Thoracolumbar Spine Evaluation and Clearance Clinical Pathway
This pathway is intended as a guide for physicians, physician assistants, nurse practitioners and other healthcare providers. It should be adapted to the care of specific patient based on the patient’s individualized circumstances and the practitioner’s professional judgment.
Johns Hopkins All Children's Hospital

Thoracolumbar Spine evaluation and Clearance
Clinical Pathway

Rationale

This clinical pathway was developed by a consensus group of 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 and 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 stability of the injury and treatment options.

Diagnosis

Radiologic studies: X-ray, CT, MRI

Clinical Management

General

1. Entire spine is immobilized during primary survey.
2. Radiographic clearance of the spine is not required before emergent surgical procedures. Presence of a spinal column injury is simply assumed until excluded.
3. Secondary and tertiary exams include examination of the spine for tenderness as well as testing all motor roots, sensation and reflexes.
4. Tertiary exams are performed only on alert and unimpaired patient without distracting injuries.
5. If any spine fractures are found, entire spine must be radiographed.
6. Patients with radiographic injury will have spine consultation for focused pre-operative evaluation regarding relative instability and severity of injury prior to intubation when possible.
7. Patients remain on spine precautions until spine is cleared.
Thoraco-Lumbar
1. CT scan of thoracic and lumbar spines if there are clinical findings on secondary or tertiary exams or an unreliable exam. Multi-detector CT-scan with reformatted axial collimation is superior to plain films.
2. Radiographic Thoraco-Lumbar clearance is not needed prior to OR for non spine surgery. Thoracic & Lumbar clearance may however be required for some non-supine positioning in the OR, depending upon acuity and case type.
3. Tertiary exam is necessary to clear thoracic and lumbar spines.

Emergency Center Management
DEFINITIONS:
Stable spine injury: Those injuries not associated with a neurologic deficit and 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 and 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 there is a mechanism or physical finding suggesting a thoracic, lumbar, or sacral spine injury, then the appropriate screening radiologic studies are:

   a) spine reconstructions from the chest and abdominal CT-scan if these are being done to rule out chest or abdominal injuries

   OR

   b) plain x-rays of the T,L, and S spine. Concerning radiologic findings may be followed with “formal” CT scans of the appropriate vertebral regions.
GUIDELINES:

1. Follow ABC’s.
2. Secondary survey:
   a. Logroll patient with full C-spine immobilization to determine areas of tenderness in the thoracic and lumbosacral spine. If tenderness is present, assume the spine to be unstable.
   b. Examine for areas of increased kyphosis or spinous process step-off.
   c. Perform neurologic exam to determine any deficits suggestive of neurologic injury.
   d. Examine rectal tone (involuntary and voluntary).
3. Obtain AP and lateral thoracic X-rays for patients with pain in thoracic vertebrae or perform AP and lateral spine reconstructions from the chest and/or abdominal/pelvis CT Scans if these have been performed.
4. Obtain AP and lateral lumbosacral X-rays for patients with pain in the lumbosacral vertebrae. Keep high index of suspicion for possible lumbar fracture in patients with abdominal wall “seatbelt sign.” OR perform AP and lateral spine reconstructions from the abdominal/pelvis CT Scan if these have been performed.
5. If neurologic injury is found without bony injury, or vertebral body fractures are found obtain an MRI scan of the involved spinal level. Consider screening MRI of non–involved spinal levels. Always include at least a vertebra above and below. (Example: A C7 Body fracture will require CT & MRI of the cervical and thoracic spine)
6. Consult the spine service if bony injury or neurologic deficit is found.
7. If bony injury is found or a neurologic injury is found with concomitant bony injury, perform a complete neurological exam using the ASIA format.
8. Maintain spinal precautions until cleared by the consulting service or negative MRI’s.
10. If fracture is noted in one area of spine, complete C/T/LS spine radiographs should be obtained to assess additional fractures. Reformattung of the chest and abdominal/pelvis CT scans to examine the spine is preferable if these CT scans have been obtained.
Algorithm 1. Evaluable Thoracolumbar (TL) Spine Injury Patient

- This algorithm applies to patients meeting Trauma Activation Criteria.
- All blunt trauma patients should be considered as having a TL spine injury until proven otherwise.

Prior to Arrival at Trauma Center

- Resuscitation / ATLS protocol
- Spine stabilization
  - Place semi-rigid C-collar; immobilize entire patient on long-spine board with proper padding
  - Maintain spine precautions (log roll, elevating HOB via reverse Trendelenburg only)
- Clear cervical spine using Cervical Spine Guideline

EVALUABLE PATIENT CRITERIA
(must fulfill all criteria)

- Glasgow Coma Scale score = 15
- Not intoxicated
- No distracting injury preventing patient’s full concentration on exam
- Reliable / cooperative clinical exam

Determine if patient has neurological deficits* and/or TL spine (bone) tenderness/pain (not soft tissue), paraspinal edema, or palpable interspinous gap

No Neurological Deficits Present

No neurological deficit and without TL spine tenderness/pain, paraspinal edema, or palpable interspinous gap

Imaging*
- No spinal imaging required.
- Consider imaging in the case of a cervical spine fracture, despite the absence of neurologic deficits.

