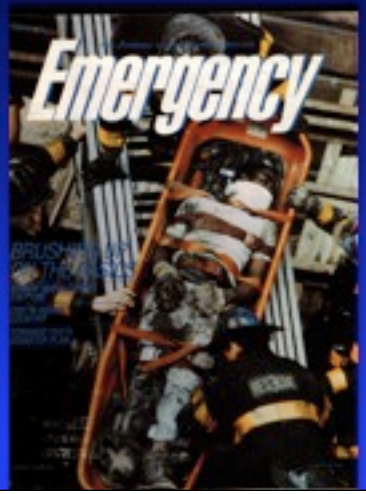
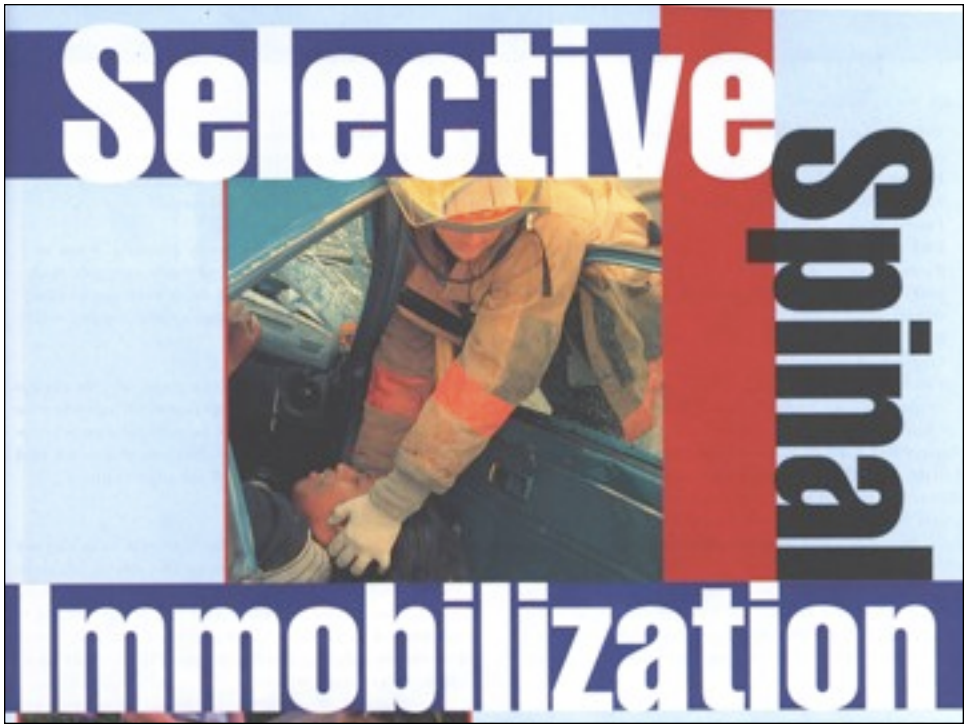
Current Issues in Spinal Management



Jon Politis

- Colonie, NY (Albany)
- EMS Chief
- Paramedic since 1980
- EMT since 1971
- Ski patroller since 1968
- Active on EMS unit since 1971
- EMS "life-er"


COLONIE EMS
EMERGENCY MEDICAL SERVICE
642


Selective
Spinal
Immobilization

Ok, first the disclaimer...

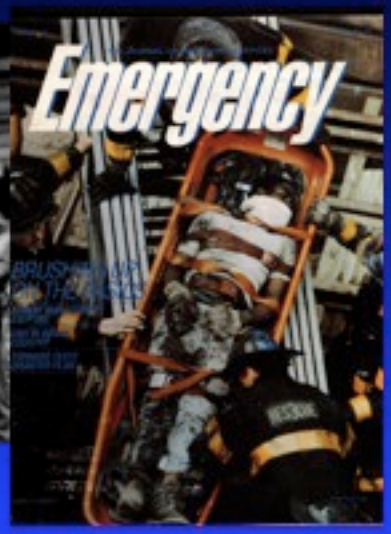
- This is a update based on the medical literature
- Some items being discussed today are controversial, so if you have any questions PLEASE ASK !
- Please follow your existing protocols

How did we get here ?

