CLINICAL PRACTICE GUIDELINE: Dislocations and Fractures

STANDARD:

There must be protocols in Level I and II Centers for the following orthopedic emergencies: 1) the type and severity of pelvic and acetabular fractures that will be treated at the institutions as well as those that will be transferred out for care; 2) the timing and sequence for the treatment of long bone fractures in multiply injured patients; and 3) the wash out time for open fractures. These protocols must be included as part of the PIPS process. (CD 9-14)

DEFINITIONS:

None

GUIDELINES:

The following are guidelines for immobilization and definitive management of fractures and dislocations by body part:

INJURY	X-RAYS	REDUCTION IMMOBILZATION	TREATMENT
HAND:			
DIP or PIP dislocation	AP/Lat finger	Dorsal splint in extension, or Buddy tape	Closed reduction
Metacarpal fracture	AP/Lat hand	Dorsal-volar splint	Closed reduction, wires
ARM:			
Wrist	AP/Lat wrist	Dorsal-volar splint	Closed reduction
Distal radius	AP/Lat forearm	Sugar tong splint	Closed reduction, or ORIF
Forearm, radius and/or ulna	AP/Lat forearm	Sugar tong splint	Closed reduction, or plates
Radial head	AP/Lat Elbow AP/Lat forearm	Posterior elbow splint	Closed reduction, or ORIF
Olecranon	AP/Lat elbow AP/Lat forearm	Posterior elbow splint	ORIF
Distal humerus	AP/Lat elbow AP/Lat humerus	Posterior elbow splint (Beware of vascular compromise)	ORIF
Humeral shaft	AP/Lat humerus	Coaptation splint (Beware of radial nerve compromise)	Conservative ORIF
Proximal humerus (surgical and anatomic neck)	AP/axillary shoulder AP/Lat humerus	Coaptation splint Sling	Conservative ORIF
SHOULDER:			
Scapula	AP/axillary/scapular shoulder	Sling	Conservative ORIF
Clavicle	AP/axillary shoulder	Sling	Conservative

PELVIS:			
Anterior ring, pubic symphysis, rami	AP, inlet and outlet pelvis, CT scan	Initial bedrest	Non-operative or ORIF
Posterior ring, sacrum, SI fracture/ dislocation, iliac wing	AP, inlet and outlet pelvis, CT scan	Initial bedrest. If hemodynamically unstable consider T-POD, angioembolizaiotn or external fixation	ORIF
Acetabulum	AP pelvis, Judet views, thin cut (3mm) CT scan	Distal femoral traction, Buck's traction, tibial traction, or nothing	ORIF
FEMUR:			
Femoral head	AP pelvis, AP/lat hip	Distal femoral traction, or nothing	ORIF
Femoral neck	AP pelvis, AP/lat both hips (uninjured side with templates)	Buck's traction, or nothing	ORIF
Intratrochanteric femur	AP pelvis, AP/lat hip	Buck's traction, or nothing	ORIF
Subtrochanteric femur	AP pelvis, AP/lat femur	Distal femoral traction, tibial traction	ORIF
Femoral shaft	AP/lat femur, AP/lat knee, AP pelvis	Hare traction splint, or Speed Splint	ORIF
Supracondylar femur	AP/lat femur, AP/lat knee, AP pelvis	Knee immobilizer, or tibial traction	ORIF
LOWER LEG:			
Patella	AP/lat knee	Knee immobilizer	ORIF
Tibial plateau	AP/lat knee, CT scan (after spanning ex-fix)	Knee immobilizer	ORIF, or spanning ex-fix
Tibial shaft	AP/lat tibia	Posterior sugar tong splint	ORIF
ANKLE:			
Pilon	AP/lat ankle, mortise view, AP/lat tibia, or CT scan after spanning ex-fix	Posterior sugar tong splint, calcaneal traction	ORIF
Malleolus (medial, lateral, posterior)	AP/lat ankle, mortise view	Posterior sugar tong splint	ORIF
FOOT:			
Calcaneus	Lat foot, oblique foot, Harris heel view, thin cut CT (3mm)	Posterior sugar toe splint with toe plate	ORIF
Talus	Lat foot, oblique foot	Posterior sugar toe splint with toe plate	ORIF
Metatarsals and phalanx	AP/lat and oblique foot	Posterior sugar toe splint with toe plate	ORIF

MONITORING PERFORMANCE IN PI PROGRAM

Timing of fracture management is tracked on the Trauma PI Dashboard.

REFERENCES:

1. American College of Surgeons: Committee on Trauma: Advanced Trauma Life Support. Ed 5. Chicago, American College of Surgeons 1993.

2. Barba CA, Taggert J, Morgan AS, et al: A new cervical spine clearance protocol using computed tomography. J Trauma 51:652–657, 2001.

3. Berne JD, Velmahos GC, El-Tawil Q, et al: Value of complete cervical helical computed tomographic scanning in identifying spine injury in the unevaluable blunt trauma patient with multiple injuries: A prospective study. J Trauma 47:896–906, 1999.

