
Part of the Joint Trauma System (JTS) Clinical Practice Guideline (CPG) Training Series
This presentation offers updated, accurate guidance to the deployed caregiver in order to provide the best care to patients who suffer a spine or spinal cord injury.

This presentation is based on the Cervical and Thoracolumbar Spine Injury CPG, 05 Aug 2016 (ID:15). It is a high-level review. Please refer to the complete CPG for detailed instructions. Information contained in this presentation is only a guideline and not a substitute for clinical judgment.
Agenda

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Summary

- Patients should have a cervical spine collar placed as early as possible when appropriate and removed using the appropriate algorithm.

- Avoid hypotension and hypoxemia in patients with a spinal injury.

- Surgery should be delayed if possible until arrival at a location where definitive therapy will be provided.

- Transportation often involves use of a vacuum spine board.
Spinal injuries are prevalent on the battlefield due to blunt and penetrating injuries commonly caused by blasts.

Patients are generally placed into **3 clinical categories:**
1. Complete spinal cord syndrome.
2. Incomplete spinal cord injury.
3. Spine fractures but normal neurological function.
Complete an accurate and thorough neurological examination during workup of a trauma patient.

- Most common serial exam finding discrepancies are due to failure to perform and document findings of a neurological exam.
- The quality of examinations may also be impacted by medical interventions and other injuries.
Thorough exam should include:

- Motor exam of the 10 American Spinal Injury Association (ASIA) key motor groups.
- Sensory examination (pin prick and light touch) using ASIA dermatomal standards.
- Digital rectal exam that assesses sphincter, pinprick sensation, resting tone and bulbocavernosus reflex
- Normal and pathological reflex testing
The Combat Neuro Exam, an alternative to the ASIA, is available and may be more amenable to completion by non-spine specialists.

Determination of when to image the whole spine versus selective imaging is based on exam, patient mental status, and mechanism of injury.

- Patients who have one identified fracture in the spine should have their entire spine imaged.
- Certain mechanisms of injury, such as mounted blast, warrant imaging of the whole spine.
Trauma patients who have sustained the following injuries should have a rigid cervical collar initially placed:

- Patient complaining of neck pain or displaying neurological impairment.
- Trauma resulting in loss of consciousness.
- Trauma resulting in temporary amnesia/loss of consciousness.
- Major explosive or blast injury.
- Mechanism that produces a violent impact on the head, neck, torso or pelvis:
  - Mechanism that creates sudden acceleration/deceleration or lateral bending forces on the neck or torso.
  - Fall from height.
  - Ejection or fall from any motorized vehicle.
  - Vehicle roll-over.
The cervical collar should be placed pre-hospital if the tactical situation allows or as early as possible.

The collar should be maintained until removed by a qualified provider.

If possible, a cervical spine (c-spine) should be cleared of injury and collar removed within 24 hours of collar placement.
Reliable patients are those who:

- Can adequately communicate.
- Exhibit a normal level of consciousness.
- Lack a distracting injury.

A distracting injury is any injury that may obscure the patient’s ability to notice pain in the neck.

- This is a judgement left to the treating physician.

C-spine cleared algorithmically using the reliable or unreliable algorithm.
Physical Exam. While maintaining C-spine control, remove collar, inspect for deformities, palpate for point tenderness. If none, then check for active full range of motion.

Cervical collar to remain in place until work-up complete

Decreased level of consciousness (GC<15) or painful distracting injury?

No to both

Patient complaining of neck pain, paresthesia or weakness?

No

Yes

Is the patient unable to communicate adequately?

No to both

Yes

Imaging: CT Scan C-spine* (If no scanner, obtain lateral, AP, odontoid films)

Normal Imaging

Abnormal Imaging

Imaging Inadequate*

Physical Exam. While maintaining C-spine control, remove collar, inspect for deformities, palpate for point tenderness. If none, then check for active full range of motion.

No Findings

Any Findings (Keep Collar On)

No Findings

Any Findings

No Findings

Any Findings

1. C-spine cleared.
2. Remove collar.

1. Keep collar on.
3. MRI C-spine.

1. Keep collar on.
2. Repeat films needed.

*Film Adequacy: Axial CT from the occiput to T1 with sagittal and coronal reconstructions.
Unreliable patients should undergo CT of the cervical spine (c-spine) with fine cuts to clear it of injury, but full c-spine plain radiography is adequate if it is the only option.

