Pre-hospital Spinal Motion Restriction Standard update

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What is happening

• Pre-hospital Spinal Motion Restriction Standards are slowly changing

• Impact on on-field sport coverage?

• CASEM – working group looking at this

• Collaboration between CASEM/CATA/SPC
Objective

• Review etiology and nature Spinal Cord Injuries

• Review evidence and debate around Spinal Motion Restriction Approaches

• Discuss upcoming 2017 changes to BLS Spinal Motion Restriction Standards, and further work being done
Epidemiology of Spinal Cord Injury (SCI)

• 53 per million cases of trauma → Spinal Cord Injury (SCI)
• 7% from sport (UK study)
• Of fractures causing SCI:
  • ~50% are C-spine (C6/7, C2)
  • 37% are T-spine
  • 11% are L-spine
SCI

- Stable spinal fracture: injury where the vertebral components will not be displaced by movements – undamaged cord is not in danger

- Unstable spinal fracture – disruption of 2-3 vertebral columns
  - ↔ direct mechanical damage as a result of traction and compression
  - ↔ Ischemia and cord swelling
  - Further displacement can occur
Vertebral columns
Immobilization - philosophy

• Decreased incidence or further deterioration of existing SCI
• Rigid cervical collar, head blocks with straps/tape, long board/straps, scoop stretcher, vacuum mattress
• Conservative approach – all trauma patients considered to be at potential risk of spinal injury have immediate neck immobilization (expert opinion vs scientific evidence)
• tremendous variation it is administered
"Spinal Immobilization" vs "Spinal Motion Restriction" (SMR)

- used synonymously
- true "spinal immobilization" is impossible.
- "Spinal Motion Restriction" (SMR) - attempts to maintain the spine in anatomic alignment and minimizes gross movement
The Debate: Kwan and all (2009)

• Low prevalence of SCI

• SMR is not benign:
  • Takes time – delays initiation of care in time-critical patients (collar & board)
  • Raises intracranial pressure (collar)
  • Increases aspiration risk (collar & board)
  • Potentially reduces airway opening and respiratory efficacy (collar & board)
  • Increases risk of decubitus ulceration (board)
The Debate: Hauswald’s & all (1998); Blackham & all (2009)

• SCI is done at time of impact
  • Forces on impact – greater magnitude than those with subsequent movement (felt to not be sufficient enough to cause further damage)

• Spinal cord hemorrhage and edema both occur following trauma, and complicate the assessment of further movement as a contributing factor
The Debate: Blackham & all (2009)

- No reports of acute deterioration in an alert and cooperative patient with cervical spine injury as a result of a failure to immobilize

- Alert and cooperative patients will develop a position of comfort with muscle spasm protecting damaged spine

- Muscle spasm may be a superior method to an artificial procedure in immobilizing spine in an alert and cooperative patient (hypothesis)

- ** More studies are needed
Myths/Facts

• Long Backboard (LBB) neutralize c-spine when used properly.

  • 98% of healthy college students – some degree of cervical extension
  • 0-3.75 inches of occipital padding may be needed to achieve neutrality
  • This variance increased in elder patient due to accentuated AP spinal curve (accentuated cervical lordosis and thoracic kyphosis)
  • Thus, multiple areas will require additional amounts of padding and even then, a flat LBB is not likely to fully neutralize these extreme curves.
Myths/Facts

• Use of the LBB is a benign intervention
  • Increased risk of pressure ulcers
    • 70mmHg for 2+ hours – tissue ischemia
    • LBB – 233.5mmHg at sacrum; 82.9 mmHg at thorax
  
• Decreased respiratory function –
  • Atelectasis
  • Increased respiratory effort

• Pain from LBB – false-positive midline vertebral tenderness – unnecessary imaging
  • 21% of patients with cervical spine pain
  • 33% of patients with lumbar spine pain
Myths/Facts

• Although the LBB may not be used on trauma patients anymore, I still need to utilize a cervical collar

  • This is up for debate now too

  • Collars allow over 30° of flexion/extension and rotation
BLS 2017 Patient Care Standards: Consider SMR assessment for following MOI

