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# Thoracolumbar Spine Evaluation and Clearance Clinical Pathway

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Owners: Neurosurgery/Orthopedics

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## Rationale

This clinical pathway was developed by a consensus group of Johns Hopkins All Children's Hospital (JHACH) physicians, advanced practice providers, and nurses to standardize the management of children presenting with concerns for thoracolumbar (TL) spine injuries. This guideline will assist to:

1. Define patients in which evaluation of the lower spine must be undertaken.
2. Define early intervention of lower spine injuries to prevent neurologic deterioration.

## Background

Thoracic and lumbar spine injuries can cause significant long-term consequences to the patient and require comprehensive assessment and management to determine the stability of the injury and treatment options.

## Diagnosis

Radiologic studies: X-ray (XR), computed tomography (CT), magnetic resonance imaging (MRI)

## Clinical Management

General:

1. The entire spine is immobilized during the primary survey
2. Radiographic clearance of the spine is not required before emergent surgical procedures
    a. The presence of a spinal cord injury (SCI) is simply assumed until excluded
3. Secondary and tertiary exams include examination of the spine for tenderness as well as testing all motor roots, sensations, and reflexes
4. Tertiary exams are performed only on alert and unimpaired patients without distracting injuries
5. The entire spine must be radiographed if any spine fractures are found
6. Patients with radiographic injury will have Spine Team (Neurosurgery) consultation for focused pre-operative evaluation regarding relative instability and severity of injury before intubation when possible
7. Patients remain on spine precautions until the spine is cleared

Thoracolumbar (T/L):

1. CT of thoracic and lumbar spines if there are clinical findings on secondary, tertiary, or an unreliable exam
    a. Multi-detector CT with reformatted axial collimation is superior to plain films

2. Radiographic T/L clearance is not needed before the operating room (OR) for non-spine surgery
    a. T/L clearance may be required for some non- supine positioning in the OR, depending upon acuity and case type
3. A tertiary exam is necessary to clear the thoracic and lumbar spines

**Emergency Center Management**

Definitions:
Stable spine injury: Those injuries not associated with a neurologic deficit, not at risk for development of neurologic deficit, and not prone to late collapse (e.g., transverse process fractures, spinous process fracture, minimal compression fracture)

Unstable spine injury: Any fracture pattern associated with a neurologic deficit, those that are prone to develop a neurologic deficit, or those prone to late collapse (e.g., fracture subluxation and dislocation, severe burst fractures)

Screening radiologic studies: If a mechanism or physical finding suggests a thoracic, lumbar, or sacral spine injury, then the appropriate screening radiologic studies are:

1. Spine reconstructions from the chest and abdominal CT if needed to rule out chest or abdominal injuries

or

2. Plain XR of the thoracic, lumbar, or sacral spine
    a. Concerning radiologic findings may be followed with "formal" CT of the appropriate vertebral regions

Guidelines:
1. Perform an airway, breathing, and circulation (ABC) survey
2. Secondary survey:
    a. Log roll patient with full cervical (C)-spine immobilization to determine areas of tenderness in the thoracic and lumbosacral spine
        i. If tenderness is present, assume the spine to be unstable
    b. Examine for areas of increased kyphosis or spinous process step-off
    c. Perform a neurologic exam to determine any deficits suggestive of neurologic injury
    d. Examine rectal tone (involuntary and voluntary)
3. Obtain anteroposterior (AP) and lateral thoracic XR for patients with pain in thoracic vertebrae or utilize AP and lateral spine reconstructions from the chest and/or abdominal/pelvis CT if these have been performed
4. Obtain AP and lateral lumbosacral XR for patients with pain in the lumbosacral vertebrae
    a. Keep a high index of suspicion for possible lumbar fracture in patients with abdominal wall "seatbelt sign" or utilize AP and lateral spine reconstructions from the abdominal/pelvis CT if these have been performed

