Selective Spinal Immobilization
Objectives

- Understand the background of spinal immobilization.
- Understand the rationale for developing a current selective spinal immobilization protocol.
- Review the data on the selective spinal immobilization.
- Cases and application of protocol
The Problem

- Between 2-4% of blunt trauma patients sustain cervical spine injury
- Early trauma education suggested mechanism of injury as a sole reason for treatment of presumed spinal injury
- EMS education resulted in increased practice of cervical immobilization
Immobilization - The Concept

- Prevent neurologically intact, unstable injuries from deteriorating

- Prevent progression of neurologic deficits as a result of unstable injury movement
Why not immobilize everybody?

- 99.5-96% of EMS trauma patients do not have a spine injury
- EMS provider confusion/education
- Immobilization causes patient pain and anxiety...possibly injury
- Patient refusal for immobilization
Why not board and collar everybody?

- Time consuming for EMS/ED
- Unnecessary transports
- Immobilization is uncomfortable
- Time immobilized =
  - Increased pain
  - Potential trauma
  - Risk of aspiration
  - Vulnerable position
What’s all the fuss?

Why is this such a big deal?
- Time
- Money
- Health issues
Why not immobilize everybody?

- >1,000,000 U.S. Patients receive cervical radiography each year
- >97% of exams are negative
- Cost exceeds $175,000,000 each year
- Patient exposure to radiation
  - ~3000 cases of thyroid cancer/yr
- Immobilization causes pain and anxiety
- Slows time to disposition
Cervical Spine Evaluation
EMS vs. ED Perspectives

- **EMS**
  - Who is at risk for cervical injury such that injury might be exacerbated with EMS movement / transport?

- **ED**
  - Who is at risk for cervical injury such that radiographic studies need to be done to elucidate question of injury?
Can we recognize who may have injuries? Yes!

National Emergency X-Radiography Utilization Study

NEXUS!
Hypothesis:

*Blunt trauma victims* have virtually no risk of *cervical spine* injury if they meet all of the following criteria:

- No Neurologic deficit
- No posterior midline tenderness
- No Altered Level of Consciousness
- No evidence of ETOH/Tox
- No other distracting painful injury
NSAID mnemonic

- **N**eurologic deficit
- **S**pinal Tenderness, posterior midline
- **A**ltered Mental Status or LOC
- **I**ntoxicated
- **D**istracting painful injuries
NEXUS Definition: Altered Neurologic function

- GCS 14 or less
  - disoriented to person, place, time, events
- Inability to remember 3 objects at 5 min.
- Any focal deficit
  - Numbness, tingling, weakness
- Delayed/inappropriate response to external stimuli
NEXUS Criteria

- No posterior midline tenderness
  - Specific to midline cervical spinal tenderness
  - Not considered positive if there is tenderness on the sides of the neck
NEXUS Definition: Intoxication

Patients should be considered intoxicated if they have:

1) History of recent intoxication or ingestion
2) Evidence of intoxication on exam
What is a significant distracting injury?

- Ill-defined in the literature:
- “Distracting Painful Injuries associated with Cervical Spinal Injuries in Blunt Trauma”* suggests:
  1) Any long bone fracture
  2) Visceral injury necessitating surgical consult

What is a significant distracting injury? #2

3) Large laceration, degloving or crush
4) Large burns
5) any injury producing acute functional impairment

- Ultimately up to clinician.
  - Use to increase sensitivity
NEXUS Study

- 21 Centers enrolled 34,069 Blunt trauma victims who underwent cervical spine radiography.
NEXUS - Results

- 818 patients with fracture were identified
- 8 were not identified by Nexus criteria
- 810 were identified by clinical decision rules (Nexus criteria)
- Sensitivity 99% (95% CI 98-99.6%)
8 Patients Not Identified By NEXUS Rules