- Legitimate concern over catastrophic SCI
- Lot's of training
- Airway/spine
- Legitimate Fear
- Concept of Do No Harm

Spinal mgt circa 60s

Spinal mgt circa 70s



1971 AAOS book said...

- **Signs of spinal injury**
  - **Pain**
  - **Tenderness**
  - **Unconscious**
  - **Lacerations**
  - **Deformity**
  - **NO mention of mechanism**
  - **Painful movement** (Simple ROM test recommended)

1977 AAOS book said...

- Signs of spinal injury
  - Pain/tenderness
  - Unconscious
  - Paralysis
  - Lacerations/ contusions
  - NO mention of mechanism
  - Painful movement (Simple ROM test suggested)

Spinal mgt circa 80s

1981 AAOS book said...

- Same signs and symptoms but mechanism now considered...
  - Falls from heights
  - Diving, motorcycle and car accidents
  - Anybody with evidence of trauma above the clavicles...

Spinal mgt circa 90s

1993 AAOS book said...

- Spinal injury must be assumed with...
  - Violent impacts to
    - Head-neck-torso-pelvis
  - Sudden accelleration/ decelleration
  - Falls
  - Unrestrained MVA occupants
  - GSW to neck/trunk

Are there "high risk" mechanisms ?

- The Axial Load
  - "Spear tackle"
  - Fall from height and ankle injury
- Hyperextension
- Hyperflexion

How much spinal movement is OK ?

- Least handling, causes least damage presumption
- Nobody really knows how much movement is safe !

Spine Care Malaysia vs New Mexico....

- Malaysia-None
- NM-Lots
- Who did better ?

- Hauswald, et al SAEM, 3/98

2 Schools of Thought

1. Damage is done during initial trauma
2. Small amounts of movement can increase damage

Benefits of immobilization ?

- Prevent movement of spine
- How much movement is too much ?
- Reduce catastrophic secondary SCI ?

Anecdotal

Risks to Immobilization ?

- Uncomfortable
- Delays transport
- Aspiration/airway
- Un-necessary x-rays

Lots.... do a MEDLINE search

Backcountry Consequences...

- Complexity of rescue
- Evacuation time
- Risk to rescuers and victim due to complex evacuation

Recreational Consequences

- Falling and impact is a normal consequence of....
  - Skiing
  - Football
  - Mt. Biking

What if everyone was immobilized due to mechanism ?

Clearing the spine ?

- Who gets an X-ray ?
- The ED criteria ....
  - Reliable patient ***
  - No spinal pain on exam
  - Neuro exam normal
  - No pain with simple ROM test

Do we clear spines today ?

- Obvious negative mechanisms.....
  - Isolated sprained ankle
  - Isolated Fractured wrist

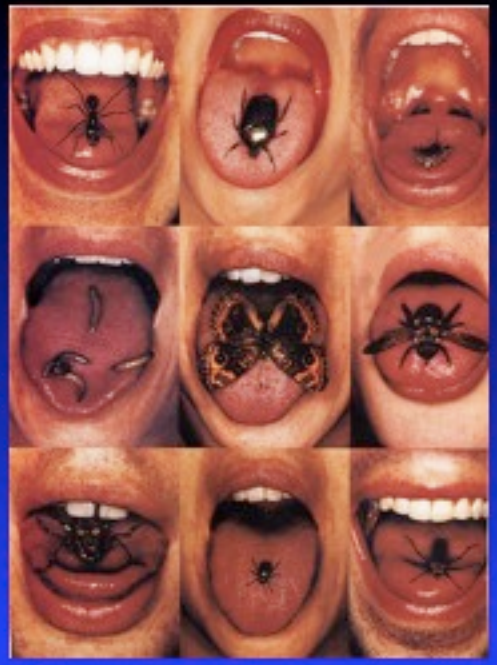
Mechanisms.....

1990

2003

EMS Spinal Assault

If the ED physicians have criteria why haven't we used them in the field before now ?



How have the ED criteria been validated ?

