Trauma Center Practice Management Guideline

Blank Children's Hospital (BCH)—Des Moines

Non-Accidental Trauma (NAT)	
PEDIATRIC **Practice Management Guideline**	**Effective: 04/2014**
Contact: Trauma Center Medical Director/ Trauma Center Trauma Program Manager	**Last Reviewed: 07/2017**

1.0 Purpose:

- To provide guidelines for the initial evaluation and management of all children <12 months of age or non-ambulatory with a skeletal fracture or other injury suspicious for abuse, and children 12-24 months of age with an injury suspicious for abuse. Older children with injuries concerning for abuse are also evaluated on a case by case basis with recommendations included in this guideline.
- For the purpose of this guideline, non-ambulatory children are defined as those who are not walking independently. Cruising is not considered walking independently.

2.0 Etiology/Statistics:

- There were 678,932 cases of confirmed child abuse and neglect reported to the U.S. Department of Health & Human Services in 2013.
    - This is equal to 9.1 victims per 1,000 children in this population.
    - The victims of abuse were 44% white, 22.4% Hispanic, and 21.2% African-American.
    - The highest rate of abuse occurs in the first year of life with a rate of 23.1 per 1,000 children.
- There were 1,484 total deaths from child abuse or neglect reported to the U.S. Department of Health & Human Services in 2013.
    - This is equal to 2.04 deaths per 100,000 children.
    - Nearly three quarters (73.9%) of the deaths reported were younger than 3 years old.
    - 79% of deaths were caused by one or both parents.

3.0 Differential Diagnosis:

- Accidental injury and certain medical conditions may mimic abuse.

4.0 Guideline Eligibility Criteria:

- Children from newborn through adolescence with an injury suspicious for abuse.

5.0 Guideline Exclusion Criteria:

- Children in motor-vehicle collision, regardless of age or ambulatory status are excluded from this guideline.

6.0 Critical Points of Evidence:

6.1 *Evidence Supports*

- Physical abuse is the cause of 12-20% of all fractures in infants and toddlers (3). Age is a strong determinant of abuse potential and **a non-ambulatory child presenting with a fracture should be regarded highly suspicious of NAT** (2). Children <2 years with fractures suspicious for child abuse should have a radiographic skeletal survey to look for other bone injuries or osseous abnormalities. (3). Additional fractures are identified in approximately 10% of skeletal surveys, with higher yields in infants (3).
- **Abusive head trauma (AHT**) is the leading cause of death from trauma in children younger than 2 years (6). It is vital that a diagnosis of abuse is not missed, with evidence showing that in 50-80% of fatal or near-fatal abuse cases there was evidence of prior abusive injuries (2). Infants are at the greatest risk of abusive head injury with the median age between 2-6 months, correlating with the peak age of crying (6). AHT should be considered in all children with neurological signs and symptoms, especially if there is no history of trauma, or history of minor trauma such as a short fall (17). Head CT is recommended as the initial imaging modality when there is concern for AHT (9, 18).
- **Bruising or bleeding** in a child may raise the concern for child abuse. Assessing whether the findings are the result of trauma and/or whether the child has a bleeding disorder is important (1). The patient with bruising or intracranial hemorrhage with concern for abuse should have a hematological evaluation including CBC, PT/PTT, VW panel, and Factor VIII and IX levels to rule out the most common bleeding disorders (1).

6.2 *Evidence Lacking/Inconclusive*

- **Hepatic transaminases** have traditionally been ordered to screen for internal injuries in patients who have sustained blunt abdominal trauma, as well as in the non-accidental trauma work-up of young children with skeletal or other injuries suspicious for abuse. There is limited data as to what threshold indicates the need for further testing such as CT abd/pelvis. While levels of 150-200 IU/L are often used to trigger imaging in the patient with blunt abdominal trauma, there is recent data to suggest that children

evaluated for physical abuse with transaminase levels >80 IU/L should undergo definitive testing for abdominal injury (13). Providers may have concern regarding radiation exposure and the increased number of patients who will undergo CT abd/pelvis to rule out abdominal injury with the lower threshold for ALT/AST.