<table>
<thead>
<tr>
<th>Patient's Sex/Age (Yr)</th>
<th>Cervical-Spine Injury</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/38 C6</td>
<td>Spinous-process fracture</td>
<td></td>
</tr>
<tr>
<td>M/53 C6-C7</td>
<td>Chipped osteophyte</td>
<td></td>
</tr>
<tr>
<td>M/54 C2</td>
<td>Extension (teardrop) fracture; normal alignment without soft-tissue swelling</td>
<td></td>
</tr>
<tr>
<td>M/20 C7</td>
<td>Anterosuperior end-plate avulsion, without soft-tissue swelling</td>
<td>Treatment with soft collar only; no sequelae</td>
</tr>
<tr>
<td>F/18 C5</td>
<td>Wedge compression fracture</td>
<td>Minimal loss of body height</td>
</tr>
<tr>
<td>F/81 C2</td>
<td>Isolated lateral-mass avulsion</td>
<td>Treatment with soft collar</td>
</tr>
<tr>
<td>M/84 C2</td>
<td>Isolated lateral-mass avulsion</td>
<td>Treatment with hard collar for 2 days, followed by soft collar</td>
</tr>
<tr>
<td>M/57 C6</td>
<td>Laminal fracture</td>
<td></td>
</tr>
</tbody>
</table>

*A negative result indicated that the patient was considered to have such a low probability of cervical-spine injury that imaging was not necessary.*
NEXUS

- Performed in hospital setting
- Can this be applied to the pre-hospital setting?
- With less training, will an EMT/Paramedic miss a fracture?
  - Protocol is straight-forward.
Purpose of Selective Spinal Immobilization Protocol

- Identify and immobilize 100% of patients at risk for unstable injuries

- Identify and NOT immobilize patients who have NO/low risk for cervical spine injury...
Appendix: Q

TITLE: Selective Spinal Immobilization Protocol

REVISED: Not yet approved

1. BACKGROUND:

This protocol is intended to allow selective exclusion of full spinal immobilization in patients with a low index of suspicion for spinal injury and to use the long spine board and/or scoop stretchers for extrication purposes only.

2. INDICATIONS:

Cervical Spine:
In order for providers to defer cervical spine immobilization in patients with mechanical potential for injury, ALL of the following criteria must be evaluated and individually documented.

1. No posterior neck pain or tenderness.
2. No intoxication.
3. No altered level of alertness.
4. No focal neurologic deficit.
5. No painful distracting injuries.

Note: Axial loading of cervical spine is not recommended.

Thoracic and Lumbar Spine:
In order for providers to defer thoracic and lumbar spine immobilization in patients with mechanical potential for injury, ALL of the following criteria must be evaluated and individually documented.

For any patient with:

1. No tenderness of midline upper, mid or lower back.
2. No intoxication.
3. No altered level of alertness.
4. No neurologic deficit or incontinence.
5. No painful distracting injuries.
3. PROCEDURE

Cervical Spine:

If the above exclusion criteria are met, then extricate/assist the patient to the stretcher with the least manipulation of the spine as possible.

If the patient does not meet the exclusion criteria, apply a c-collar. Then utilize the appropriate transfer/extrication device (long spine board, KED, slider board or scoop stretcher, etc.) to move the patient to the stretcher with the least manipulation of the spine as possible.

Thoracic and Lumbar Spine:

If the above exclusion criteria are met, then extricate/assist the patient to the stretcher with the least manipulation of the spine as possible.

If the patient does not meet the exclusion criteria, utilize the appropriate transfer/extrication device (long spine board, KED, slider board or scoop stretcher, etc.) to move the patient to the stretcher with the least manipulation of the spine as possible.

Once the patient with suspected/known cervical, thoracic or lumbar spine injury is placed on the stretcher, remove the extrication device as soon as safely possible (provider discretion). Keep the patient in the supine position for transport/transfer to the appropriate destination. Any further transfers of the patient with a known or suspected spinal injury should be done with a slider board observing precautions not to manipulate the spine.

4. DEFINITIONS:

Posterior neck pain or tenderness is present if the patient reports pain on palpation of the midline neck from the nuchal ridge to the prominence of the first thoracic vertebra or any cervical spinous process.