- Tincture of time...
- Have now been validated in a large multi center study in the US- NEXUS
- Results validate ED X ray criteria

NEXUS NEJM 9/00

National Emergency X-Radiography Utilization Study

Hypothesis:

Blunt trauma victims have virtually no risk of cervical spine injury if they meet very specific criteria

NEXUS

- **21 Centers enrolled 34,069 Blunt trauma victims who underwent cervical spine radiography**

NEXUS Criteria

- No neuro deficit
- Normal level of alertness
- No evidence of ETOH/Tox
- No posterior midline tenderness
- No other distracting painful injury

What is a significant distracting injury?

"Distracting Painful Injuries associated with Cervical Spinal Injuries in Blunt Trauma"* suggests:

1) Any long bone fracture
2) Visceral injury necessitating surgical consult
3) Large laceration, degloving or crush injury
4) Large burns
5) Any injury producing acute functional impairment

* Ullrich, et al. AEM 2001;8:25-29.

Distracting Painful Injuries (DPI) Conclusions

- Very subjective evaluation
- Most cervical spine clearance studies leave definition to clinical judgement
- Several studies show good inter-observer agreement among clinicians regarding DPI
- Use DPI liberally to improve sensitivity

NEXUS Definition: Intoxication

Should be considered intoxicated if they have:

1. History of recent intoxication or ingestion
2. Evidence of intoxication on exam

NEXUS Definition: Altered neurologic function

1. GCS 14 or less
2. Disoriented to person, place, time, or events
3. Inability to remember 3 objects at 5 minutes
4. Any focal deficit
5. Delayed or inappropriate response to external stimuli

Acute Stress Reaction

- A reaction to a significant event which causes the sympathetic nervous system to over-ride the physical stimulus of an injury
- Should pass in time
- Subjective evaluation of patient
- Requires re-evaluation if pain free and significant elevation of heart rate, blood pressure or respiratory rate

NEXUS -Results

- 818 patients with fracture identified
- All except 8 were identified by clinical decision rule
- Sensitivity 99% (95% CI 98-99.6%)
- No clinically significant fractures were missed

8 Patients Not Identified By NEXUS Rules

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

NEXUS- ER Doc Results

- Application of NEXUS criteria would reduce imaging by 12.6% in emergency departments.
- Average emergency physician could expect to see a missed fracture every 125 years of practice.

Simple protocol...

But deceptively difficult !

Canadian C-Spine Rule

For alert (GCS = 15) and stable trauma patients where cervical spine injury is a concern.
Please check all variables that apply:

1. Any High-Risk Factor Which Mandates Radiography?

- Age ≥ 65 years
- or
- Dangerous mechanism *
- or
- Paresthesias in extremities

Yes → Radiography

No ↓

2. Any Low-Risk Factor Which Allows Safe Assessment of Range of Motion?

- Simple rearend MVC **
- or
- Sitting position in ED
- or
- Ambulatory at any time
- or
- Delayed onset of neck pain ***
- or
- Absence of midline c-spine tenderness

No → Radiography

Yes ↓

Unable → Radiography

3. Able to Actively Rotate Neck?

- 45° left and right

Able ↓

No Radiography

* Dangerous Mechanism:
- fall from elevation ≥ 3 feet / 5 stairs
- axial load to head, e.g. diving
- MVC high speed (> 100km/hr), rollover, ejection, motorized recreational vehicles
- bicycle struck or collision

** Simple Rearend MVC Excludes:
- pushed into oncoming traffic
- hit by taxi / large truck
- minivan
- hit by large speed vehicle

*** Delayed:
- i.e. not immediate onset of neck pain

The NEXUS Low-Risk Criteria

According to the NEXUS Low-Risk Criteria, cervical spine radiography is indicated for trauma patients unless they exhibit ALL of the following criteria:

- No posterior midline cervical spine tenderness
- and
- No evidence of intoxication
- and
- Normal level of alertness
- and
- No focal neurological deficit
- and
- No painful distracting injuries

Explanations:

There are for purposes of clarity only. There are not precise definitions for the individual NEXUS Criteria, which are subject to interpretation by individual physicians.

1. Midline posterior bony cervical spine tenderness is present if the patient complains of pain on palpation of the posterior midline neck from the nuchal ridge to the prominence of the first thoracic vertebra, or if the patient winces pain with direct palpation of any cervical spinous process.