5. If neurologic injury is found without bony injury, or vertebral body fractures are found obtain an MRI of the involved spinal level
    a. Consider screening MRI of non–involved spinal levels
    b. Always include at least a vertebra above and below (e.g., a C7 body fracture will require CT & MRI of the cervical and thoracic spine)
6. Consult the Spine Team (Neurosurgery) if a bony injury or neurologic deficit is found
7. If a neurologic injury is found with a concomitant bony injury, perform a complete neurological exam using the American Spinal Injury Association (ASIA) format
8. Maintain spinal precautions until cleared by the consulting service or a negative MRI
9. Beware of ileus in patients with spinal fractures
    a. Consider early use of nasogastric (NG) tube
10. If a fracture is noted in one area of the spine, complete cervical/thoracic/lumbosacral (C/T/L) spine radiographs should be obtained to assess for additional fractures
    a. Spine reconstructions from the chest and abdominal/pelvis CT are preferable if these have been obtained

# Initial Evaluation of the Trauma Patient with Suspected Thoracolumbar Spine Injury

**Suspected Thoracolumbar Spine Injury**

- Standard resuscitation per ATLS
- Stabilize spine (assume injury until proven otherwise): semi-rigid C-collar, transport on spine board, log roll spinal precautions
- Is patient evaluable? - GCS 15, no intoxication, no distracting injury, reliable/cooperative
- Does patient have neurological deficits? - per ASIA *Standard Neurological Classification of SCI*
- Does patient have an abnormal spine exam? - tenderness/pain, paraspinal edema, or palpable interspinous gap

**Evaluable patient, no neurological deficit, normal exam**

- T/L spine imaging typically not required (consider in the case of C-spine fracture)
- Discontinue spinal precautions

**Abnormal exam or non-evaluable patient, NO neurological deficits**

- Obtain emergent plain XR of TL spine
- For C-spine, see Cervical Spine Clearance pathway
- If XR normal but pain/tenderness persists, consider Spine Team (Neurosurgery) consult for further imaging guidance
- If XR abnormal, obtain emergent CT C/T/L spine and consult Spine Team (Neurosurgery)

**Neurological deficit present**

- Emergent imaging: CT of C/T/L spine (T/L spine can be extracted from concurrent CT C/A/P, if performed)
- Emergent Spine Team (Neurosurgery) consult
- Need for & timing of MRI to be determined by Spine Team (Neurosurgery)

Abbreviations: Advanced Trauma Life Support, ATLS; cervical-collar, C-collar; chest/abdomen/pelvis, C/A/P; Glasgow Coma Scale, GCS

**Inpatient Management – Spinal Precautions and Log Roll Guidelines**

General rules**:**

1. Patients are transported to JHACH immobilized
    a. Consider pre-hospital board times including referring hospital pre-transfer time
    b. The patient may have an extended length of time on a board

*Keep suction and airway equipment readily available for patients on log roll precautions as they cannot be easily turned to maintain their airways*
*Be prepared to maintain their airways and prevent aspiration if necessary*

2. Evaluate the patient for risk factors associated with skin breakdown such as poor nutritional status, circulatory impairment from cardiac or vascular disease, diabetes, lack of adipose tissue, etc.
3. Hardboards should only be utilized in the pediatric intensive care unit (PICU) and inpatient floors for patient transfer and obtaining films and must be discontinued as soon as possible to prevent breakdown
    a. **Do not keep the patient on a board for any longer than necessary (2 hours is the maximum time on board)**
4. Document on/off board times
5. **Don't use a slider board to transfer the patient**
    a. Sliders are flexible devices that do not offer appropriate spine immobilization
6. Must reassess sensory/motor function with every turn, transfer, and as needed

Pre-log roll assessment:

