

# **Spine Clearance in Polytrauma: Current Practice and Unique Challenges**

## **MTC Teaching**

**Leeds, 21 October 2016**

**Nigel Gummerson**

**Consultant Orthopaedic Spinal Surgeon**

# **Spine Clearance: Care of the Injured and Uninjured Spine**

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**Clinical assessment  
remains key**

**If the neck is clinically  
broken then it is until  
proven otherwise**

# Introduction

- Spinal Trauma
- Neurosurgical vs Orthopaedic
- Goals - Local and Patient based
- National Targets / Standards

# Objectives

- Be able to assess, diagnose and manage spinal trauma patients (and those who turn out to have an uninjured spine)

# Objectives

- To know of:
- Mechanism of structural failure
- Changing patterns of injury in the growing and ageing spine
- To know how:
- Document spinal cord or nerve root injury

# Objectives

- To know how:
- Use adjuncts to restrict spinal motion in paediatric and adult trauma patients
- Modified approach to restrict spinal motion in patients with fixed spinal deformity
- Apply structured assessment tools to clear or image the cervical spine
- To select appropriate method of initial imaging



## BOAST 2: SPINAL CLEARANCE IN THE TRAUMA PATIENT

### Background and Justification:

All patients involved in significant blunt trauma must be assumed to have an unstable injury to their spine; the incidence is approximately 2% and increases up to 34% in the unconscious patient. 50% of spinal injuries occur in the thoracic or lumbar spine; 20% at two levels. Immobilisation with full spinal precautions for prolonged periods creates difficulties in intensive care units. Spinal immobilisation is associated with pressure sores and pulmonary complications and is not recommended for more than 48 hours. Audits in the UK suggest poor implementation of spinal clearance policies. In the neck ligamentous disruption without a major bony injury may lead to instability. Recent comparative evaluations have shown that a modern helical CT scanning with reformatting can demonstrate the subtle abnormalities offering high sensitivity and specificity in detecting unstable injuries of the cervical spine. Plain radiographs are insensitive in the neck and the upper thoracic spine. MRI scanning has high sensitivity but only moderate specificity and is logistically difficult for ICU patients.

### Inclusions:

All trauma patients who are unconscious, unable to cooperate or who have distracting injuries that exclude reliable clinical assessment.

### Exclusions:

Children under the age of 16

### Standards for Practice Audit:

1. A protocol for protection of the entire spine must be in place in all hospitals managing trauma patients at risk of spinal injury. This protection must be maintained from arrival until appropriate examination or investigations are completed and the spine cleared of injury.
2. Documentation of the neurological status must be made in all at-risk patients; any sign of spinal cord injury mandates urgent scanning.
3. A clinical examination of the whole spine should be documented.
4. If it is anticipated a patient will remain unconscious, unassessable or unreliable for clinical examination for more than 48 hours, radiological spinal clearance imaging should be undertaken.
5. For the cervical spine, the appropriate standard is a thin slice (2-3mm) helical CT scan from the base of the skull to at least T1 with both sagittal and coronal reconstructions; extending that scan to T4/5 overcomes the difficulties of imaging the upper thoracic spine.
6. It is recommended that this cervical spine CT scan be undertaken as a routine with the first CT brain scan in all head-injured patients who have an altered level of consciousness.
7. The remaining thoracic and lumbar spine may be adequately imaged either by AP and lateral plain radiographs or by sagittal and coronal reformatting of helical CT scans of the chest, abdomen and pelvis undertaken as part of a modern CT trauma series (<5mm slices).
8. A senior radiologist must report spinal clearance images prior to withdrawal of spinal protection precautions.
9. If a spinal injury is detected, a neurological assessment must be made, even if incomplete, and repeated regularly prior to urgent transfer to an appropriate spinal injury service.
10. MRI is the urgent investigation of choice for spinal cord injury.

### Evidence Base:

Predominantly retrospective case series but with good expert reviews and an evolved multinational professional consensus over 15 years.

### Limitations:

There are insufficient series or tested protocols to recommend a policy in children.

The place of MRI as a clearance tool for instability remains uncertain.

There are practical issues with scanning ICU patients and high false positive rates for intervertebral disc and ligament abnormality.





