

# Policy

|  |                      |        |
|--|----------------------|--------|
| <b>CCHMC (insert name of manual) Policy</b>    | <i>Policy Number</i> | R-29   |
| Orthopaedic Response and Management Guidelines | 10/09/2015           |        |
|  | <i>Page</i>          | 1 of 5 |

## 1.0 PURPOSE

This document describes the guidelines for the pediatric orthopaedic surgeons expected response times and treatment recommendations that best meet match the patient's needs and promotes best outcomes. Orthopaedic injuries are rarely life threatening; however, they are commonly encountered in children with multiple injuries and can be a cause for long-term morbidity. The treatment of children with multiple injuries should follow the principles of Advanced Trauma Life Support (ATLS), and orthopaedic care must never precede the treatment of more serious life threatening injuries.

## 2.0 POLICY

As a pediatric level I trauma center, the pediatric orthopaedic team is required to be available in the trauma resuscitation area within 30 minutes after consultation has been requested by the surgical team leader for multiply injured patients based on institution specific criteria. High priority to timeliness and early intervention is given to children with the following injuries: pulseless extremity, compartment syndrome, unstable pelvis, significantly displaced fractures and dislocations, and complete / partial amputations of an extremity.

## 3.0 DEFINITIONS

Washout of open fracture = surgical management and cleaning within the operating room

## 4.0 IMPLEMENTATION

### 4.1 Open Fractures

Open fractures comprise about 2% of all fractures and 10% of fractures in children with multiple injuries.[1-9] Wound irrigation, debridement, and appropriate timing of wound closure, as well as antibiotics are well-established methods of decreasing infection.

**ED Management:** Sterile dressing should be applied to cover the wound. Gross contamination (i.e. grass, dirt) should be removed before reducing the bone ends through the skin wound to avoid introducing contamination in the deep tissues

**Antibiotics:** The Eastern Association for the Surgery of Trauma (EAST) Practice Management Guideline Work Group recommends systemic antibiotic coverage that targets gram-positive organisms be started immediately after injury[10]. Additional gram-negative coverage should be added for Gustilo type III fractures[10]. CCHMC practice is to initiate antibiotics as soon as possible after the injury, preferable within 6 hours from injury. There is Level I and Level II evidence to suggest that antibiotics should be continued for 24-48 hours in the adult population. There is consensus that routine use of prophylactic antibiotics > 72 hours after surgery is more likely to be harmful than beneficial. There is little evidence in the pediatric population but CCHMC practice is to follow the current adult evidence practice.

**Surgical Timing:** Open fractures are usually classified according to degree of associated soft tissue injury using the modified Gustilo classification. Recent level II research does not support the widely accepted standard of operating within six hours from injury. At CCHMC, timing of treatment is based on grade of injury. Emergent surgery is not necessary for grade I and II open fractures if the patients have received early antibiotics.[11] For this population, operative management should be within 24 hours. [12] Grade

# Policy

|  |                      |        |
|--|----------------------|--------|
| <b>CCHMC (insert name of manual) Policy</b>    | <i>Policy Number</i> | R-29   |
| Orthopaedic Response and Management Guidelines | 10/09/2015           |        |
|  | <i>Page</i>          | 2 of 5 |

III open fractures should be operatively treated within 6 hours due to high level of probably contamination[5].

## 4.2 Long Bone Fractures

Long bone fractures are very common in the pediatric population. Treatment options include both operative and non-operative approaches and are primarily dependent on the child's age and weight.

**Antibiotics:** To ensure adequate blood level at the time of surgical incision, it is recommended that a prophylactic antibiotic be given within one hour before incision.