- **Urinalysis** has also been traditionally used to identify patients with microscopic hematuria that may indicate occult internal injury both in the setting of NAT and in the determination for imaging in blunt abdominal trauma. It is unclear which patients undergoing NAT work-up would benefit from urinalysis screening and what threshold of RBCs may indicate the need for further imaging. Since UA screening is low-cost and non-invasive, it seems prudent to obtain a urinalysis along with transaminase levels when screening for abuse.

7.0 Diagnostic Evaluation:

Reasons to suspect abuse:

7.1 History:

- No explanation or vague explanation of an injury.
- An important detail of the explanation changes significantly.
- An explanation that is inconsistent with the pattern, age, or severity of the injury or injuries.
- An explanation that is inconsistent with the child's physical and/or developmental capabilities.
- Different caregivers provide different explanations for the injury or injuries or a single caregiver provides history that change over time.

7.2 Physical Examination:

- **Age**
  - Injuries in non-ambulatory children are of greatest concern for abuse.
- **Bruising**
  - Bruising in children<9 months of age
  - Bruising in non-ambulatory children
  - Patterned bruising
  - Extensive or clustered bruising
  - Intraoral injuries (frenulum tears) <9 months or non-ambulatory
- **Burns**
  - Patterned burns, i.e. suspected cigarette burns
  - Stocking or glove immersion burns
  - Burns in non-ambulatory patients
- **Fractures (highly specific)**
  - Classic metaphyseal lesions
  - Rib fractures

    - Scapular or sternal fractures
- **Fractures (moderately specific)**
    - Long bone fractures in non-ambulatory children
    - Digit fractures
    - Complex skull fractures
    - Vertebral body fractures/subluxations
    - Epiphyseal separations
    - Fractures of varying ages
    - Multiple fractures, especially bilateral
- **Abusive head trauma (AHT)** – Vague presenting signs and symptoms may be associated with AHT. AHT should be considered in the differential diagnoses of young children with non-specific findings such as:
    - Altered mental status
    - Fussiness
    - Vomiting
    - Lethargy
    - Seizures
    - Acute life threatening event
    - Apnea

Principles of Clinical Management

8.0 Initial Evaluation – **Children < 12months or non-ambulatory children** *with a skeletal fracture or an injury suspicious for abuse* will receive the following:

- *Thorough history* – to include any history of trauma as well as circumstances leading to the discovery of injury. It is important to document the history as early as practical in the process.
- *Head-to-toe physical assessment:* This includes thorough documentation of all abnormal findings.
- *Social services consultation*
- *Skeletal survey*
- *Transaminase Levels (ALT/AST)*
- *Urinalysis with micro*
- *Heat CT*
    - All children less than 6 months
    - Children 6-12 months with neurologic abnormality and/or external evidence of head injury. *See signs of abusive head trauma under section 7.2.*

9.0 Initial Evaluation – **Children 12-24 months** *with an injury suspicious for abuse* will receive the following:

- *Thorough history* – to include any history of trauma as well as circumstances leading to the discovery of injury. It is important to document the history as early as practical in the process.

- *Head-to-toe physical assessment*: This includes thorough documentation of all abnormal findings.
- *Social services consultation*
- *Skeletal survey*
- *Transaminase levels (ALT/AST)*
- *Urinalysis with micro*
- *Head CT*
    - Children with a neurologic abnormality and/or external evidence of head injury. See signs of abusive head trauma under section 7.2

