Trauma Center Practice Management Guideline

Blank Children's Hospital — Des Moines

Pediatric Cervical Spine Evaluation and Clearance

PEDIATRIC **Practice Management Guideline**	**Effective: 04/2014**
Contact: Trauma Medical Director	**Last Reviewed: 01/2020**

PURPOSE

To provide guidelines for the diagnostic evaluation and subsequent clearance of cervical spine injuries in the injured pediatric patient.

DEFINITIONS

Radiologic clearance of the cervical spine should occur only after the hemodynamic, respiratory, and surgical stabilization of the patient is complete. During such stabilization the cervical spine should be kept in spinal movement restriction with an approved well fitted cervical spine collar.

Plain cervical spine radiographs are the initial radiologic study to evaluate for cervical spine injury in most children with normal mental status. Plain radiographs have adequate sensitivity to identify or exclude unstable cervical spine fractures or dislocations, especially in awake children with reliable physical examinations. **Plain radiographs expose the patient to much less radiation than CT**.

A CT should also be obtained in any of the following circumstances:

- GCS score <13 or neurologic deficit on physical examination
- Inadequate cervical spine radiographs (three views in children over three years of age, inadequate lateral or open-mouth view in children under three years of age), if there is a high likelihood of injury based upon the combination of injury mechanism and physical findings.
- Suspicious or documented plain radiographic findings of fracture or dislocation
- High-clinical index of suspicion based upon injury mechanism and physical findings despite normal radiographs

Consider CT of C1-C3 in all children eight years of age and younger who are undergoing head CT, regardless of findings on plain radiographs and neurologic examination, or in those children eight years of age and younger in whom an adequate odontoid view cannot be obtained and to restrict imaging to C1-C2.

If CT is required because of inadequate plain radiographs, the study should ideally be limited to the vertebra of concern rather than imaging the entire cervical spine whenever feasible.

The radiation dose should be adjusted according to the "as low as reasonably achievable" (ALARA) principle. This approach to the use of CT for pediatric cervical spine imaging balances the potential long-term risk of radiation exposure and cost of the study with the need for diagnostic certainty in severely injured patients. A helical cervical spine CT delivers a 50 percent increase in mean radiation dose to the

cervical spine in pediatric patients relative to conventional radiography. In addition, the radiation dose to the skin and thyroid for CT evaluation of the cervical spine is approximately 10 times and 14 times, respectively.

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**.

MRI should be performed in patients with an abnormal neurologic examination or when imaging of the spinal cord or other soft tissues of the spinal column is required. MRI is less sensitive than CT for the detection of fractures of the posterior elements of the cervical spine and injuries to the craniocervical junction. Spinal MRI may also be performed for documentation of the full extent of injury in children who are victims of abusive head trauma.

GUIDELINES

Pediatric trauma patients at risk for cervical spine injury are categorized, according to their clinical presentation, into either a high risk or low risk category. Guidelines are subsequently presented by patient category.

1. **Low risk**: Those patients who present after a traumatic event with all of the following criteria met: **No neck pain, no evidence of intoxication, normal level of consciousness, normal neurological exam and the absence of painful distracting injury.**

    A. Cervical spine x-rays are not necessary but may be ordered at provider discretion. (If radiographs are completed they should be done according to the following algorithm.)
    B. Plain Films
        - Ages 0-8 years
            - Anteriorposterior view revealing the spinous processes of the second cervical through the first thoracic vertebra.
            - Lateral view revealing the base of the occiput to the upper border of the first thoracic vertebrae
        - Ages over 8 years
            - Anteroposterior view revealing the spinous processes of the second cervical through the first thoracic vertebra.
            - Lateral view revealing the base of the occiput to the upper border of the first thoracic vertebrae
            - Open mouth odontoid view revealing the lateral masses of the first cervical vertebra and entire odontoid process.
    C. CT Scan of the cervical spine may be used as an alternate to plain films at the discretion of the ordering physician, or if a CT is required to evaluate for additional injuries.
    D. If evidence of Cervical Spine Injury on Plain Film or CT scan a consultation with Neurosurgery is required and the patient should be kept in spinal movement restriction.
    E. If no radiographic evidence of injury exists but there is continued concern, stability of the cervical spine can be confirmed via dynamic flexion and extension films in an awake, cooperative patient.
        - If negative, cervical spine is cleared.

- If evidence of instability, c-collar is to be replaced, spine immobilized, and neurosurgery consulted.
- If unable to perform flexion/extension or unsatisfactory results, leave patient in properly fitted cervical collar, consider role of NSAIDs and arrange follow up with neurosurgery in 7-14 days.

2. **High Risk:** Those patients who present after a traumatic event with any one (or more) of the following NEXUS criteria: **cervical spine tenderness, evidence of intoxication, altered level of consciousness, abnormal neurologic exam or painful distracting injury**.

A. Plain films:
   - Ages 0-8 years
     - Anteroposterior view revealing the spinous processes of the second cervical through the first thoracic vertebra.
     - Lateral view revealing the base of the occiput to the upper border of the first thoracic vertebrae.
   - Ages over 8 years
     - Anteroposterior view revealing the spinous processes of the second cervical through the first thoracic vertebra.
     - Lateral view revealing the base of the occiput to the upper border of the first thoracic vertebrae.
     - Open mouth odontoid view revealing the lateral masses of the first cervical vertebra and entire odontoid process.

B. CT Scan: CT Scan of the cervical spine may be used as an alternate to plain films at the discretion of the ordering physician, or if a CT is required to evaluate for additional injuries.

