Spinal Injury

10 – 20% of patients with Head Injury also have a cervical spine injury!!!

17% of patients have a missed or delayed diagnosis....

Of those missed, about a third are at risk of permanent neurological deficit...
Watmough will have cortisone injected into his spine this morning to speed up the recovery from an injury that has plagued him since the clash against the Bulldogs in round eight and will miss the team's first few training sessions as a result.

'Paralysed' Watmough vows he'll have the backbone for Game Two after treatment for neck injury.

Watmough may have a cortisone injection. He understands this may be a temporising measure that addresses the symptoms but not the cause of the problem. He understands that he should rest after the injection and miss 6 weeks of training reflecting the slow recovery of nerves to regenerate.

Watmough vows he will investigate options before Game Two.
When the head is in the neutral position, with the normal cervical lordotic curve, forces transmitted to the head are dissipated in the cervical muscles and ligaments.
Compression fractures have an intact posterior vertebral body that prevents injury to the spinal cord...

Cervical spine instability is defined as the loss of ability of cervical spine under physiological loads to maintain relationships between vertebrae in such a way that spinal cord or nerve roots are not damaged or irritated and deformity or pain does not develop.
- Destruction or loss of function of anterior elements
- Destruction or loss of function of posterior elements
- Relative translation of vertebra in sagittal plane > 3.5 mm
- Angulation of one vertebra to another > 11 mm
- Damage to the cord
- Nerve root damage
- Abnormal narrowing of disc space

Hyper-flexion

Unstable wedge #
- Destruction or loss of function of anterior elements
- Destruction or loss of function of posterior elements
- Relative translation of vertebra in sagittal plane > 3.5 mm
- Angulation of one vertebra to another > 11 mm
- Damage to the cord
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Low-Risk Criteria for Clinical Exclusion of Cervical Spine Injury in Alert Stable Patients

**NEXUS criteria**
- No posterior midline cervical tenderness
- No intoxication
- No focal neurologic deficit
- No painful distracting injuries

**Canadian C-spine rule criteria**
- Age < 65 years
- No dangerous mechanism, such as:
  - Fall from height of >91 cm (>3 ft)
  - Axial loading injury (e.g., diving accident)
  - High-speed motor vehicle collision (>100 km/h), rollover, or ejection
  - Recreational motor vehicle, motorcycle, or bicycle injury
- No paresthesias
- Sitting position in emergency department
- Ambulatory at any time
- Neck rotation of 45° left and right

In the NEXUS study, fractures were missed in only 8 of 818 cases by using the clinical decision tool, with a negative predictive value of 99.8%.

Clearance refers to the confident exclusion of unstable cervical spine injuries that could otherwise result in neurologic injury or death.

Glasgow Coma Scale (GCS)
The Babinski sign

Plantar Reflex Flexor Response
Layers of fibres combine together and ascend up the spinal cord eventually communicating with the brain.
Central Cord Syndrome is the most common incomplete cord syndrome. Frequently associated with extreme hyperextension injury. Note that upper limb deficit greater than lower extremity deficit.

Anterior Cord Syndrome seen in flexion injuries and presents with *immediate* paralysis, because the tracts are located in the anterior aspect of the cord.

Hangman’s Fracture usually thought of as a hyperextension injury but may occur from forced flexion.
The C2 fracture accounts for nearly 19 percent of all spinal fractures and 55% of cervical fractures. A sudden forceful hyperextension centred just under the chin

Hangman Fractures can and have walked off the field...

Most patients are neurologically intact meaning that there is no injury to the spinal cord and/or nerves at the level of the fracture. Typically there is neck pain, which is the most common symptom.

Beware the Sideshow Alley Clown!
Beware the Miracle of Transient Paralysis...

Players who experience this may have a rapid and complete resolution....
BUT these players should be strongly advised to have an Xray and MRI

Should never be allowed to return to the field if symptoms persist.
Q. The strongest risk factor for stinger injuries as well as lasting symptoms.

A history of stingers in the previous season was identified to be the strongest risk factor.

BMI

Grade and position of play
If a player suffers a THIRD stinger in the same season, the player should sit out the remainder of the game. 
Even if symptoms resolve completely.
Upper Limb Dermatomes

C6

C7

C8

Upper Limb Myotome Testing

C5/4
Shoulder Shrug
C5
Elbow Flexion
C6
Wrist Extension
C7
Elbow Extension
C8
Finger Flexion
T1
Finger Abduction
A player who walks off the field with a neck injury should be questioned and examined in a seated position away from distractions and coaches.

Displacement does not explain additional traumatic injury, but rather that the amount of force applied across an unstable segment is the key determinant of neurologic deterioration.

Have Contingency Plans... then
Practice, Practice, Practice
Young children sustain injury primarily to the upper cervical spine (C1-C4), whereas children older than 8 years and adolescents tend to sustain lower cervical injury (C5-C7).
In the field, children who have symptoms suggestive of spinal injury should have their cervical spine immobilized during initial evaluation and management.

High-Risk mechanisms
High force or velocity (falls from heights > 1.5m or 3 times the body length and motor vehicle accidents), Diving injuries, blunt traumatic injuries from contact or collision sports (e.g., football, hockey, soccer), any significant acceleration-deceleration injury.

Localized cervical spine pain, Muscle spasms, and Limited neck range of motion constitute the classic Triad of symptoms associated with cervical spine injury.

SCIWORA

Up to 61% of patients with a clinical diagnosis of SCIWORA have abnormalities on MRI; therefore, an MRI should be performed when clinical concern for SCIWORA is present.
The complex anatomy of the human neck allows for high flexibility in rotation and translation through seven cervical vertebrae controlled by over 70 muscles. Analysis of isometric cervical strength with a nonlinear musculoskeletal model.

The potential for repeated minor neck injuries to lead to pathological changes in the cervical spine is an area of concern. The questions then become:

What can be done to prevent these injuries from happening.

How can one reduce the severity of future injuries?

** 27% of cervical injuries sustained during rugby union matches were recurrent.
Helicopter pilots were required to isometrically sustain a 70% load for up to 3 minutes. This protocol was designed to simulate the flight environment where pilots are required to isometrically sustain postures while wearing a flight helmet and night vision goggles.

In the Super rugby competition, forwards spend an average of 7.1 +/- 2.7 seconds in static play, defined as rucking, mauling, or scrumming, interspersed by running, jogging, or walking.

To simulate the dynamic muscular loading that occurs during a rugby game, a New Zealand group designed an endurance protocol that required participants to sustain 70% of their maximal voluntary contraction force for 7-second periods interspersed with 4 seconds at 90% of MVC.