

Spinal Assessment Protocol

Maine EMS

2002

I. History.

Injury to the spine, particularly the cervical spine, has been a topic of tremendous attention in the latter part of the 20th century. While the individual and societal impact of spine injury remains undisputed, the basic mechanism, assessment and treatment of these patients have been controversial subjects.

The prehospital care of the potential spine injury patient remains a subject of continued debate. This debate has evolved around the larger theories of spine injury processes. Two major theories abound regarding spinal cord trauma. One theory suggests that initial trauma to the spine is solely responsible for cord injury with subsequent care and treatment representing minimal risk of further injury – providing that major axial or rotational loading is minimized. Proponents of this theory have argued prehospital immobilization of the spine as unnecessary due to the relative insignificance of post-injury movement forces compared to initial injury.¹

The second theory suggests that energy from the initial traumatic insult is significant and that subsequent movements of the spine can result in injury exacerbation with secondary cord injury.²⁻⁴ The proponents of this view have frequently promoted immobilization as essential to prehospital secondary injury prevention.

Modern prehospital emergency care has accepted the latter premise as the prevailing view in spine injury. This concept has formed the foundation of prehospital care for potential spine injury patients. As a consequence of this foundation, substantial resources have been employed for medical provider training and treatment in secondary spine injury prevention with patient immobilization evolving into a practice routinely employed.

II. Clinical Clearance of the Patient.

Providing an effective and reliable process for the clinical clearance of the spine following blunt trauma has become an arduous task. Literature from the realms of trauma surgery, radiology, physiatry, and emergency medicine has considered groups of patients suffering cervical spine fracture in an attempt to classify those at risk for injury and require radiographic evaluation.⁵⁻⁷

Prior to the year 2000, the preponderance of research and position papers included mechanism of injury as an independent variable to prompt radiographic evaluation of the trauma patient spine. These proposals included a decision rule in the radiology literature.⁸ Other authors, however, have noted a lack of correlation between mechanism of injury and likelihood of cervical spine injury.^{9,10}

The initial Maine EMS Spine Assessment Protocol, enacted in approximately 1994, included consideration of mechanism of injury as the first step in the protocol. This step instructed prehospital providers to consider mechanism as “positive,” “uncertain,” or “negative.” Those with positive or negative mechanisms were automatically “ruled in” or “ruled out,” respectively, for the practice of spine immobilization. The spinal assessment protocol was then left to for application only to those with an uncertain mechanism.

The definition of an uncertain mechanism has proven rather difficult to clarify in the protocol application. This step has also proven difficult to factor for quality assurance efforts. Finally, the lack of literature suggesting a clear association with specific mechanisms and their relevance in clinical clearance has proven problematic.

More recent and large-scale efforts (See section III, Nexus) have excluded mechanism consideration from spine injury assessment. This development has been incorporated into the Maine EMS Spine Protocol revision as an attempt to bring the prehospital clinical evaluation into a more consistent practice with the in-hospital emergency evaluation.

III. The NEXUS Study Group.

The approach to the assessment of patients with suspected cervical injury has been profoundly affected by the 2000 publication of the NEXUS study group findings.¹¹ This multi-center investigation enrolled 34,069 patients with 818 identified cervical spine fractures. The investigation evaluated a 5-step clinical decision rule for cervical spine assessment. To date, this investigation represents the most extensive consideration of the cervical spine assessment process.

The clinical decision rule evaluated in the NEXUS trial assessed patients for:

- 1). Midline posterior cervical spine tenderness
- 2). Focal neurologic deficit
- 3). Altered mental status/altered level of alertness
- 4). Acute intoxication
- 5). Presence of painful, distracting injury

The investigators found the decision rule to accurately identify nearly 100% of all significant cervical spine injuries with a “missed injury” frequency of approximately 1 in 4000 patients. Further, the application of the decision rule to emergency practice would have resulted in approximately 13% fewer radiographic studies at the participating centers.

The clinical application of the NEXUS findings can be generalized to apply to the vast majority of prehospital populations. Notable exclusions might be special groups of patients with injury risk factors beyond those discovered in the typical patient population. For example, those patients with Down syndrome have more cervical spine disease including laxity of the ligaments and are at higher risk for cord damage.¹² Pediatric patients may have spinal cord injury without radiographic abnormality - termed SCIWORA.¹³ Complications of other disease processes might also render one more susceptible to cervical spine injury, such as those with metastatic disease to the spine.¹⁴ An additional finding in patients over 60 years of age has been a lower incidence of cervical spine fractures, despite an increased propensity for fracture at C1 or C2.¹⁵

EMS Providers as extensions of the Emergency Department.