4. Biffl WL, Harrington DT, Cioffi WG: Implementation of a tertiary trauma survey decreases missed injuries. J Trauma 54:43–44, 2003.

5. Bone LB, McNamara K, Shine B, Border J: Mortality in multiple trauma patients with fractures. J Trauma 37:262–264, 1994.

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

7. Bosse MJ, MacKenzie EJ, Riemer 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 with a plate: A comparative study. J Bone Joint Surg 79A:799–809, 1997.

8. Bray TJ: Design of the Northern Nevada Orthopaedic Trauma Panel: A model, level II community-hospital system. J Bone Joint Surg 83A:283–289, 2001.

9. Baumgartner M, Huggins T: Femoral Neck Fractures. In Bucholz R, Heckman J (eds). Fractures in Adults. Philadelphia, Lippincott, Williams & Wilkins 1714–1715, 2001.

10. Byrd HS, Cierny II G, Tebbetts JB: The management of open tibial fractures with associated soft-tissue loss: External pin fixation with early flap coverage. Plast Reconstr Surg 68:73–79, 1981

11. Cierny III G, Byrd HS, Jones RE: Primary versus delayed soft tissue coverage for severe open tibial fractures. Clin Orthop 178:54–63, 1983.

12. Crosby LA, Lewallen DG (eds): Emergency Care and Transportation of the Sick and Injured. Ed 6. Rosemont, IL, American Academy of Orthopaedic Surgeons, 1995.

13. Crowl AC, Young JS, Kahler DM, et al: Occult hypoperfusion is associated with increased morbidity in patients undergoing early femur fracture fixation. J Trauma 48:260–267, 2000.

14. Dalal SA, Burgess AR, Siegel JH, et al: Pelvic Fracture in multiple trauma: Classification by mechanism is key to pattern of organ injury, resuscitative requirements, and outcome. J Trauma 29:981–1000, 1989.

15. Delong WG, Born CT, Wei SY, et al: Aggressive treatment of 119 open fracture wounds. J Orthop Trauma 46:1049–1054, 1999.

16. Desai SM, Bernhard WN, McAlary B: Regional anesthesia: Management considerations in the trauma patient. Crit Care Clin 6:85–101, 1990.

17. Geerts WH, Code KI, Jay RM, et al: A prospective study of venous thromboembolism after major trauma. N Engl J Med 331:1601–1606, 1994.

18. Geerts WH, Jay RM, Code KI, et al: A comparison of low-dose heparin with low-molecular-weight heparin as prophylaxis against venous thromboembolism after major trauma. N Engl J Med 335:701–707, 1996.

19. Godina M: Early microsurgical reconstruction of complex trauma of the extremities. Plast Reconstr Surg 78:285–292, 1986.

20. Gopal S, Majumder S, Batchelor A, et al: Fix and flap: The radical orthopaedic and plastic treatment of severe open fracture of the tibia. J Bone Joint Surg 82B:959–966, 2000.

21. Griffen MM, Frykberg ER, Kerwin AJ, et al: Radiographic clearance of blunt cervical spine injury: Plain radiograph or computed tomography scan? J Trauma 55:222–226, 2003

22. Grossman MD, Reilly PM, Gillett T, et al: National survey of the incidence of cervical spine injury and approach to cervical spine clearance in U.S. trauma centers. J Trauma 53:426–429, 2002

23. Gulli B, Templeman D: Compartment syndrome of the lower extremity. Orthop Clin North Am 25:677–684, 1994

24. Gustilo RB, Anderson JT: Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones. J Bone Joint Surg 58A:453–458, 1976

25. Gustilo RB, Mendoza RM, Williams DN: Problems in the management of type III (severe) open fracture: A new classification of type III open fracture. J Trauma 24:742–746, 1984

26. Gustilo RB, Merkow RL, Templeman D: The management of open fractures. J Bone Joint Surg 72A:299–304, 1990

27. Hauser CJ, Visvikis G, Hinrichs C, et al: Prospective validation of computed tomographic screening of the thoracolumbar spine in trauma. J Trauma 55:228–234, 2003.

28. Holmes JF, Panacek EA, Miller PQ, et al: Prospective evaluation of criteria for obtaining thoracolumbar radiographs in trauma patients. J Emerg Med 24:1–7, 2003.

29. Husain FA, Martin MJ, Mullenix PS, et al: Serum lactate and base deficit as predictors of mortality and morbidity. Am J Surg 185:485–491, 2003.

30. Juhl M, Moller-Madsen B, Jensen J: Missed injuries in an orthopaedic department. Injury 21:110–112, 1990.

31. Kutsy RL, Robinson LR, Routt Jr ML: Lumbosacral plexopathy in pelvic trauma. Muscle Nerve 23:1757–1760, 2000.

32. Lee J, Abrahamson BS, Harrington TG, et al: Urologic complications of diastasis of the pubic symphysis: A trauma case report and review of world literature. J Trauma 48:133–136, 2000

33. Marion DW, Domeier R, Dunham CM, et al: Practice Management Guidelines for Identifying Cervical Spine Injuries after Trauma, 2002

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

35. McQueen MM, Gaston P, Court-Brown CM: Acute compartment syndrome: Who is at risk? J Bone Joint Surg 82B:200–203, 2000.