2. Patients should be considered intoxicated if they have either of the following: a) a recent history by the patient or an observer of intoxication or intoxicating ingestion; or b) evidence of intoxication on physical examination such as odor of alcohol, slurred speech, ataxia, dysmetria or other cerebellar findings, or any behavior consistent with intoxication. Patients may also be considered to be intoxicated if tests of bodily secretions are positive for drugs or alcohol that affect level of alertness.

3. An altered level of alertness can include any of the following: a) Glasgow Coma Scale score of 14 or less; b) disorientation to person, place, time, or events; c) inability to remember 3 objects at 5 minutes; d) delayed or inappropriate response to external stimuli; or, e) other.

4. Any focal neurologic finding on motor or sensory examination.

5. No precise definition for distracting painful injury is possible. This includes any condition thought by the clinician to be producing pain sufficient to distract the patient from a second (neck) injury. Examples may include, but are not limited to: a) any long bone fracture; b) a visceral injury requiring surgical consultation; c) a large laceration, degloving injury, or crush injury; d) large burns; or e) any other injury producing acute functional impairment. Physicians may also classify any injury as distracting if it is thought to have the potential to impair the patient's ability to appreciate other injuries.

Clearing the "C" spine or "selective" immobilization ?

Regardless of semantics...

- Formal training in procedure
- NO room for sloppy assessment
- Disciplined approach
- Tight QI

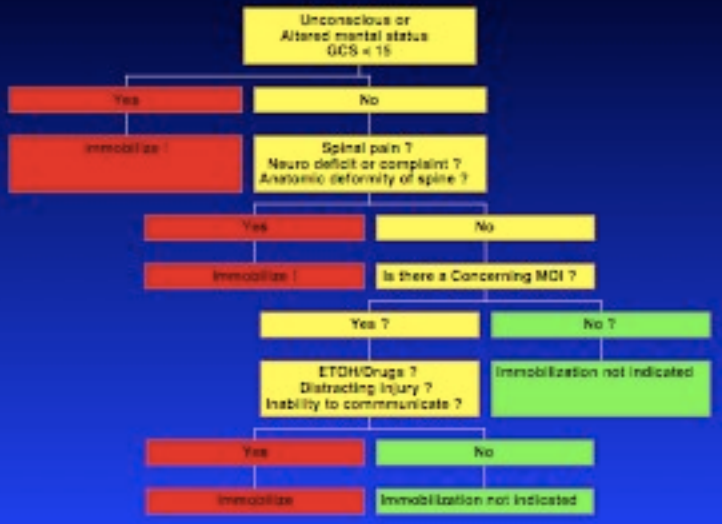
NAEMSP Policy Statements

- Clinical guidelines for delayed or prolonged transport
- Indications for pre-hospital spinal immobilization