EMS providers play a crucial role in the delivery of emergency care. They have been given the tools of assessment and initial treatment, and participate in the Quality Improvement process inherent in the medical realm. These professionals are obvious extensions of the emergency department and treated consistent with this view by the Maine EMS Medical Directions and Practice Board. As an extension of the emergency department, EMS providers are expected to provide care consistent with care standards practiced by Emergency Physician, physician extenders, and nurse counterparts.

The 2002 Maine EMS Spine Assessment Protocol attempts to align prehospital practice with ED care, consistent with the NEXUS findings.

The first caveat of any medical intervention is to “First, do no harm.” Maine prehospital providers are expected to utilize this protocol to patients’ benefit in directing the appropriate patient selection for prehospital spinal immobilization.

IV. The Spine Evaluation and the 2002 Maine EMS Spine Assessment Protocol (Figure 1).

A. Mechanism of Injury.

Mechanism of Injury: Axial load (diving), Blunt trauma, MVC* or bicycle, fall>3ft, adult fall from standing ht.

***MVC applies to crashes of all motorized vehicles: e.g. automobile, motorcycle, snowmobile, etc.**

The suspected spine injured patient evaluation begins with the history. While mechanism of injury consideration is not included as a means of patient exclusion for immobilization, the injury mechanism does serve as an initial historical component to adjust the potential for spine injury.

Historical components that should heighten suspicion for spine injury include axial load (e.g. diving into a body of water), blunt trauma (particularly to the head or neck), motor vehicle collision (MVC – e.g. automobile, snowmobile, motorcycle, all terrain vehicle, etc.), bicycle accident, or falls from a height greater than 3 feet. Falls from a standing height represent a risk to adult patients, particularly elderly patients or those with pre-existing spine injuries.^{10,16-18}

It should be re-emphasized that the mechanism does not necessitate a collar and long board. Rather, the mechanism should serve only to alert medical providers to the need for spine injury screening.

B. Patient Reliability.

<p>Unreliable? ** (Intox/Alt LOC/ Acute Stress Reaction)</p>

**** Clearance of the spine requires the patient to be calm, cooperative, sober, and alert.**

The 2002 Maine EMS Spine Assessment Protocol has incorporated into a single step the fusion of 2 NEXUS components: assessment for intoxication and altered mental status. These steps have been fused into a single mental status evaluation by prehospital providers.

The use of a single patient reliability step is meant to simplify the spine assessment algorithm from 5 steps to 4. Additionally, the use of a single query is intended to emphasize the importance of any factor that might affect the patient's injury awareness or level of consciousness during the prehospital examination.

Prehospital providers should be alert for any patient who has suffered a change in mentation as a consequence of head injury, intoxication, acute stress reaction, or other possibility. If the patient is unreliable, the spine should not be cleared clinically and the patient should be immobilized.

It is essential for prehospital providers to recognize the importance of determining an injured patient to be calm, cooperative, sober, and alert before spinal injury clearance can take place. If the patient is deemed reliable, medical providers should proceed to the physical examination and assessment for distracting injuries.

C. Distracting Injury.

Distracting Injury?***

*****Distracting injury includes any injury that produces clinically apparent pain that might distract the patient from the pain of a spine injury – pain would include medical as well as traumatic etiologies of pain.**

Distracting injury has been recognized as a critical component in the spinal injury assessment.^{11,19} Distracting injuries are thought to present painful conditions that affect any injured patient's perception of injury to other body sites, including the cervical spine.

Defining the exact premise of “distracting injury” has proven difficult. However, the Nexus authors have accepted a distraction to include any injury that produces clinically apparent pain that might distract the patient from the pain of a spine injury.¹¹ Other authors have suggested distracting injuries to include, but not be limited to, head injury, upper or lower back pain, chest pain, abdominal or pelvic pain, and extremity trauma.¹⁹

If any significantly distracting injury is believed to be present, the patient should undergo prompt immobilization.