1. Review medical diagnosis (know the patient)
    a. Clearance of spine per provider by radiologic evaluation
    b. Level of SCI/stability of spine fractures
    c. Other injuries
2. Review medical order for activity
    a. Spinal precautions until spines clear
        i. Head of bed (HOB) flat or reverse Trendelenburg (if not contraindicated)
    b. Log roll
    c. Log roll with cervical spine precautions
3. Determine the number of staff required to perform the log roll
    a. Leader positioned at HOB
    b. Assistants (1 – 2) for placement on hardboard, wound/skin assessment, linen change
    c. Assistants (3 – 4) positioned for turning
        i. Additional staff may be required depending on patient size and/or injuries
            1. 1st assistant at torso
            2. 2nd assistant at hips
            3. 3rd assistant at legs
4. HOB flat
    a. Maintained at all times

    b. Reverse Trendelenburg may be used to elevate the patient's head after the log roll procedure is completed
5. Inspect cervical collar
    a. Correct size?
    b. Appropriately applied/positioned?
6. Inspect cervical traction (if indicated)
    a. Are weights secure and hanging freely?

Prepare for log roll:

1. Prepare patient for log roll turn
    a. Explain procedure
    b. Instruct patient to lay still and not to assist with turn
    c. Ensure the patient is in proper alignment before turn
    d. Raise bed to approximate waist level of all participants

Log roll procedure:

1. The leader takes position at the patient's head
    a. Position hands on each side of the patient's head
    b. Place thumbs at the mandible bilaterally
    c. Place fingers behind the head at the occipital ridge
    d. Maintain firm, gentle stabilization of the neck throughout the procedure
2. Leader to assess the current motor and sensory function of the patient
3. The leader directs assistants to turn the patient (in unison on count of "3") toward them onto the patient's side
    a. The leader monitors alignment (nose & umbilicus) continuously
4. Leader directs assistants on the opposite side to proceed with the turn
    a. Placement of rigid backboard
        i. Position rigid backboard for contact with patient's back
        ii. Assess skin integrity while the patient is on their side
        iii. Change linen
5. The leader directs return to a supine position on the count of "3"
    a. The patient should be gently rolled as a unit maintaining spinal alignment
6. Continue with patient care
    a. Rigid backboard (patient should be centered on the board) and if not centered:
        i. Leader maintains cervical alignment as described
        ii. Equal number of assistants on either side of the patient
        iii. On the count of "3", the patient should be repositioned to the center of the rigid backboard
    b. Linen change:
        i. Leader maintains cervical alignment as described and assesses spinal alignment
        ii. Assistants move to opposite sides of the bed
        iii. Repeat the log roll procedure in the opposite direction
7. Leader re-assesses sensory/motor function after all logroll procedures

Transfer/transport guidelines:

1. Log roll procedure is used at all times until spines are cleared by provider order
2. A rigid backboard is used at all times for transfers from one surface to another until spines are cleared by the provider order
    a. Stretcher to stretcher
    b. Stretcher to procedure/diagnostic table
    c. Stretcher to bed
    d. Bed to procedure/diagnostic table
    e. Bed to bed
3. Slider boards must not be used to lift or transfer patients
    a. The slider is not a rigid surface, thus not suitable for lifting or transfer
    b. Exception: slider may be used under hardboard (not next to patient) to reduce friction associated with movement from surface to surface
4. Portable diagnostic XR
    a. Place patient on rigid backboard per log roll procedure
    b. The leader and assistants lift the patient on a rigid hardboard in unison on the count of "3"
    c. Pancake XR board is placed between bed and patient on rigid backboard
    d. Count "1-2-3" in unison to lower the patient/hardboard onto the pancake board
    e. Notify Radiology that the patient is ready for films
    f. Patient remains on hardboard and pancake board until Radiology approves the quality of films obtained
        i. **The patient should not remain on the hardboard for > 2 hours!!**
    g. Remove patient from pancake board
        i. Leader and assistants lift patient on rigid hardboard
        ii. The pancake board is removed
        iii. Leader and assistants lower patient in unison (still on hardboard) to bed surface
        iv. Remove patient from rigid backboard using log roll procedure

**Outcome Measures**

- Team compliance with guideline
- Unexpected mortality or morbidity

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Thoracolumbar Spine Evaluation and Treatment Clinical Pathway

*Johns Hopkins All Children's Hospital*

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