## BRITISH ORTHOPAEDIC ASSOCIATION STANDARDS for TRAUMA (BOAST) ©

### BOAST 8: THE MANAGEMENT OF TRAUMATIC SPINAL CORD INJURY

#### Background and Justification:

Spinal cord injury resulting in neurological deficit is a rare but potentially devastating injury. Compromise to the spinal cord may be due to trauma, vascular injury or other disease process and can result in immediate or insidious onset of neurological symptoms including loss or reduction of voluntary motor function, sensory impairment, bowel or bladder dysfunction and loss of autonomic function. The incidence in the United Kingdom is estimated at 12-16 per million population with about 75% of cases due to trauma. Appropriate management from the time of diagnosis of cord injury has been shown to have significant effect on the long-term outcome for patients and reduce short and long-term complications.

#### Included Patients:

All patients with traumatic spinal cord injury resulting in complete or incomplete para- or tetraplegia. The audit standards apply to those with polytrauma and those with isolated spinal cord injuries but do not apply to patients with spinal column injury without cord involvement. These audit standards apply to adults and children.

#### Standards for practice audit:

1. All Major Trauma Centres and Trauma Units must have a named, linked Spinal Cord Injury Centre.
2. All hospitals within a major trauma network should have an agreed, common protocol for protecting the neck and spine together with an agreed, common protocol to exclude significant injury (clearance of the neck and spine eg BOAST-2).
3. Centres managing patients with spinal cord injury require 24-hour access to CT and MRI.
4. Clinical evaluation of injured patients must include appropriate and repeated examination of the peripheral nervous system which should be recorded in the medical notes on an ASIA chart in keeping with the International Standards for Neurological Classification in Spinal Cord Injury.
5. Protocols for resuscitation and acute management including skin care, gastric, bowel and bladder care and neuroprotection must be agreed with the linked Spinal Cord Injury Centre and available in all Emergency Departments that may receive patients with spinal cord injury.
6. Centres treating these injuries must have the capability of performing specialist spinal surgery within 4 hours of injury. For those requiring surgery, protocols for anaesthesia and spinal stabilisation must be agreed with the linked Spinal Cord Injury Centre.
7. Protocols for nursing, joint protection and therapy requirements must be agreed with the linked Spinal Cord Injury Centre.
8. Management of the spine must follow written, agreed protocols with the linked Spinal Cord Injury Centre, or alternatively the on call consultant at that centre should be contacted within 4 hours of injury.
9. An early, joint management plan must be formulated and recorded in the medical notes within 12 hours.
10. Once the patient is fit for transfer to a Spinal Cord Injury Centre this should take place within 24 hours, unless it is agreed that it is the patient's best interest to remain in a Major Trauma Centre or Trauma Unit.
11. Spinal Cord Injury Centres should provide an outreach visit within 5 days of referral for patients unfit for transfer, and then follow-up contact (or visit) at least weekly until the patient is transferred.
12. Appropriately trained psychological support must be available for patients, family and carers.
13. All patients with new spinal cord injuries in England must have referral data submitted to the National Spinal Cord Injuries Database. The referral website is found at [www.spinalcordinjury.nhs.uk](http://www.spinalcordinjury.nhs.uk)

#### References:

References are found at [www.spinalcordinjury.nhs.uk/docs.aspx](http://www.spinalcordinjury.nhs.uk/docs.aspx)

Management of People with Spinal Cord Injury. NHS Clinical Advisory Groups Report (August 2011)

The Initial Management of Adults with Spinal Cord Injuries (May 2012)

ASIA Protocol

Professional consensus

## Head injury

Triage, assessment, investigation and early  
management of head injury in children, young  
people and adults