**Surgical Timing:** Optimal timing and sequence for the treatment of long bone fractures in children is associated with lessened incidence of complications and improved outcomes. Priority block time for operative management is scheduled early on week days. There is strong evidence in the adult literature that long bone fractures should be stabilized within 24 hours to prevent pulmonary complications, particularly in the multiply injured patient. Based on the severity of the patient's condition, in collaboration with the attending trauma surgeon, the goal of the pediatric orthopaedic team is to provide treatment of these fractures within 24 hours of injury.[13, 14]

## 4.3 Pelvic Fractures [15-17]

Pediatric pelvic fractures are more uncommon than in the adult population.[18] The evaluation and treatment are significantly different from the adult population, because of important anatomical differences between the two populations. Pediatric pelvic fractures are most frequently caused by high-energy mechanisms such as pedestrian collisions with moving vehicles and motor vehicle crashes. Therefore, when a pelvic fracture occurs in a child, there should be a high suspicion for associated head, thoracic, urologic and abdominal injuries.

**ED Treatment:** Blood loss after pelvic fracture has been found to occur less frequently in the pediatric population.[19, 20] When a displaced pelvic fracture is diagnosed in a hemodynamically unstable patient, a pelvic binder should be placed during the initial trauma evaluation for an unstable ring injury. This should decrease intra-pelvic volume and potentially tamponade off any bleeding from vessels and bone.

**Management:** The Torode and Zieg (1985) classification is the most widely used system for classification of pelvic fractures in children. A modified Torode classification of pediatric pelvic fractures was developed in 2012 and subdivides Type III pelvic fractures into 2 groups depending on the location of the fracture.[21] Rationale for this modification was the likelihood of type III-B injuries showing similar characteristics (i.e. blood requirement, operative management) to those children with type IV injuries.

- Type I – avulsion fractures
- Type II – iliac wing fractures
- Type III-A – stable anterior pelvic ring fractures
- Type III-B – stable anterior and posterior pelvic ring fractures
- Type IV – unstable pelvic ring injuries

# Policy

|  |                      |        |
|--|----------------------|--------|
| <b>CCHMC (insert name of manual) Policy</b>    | <i>Policy Number</i> | R-29   |
| Orthopaedic Response and Management Guidelines | <i>10/09/2015</i>    |        |
|  | <i>Page</i>          | 3 of 5 |

The pediatric orthopaedic team, in association with the surgical team, will determine the severity of injury and the necessary treatment plan. Treatment is individualized based on patient age, fracture classification, stability of the pelvic ring, and extent of concomitant injuries. Treatment can differ significantly between skeletally immature and skeletally mature pelvic fractures. The most reliable method of deciding skeletal maturity is the status of the triradiate cartilage. After triradiate closure, injury patterns are close to that of an adult. On average, the triradiate cartilage closes at 14 years in boys and 12 year in girls.[15]

Most stable pelvic injuries in the pediatric population will be managed non-operatively with protected weight bearing and gradual return to activity. Patients that have an unstable ring fracture merits operative reduction and fixation, regardless of the patient's age or skeletal maturity.

#### 4.4 Acetabular Fractures[15]

Overall, acetabular fractures are not common. Most pediatric acetabular fractures are in adolescents, with very few reported at less than 10 years of age. Fractures of the acetabulum may occur with less energy than adult acetabular fractures.

**ED Treatment:** After standard trauma evaluation, the most urgent situation to an acetabular fracture is a concomitant hip dislocation, which should be reduce urgently to attempt and preserve blood supply to the femoral head.

**Management:** Treatment of acetabular fractures will depend on the grade of injury. The nature of the developing hip joint necessitates an individualization of treatment for each pediatric acetabular fracture. Those cases requiring operative intervention will be managed in a timely fashion with the available assistance of an orthopaedic traumatologist. The consultation of the adult traumatologist will be obtained when in the opinion of the team, the adult institution expertise exceeds the pediatric expertise.

## 5 OVERSIGHT

Orthopaedics, Trauma

## 6 REFERENCES

1. Abdelgawad, A.A.M.D.D.S. and E.M.M.D. Kanlic, *Orthopedic Management of Children With Multiple Injuries*. Journal of Trauma-Injury Infection & Critical Care, 2011. **70**(6): p. 1568-1574.
2. Hauser, C.J., C.A. Adams Jr, and S.R. Eachempati, *Prophylactic antibiotic use in open fractures: An evidence-based guideline*. Surgical Infections, 2006. **7**(4): p. 379-405.
3. Pace, J.L., M.S. Kocher, and D.L. Skaggs, *Evidence-based review: Management of open pediatric fractures*. Journal of Pediatric Orthopaedics, 2012. **32**(SUPPL. 2): p. S123-S127.
4. Walton, R., et al., *Immediate care of open extremity fractures: Where can we improve?* BioMed Research International, 2014. **2014**.