Follow-Up
Attending physician or experienced resident
- Clears the spine
- Documents clearance in medical record
- Removes TL-spine precautions

No neurological deficit but with significant TL spine (bone) tenderness/pain, paraspinal edema, or palpable interspinous gap

Imaging*
- If patient also having CT scan of chest, abdomen, and pelvis, the CT of the TL spine will be extracted from those studies. However, an order still must be written for CT thoracic and/or lumbosacral spine.
- If body CT not required for other reasons, obtain a dedicated CT of the thoracic and/or lumbosacral spine.

Follow-Up
Abnormal CT Results
- If CT abnormal, obtain urgent Spine consult** and obtain C-spine CT as described in the Cervical Spine Guideline.

Normal CT Results
- If CT negative and patient’s pain resolves, patient can be clinically cleared.
- If spine series negative and significant pain persists, continue spine precautions and refer on non-emergent basis to spine specialist.

Neurological Deficit Present

Neurological deficit referable to spine injury

Imaging*
- Emergent CT of C-spine.
- Emergent CT of TL-spine (can be extracted from a concurrent chest, abdomen, and pelvis CT if available).

Follow-Up
Emergent Spine consult**
  - Need for MRI to be determined by Spine specialist.***
  - If there is a transverse process fracture or spinous process fracture, both spine consult and MRI are necessary.
  - With the presence of an indeterminate-age compression fracture of the thoracolumbar spine AND concomitant back pain, obtain MRI to assess acuity.

* Determine if C-spine imaging is needed, per Cervical Spine Guideline.
** To determine if patient has neurological deficits, use ASIA Standard Neurological Classification of Spinal Cord Injury.
*** MRI can be done at any point post-injury
Algorithm 2. Non-Evaluable Thoracolumbar (TL) Spine Injury Patient

- This algorithm applies to patients meeting Trauma Activation Criteria.
- All blunt trauma patients should be considered as having a TL spine injury until proven otherwise.

Prior to Arrival at Trauma Center

- Resuscitation / ATLS protocol
- Spine stabilization
  - Place semi-rigid C-collar; immobilize entire patient on long-spine board with proper padding
  - Maintain spine precautions (log roll, elevating HOB via reverse Trendelenburg only)
- Clear cervical spine using Cervical Spine Guideline

NON-EVALUABLE PATIENT CRITERIA*
(any of the following)

- Glasgow Coma Scale < 15
- Intoxicated
- Distracting injury (preventing patient’s full concentration on exam)
- Reliable / cooperative clinical exam

Determine if patient has neurological deficits* and/or paraspinal edema or palpable interspinous gap, and/or spine bony tenderness (not soft tissue)

Imaging**

- Emergent CT of cervical spine
- Emergent CT of TL spine (can be extracted from concurrent chest, abdomen, and pelvis CT if available)

Normal Imaging Studies

- Focal Neurological Deficits Referable to Spine Injury
  - Emergent MRI at suspected level of injury (if evaluation of entire spine required, request MRI Spinal Trauma Survey)***
  - Emergent Spine consult****

- No Focal Neurological Deficits

Abnormal Imaging Studies

- Focal Neurological Deficits
  - If patient likely to become evaluable within 24 hours, (i.e., intoxicated without neurological injury), continue spine precautions and reevaluate once intoxication resolved, based on the Evaluable or Non-Evaluable guidelines.
  - If patient unlikely to become evaluable within 24 hours, physician may remove TL-spine precautions after documenting patient’s TL spine radiographic clearance* in medical record.
  - Emergent MRI at suspected level of injury (if evaluation of entire spine required, request MRI Spinal Trauma Survey)***
  - Emergent Spine consult****

- No Focal Neurological Deficits
  - Elective Spine consult****
  - If there is an isolated transverse process fracture or spinous process fracture, no consult is necessary.

*Consider delaying decision point in imaging if patient is deemed likely to become evaluable and no neurological deficits are observed upon limited examination.

**Determine if C-spine imaging is needed, per Cervical Spine Guideline.

***MRI can be done at any point post-injury.

****To determine if patient has neurological deficits, use ASIA Standard Neurological Classification of Spinal Cord Injury.
Inpatient Management – Spinal Precautions
Logroll Guidelines

General rules:
1. Patients are transported to JHACH immobilized so we must consider pre-hospital board times (don’t forget referring hospital pre-transfer time as well), thus you may receive patient that has had extended length of time on a board. *Keep suction and airway equipment readily available for patients on log roll precautions. They cannot be easily be turned to maintain their airways, so we must be prepared to maintain their airways and prevent aspiration if necessary*
2. Evaluate your 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 be utilized in the PICU/Floor for patient transfer and obtaining films only and must be discontinued as soon as possible to prevent breakdown. **Do not keep patient on a board for any longer than necessary (2 hours is maximum time on board).**
4. Document off/on board times.
5. **Don’t use slider board to transfer the patient.** Sliders are flexible devices that do not offer appropriate spine immobilization.
6. Must reassess sensory/motor function with every turn, transfer and prn.

