

NEW YORK STATE IN-HOSPITAL CERVICAL SPINE CLEARANCE GUIDELINES IN BLUNT TRAUMA

STAC Evaluation Subcommittee

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Cervical Spine Evaluation in Adults (Eighteen years and older)

Purpose:

To review current evidence regarding clearance of the Cervical Spine in adults admitted to the hospital following blunt trauma and to propose a Clinical Guideline for doing so that is safe and efficient and consistent with the evidence.

Introduction:

Patients admitted to the hospital after trauma may have an injury of the cervical spine that is not immediately obvious. Neck pain is one indication of potential injury, and another more clear indication, is the presence of neurological injury of spinal origin. Such neurological injuries could include central cord syndrome, quadriplegia or paresis, radicular pain, or hemiparesis. In cases where there is no clear indication of neurological injury, however, patients still need to be evaluated for cervical spine injuries, because an unstable spinal injury could be delayed and result in devastating neurological deterioration.

Clearance of the cervical spine may be straight-forward in a patient who is awake and alert. They can verbalize symptoms and actively demonstrate neck movements. A good physical examination is essential, but many patients will require some form of imaging. Imaging studies traditionally included plain radiographs including anterior-posterior, lateral, and odontoid views. Swimmers or flexion-extension views have been added as adjuncts in some protocols. In the past decade, however, computed tomography (CT) scanning has supplanted plain radiography as the primary screening modality for patients who require imaging. Helical and multislice scanners are common and able to provide thin-cut, high-resolution imaging of the cervical spine in three plains: axial, sagittal, and coronal. CT can evaluate bony anatomy, alignment, and the relationship of facet joints and bony endplates, and the addition of soft tissue windows can provide some information on prevertebral swelling and existence of disc herniations. Plain radiographs are used now primarily in situations where a CT scanner is not available.

Clearance of the cervical spine presents more of a challenge in patients who cannot reliably participate in the evaluation. Such patients may have mental status changes related to drug or alcohol intoxication, respiratory or metabolic disturbances, traumatic brain injury, or other significant injuries which may mask, or distract, from pain in the cervical region. Since the cervical spine cannot be cleared expeditiously in these patients, the cervical spine collar has often been left in place until their mental status has improved, or until additional imaging, such as dynamic flexion/extension radiographs or MRI, can be performed to assess for instability or ligamentous injury.

Prolonged use of hard cervical collars can lead to pressure sores which can ultimately lead to infection, need for surgical debridement, or even death. Ackland, et al (2007) found that the most significant factor related to cervical collar-related pressure sores was the time to cervical spine clearance; there was a 66 percent increase in the probability of developing collar-related ulcers for each one-day prolongation of cervical collar usage. As a result, that institution changed its clearance protocol so that it relied more heavily upon multi-slice CT imaging than on MR imaging.¹ Other reported complications of prolonged cervical collar usage are elevated intracranial pressure, prolonged mechanical ventilation, and ventilator associated pneumonias. MRI scanning in obtunded patients carries similar risks, including ICP elevation and resultant secondary brain injury, and aspiration pneumonia.³

The unreliable patient with intact gross motor function or with deficits that can be attributed to brain injury represents a conundrum for clinicians, since clearance of the cervical spine cannot proceed based on clinical signs alone. Practitioners may elect to wait for such patients to achieve a reliable examination, or to use dynamic imaging or MRI before discontinuing the hard cervical collar. Dynamic flexion/extension radiographs are time consuming and run the risk of cervical spinal cord injury by the passive movement of the neck, despite performing such movements under controlled circumstances. Flexion/extension radiographs are, therefore, not recommended in most commonly used algorithms. MRI is indeed superior to CT for identifying ligamentous, disc, or other soft tissue injuries. MRI may reveal such soft tissue injuries in approximately 25 percent of patients with negative CT imaging.¹⁰ However, there is a well-known false positive rate for clinically significant MRI findings. Not all ligamentous injuries, for example, especially if involving only one spinal column, signify spinal instability requiring surgery for stabilization. There are also significant risks in taking severely injured, mechanically ventilated patients to the MRI suite.

