM, Court-Brown CM. Compartment monitoring in tibial fractures. The pressure threshold for decompression. J Bone Joint Surg 1996;78B:99-104.

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Henley MB, Chapman JR, Agel J, et al. Treatment of type II, IIIA, and IIIB open fractures of the tibial shaft: a prospective comparison of unreamed interlocking intramedullary nails and half-pin external fixators. J Orthop Trauma 1998;12:1-7.

Ilizarov GA. The tension-stress effect on the genesis and growth of tissue: part I. The influence of stability of fixation and soft-tissue preservation. Clin Orthop 1989;238:249-262.

Ilizarov GA. The tension-stress effect on the genesis and growth of tissue: part II. The influence of the rate and frequency of distraction. Clin Orthop 1989;239:263-285.

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Selby R, Geerts WH, Kreder HJ, et al. A double-blind, randomized controlled trial of the prevention of clinically important venous thromboembolism after isolated lower leg fractures. J Orthop Trauma 2015 May;29(5):224-30.

Limb salvage
Lange RH, Bach AW, Hansen ST Jr. Open tibial fractures with associated vascular injury: prognosis for limb salvage. J Trauma 1985;25:203-208.

Johansen K, Daines M, Howey T, et al. Objective criteria accurately predict amputation following lower extremity trauma. J Trauma 1990;30:568-572.

Bosse MJ, MacKenzie EJ, Kellam JF, et al. A prospective evaluation of the clinical utility of lower-extremity injury-severity scores. J Bone Joint Surg 2001;83A:3-14.

Tibial plafond fracture

Ruedi T. Fractures of the lower end of the tibia into the ankle joint: results 9 years after open reduction and internal fixation. Injury 1973;5:130-137.

Teeny SM and Wiss DA. Open reduction and internal fixation of tibial plafond fractures. Variables contributing to poor results and complications. Clin Orthop 1993;292:108-117.

Wyrsch B, McFerran MA, McAndrew M, et al. Operative treatment of fractures of the tibial plafond. A randomized prospective study. J Bone Joint Surg 1996;78A:1646-1657.

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Ankle fracture

Pettrone FA, Gail M, Pee D, et al. Quantitative criteria for the prediction of the results after displaced fracture of the ankle. J Bone Joint Surg 1983;65A:667-677.

Franklin JL, Johnson KD, Hansen ST Jr. Immediate internal fixation of open ankle fractures. Report of thirty-eight cases treated with a standard protocol. J Bone Joint Surg 1984;66A:1349-1356.

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Talus fracture

Hawkins LG. Fractures of the neck of the talus. J Bone Joint Surg 1970;52A:991-1002.

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Lisfranc fracture

Kuo RS, Tejwani NC, DiGiovanni CW, et al. Outcome after open reduction and internal fixation of Lisfranc joint injuries. J Bone Joint Surg 2000;82A:1609-1618.

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Calcaneus fracture

Essex-Lopresti P. The mechanism, reduction technique and results in fractures of the os calcis. (reprinted from Br. J Surg 1951) Clin Orthop 1993;290:3-16.

Sanders R, Fortin P, Dipasquale T, et al. Operative treatment in 120 displaced intraarticular calcaneal fractures: Results using a prognostic computed tomography scan classification. Clin Orthop 1993;290:87-95.

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Shoulder injuries

Ada JR, Miller ME. Scapular fractures: Analysis of 113 cases. Clin Orthop 1991;269:174-180.

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Proximal humerus fracture

Neer CS. Displaced proximal humerus fractures. Part I. Classification and evaluation. Part II. Treatment of three-part and four-part displacement. J Bone Joint Surg 1970;52A:1077-1103.

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Humerus shaft fracture

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Distal humerus fracture

Schemitsch EH, Tencer AF, Henley MB. Biomechanical evaluation of methods of internal fixation of the distal humerus. J Orthop Trauma. 1994;8:468-475.

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Fractures and injuries about the elbow

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