Issued: January 2014

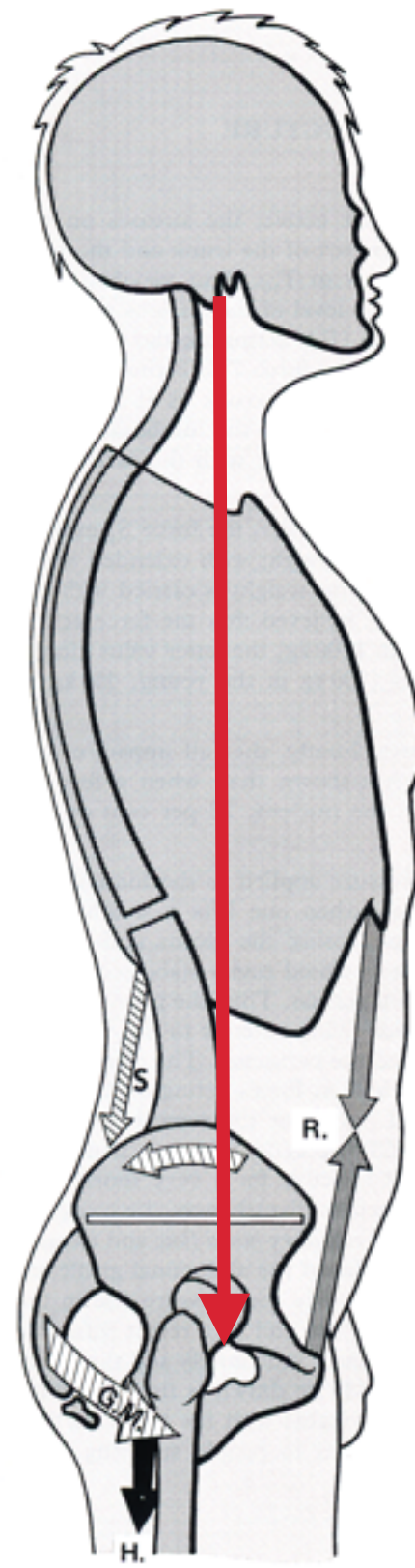
**NICE clinical guideline 176**

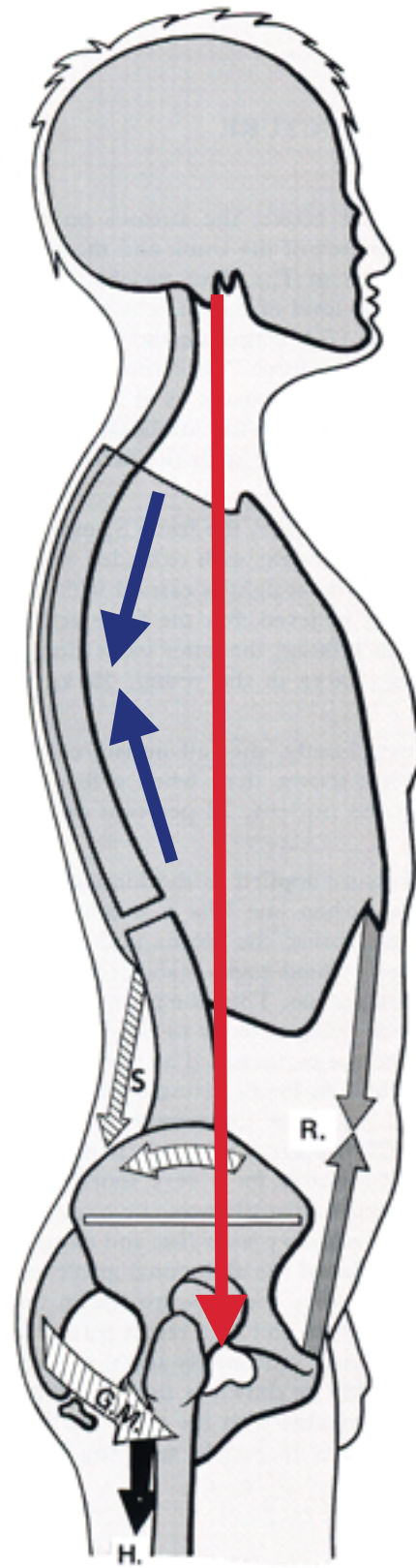
[guidance.nice.org.uk/cg176](http://guidance.nice.org.uk/cg176)