Patients should be considered intoxicated if they have either of the following:

1. A history provided by the patient or an observer of intoxication or recent ingestion of alcohol or other mind altering substances such as benzodiazepines, narcotics or recreational drugs.
2. Evidence of intoxication on physical examination such as an odor of alcohol, slurred speech, ataxia, dysmetria, or other cerebellar findings or behavior consistent with intoxication.
An altered level of alertness can include any of the following:
- A Glasgow Coma Scale score of 14 or less.
- Disorientation to person, place, time, or events.
- A delayed or inappropriate response to external stimuli, or other findings.

A focal neurologic deficit is any neurologic finding on motor or sensory examination that is abnormal. This includes sensory or motor abnormalities or autonomic dysfunction.

No precise definition of a painful distracting injury is possible. This category includes any condition thought by the provider to be producing pain or anxiety sufficient to distract the patient from a second (neck) injury. Such injuries may include, but are not limited to: any long-bone fracture, a significant abdominal injury, a large open wound or crush injury, large burns, or any other injury causing acute functional impairment.

**Physician PEARLS:**

In patients at extremes of age, or patients with any underlying baseline mental dysfunction such as: dementia, other chronic neurologic conditions, rheumatoid arthritis, chronic steroid therapy, severe osteoporosis, those who are chronically bedridden require a higher level of concern. For possible cervical spine injuries in these patients a lower threshold for using a c-collar should be instituted.

Padding (inflatable mattress, towel rolls, blankets, etc.) is recommended when appropriate for patient comfort.
...AND YOU THINK YOU HAVE STRESS..
Stable Spine Injuries

UNStable Spine Injuries
NON-Clinically Significant Spine Injuries

Clinically Significant Spine Injuries
EMS older patient spine conundrum

- Nexus: Be Selective on Everyone

- Canadian: Doesn’t apply to $12 \leq pt \geq 65$
12 Cases

- Use the checklist
- Immobilize ?
- Not immobilize ?
- Rationale
- 30 Seconds for each case
The Checklist

**Cervical Spine:**
In order for providers to defer cervical spine immobilization in patients with mechanical potential for injury, ALL of the following criteria must be evaluated and individually documented.

1. No posterior neck pain or tenderness.
2. No intoxication.
3. No altered level of alertness.
4. No focal neurologic deficit.
5. No painful distracting injuries.

*Note: Axial loading of cervical spine is not recommended.*
Case #1
22 y/o Female Bicycle Crash

- Asking repeated questions
- Facial abrasions
- Obvious wrist fracture
Case #2
Two Car Crash

- Ambulatory
- Alert
- No spine pain
- No obvious injuries
- Pale
- Anxious
- P-130
Case # 3
Male Baseball Player

- Fell on head during play
- Alert
- Denies any injuries/pain
- Obvious scalp contusion
- Vitals normal
- Exam normal
Case # 4
Bar Fight

- In fight
- Large contusion
- Denies pain
- Exam normal
- ETOH smell
Case # 5
2 Car MVC

- Minor 2 Car MVC
- Knee contusion
- Exam normal
- No pain
- Vitals normal
- Wants to go home
Case # 6
Motorcycle MVC

- Keeps asking “how is my bike?”
- Road rash
- Vitals normal
- Exam normal
- Denies pain
Case # 7
High Impact MVC

- 48 y/o Restrained Driver
- Airbag deployment
- Chest pain, sweaty
- Denies spine pain
- Exam normal
- Vitals
  - BP 130/90
  - P 130
  - R 18
Case # 8
Roll Over

- Wearing seat belt
- No apparent injuries
- Denies pain
- Alert, No ETOH
- Exam normal
Case # 9
Jogger Struck By Bicycle

- Spun around
- Obvious patella dislocation
- Contused head
- Denies spinal pain
- Alert, sober
Case # 10
Fell Off Bike

- Bike racer
- Road rash
- Denies spinal pain
- Exam normal
- Alert, sober
- Vitals normal
- Slightly tachycardic
Case # 11
Fall Down Ladder

- Alert, Sober
- Denies spinal pain
- Exam normal
- Small scalp laceration
- Vitals normal
OK, let’s review the results!

1. No posterior neck pain or tenderness.
2. No intoxication.
3. No altered level of alertness.
4. No focal neurologic deficit.
5. No painful distracting injuries.
Questions ?