Prior to removal of rigid cervical collars in unreliable patients, a general rule should be that two of three modalities (exam, MRI, CT) should be clear of injury.
**Cervical Spine Clearance Algorithm**

**Unreliable Patient**

**Physical Exam** (after distracting injury stabilized and LOC clear). While maintaining C-spine control, remove collar, inspect for deformities, palpate for point tenderness. If none, check for active full range of motion.

- **No Findings**
  - 1. C-Spine cleared.
  - 2. Remove collar.

- **Any Findings**

**Limited Exam.** While maintaining C-spine control, remove collar, visually inspect and palpate for deformities. Replace collar.

**Cervical collar to remain in place until work-up complete**

- **Decreased level of consciousness (GC<15) or painful distracting injury?**
  - Yes to both
  - **Imaging: CT Scan C-spine**
    - **Normal Imaging**
      - 1. Keep collar on.
      - 2. Repeat films needed.
    - **No Findings**
      - 1. Keep collar on.
      - 2. Obtain Neurosurgery Consult.
      - 3. MRI C-spine.
    - **Any Findings**

- **Is the patient able to communicate adequately?**
  - No
    - Maintain immobilization. Clinical decision to clear per policy at definitive level of care. Document in chart.
  - Yes

**Abnormal Imaging**

- 1. Keep collar on.
- 2. Obtain Neurosurgery Consult.
- 3. MRI C-spine.

**Imaging Inadequate**

- 1. Keep collar on.
- 2. Repeat films needed.

*Film Adequacy: Axial CT from the occiput to T1 with sagittal and coronal reconstructions.*
If unable to remove a cervical collar within 24 hours, the stiff extrication collars should be replaced with collars designed for long-term immobilization (i.e. Miami-J with Occian back).

For an unreliable patient with negative imaging findings, the incidence of significant cervical instability is small, but not zero.

- A reliable clinical examination or MRI in a cooperative, extubated patient is required before clearing the cervical spine.
- A high-quality negative CT scan is considered adequate if a patient cannot undergo an MRI.
• The decision to definitively clear a cervical spine without exclusion of ligamentous injury by reliable exam or MRI should be left to the level of care providing definitive treatment.
  
  □ Risk of significant neck movement exists in obtunded patients while transiting aeromedical evacuation (AE) system.
  
  □ Staff should maintain cervical spine immobilization until arrival at definitive care while transiting AE system.
  
  □ Staff should be mindful of possible occipital skin breakdown from the cervical collar.

• The JTS Cervical Spine Clearance Status Sheet or Trauma Resuscitation Record (DD Form 3019) should be used to document the cervical spine evaluation and clearance status.
Patients with neurologic compromise from a spine injury should have an invasive arterial line for continuous blood pressure monitoring with a goal MAP of 85-90 mm Hg for up to 7 days following injury and maintain a SaO2 > 92%.

- Vasopressor therapy and supplemental oxygen may be necessary in an euvolemic patient.
- Vasopressors can cause ischemic loss in tissue, so fluids remain the initial therapy for hypotension.

Corticosteroids are not recommended.
Keep patients flat prior to surgical correction or external bracing, although the bed can be placed in 30 degrees reverse Trendelenburg.

Logrolling can be done safely in most cases to prevent skin breakdown.

Start deep vein thrombosis (DVT) prophylaxis early and maintain beyond evacuation.

- Pneumatic compression devices
- Early active or passive mobilization when able
- Chemical prophylaxis is usually initiated within 24-72 hours of injury.
- If DVT is present, anticoagulation should be started, but if contraindicated, an IVC filter should be considered.

It is incumbent upon the spine surgeon to alter patient handling and DVT prophylaxis/treatment assumptions.
External immobilization options in theater should include semi-rigid orthosis, halo, and sternal-occipital-mandibular immobilizer (SOMI)-like devices or cervico-thoracic braces.

Operative treatment in theater that can be delayed until after transport of the patient should be delayed.