10.0 Initial Evaluation – **Children >24 months** with an injury suspicious for abuse will receive the following:

- Thorough history – to include any history of trauma as well as circumstances leading to the discovery of injury. It is important to document the history as early as practical in the process.
- Head-to-toe physical assessment: This includes thorough documentation of all abnormal findings.
- Social services consultation
- Skeletal survey – *recommended only in children up to 5 years on a case-by-case basis*:
    - i.e. unconscious patient, non-verbal patient, or inadequate exam
- Transaminase levels (ALT/AST)
    - Recommended with multiple or severe injuries or with concern for abd/pelvic trauma.
    - Order in conjunction with UA as indicated
- Urinalysis with micro
    - Recommended with multiple or severe injuries or with concern for abd/pelvic trauma.
    - Order in conjunction with ALT/AST as indicated
    - Order in conjunction with urine toxicology as indicated
- Head CT
    - Children with neurologic abnormality and/or external evidence of head injury*. See signs of abusive head trauma under section 7.2.*

11.0 Further laboratory evaluation – specific to the injury or individual circumstances

- Urine and serum toxicology
    - Concern for ingestion
    - Evidence of neurologic abnormality
        - If head CT is obtained due to concerns for abusive head trauma (fussiness, vomiting, seizures, ALTE, etc.), urine and serum toxicology is also indicated
    - Report or suspicion of substance abuse in caregiver, either by history or presentation.
- CBC, PT/PTT, VW Panel, Factor VIII and IX levels*

- Intracranial hemorrhage (ICH) concerning for abusive head trauma (i.e. diffuse intracranial hemorrhage, mixed density blood, bilateral subdural hematomas, ICH with altered mental status, ICH with no history of trauma).
- Bruising concerning for inflicted injury.
    - Factors which increase the likelihood of abusive bruising include:
        - <9 months of age
        - Non-ambulatory child
        - Location: buttocks, genitals, ears, hands, feet, torso
        - Patterned bruising
        - Extensive or clustered bruising
- Other injury associated with bleeding
    - Solid organ injury concerning for inflicted trauma

  * *Patients with clinically significant bleeding (especially if surgery may be required) will need urgent CBC, PT/PTT and Platelet Function Assay (PFA). Hematology should be consulted urgently if PFA is elevated.*

12.0 Further Diagnostic Evaluation

- Abd/pelvis CT with IV contrast
    - Abnormal abdominal exam such as bruising, distention, tenderness, vomiting
    - Consider with >10 RBCs per HPF on urinalysis
    - ALT/AST >80 mg/dl
        - Or admit to Trauma Service for observation and serial abdominal exams.
- MRI brain/spine
    - May be indicated with ICH to further delineate injury, per neurosurgery or CARE team.

13.0 <u>Consultation</u>

- Social Services Consult
    - In patients with a history and exam/diagnostic findings that may be concerning for abuse and warrant a comprehensive SW evaluation.
- Department of Human Services(DHS)
    - In accordance with federal and state laws, any person with concerns about the safety of a minor must initiate a referral to Iowa Department of Human Services within 24-hours. If made, the attending provider must be made aware of this referral.
- BCH Regional Child Protection Center (RCPC) notification/consultation
    - Indicated with concerns of abuse identified by social worker or attending physician such as inconsistency between pattern of injury an mechanism.

- Orthopedic consultation
    - **Children < 12 months or non-ambulatory children with a long bone fracture must have orthopedic consultation** *prior to disposition from the ED. This may include radiologic review only, at the discretion of the orthopedic team.*

- Neurosurgical Consult
    - **All patients with skull fractures** (including convexity, base and orbits) must have a neurosurgical consultation prior to discharge from the hospital. *See Management of Pediatric Skull Fractures Guideline.*
- Ophthalmology Consult
    - Indicated in patients with intracranial hemorrhage. Also consider for injuries to the face/neck or eyes and/or eye findings concerning for genetic disorders. Ophthalmology may be consulted by the Trauma Service after admission if appropriate.