C. If evidence of Cervical Spine Injury on Plain Film or CT scan a consultation with Neurosurgery is required and the patient should be kept in spinal movement restriction.

D. If Plain Films are negative but patient has any of the following, take action as recommended below:
   - C spine tenderness
     - Flexion/Extension Films (For patients with a normal neurological exam)
     - Consider MRI if non-cooperative or unable to perform active ROM
   - Intoxication
     - Clear cervical spine when clinically unimpaired.
   - Altered Level of Consciousness
     - MRI when clinically appropriate
   - Altered Neurological Exam
     - MRI as soon as possible and consult neurosurgery
   - Painful distracting injury
     - Stabilize and control pain of injuries and attempt to clear clinically

E. If any injury to the c-spine is identified, proceed with evaluation of the entire spine.

F. Spine x-ray clearance
   - When a patient is admitted, the patient's spine and neurological status will be clearly documented in the progress notes section of the medical record.
   - Cervical spine clearance should be documented in the progress notes section of the medical record in addition to the doctor's order section for removal of cervical collar.

*Note: For those patients admitted to the trauma service, a mid-level provider with Trauma Services or Neurosurgery services may clear the patient's cervical spine once case is discussed with the attending trauma surgeon. C-spine clearance is subsequently documented in the progress notes.

FORMS/ALGORITHMS

See the following attached algorithms:

- *Pediatric Cervical Spine Injury Protocol: Low Risk*
- *Pediatric Cervical Spine Injury Protocol: High Risk*

REFERENCES

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Pediatric Cervical Spine Injury Protocol
Low Risk Mechanism of Injury

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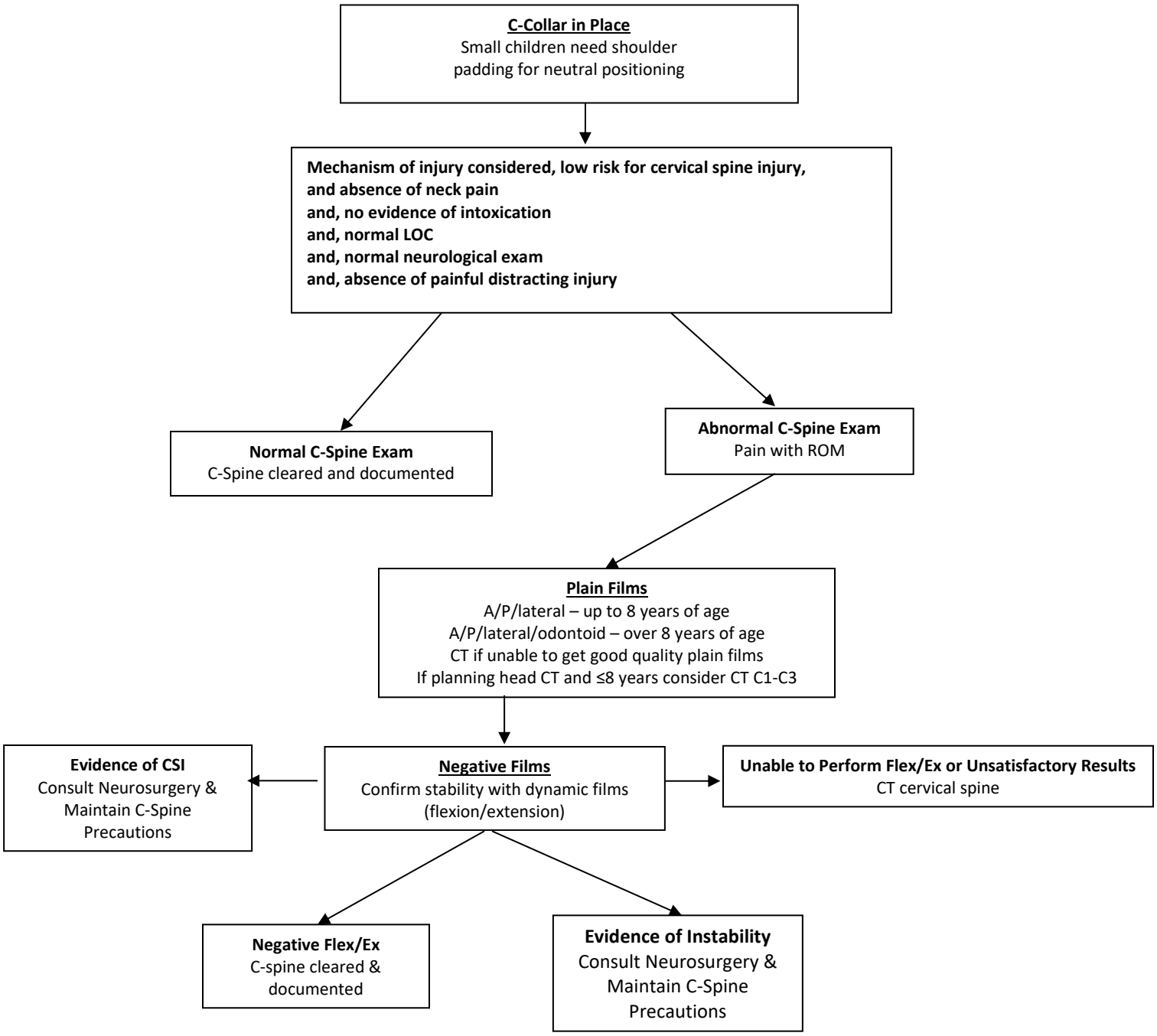

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Pediatric Spine Injury Protocol
High Risk Mechanism of Injury

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