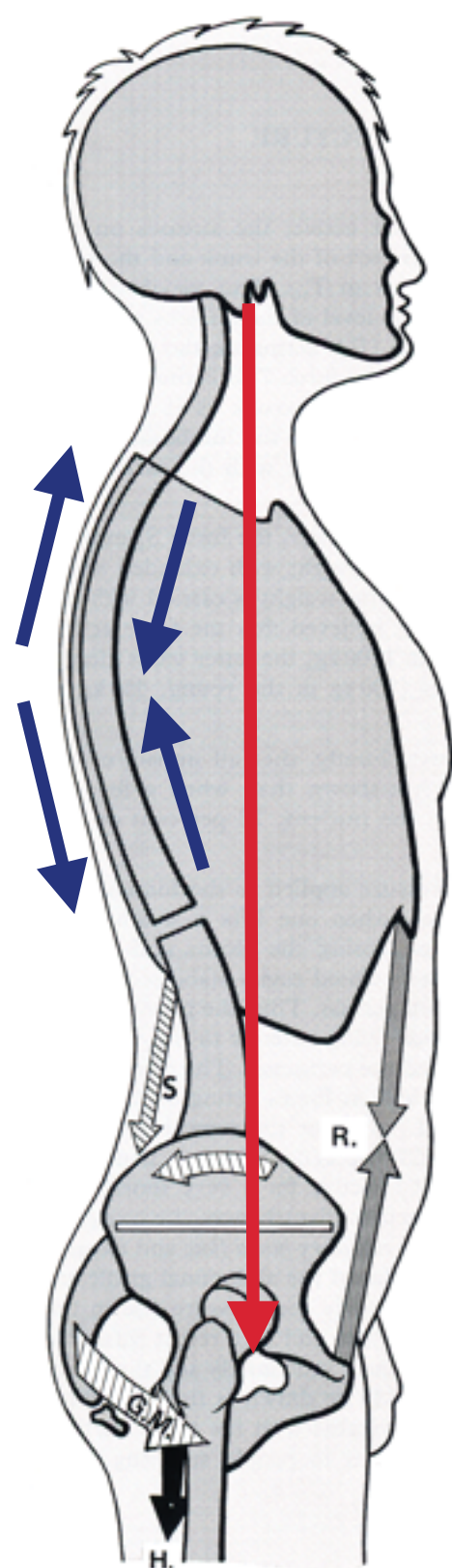
**How is the  
spine injured?**

**How is the  
spine injured?**

**and what are the  
consequences?**







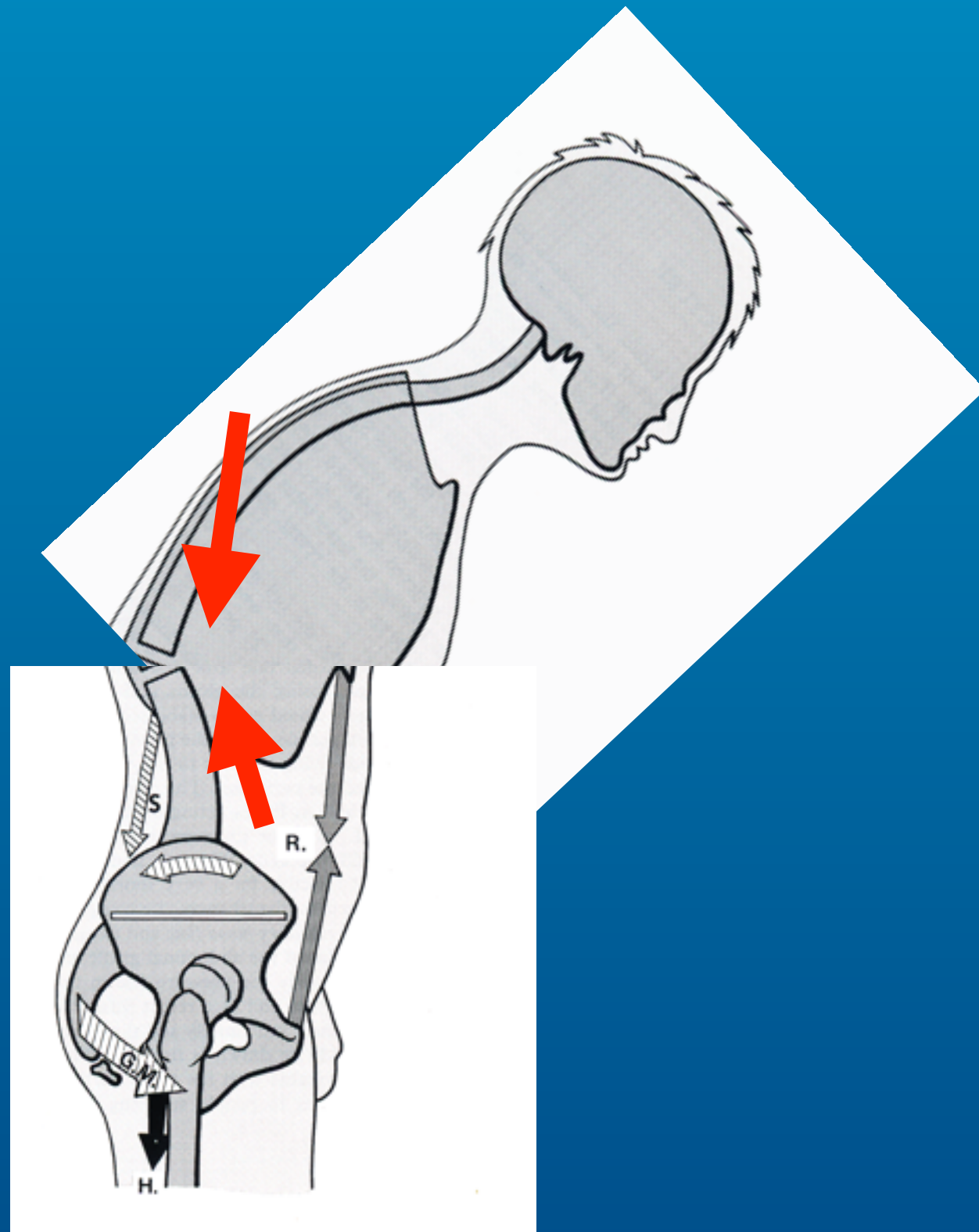
# Spinal Stability

- Maintain patterns of displacement under physiological load
- No initial / additional neurological deficit
- No major deformity
- No incapacitating pain