Surgical instrumentation in theater can be limited. Procedures are often performed with the understanding that additional procedures may need to be performed.
Patients that may benefit from immediate surgery in-theater include:

- Patients with incomplete injuries.
- Patients with progressive neurologic deficit.
- Patients with an open cerebrospinal fluid (CSF) leak.
- Patients with expected prolonged delay in transport.
- Urgent reduction may improve the degree in “root sparing” in a cervical spinal cord injury.
For penetrating spinal injuries with an incomplete injury with continued canal compromise, decompression, if attempted, should be done within 24-48 hours.

- If instability is present, stabilization should be considered at the time of surgery.

Cefazolin 2 gm IV q 8 hours for 24-72 hours is sufficient for penetrating injuries without evidence of contamination.

- Fragments passing through contaminated viscus structures require longer, broader coverage (e.g., 3rd generation cephalosporin for 7-10 days).
- Open wounds with a CSF leak also require broad spectrum coverage.
Transport Considerations

- A vacuum spine board is frequently used to transport patients with thoracolumbar fractures.
  - The vacuum spine board protocol dictates periodic deflation and re-inflation to reduce risk of pressure sores.
  - Logrolling without release of vacuum does not reduce risk of pressure sores.
  - Care should be given to padding and pressure reduction, namely the occiput and heels.

- Thoracolumbosacral orthosis or other external braces should not be worn during the transport process.
Intent (Expected Outcomes)

- A complete and thorough neurologic exam is performed on all patients with known or suspected spinal injuries, and it is documented in the patient’s medical record.
- There is no proven benefit to the use of steroids in penetrating or blunt spinal cord injury, so steroids are not used in these patients.
- In patients with unstable thoracic, lumbar, and sacral spine injuries, the vacuum spine board is used for transfer out of theater.
- For optimal care of these patients across the continuum, the JTS C-Spine Clearance Status Sheet or Trauma Resuscitation Record (DD Form 3019) is utilized at the time of final disposition of the patient, and documentation is complete.
- Obtunded U.S. patients requiring c-spine clearance have a c-spine collar in place at the time of transfer to a Role 4 facility.

Data Source

- Patient Record and the ASIA or Combat Neuro Exam worksheet
- Department of Defense Trauma Registry (DoDTR)
Performance/Adherence Measures

- In patients with known or suspected spine injuries, the ASIA or Combat Neuro Exam worksheet was utilized to document adequately the patient’s neurologic status, and the documentation was placed in the patient’s medical record.
- Steroids were not used in the management of patients with penetrating or blunt spinal cord injuries.
- In patients with known or suspected unstable spine fractures (3 column instability) being evacuated out of theater, the vacuum spine board was used for transport.
- The JTS C-Spine Clearance Status Sheet or Trauma Resuscitation Record (DD Form 3019) was utilized, and documentation was complete at the time of final disposition of all patients requiring C-spine clearance at the local medical treatment facility.
- All obtunded patients (intubated; GCS ≤ 8) requiring c-spine clearance had CT imaging at a Role 3 facility.
- All obtunded U.S. patients, in addition to the above, had a c-spine collar in place at the time of transfer to a Role 4 facility.
- All U.S. patients with abnormal c-spine imaging had a c-spine collar in place at the time of transfer to an Role 4 facility.
References

References


Appendices

**Appendix A:** American Spinal Injury Association Worksheet

**Appendix B:** Combat Neuro Exam Worksheet

**Appendix C:** Cervical Spine Clearance Algorithm— Reliable Patient With No Neurologic Deficit

**Appendix D:** Cervical Spine Clearance Algorithm— Unreliable Patient

**Appendix E:** Cervical Spine Clearance Status

**Appendix F:** Additional Information Regarding Off-Label Uses in CPGs
Contributors

- CDR Chris Neal, MC, USN
- Col Randall McCafferty, USAF, MC
- LTC Brett Freedman, MC, USA
- MAJ Melvin Helgeson, MC, USA
- COL Michael Rosner, MC, USA
- CDR Dennis Rivert, MC, USN
- CDR David Gwinn, MC, USN

Slides: Maj Andrew Hall, USAF, MC
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