Pre-Log Roll Assessment:
1. Review Medical Diagnosis (Know your patient)
   • Clearance of spines per MD by radiologic evaluation
   • Level of SCI/stability of spine fractures
   • Other injuries
2. Review Medical Order for Activity
   • Spinal Precautions until spines clear
     • HOB flat or Reverse Trendelenburg (if not contraindicated)
     • Log Roll
     • Log Roll with cervical spine precautions
3. Determine number of staff required to perform logroll
   • Leader positioned at HOB
   • Assistants (1-2) for placement on hardboard, wound/skin assessment, linen change
   • Assistants (3-4) positioned for turning
     • Additional staff may be required depending on patient size and/or injuries
     • 1st assistant @ torso
     • 2nd assistant @ hips
     • 3rd assistant @ legs
4. HOB flat
   • maintained at all times
   • Reverse Trendelenburg may be used to elevate patient head after logroll procedure completed
5. Inspect Cervical Collar
   • Correct size?
• Appropriately applied/positioned?
6. Inspect cervical traction (if indicated)
• Are weights secure and hanging freely?

Prepare for Log Roll:
A. Prepare patient for log roll turn
1. Explain procedure
2. Instruct patient to lay still, not to assist with turn
3. Ensure patient is in proper alignment prior to turn
4. Raise bed to approximate waist level of all participants

Log Roll Procedure:
A. Leader takes position at patient’s head
   1. Position hands on each side of patient’s head
   2. Place thumbs at the mandible bilaterally
   3. Place fingers behind head at occipital ridge
   4. Maintain firm, gently stabilization of neck throughout procedure
B. Leader to assess current motor and sensory function of patient
C. Leader directs assistants to turn patient (in unison on count of “3”) toward them onto patient’s side
   1. Leader monitors alignment (nose & umbilicus) continuously
D. Leader directs assistants on opposite side to proceed with turn
   1. Placement of rigid backboard
      a. position rigid backboard for contact with patient’s back
      b. assess skin integrity while patient is on his/her side
      c. change linen
E. Leader directs return to supine position on count of “3”
   1. Patient should be gently rolled as a unit maintaining spinal alignment
F. Continue with patient care
   1. Rigid backboard:
      *Patient should be centered on board. If not centered, then:*
      a. Leader maintains cervical alignment as described
      b. Equal number of assistants on either side of patient
      c. On “1-2-3” count, patient should be repositioned to center of rigid backboard
   2. Linen change:
      a. Leader maintains cervical alignment as described and assess spinal alignment
      b. Assistants move to opposite side of bed
      c. Repeat log roll procedure in opposite direction
G. Leader re-assesses sensory/motor function after all logroll procedures

Transfer/Transport Guidelines:
H. Log Roll procedure is used at all times until spines are cleared by MD order
I. A rigid backboard is used at all times for transfers from one surface to another until spines are cleared by MD order
1. Stretcher to stretcher
2. Stretcher to procedure/diagnostic table
3. Stretcher to bed
4. Bed to procedure/diagnostic table
5. Bed to bed

J. Slider boards must not be used to LIFT or TRANSFER patient. Slider is not a rigid surface, thus not a suitable lifting or transfer device.
Exception: slider may be used under hardboard (not next to patient) to reduce friction associated with movement from surface to surface.

K. Portable Diagnostic X-rays
1. Place patient on rigid backboard per log roll procedure
2. Leader and assistants lift patient on rigid hardboard in unison count “1-2-3”
3. Pancake x-ray board is placed between bed and patient on rigid backboard
4. Count “1-2-3” in unison to lower patient/hardboard onto pancake board
5. Notify radiology that patient is ready for films
6. Patient remains on hardboard and pancake board until radiology approves quality of films obtained

**Patient should not remain on hardboard > 2 hours!!**
7. Remove patient from pancake board
   a. Leader and assistants lift patient on rigid hardboard.
   b. Pancake board is removed
   c. Leader and assistants lower patient in unison (still on hardboard) to bed surface
   d. Remove patient from rigid backboard using log roll procedure

**Outcome Measures:**

- Team compliance with guideline
- Unexpected mortality or morbidity
References

Advanced Trauma Life Support. American College of Surgeons, Committee on Trauma. Presentation on Spine and Spinal Cord Trauma, 2008.


American Spinal Injury Association (ASIA). Standard Neurological Classification of Spinal Cord Injury. Rev. 03/06.


University of Kentucky
www.mc.uky.edu/traumaservices/PediatricTraumaCareGuidelines2011.pdf

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TL Spine Evaluation and Treatment Clinical Pathway

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Disclaimer

Clinical Pathways are intended to assist physicians, physician assistants, nurse practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches for the diagnosis, management, or prevention of specific diseases or conditions. The ultimate judgment regarding care of a particular patient must be made by the physician in light of the individual circumstances presented by the patient.

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