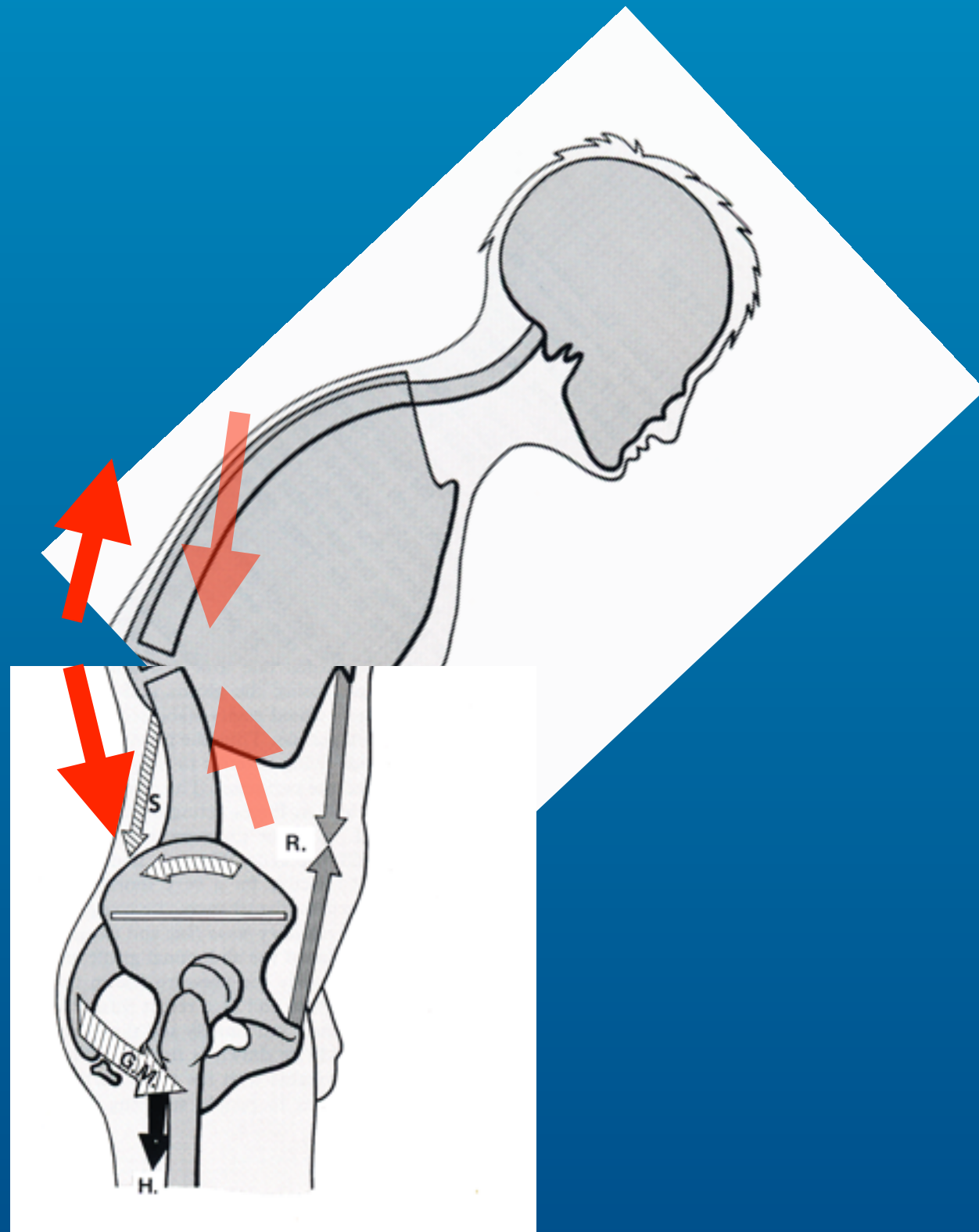
**White and Panjabi**