There is mounting evidence to support clearance of the cervical spine in many unreliable patients on the basis of high-resolution CT scanning alone. The majority of significant injuries “missed” by CT scans in the past were in fact demonstrated on the images upon further in-depth review. Furthermore, the incidence of significant, cervical spine injury in a negative CT scan with axial, coronal, and sagittal imaging and careful review of all bone and soft tissue windows is small and approaches zero.^{6,8,10} Therefore, current evidence indicates that MRI likely provides little additional clinical benefit in patients with truly negative CT imaging. Thus, in unreliable patients with a good quality, fine-cut CT, reviewed carefully by an experienced radiologist and judged to be negative, one may consider removing the cervical collar.^{1,3,6,8,10} Trauma care providers might also elect to obtain a neurological or orthopedic spine surgeon consultation before considering collar removal to verify clinical and radiographic findings.¹¹

Cervical Spine Clearance Algorithm

Any patient with a suspected cervical spine injury and a neurologic deficit should have a cervical collar in place and should be referred immediately for spine surgeon consultation and imaging. All other patients who have indications for pre-hospital cervical collar placement should undergo cervical spine clearance. If possible, the cervical spine should be cleared and the collar removed within 24 hours of collar placement. If the clinical scenario requires that the collar remain in place for more than 24 hours, stiff extrication collars should be replaced with collars designed for long-term immobilization – ones that provide greater padding and pressure ulcer prevention.

There are separate algorithms for reliable and unreliable patients. *Unreliable* patients are those who cannot adequately communicate, have a decreased level of consciousness (GCS < 15), or have a significant distracting injury. Significant *distracting injury* is defined as any injury which is so painful that it may obscure the patient's ability to notice pain in their neck. Some evidence suggests proximity increases the risk of distraction, and therefore upper extremity and upper torso injuries are more likely to be distracting than lower torso or lower extremity injuries.⁵ The treating physician has final say in determining if a certain injury is distracting enough to render a patient unreliable and require clearance via the unreliable patient algorithm. If uncertain, err on the side of caution and consider the injury distracting and proceed accordingly.

The Appendix that follows provides flow charts for the assessment of trauma patients for cervical spine injuries, both with reliable and unreliable examinations. These algorithms were based upon protocols written by several trauma centers in New York State, including the North Shore University Hospital Medical Center, New York Presbyterian Hospital, Lincoln Hospital Center, and Richmond University Medical Center in addition to the Joint Theatre Trauma System Clinical Practice Guidelines used by the US military. For the reliable patient, many algorithms utilize criteria that are outlined by the Canadian C-spine Rule, NEXUS (National Emergency X-Radiography Utilization Study Group), and the Eastern Association for the Surgery of Trauma.^{4,7,9}

Key points:

