

# **Trauma Center Practice Management Guideline**

## *Blank Children's Hospital —Des Moines*

<b><i>Choice of Imaging Modality</i></b>	
<b>PEDIATRICS</b> Practice Management Guideline	<b>Effective: 07/2017</b>
<b>Contact: Trauma Medical Director</b>	<b>Reviewed: 01/2020</b>

### **PURPOSE**

The purpose of this guideline is to recognize the different physiological and anatomical considerations of the growing child and to highlight the different approach to imaging needed. Also, this guideline will help clinicians dealing with a severely injured child to make imaging decisions. The use of adult protocols is not appropriate as a routine investigation in childhood.

### **POLICY STATEMENTS**

All examinations using ionizing radiation should be performed only when necessary to answer a medical question help treat a disease, or guide a procedure. The clinical indication and patient medical history should be carefully considered before referring a patient for any imaging examination.

Exposure to ionizing radiation should always be kept to a minimum in the injured child and imaging examinations should use techniques that are adjusted to administer the lowest radiation dose that yields an image quality adequate for diagnosis or intervention.

The increased risk from ionizing radiation in children is due to a number of factors. Developing and maturing tissues in the growing child are more radiosensitive, there is a cumulative lifelong radiation risk, and they have a longer life time in which to express the increased relative risk.

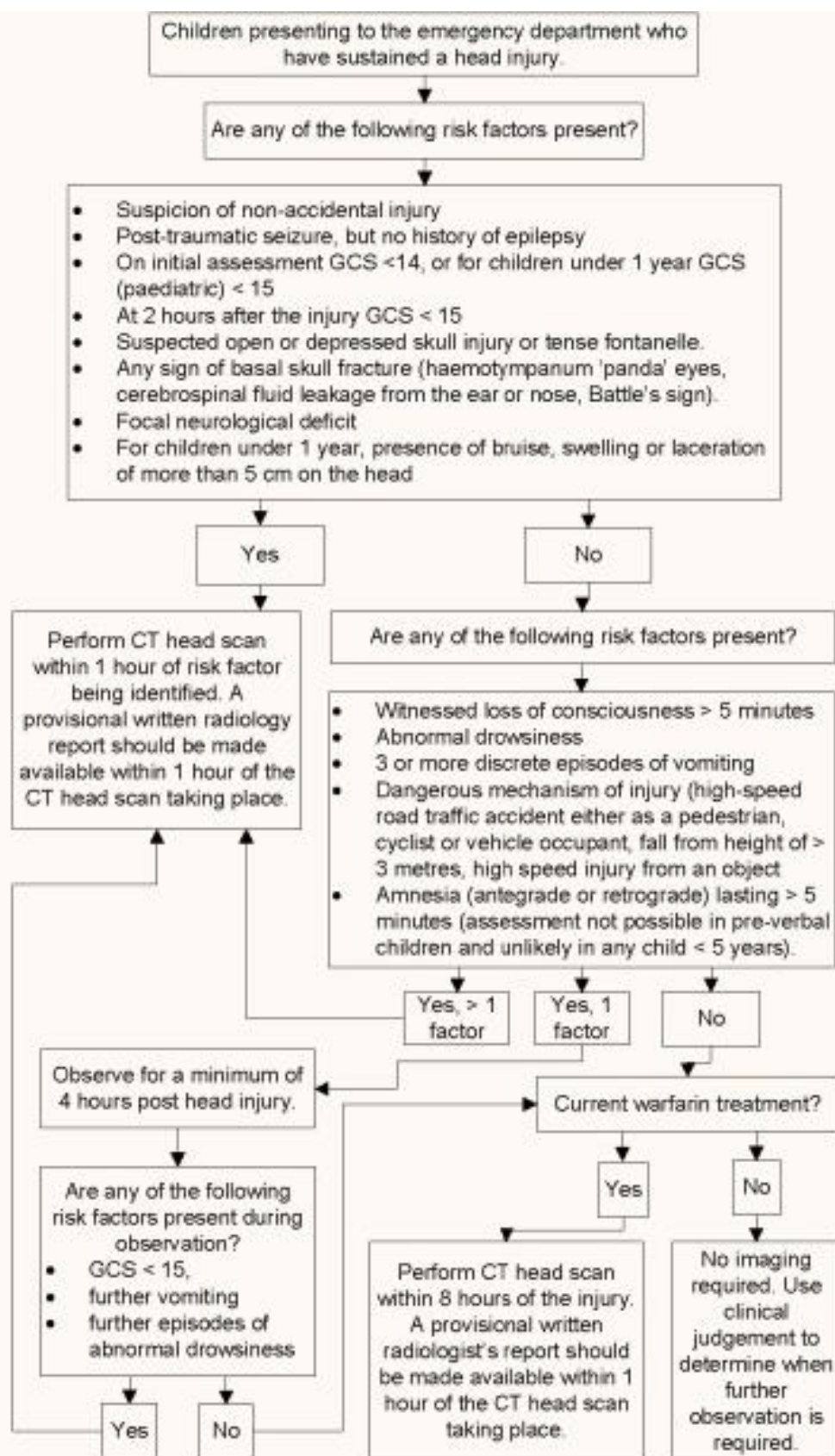
The injury pattern in children is typically isolated to one anatomical area rather than multiple sites. It is important to appreciate this pattern of potential injury when considering the need for imaging.