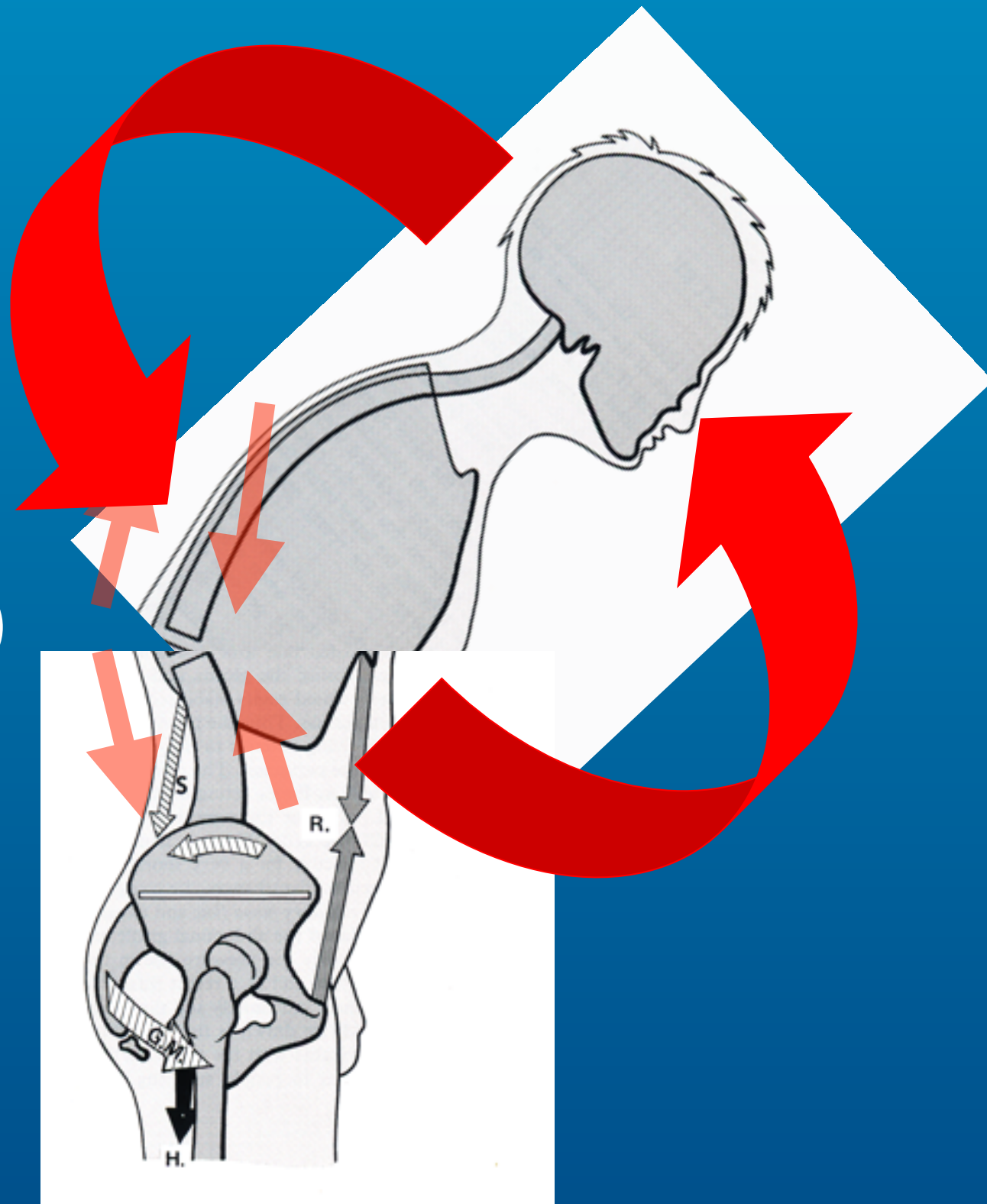
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