• any trauma associated with complaints of neck or back pain
• sports accidents (impaction, falls)
• diving incidents and submersion injuries
• explosions, other types of forceful acceleration/deceleration injuries
• falls (e.g. stairs)
• pedestrians struck
• electrocution
• lightning strikes
• penetrating trauma to the head, neck or torso
BLS 2017 Patient Care Standards: **Risk Criteria**

- neck or back pain
- spine tenderness
- neurologic signs or symptoms
- altered level of consciousness
- suspected drug or alcohol intoxication
- a distracting painful injury (any painful injury that may distract the patient from the pain of a spinal injury)
- anatomic deformity of the spine
BLS 2017 Patient Care Standards: Risk Criteria

• high-energy mechanism of injury, such as,
  • i. fall from elevation greater than 3 feet/5 stairs,
  • ii. axial load to the head (e.g. diving accidents),
  • iii. high speed motor vehicle collisions (≥100 km/hr), rollover, ejection
  • iv. hit by bus or large truck
  • v. motorized/ATV recreational vehicles collision
  • vi. bicyclist struck or collision

• age ≥65 years old including falls from standing height;
BLS 2017 Patient Care Standards

• MOI – yes; Risk Criteria – none -> No SMR

• MOI – yes; Risk Criteria – 1 or more -> SMR using a cervical collar only*, attempt to minimize spinal movement, and secure the patient to the stretcher with stretcher straps
BLS 2017 Patient Care Standards

• Spinal boards/adjustable break-away stretchers should be considered primarily as extrication/patient lifting devices.

• The goal should be to remove the patient from these devices as soon as it is safe to do so.

• Spinal boards/adjustable break-away stretchers may remain in place if paramedic deems it safer/more comfortable for patient in consideration of short transport times (<30 min).
BLS 2017 Patient Care Standards

• Patients who have had a spinal board/adjustable break-away stretcher applied by a first responder prior to the paramedic’s arrival should still be assessed for SMR as per the Standard.

• Unless otherwise required, SMR may be modified to meet this standard.
International Liaison Committee On Resuscitation (ILCOR)

• Working on new guidelines reassessing:
  • The use and application of C-spine Collars;
  • The use and application of Long Board and Scoop Stretcher including strap application;
  • The transfer to EMS stretcher

• Should be coming out later this year (2017)
Some more consensus outcomes that do exist

• Penetrating Trauma with no neurological signs does not require immobilization

• ‘Standing Take Down’ practice should be avoided.

• Conscious patient with no overt alcohol, drug use and no major distracting injuries may self-extricate, and walk-over the stretcher to lie down and be examined
More still to come

• BLS SMR standard does not allow the paramedic to “clear the spine” for blunt trauma patients. Rather, it identifies patients where the mechanism of injury in combination with and the absence of risk criteria mean a spine injury does not have to be considered.

• Using SMR does not mean the paramedic has “cleared” the spine for blunt trauma patients. The paramedic must at all times manage the patient to minimize spinal movement.
In-field c-spine clearing research in Ontario

- Ontario Study: A Pragmatic Strategy Empowering Paramedics to Assess Low-Risk Trauma Patients with the Canadian C-spine Rule and Selectively Transport them Without Immobilization
- Started in 2011 in Ottawa – Dr. C. Vaillancourt
- Now: 12 different EMS services across Ontario are involved in study
Ontario EMS Study

• ½ million patients transported with collar and board/ year in Ontario
• Less than 1% of these actually had a spinal injury (? Stable vs unstable)

• Study looks at applying Canadian C-spine Rules (CCSR) in the field on stable, alert trauma patients
Ontario EMS Study

Inclusion criteria
• Alert and cooperative (GCS – 15)
• Stable (vital signs)
• Acute Injury (< 48 hours)

Exclusion criteria
• Boarded/Collared for other reasons
• 8 + years old (use to be 16)
• No penetrating trauma
• Acute paralysis
• Pre-existing abnormal C-spine
The Canadian C-Spine Rule

Please check off all choices within applicable boxes:

1. Any One High-Risk Factor Which Mandates Immobilization?
   - No
     - Age ≥ 65 years
     - Dangerous mechanism *
     - Numbness or tingling in extremities
   - Yes