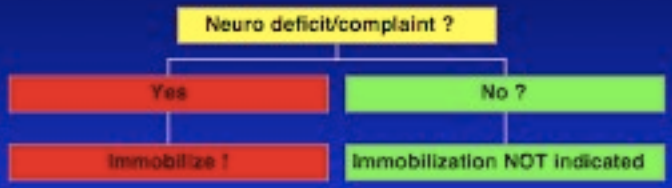
PhTLS Protocol
Indications for Spinal

- Written by an expert group based upon the medical literature

Indications for spinal Immobilization- Blunt Trauma

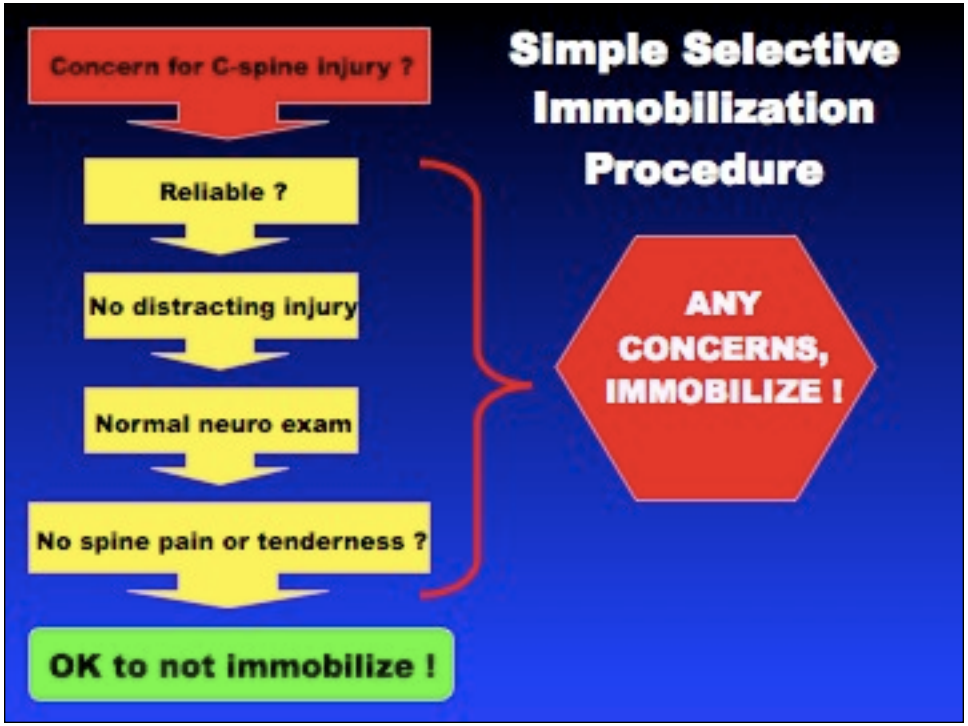


Indications for spinal immobilization- Penetrating Trauma



Clear "YES" reasons to immobilize !

- Unconscious or altered LOC
- Spine pain or tenderness
- Neuro deficit or complaint
- Anatomic deformity


Concern for C-spine injury ?
Reliable ?
No distracting injury
Normal neuro exam
No spine pain or tenderness ?
OK to not immobilize !
Simple Selective Immobilization Procedure
ANY CONCERNS, IMMOBILIZE !


Caution... immobilization criteria may...
• Miss some stable fractures !
• Miss unstable fractures in patients..
– <12 years old
– > 65 years old

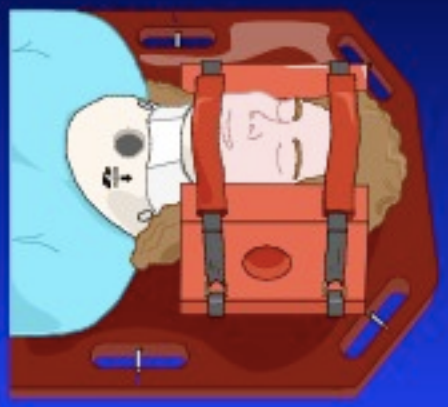
When you immobilize do it right !

- NO.....
  - Walking to the board
  - Sliding around
  - Taking too long
  - Causing pain
  - Compromising alignment

Immobilization Issues

- Optimal positioning
- Collar effectiveness
- Short devices
- Boards/strapping
- Vacuum mat
- Helmet removal

Immobilization "benchmarks"



- Prevention of..
  - Flexion
  - Extension
  - Lateral movement
- Can be rolled on side
- Speed of application
- Comfort

What do collars really do ?

- The science says....
  - Best only limit ROM by perhaps 70%
  - Can't be used alone
  - Only device with near 100% ROM limit is board and head restraint

Davis, et al, J Trauma, 1986

The standard backboard

- Tried and true
- Standard of care
- Not anatomical
- Generates painful symptoms
  - Occipital and lumbar pain
- Confuses evaluation in the E.D.
- Leads to unnecessary X-rays
- Can lead to pressure necrosis on the back
- Does not provide adequate lateral immobilization when patient in lateral position

Figure 2. Log roll maneuver. (Adapted from Department of the Army, Academy of Health Sciences. 91A sustainment training manual, 1985, no copyright. US Government Printing Office, Washington, DC.)