# Policy

|  |                      |        |
|--|----------------------|--------|
| <b>CCHMC (insert name of manual) Policy</b>    | <i>Policy Number</i> | R-29   |
| Orthopaedic Response and Management Guidelines | 10/09/2015           |        |
|  | <i>Page</i>          | 4 of 5 |

5. Weber, D., et al., *Time to initial operative treatment following open fracture does not impact development of deep infection: A prospective cohort study of 736 subjects*. Journal of Orthopaedic Trauma, 2014. **28**(11): p. 613-619.
6. Schenker, M.L., et al., *Does timing to operative debridement affect infectious complications in open long-bone fractures? A systematic review*. Journal of Bone and Joint Surgery - Series A, 2012. **94**(12): p. 1057-1064.
7. Pollak, A.N., et al., *The relationship between time to surgical débridement and incidence of infection after open high-energy lower extremity trauma*. Journal of Bone and Joint Surgery - Series A, 2010. **92**(1): p. 7-15.
8. Stewart Jr, D.G., R.M. Kay, and D.L. Skaggs, *Open fractures in children: Principles of evaluation and management*. Journal of Bone and Joint Surgery - Series A, 2005. **87**(12 I): p. 2784-2798.
9. Weant, K.A., *Antibiotic Prophylaxis for Open Fractures in the Emergency Department*. Advanced emergency nursing journal, 2015. **37**(1): p. 23-29.
10. Hoff, W.S., et al., *East practice management guidelines work group: Update to practice management guidelines for prophylactic antibiotic use in open fractures*. Journal of Trauma - Injury, Infection and Critical Care, 2011. **70**(3): p. 751-754.
11. Skaggs, D., *Effect of delay of surgical treatment on rate of infection in open fractures in children*. Journal of pediatric orthopaedics, 2000. **20**(1): p. 19-22.
12. Skaggs, D.L., et al., *The effect of surgical delay on acute infection following 554 open fractures in children*. The Journal of Bone & Joint Surgery, 2005. **87**(1): p. 8-12.
13. Mendelson, S., *Early versus late femoral fracture stabilization in multiply injured pediatric patients with closed head injury*. Journal of pediatric orthopaedics, 2001. **21**(5): p. 594-599.
14. Hedequist, D., *Early Versus Delayed Stabilization of Pediatric Femur Fractures: Analysis of 387 Patients*. Journal of orthopaedic trauma, 1999. **13**(7): p. 490-493.
15. Amorosa, L.F., *High-energy Pediatric Pelvic and Acetabular Fractures*. The Orthopedic clinics of North America, 2014. **45**(4): p. 483-500.
16. Shore, B.J., et al., *Pediatric pelvic fracture: A modification of a preexisting classification*. Journal of Pediatric Orthopaedics, 2012. **32**(2): p. 162-168.
17. Banerjee, S., *Paediatric pelvic fractures: 10 years experience in a trauma centre*. Injury, 2009. **40**(4): p. 410-413.
18. Marmor, M., *Short-term pelvic fracture outcomes in adolescents differ from children and adults in the National Trauma Data Bank*. Journal of children's orthopaedics, 2015. **9**(1): p. 65-75.

# Policy

|  |                      |        |
|--|----------------------|--------|
| <b>CCHMC (insert name of manual) Policy</b>    | <i>Policy Number</i> | R-29   |
| Orthopaedic Response and Management Guidelines | <i>10/09/2015</i>    |        |
|  | <i>Page</i>          | 5 of 5 |

| HISTORY              |  |
|----------------------|--|
| <b>Original Date</b> |  |
| 10/9/15              |  |
| <b>Revision Date</b> |  |
|                      |  |
| <b>Review Date</b>   |  |
|                      |  |