If CT is deemed most appropriate investigation, use appropriate dose reduction procedures. The radiation dose should be adjusted according to the "as low as reasonably achievable" (ALARA) principle.

### **CHOICE OF IMAGING MODALITY**

#### **Cranial imaging**

CT is the primary investigation for cranial imaging in a child who has suffered head trauma. Fulfilling the criteria for a head CT scan is not an indication on its own for a CT of the cervical spine or any other part of the body in the injured child.



## **Cervical spine imaging**

Cervical spine injuries in children is uncommon. Imaging of the cervical spine is recommended when there is clinical suspicion of cervical spine injury on history or examination. Adequate radiographs of the cervical spine may exclude significant bony injury and may obviate the need for CT, but appropriate views are difficult to obtain in the injured child.

Children, especially those younger than five years, are more prone to radiation-induced malignancies due to increased radiosensitivity of certain organs and a longer latency period to develop a cancer. Estimated lifetime cancer mortality risks attributable to the radiation exposure from a CT for a one year old is approximately 0.07 to 0.18 percent, which is a risk that is an order of magnitude higher than that for adults who are exposed to a CT of the cervical spine. Thus, **the risk of radiation exposure exceeds the benefit of CT imaging in the majority of children evaluated for cervical spine injury, except for those with a higher likelihood of abnormality as determined by the initial evaluation.**

See Pediatric Cervical Spine Injury Guideline and Algorithms

## **Imaging of the spine**

CT of the spine is the gold standard imaging modality to rule out spine injury. CT of the thoracic and lumbar spine is included in a CT of chest, abdomen and pelvis and targeted CTs of the spine are not required if these scans are obtained. If there is definitive neurological signs, the primary imaging modality should be MRI.

## **Imaging of the chest**

The primary investigation for blunt chest trauma in children is chest x-ray. This will detect pneumothorax, hemothorax, rib fractures, gross mediastinal abnormalities and diaphragmatic injuries.

Penetrating trauma is an indication for contrast-enhanced chest CT due to the incidence of occult vascular injury.

Obtaining a chest CT is unlikely to lead to a change in management when the chest x-ray is normal, when the patient is conscious and when the patient is clinically stable.

## **Imaging of the abdomen**

If clinically indicated, contrast-enhanced CT is the modality of choice for assessment of acute traumatic intra-abdominal injury. Single-volume, dual-contrast CT of the abdomen is advised to minimize radiation burden.

There are no mechanisms of injury which mandate abdominal CT as an isolated factor. Isolated head injury with depressed mental status should not be the only justification for abdominal CT. The decision to perform abdominal CT should be made on the basis of the clinical history and examination.

The following clinical variables had been found to be associated with intra-abdominal injury and may indicate the need for abdominal CT:

- Lap belt or handlebar injuries

- Abdominal wall ecchymosis
- Abdominal tenderness in a conscious patient
- Abdominal distention
- Clinical evidence of persistent hypovolemia, such hypotension, persistent tachycardia
- Blood per rectum or nasogastric tube

### **Imaging of the limbs**

Using clinical history and examination, clinicians should request plain radiographs of the injured regions as the primary investigation. This usually includes anteroposterior and lateral views including the adjacent joints. CT may be required for complex fractures.

### **Imaging of the pelvis**

Pelvis fractures are rare in children. A screening pelvic radiograph is not indicated in all cases. Pelvic imaging should only be considered if there are concerns after clinical assessment. The bony pelvis will be included on CT evaluation of the abdomen and pelvis. Where clinically indicated, contrast enhanced CT of the abdomen and pelvis is the modality of choice.

### **Interventional radiology**

The interventional radiologist needs to keep radiation dose and contrast load as low as possible while still providing good quality examination.

### **References:**

The Royal College of Radiologist. Pediatric trauma protocols. London: The Royal College of Radiologist, 2014.

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