Log Rolling

Log Rolling

- Single study in the literature looked at thoraco-lumbar spine immob
- Radiographically evaluated three patients during log roll
- Normal volunteer, cadaver with unstable T-L spine, patient with unstable T12-L1 fracture dislocation

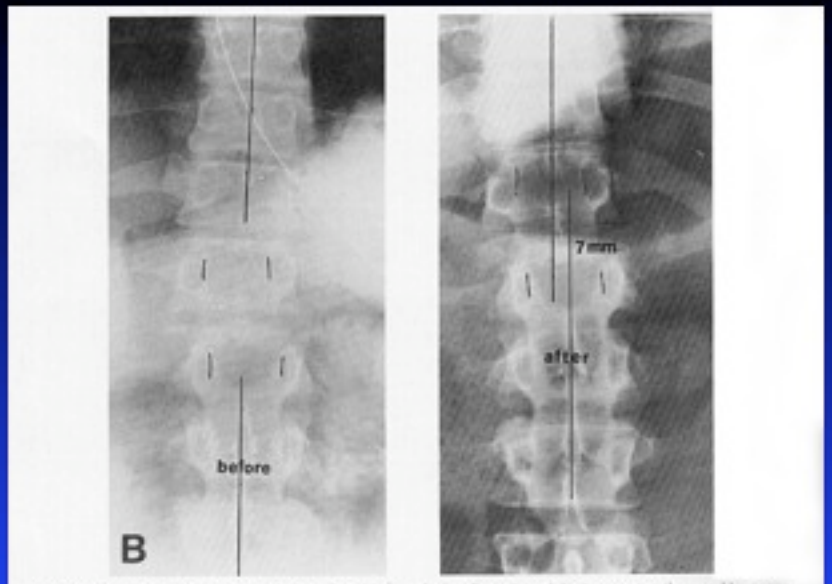


FIG. 5B. Turning from the supine to the lateral position results in a 7-mm lateral displacement at the unstable segment.

Log Rolling

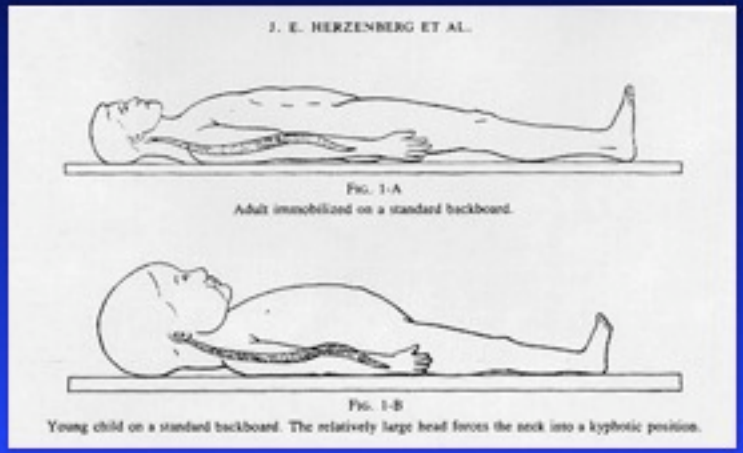
- Conclusions and the bottom line
  - Log rolling has the potential for causing substantial motion in the spine
  - There is very little evidence in the literature that provides adequate guidelines

What is a neutral position ?

- Adults....
  - 2cm lift under occiput
- Children...
  - Lift under torso

De Lorenzo, et al, Annals EM, 9/96

Anatomy and Spinal Neutrality



J. E. HERZENBERG ET AL.

FIG. 1-A

Adult immobilized on a standard backboard.

FIG. 1-B

Young child on a standard backboard. The relatively large head forces the neck into a kyphotic position.

What is neutral alignment for the elderly ?

- Spinal curvatures ?
- Osteoporosis ?
- Ever seen a board be cruel/unusual punishment ?

Spineboard as a splint...

- What were you taught in splinting 101 ?
- Ever been supine on a board for 2-3 hours ?
- Padding increases comfort !

Hauswald, PEC, 2000

Short devices: Science says....

- Immobilization time ?
- Evidence of effectiveness ?
- Actual "C" spine control

Gilbertson, et al, 1986 NYS DOH

Helmet removal ?

- Football players ?
  - Helmet
  - Shoulder pads
  - Neutral alignment
- Other helmets ?