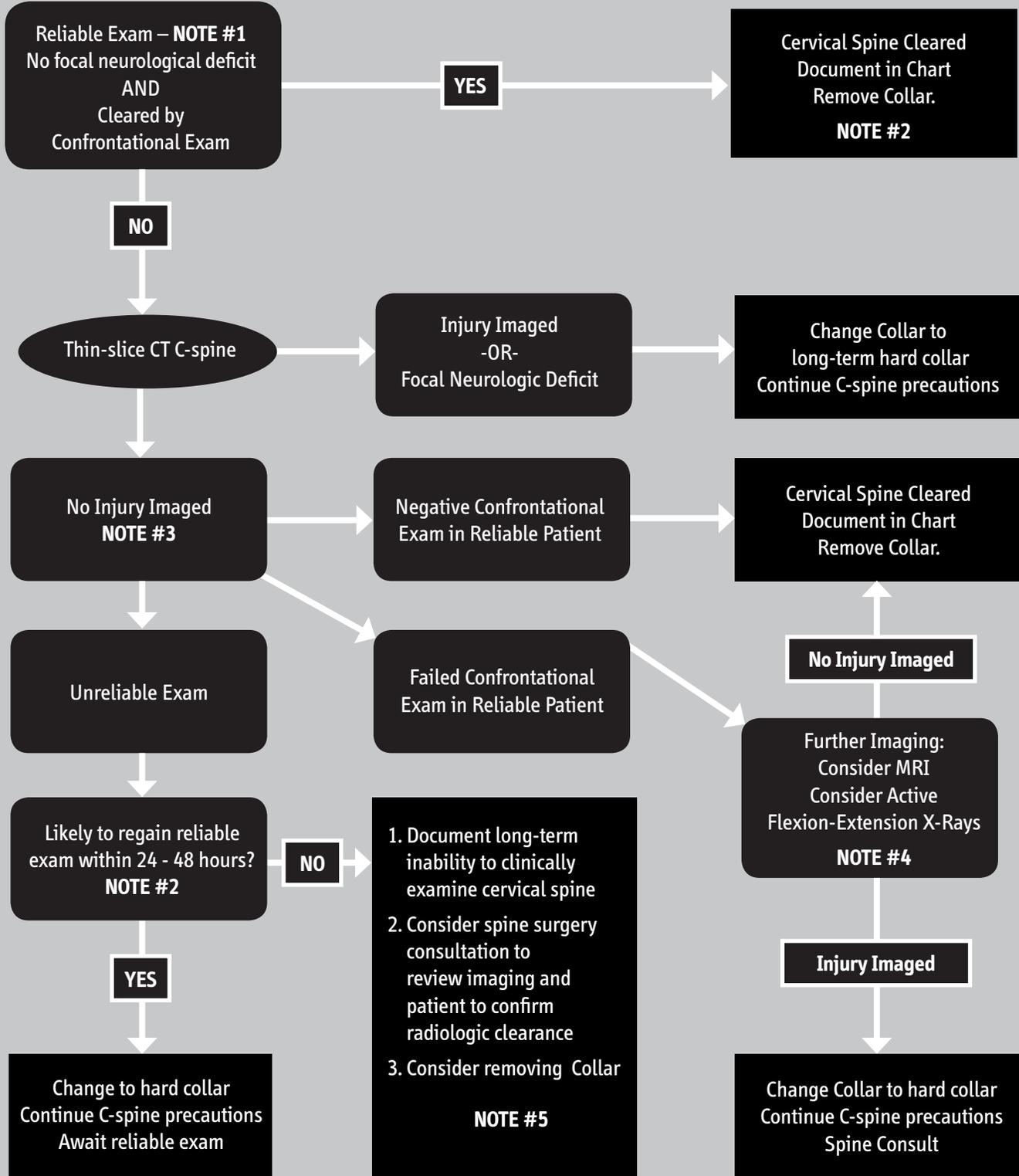
- The supplied algorithm applies only to patients 18 years or older.
- It is preferable to remove hard cervical collars in trauma patients without cervical spine injury as soon as possible to avoid complications related to such collars.
- Computed tomography imaging should be obtained within 24-48 hours of admission.
- Cervical spine CT scans should be carefully reviewed by qualified radiologists and/or practitioners with expertise in spine surgery prior to discontinuing hard collars in unreliable patients.
- It is the opinion of the State Trauma Advisory Committee that this algorithm, based upon recent medical literature, represents a reasonable protocol for cervical spine clearance in adult trauma patients. However, creation and adoption of any protocol on this subject should remain at the discretion of individual hospitals.