Distracting injuries should include atraumatic as well as traumatic painful conditions. A patient with severe chest pain of suspected cardiac etiology who has subsequently become involved in a motor vehicle crash might serve as an example for such a distracting injury. However, the occurrence frequency of atraumatic painful conditions, with simultaneous event mechanisms leading to spine injury, would be expected to be uncommon and substantially small relative to typical traumatic injuries serving as distracters. As a consequence, prehospital providers should not accept this concept as a directive that medical patients without events suggestive of traumatic spine injury potential should be considered candidates for spinal immobilization.

Examples of traumatic injuries that would not be deemed as significant spine injury distractions would include patients with minor extremity lacerations or abrasions, isolated extremity injuries affecting a single joint (e.g. ankle or wrist ligamentous injury), and minor soft tissue contusions sustained in falls, blunt trauma, or MVC's.

D. Neurological Evaluation.

**Abnormal
Sensory/Motor
Exam?**

If the patient is reliable and without distracting injury, prehospital providers should proceed to a careful and complete neurological examination. This examination should include commonly accepted assessment means for consideration of motor or sensory deficits from spine injury.

Any abnormal neurological examination finding(s), including loss of urethral or rectal sphincter control, should direct providers to proceed with spinal immobilization.

E. Complaints of Pain or Examination Tenderness.

Spine Pain/ Tenderness?

An additional Maine EMS 2002 Spine Assessment Protocol departure from the NEXUS investigation is the direction to immobilize patients for a complaint of neck pain as well as any tenderness present in the prehospital spine assessment. This change is purposefully meant to provide an added level of concern for spine injury by increasing the “sensitivity” of the spine assessment protocol. This direction should also serve as a means for decreasing the disagreement potential between providers’ (both in and out of the hospital) assessment of individual patients.

While the NEXUS investigation applies solely to the cervical spine, large-scale clinical trials evaluating clinical decision rules for thoracic, lumbar, or sacral spine injuries have yet to be performed. As a consequence, care of the entire spine generally follows cervical spine assessment and treatment principles.

The prehospital assessment of tenderness should include, but not be limited to, the palpation of the posterior midline spine. While NEXUS has emphasized the sole importance of posterior, midline spine tenderness in cervical spine assessment,¹¹ the Maine EMS 2002 Spine Assessment Protocol includes consideration of any areas of spine tenderness as a means for immobilization. This decision represents another adaptation of the NEXUS rules in an attempt to improve the instrument’s sensitivity for any spine injury as well as decreasing medical provider disagreement potential.

F. Applicability of Provider Training to the Maine EMS 2002 Spine Assessment Protocol.

This protocol may be used by MEMS licensees, at the AA level or above, who have successfully completed the MEMS Spine Injury Management Course.

The 2002 Maine EMS Spine Assessment Protocol is intended for use by Maine EMS providers who have successfully completed the Maine EMS Spine Injury Management Course.

Individuals who have completed the course prior to the 2002 revision are not required to repeat the course in order to implement the changes. Maine EMS providers who have successfully completed the course prior to 2002 are encouraged to attend a second, updated course or any educational offerings to serve as an introduction to the changes.

Individuals who have not previously attended a Maine EMS Spine Injury Management Course are required to complete the course prior to their use of the 2002 Spine Assessment Protocol. This course will emphasize the rationale underlying the protocol and address issues pertinent to its successful implementation, including the approach to the potential spine injured patient how this approach may differ from protocols in other settings.

V. References.

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VI. Frequently Asked Questions addressing the 2002 Maine EMS Spine Assessment Protocol.

1. Why should Maine EMS utilize a spine assessment protocol?

While the specter of spine injury looms large for prehospital trauma patients, the practice of immobilizing every patient would be cumbersome and injurious. It is a well accepted premise that immobilization leads to discomfort that is a direct function of the length of time of patient immobilization. Therefore, a policy requiring immobilization of selected “at risk” patients is in the interest of patients and providers.

2. What are the changes in the 2002 Spine Assessment Protocol relative to the Maine spine protocol adopted in 1994?

The NEXUS study, published in 1999, confirmed an effective, standardized cervical spine assessment algorithm for emergency physicians. This 38,000 patient, multi-center trial affirmed a 5-step algorithm for the detection of significant cervical spine injuries. The 2002 Maine EMS Protocol revision incorporates the NEXUS findings into a revised spinal assessment protocol for use by Maine EMS providers.