2. Any One Low-Risk Factor Which Allows Safe Assessment of Range of Motion?
   - No
   - Yes
     - Simple rearend MVC **
     - Ambulatory at any time at scene
     - No neck pain at scene when asked
       (answer “yes” if no pain)
     - No pain during midline c-spine palpation
       (answer “yes” if no pain)

3. Patient Voluntarily Able to Actively Rotate Neck 45°
   - Left and Right When Requested, Regardless of Pain?
     - No
     - Yes
       - Able
         - No C-Spine Immobilization ***
       - Unable
         - C-Spine Immobilization

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

** Simple Rearend MVC Excludes:
  - pushed into oncoming traffic
  - hit by bus/large truck
  - rollover
  - hit by high speed vehicle (≥100 km/hr)
1. Any ONE **high-risk** factor which mandates immobilization?

- [ ] No  [ ] Yes  Age $\geq 65$ years
- [ ] No  [ ] Yes  Dangerous Mechanism*
- [ ] No  [ ] Yes  Numbness or tingling in extremities
**Dangerous Mechanism:**
- fall from elevation ≥3 feet/5 stairs
- axial load to head, e.g. diving
- MVC: rollover, ejection, high speed (≥100km/h)
- motorized recreational vehicles, e.g. ATV, snowmobile
- bicycle collision with object, e.g. post, car

**Simple Rearend MVC Excludes:**
- pushed into oncoming traffic
- hit by bus/large truck
- rollover
- hit by high speed vehicle (≥100km/h)
2. Any ONE **low-risk** factor which allows safe assessment of range of motion?

- No  ❑ Yes  Rearended in Simple Rearend MVC**
- No  ❑ Yes  Ambulatory at any time at scene
- No  ❑ Yes  No neck pain at scene when asked
  *answer “yes” if no pain*
- No  ❑ Yes  No pain during midline c-spine palpation
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**Dangerous Mechanism:**
- fall from elevation ≥3 feet/5 stairs
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**Simple Rearend MVC Excludes:**
- pushed into oncoming traffic
- hit by bus/large truck
- rollover
- hit by high speed vehicle (≥100km/h)
3. Patient voluntarily able to actively rotate neck 45° left and right when requested, regardless of pain?

☐ No  ☐ Yes
Ontario EMS Study: Canadian C-spine Rules (CCSR)

• Consists of 3 screening questions

• 1. Any high risk factor that require immobilization
• If none:
• 2. Any low risk factor that would allow for evaluation of neck rotation
• 3. Can the patient actively rotate the neck at least 45%

• If patient passes all 3 – no need for immobilization in field, or x-ray in ER
Ontario EMS Study: Measured objectives

• Pain intervention
• Mean time from EMS arrival to ED disposition
• Patient radiation Exposure
• Incidence of pressure sores
• SAFETY

• Number of c-spine immobilized
• Time spent on scene
• Time spent in hospital by EMS and patient
• Cost savings
So what can Sport Docs expect?

- Your local EMS service may be part of the study

- BE PREPARED for CHANGE!

- Clinical Judgment should ALWAYS prevail!

- Stay tuned for CASEM’s position statement!
• Thank you
References

• **Prehospital spinal immobilisation: an initial consensus statement**; D Connor, I Greaves, K Porter, M Bloch, on behalf of the consensus group, Faculty of Pre-Hospital Care (UK); Trauma, 2015, Vol 17(2) 146-150

• **Pre-hospital Management of Spinal Injuries: Debunking the Myths of the Long backboard**; Josly Joseph, Joshua Bucherl EmDocs, Feb 10th 2016

• Pre-Hospital Care Management of a Potential Spinal Cord Injured Patient: A Systematic Review of the Literature and Evidence-Based Guidelines; Henry Ahn, 1 Jeffrey Singh, 2 Avery Nathens, 3 Russell D. MacDonald, 4 Andrew Travers, 5 John Tallon, 6 Michael G. Fehlings, 1 and Albert Yee 1l. JOURNAL OF NEUROTRAUMA 28:1341–1361 (August 2011) a Mary Ann Liebert, Inc. DOI: 10.1089/neu.2009.1168