Swenson, et al, AM J Sports Med. 3/97

Vacuum mattress

- As effective as best spineboard in immobilization
- Improved comfort
  - European standard

Johnson, et al, PEC 1995

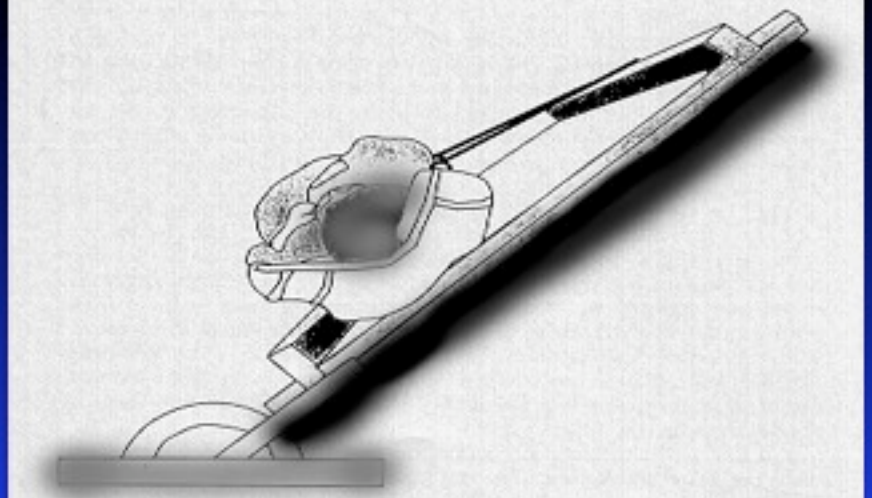


FIGURE 1. Measurement of the angle of tilt after slippage is initially noted by the subject.

Strapping methods

- Speed
- Effectiveness
- Comfort

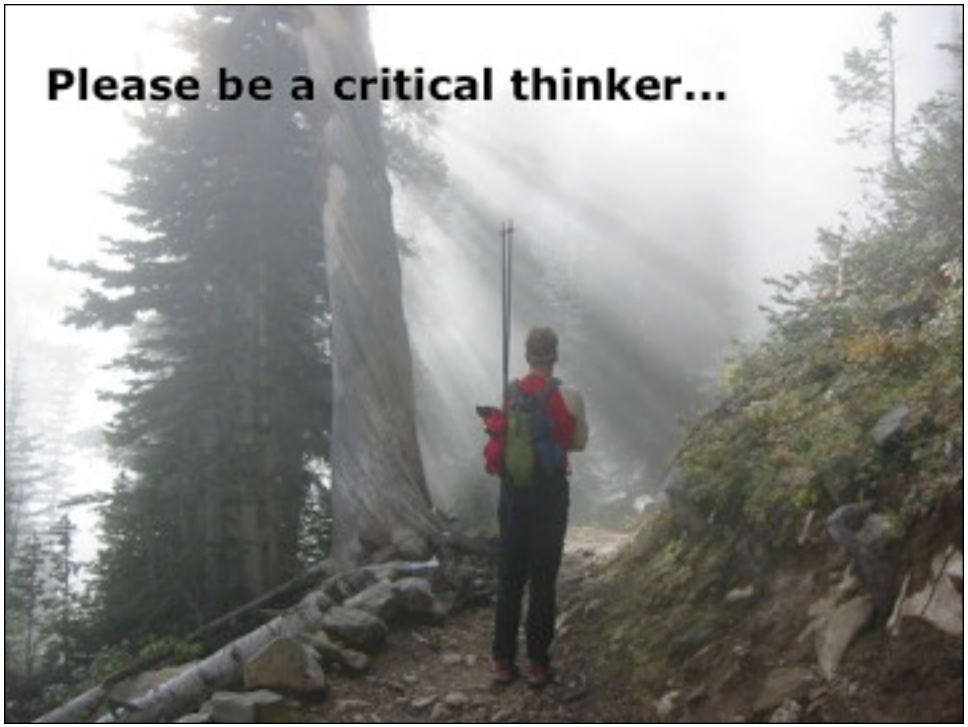
Summary

- Who does and does not get immobilized is going to change
- Training and intensive QA review will be necessary to use the same criteria as the ED

Summary

- Those we DO immobilize need to be handled with benchmarks of
  - Comfort
  - Speed/security
  - Doing no harm

That's the bottom line any questions ?




www.JonPolitis.com