The most notable change between the 2002 Protocol and the earlier Maine EMS Spine Protocol removes the question of “mechanism of injury” from the patient assessment. While the mechanism of injury is an important consideration for the potential of spine injury, it does not serve as a reliable marker for the exclusion/inclusion of injury. Rather, the question of mechanism is one that lends a great deal of ambiguity and subjective determination between healthcare providers. Neither the NEXUS protocol nor the 2002 Maine EMS Spine Assessment Protocol utilize mechanism consideration to direct patient immobilization.

3. Does the exclusion of “Mechanism of Injury” assessment suggest that this question should be ignored by prehospital providers?

The mechanism of injury is an important consideration for the assessment of any trauma patient. This factor should remain an important component of the complete patient evaluation. However, the mechanism of injury should not serve as a sole indicator for the purpose of spine immobilization in trauma patients.

NEXUS findings have demonstrated that patients with significant cervical spine injuries will present with physical assessment findings (e.g. tenderness, distracting injuries, intoxication, etc.), independent of the historical mechanism of injury.

4. Are there differences between the NEXUS protocol and the Maine EMS protocol?

The Maine EMS protocol is more conservative than the NEXUS study in its clinical application. Whereas the NEXUS study attempts to identify ED patients in need of radiographic assessment, the Maine EMS protocol attempts to identify for prehospital personnel those patients requiring immobilization due to risk of spine injury

A number of changes from the NEXUS findings are present in the 2002 Maine EMS protocol revision. Foremost amongst these is the fusion of 2 NEXUS components: assessment for intoxication and altered mental status. These steps have been merged into a single mental status evaluation by prehospital providers. This change is meant to simplify the algorithm from 5 steps to 4. Additionally, the use of a single query of the patient's mentation appropriateness is intended to emphasize the importance of any factor present during the prehospital examination that might affect the patient's injury awareness or level of consciousness.

Additional changes include directions to immobilize patients for a complaint of neck pain as well as any tenderness present in the spine assessment. These 2 changes are purposefully meant to provide an added level of concern for spine injury by increasing the "sensitivity" of the spine assessment protocol as well as decreasing the potential for disagreement between providers' assessment of individual patients.

5. Why was the Maine EMS protocol altered to include a complaint of spine pain or any spine tenderness as indications for immobilization?

The purpose of the Spine Assessment Protocol is to insure immobilization of all patients with significant spine injury while excluding from immobilization those trauma patients with no reasonable suspicion of injury.

While this goal might seem easily attainable, any protocol or patient assessment process intended to achieve this aim has occasionally proven to be contentious when subjected to different medical providers with varying training backgrounds and/or assessments of the same patient.

The Maine EMS Spine Assessment Protocol is intended to function with a substantial degree of patient "over-immobilization" by prehospital providers. It is the intent of the protocol to thereby minimize the likelihood for disagreement between medical providers. It is the expectation that these changes will ensure that when disagreement does exist, the error will favor the patient who is

needlessly immobilized instead of the patient who required immobilization and did not receive it.

6. Will there be a QA process to investigate the utilization and effectiveness of the protocol?

It is the intent of the Medical Directions and Practice Board, in conjunction with Maine EMS Regional Coordinators, to implement a statewide QA process for the spine protocol change. This QA process will attempt to assess the utilization of the protocol and the factors most frequently leading to the determination for a spine immobilization requirement.

A process of integrating hospital QA with the prehospital QA reports will be initiated simultaneous to the implementation of the revised protocol. This coupling of data will lend insight into outcomes and disagreement between prehospital findings and hospital practices/diagnoses.

7. Is the Maine EMS 2002 spine protocol revision intended to direct practice solely to the assessment of the cervical spine or to the entire spine?

The NEXUS investigation applies solely to the cervical spine assessment. Large-scale clinical trials have not been performed to evaluate assessment processes for the thoracic, lumbar, or sacral spine elements.

Care of the entire spine generally follows cervical spine assessment and treatment principles. Additionally, spine pain complaints or findings of tenderness, in areas other than the cervical spine, should be interpreted to represent a distracting injury for cervical spine evaluation.

The 2002 protocol is intended to represent a conservative prehospital practice initiative directed to all spine areas, particularly the cervical spine.

8. Why should a Maine EMS provider implement a practice that utilizes the Maine EMS Spine Assessment Protocol in preference to “immobilizing everyone?”