36. Montgomery KD, Potter HG, Helfet DL: The detection and management of proximal deep venous thrombosis in patients with acute acetabular fractures: A follow-up report. J Orthop Trauma 11:330–336, 1997.

37. Morgan SJ, Jeray KJ, Phieffer LS, et al: Attitudes of orthopaedic trauma surgeons regarding current controversies in the management of pelvic and acetabular fractures. J Orthop Trauma 15:526–532, 2001.

38. Offner PJ, Hawkes A, Madayag R, et al: The role of temporary inferior vena cava filters in critically ill surgical patients. Arch Surg 138:591–594, 2003.

39. Ogura H, Tanaka H, Koh T, et al: Priming, second-hit priming, and apoptosis in leukocytes from trauma patients. J Trauma 46:774–781, 1999.

40. Olson SA, Finkemeier CF, Moehring HD: Open Fractures. In Bucholz F, Heckman JD (eds). Fractures in Adults. Ed 5. Philadelphia, Lippincott, Williams & Williams 285–317, 2001

41. Ostermann PA, Henry SL, Seligson D: Timing of wound closure in severe compound fractures. Orthopedics 17:397–399, 1994.

42. Pape HC, Giannoudis P, Krettek C: The timing of fracture treatment in polytrauma patients: Relevance of damage control orthopedic surgery. Am J Surg 183:622–629, 2002.]

43. Pape HC, Van Griensven M, Rice J, et al: Major secondary surgery in blunt trauma patients and perioperative cytokine liberation: Determination of the clinical relevance of biochemical markers. J Trauma 46:774–781, 2001.

44. Patzakis MJ, Bains RS, Lee J, et al: Prospective, randomized, double-blind study comparing single-agent antibiotic therapy, ciprofloxacin to combination antibiotic therapy in open fracture wounds. J Orthop Trauma 8:529–533, 2000

45. Patzakis MJ, Harvey JP, Ivler D: The role of antibiotics in the management of open fractures. J Bone Joint Surg 56A:532–541, 1974.

46. Riemer BL, Butterfield SL, Diamond DL, et al: Acute mortality associated with injuries to the pelvic ring: The role of early patient mobilization and external fixation. J Trauma 35:671–675, 1993.

47. Riemer BL, Butterfield SL, Ray RL, Daffner RH: Clandestine femoral neck fractures with ipsilateral diaphyseal fractures. J Orthop Trauma 7:443–449, 1993.

48. Routt Jr ML, Falicov A, Woodhouse E, Schildhauer TA: Circumferential pelvic antishock sheeting: A temporary resuscitation aid. J Orthop Trauma 16:45–48, 2002.

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

50. Scalea TM, Scott JD, Brumback RJ, et al: Early fracture fixation may be “just fine” after head injury: No difference in central nervous system outcomes. J Trauma 46:839–846, 1999.

51. Schenarts PJ, Diaz J, Kaiser C, et al: Prospective comparison of admission computed tomographic scan and plain films of the upper cervical spine in trauma patients with altered mental status. J Trauma 51:652–657, 2001

52. Sees DW, Rodriguez Cruz LR, Flaherty SF, et al: The use of bedside fluoroscopy to evaluate the cervical spine in obtunded trauma patients. J Trauma 45:768–771, 1998.

53. Sinclair JS, McNally MA, Small JO, Yeates HA: Primary free-flap cover of open tibial fractures. Injury 28:581–586, 1997.

54. Stover MD, Morgan SJ, Bosse MJ, et al: Prospective comparison of contrast-enhanced computed tomography versus magnetic resonance venography in the detection of occult deep pelvic vein thrombosis in patients with pelvic and acetabular fractures. J Orthop Trauma 16:613–621, 2002

55. Templeman D, Lang R, Harris B: Lower extremity compartment syndrome associated with the use of pneumatic anti-shock garments. J Trauma 27:79–81, 1987.

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

57. Townsend RN, Lheureau T, Protech J, et al: Timing fracture repair in patients with severe brain injury (Glasgow Coma Scale score <9). J Trauma 44:977–982, 1998.

58. Tscherne H, Gotzen L (eds): Fractures with Soft Tissue Injuries. New York, Springer-Verlag 1984.

59. Vanek VW: Meta-analysis of effectiveness of intermittent pneumatic compression devices with a comparison of thigh-high to knee-high sleeves. Am Surg 64:1050–1058, 1998.

60. Wiss DA, Gellman H, Moldawer TD: Gunshot Wounds to the Musculoskeletal system. In Browner BD, Jupiter JB, Levine AM, Trafton PG (eds). Skeletal Trauma. Philadelphia, WB Saunders Company 449–486, 1998. [

61. Young JW, Burgess AR, Brumback RJ, Poka A: Pelvic fractures: Value of plain radiography in early assessment and management. Radiology 160:445–451, 1986.