References

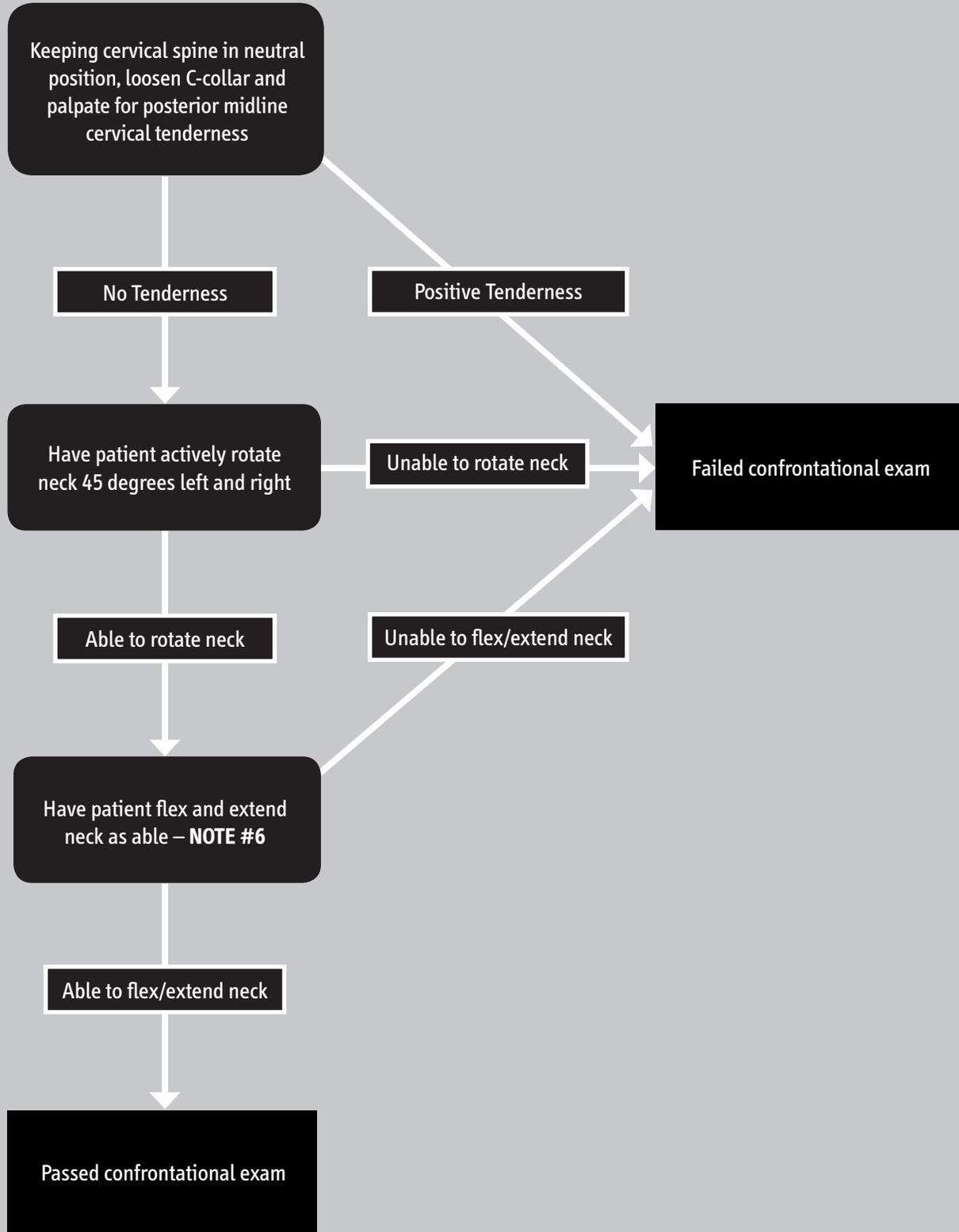
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APPENDIX: New York State Inpatient Cervical Spine Clearance Guidelines



New York State Inpatient Cervical Spine Confrontational Exam Protocol





NOTES

1. Reliable Exam Definition -

In the clinical judgment of the physician:

- a. Patient is awake and alert.
- b. Patient has no distracting injuries.
- c. Patient is not intoxicated.

The Canadian C-spine Rule⁹ denotes age \geq 65 years as a “high-risk” criterion for imaging. Hospitals may choose to include age as a criterion when considering clinical cervical spine clearance.

2. Hospitals may consider transfer to trauma centers if there are insufficient resources to appropriately clear cervical spines in patients who do not meet criteria for clearance by confrontational examination or have a suspected neurological deficit.
3. Full review of a thin-cut cervical spine CT (2.5 mm or less slice thickness) entails careful attention to all axial, coronal, and sagittal imaging in, both, soft tissue and bone windows.
4. Active flexion-extension imaging requires patient to actively perform flexion and extension movements to prevent forced movements that may worsen existing spinal ligamentous injury. During active flexion-extension, patients are not likely to move their necks beyond their limitations due to pain.
5. Additional imaging studies can be preformed, if, in the clinical judgment of the clinician, the mechanism of injury results in a concern for occult cervical spine injury.
6. This step, based upon physician’s clinical judgment, may be eliminated in patients not able to flex/extend neck from previously existing reasons for reduced cervical spine mobility.