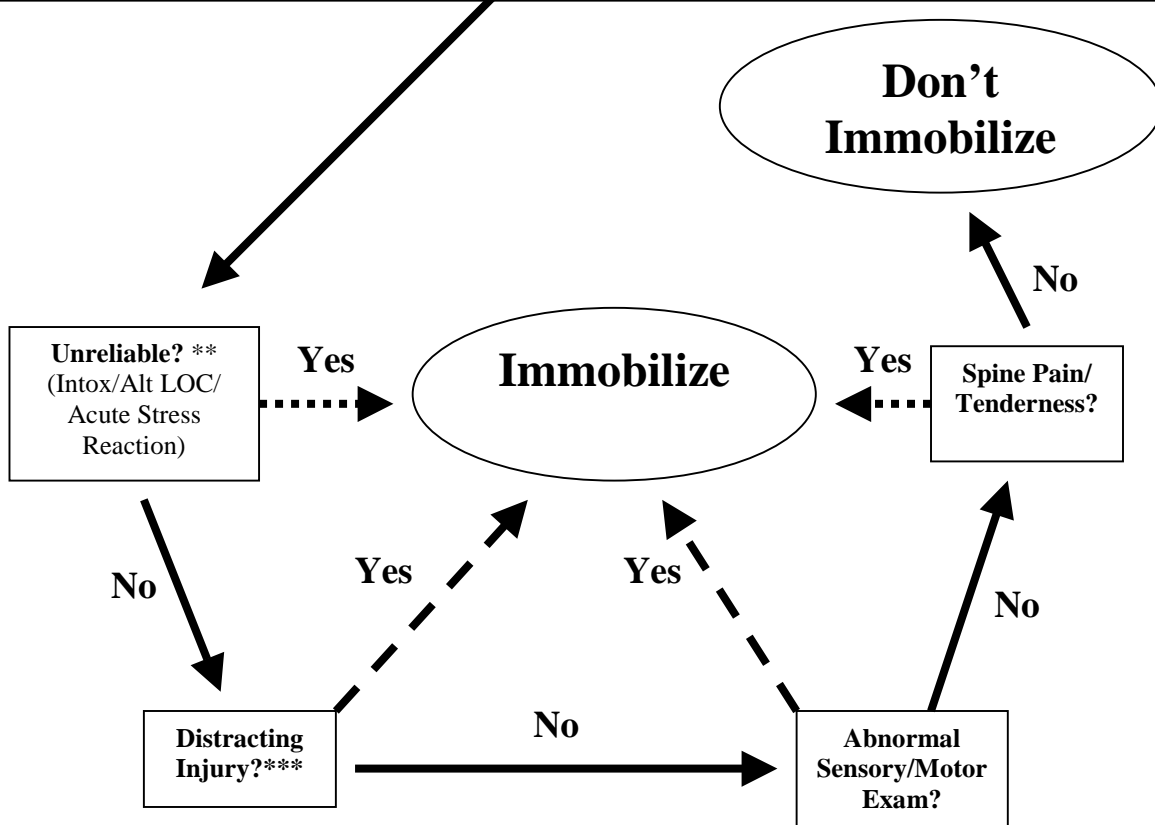
Immobilization on a long board and within a collar is not a benign procedure. Some common reactions and potential complications include claustrophobia, nausea, vomiting, posterior head pain, neck pain, back pain, or skin breakdown. These complications are generally accepted to increase significantly as a direct function of immobilization time. Therefore, the practice of immobilization of all patients, regardless of risk of spine injury, is a practice that leads to issues that may needlessly complicate the course of trauma patients without spine injury risk.

The intent of the Maine EMS Medical Directions and Practice Board is to set Maine EMS practices that are consistent with the best practices in prehospital medical care. Simultaneously, these practice protocols should serve to assist providers, not hinder their practice.

The Maine EMS Spine Assessment Protocol is intended to accomplish both these goals in addition to improving the initial spine protocol from the perspective of both prehospital and hospital medical providers. Attempts at extensive QA and education will be directed at assessing the medical efficacy of the practice as well as the satisfaction of those who encounter it.

Figure 1. 2002 Maine EMS Spine Assessment Protocol.

Mechanism of Injury: Axial load (diving), Blunt trauma, MVC* or bicycle, fall>3ft, adult fall from standing ht.



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