14.0 Admission/Disposition

- **Injuries require admission for medical management:**
    - **Pediatrics** will admit all patients with suspected NAT.
    - **Consult Trauma Service** for evaluation on all pts with suspected or proven NAT.
    - **Sub-specialty consultation** as indicated.
    - It is advisable to inform the family of the plan to involve the CARE team if applicable.
    - Isolated injuries *with no ongoing concern for abuse* may be admitted to the appropriate surgical sub-specialty as appropriate (Neurosurgery, Orthopedics, Trauma).
- **Injuries DO NOT require admission for medical management:**
    - Reasonable suspicion for abuse:
        - DHS report is made
            - Request DHS involvement for discharge. Once a safe disposition has been established by DHS, the patient may be discharged from the ED.
            - If a safe disposition cannot be developed by DHS in the ED in a timely manner, the patient will be admitted to the Trauma Service for observation until a plan is in place.
    - Provider is unsure if there is reasonable suspicion for abuse:
        - Discuss with RCPC team for further direction, if available.
        - A DHS report at discretion of provider/SW.
            - Discharge home at discretion of provider.
    - No reasonable suspicion for abuse:
        - No CPS referral made.
        - Documentation indicating no concerns for abuse.

15.0 Important considerations:

- Admitted for a Medical Diagnosis

- Patients admitted for a non-traumatic diagnosis (i.e. seizures, FTT) and later suspected to have an injury should have a Trauma Consultation as soon as the injury is discovered. Trauma team consultation should not be delayed for a sub-specialty surgical consult.

16.0 Concern for abuse outside BCH ED

- Outside hospitals:
  - Children <12 months or *non-ambulatory* with a skeletal fracture or other injury suspicious for abuse should be transferred to BCH ED for evaluation.
  - Children > 12months with an injury suspicious for abuse should also be transferred to BCH ED *prior to referral for orthopedic or other sub-specialty follow-up*. It is prudent to maintain a high index of suspicion for abuse in children under 24 months of age with a fracture or other injury.

Reference

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A. Evaluation of children < 12 months or non-ambulatory with a skeletal fracture or other injury suspicious for abuse:

- Thorough history
- Head-to-toe physical assessment
- Social Services consultation
- Skeletal survey
- ALT/AST
- UA with micro
- Head CT
  - All children less than 6 months
  - Children with neurologic abnormality (see section 7.2) and/or external evidence of head injury

B. Blood and urine (additional evaluation) as indicated:

Urine & serum toxicology
- Concern for ingestion
- Evidence of neurologic abnormality (if head CT is obtained)
- Report or suspicion of substance abuse in caregiver by history or presentation

CBC, PT/PTT, VW Panel, Factor VIII & IX levels
- Intracranial hemorrhage (ICH) concerning for abusive head trauma
  - Diffuse ICH
  - ICH with mixed density blood
  - Bilateral SDH
  - ICH with altered mental status
  - ICH with no history of trauma
- Bruising concerning for inflicted injury
  - < 9 months of age
  - Non-ambulatory child
  - Location: buttocks, genitals, ears, hands, feet, torso
  - Patterned bruising
  - Extensive or clustered bruising
- Other injury associated with bleeding such as solid organ injury

Bone abnormality evaluation
Vit D 25, PTH, Alkaline Phosphatase, Calcium, Phosphorus levels
- Skeletal fracture concern for abuse
- Radiographic concern for osteopenia or metabolic bone disease

C. Consultation as indicated:

Neurosurgical Consultation
All patients with skull fractures (including convexity, base and orbits) must have a neurosurgical consultation prior to discharge from the hospital.

Orthopedic Consultation
Children < 12 months or non-ambulatory children with a long bone fracture must have orthopedic consultation prior to disposition from the ED.

Ophthalmology Consultation
Patients with ICH; also consider for injuries to the face/neck or eyes and eye findings concerning for genetic disorders. Ophtho may be consulted after

D. Diagnostic imaging (additional) as indicated:

CT Abd/Pelvis with IV contrast

- Abnormal chest or abdominal exam
- Consider with >10 RBCs per HPF on urinalysis
- ALT/AST >80 mg/dl
    - imaging (additional) as indicated:

Neurosurgical Consultation

All patients with skull fractures (including convexity, base and orbits) must have a neurosurgical consultation prior to discharge from the hospital.