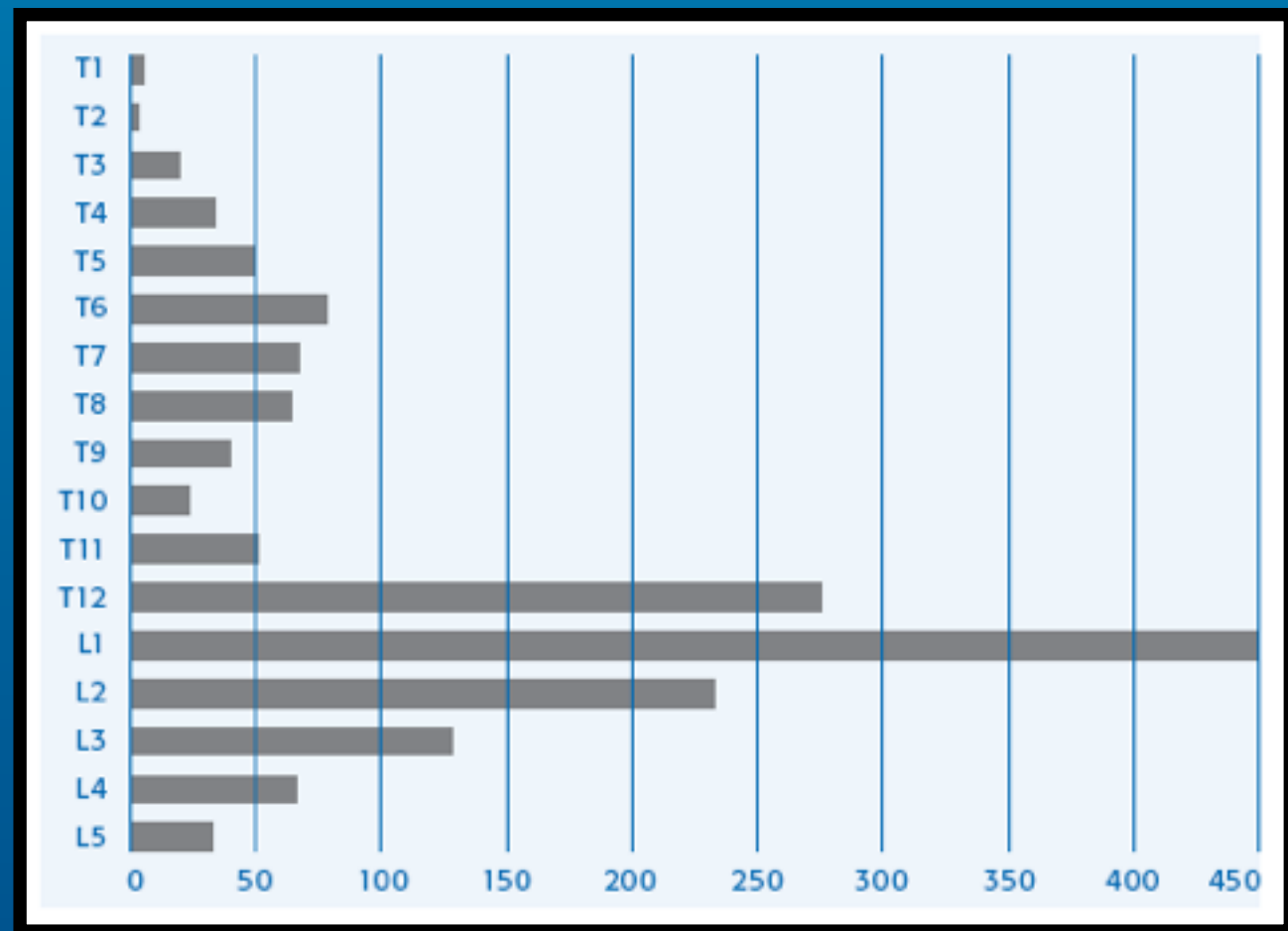
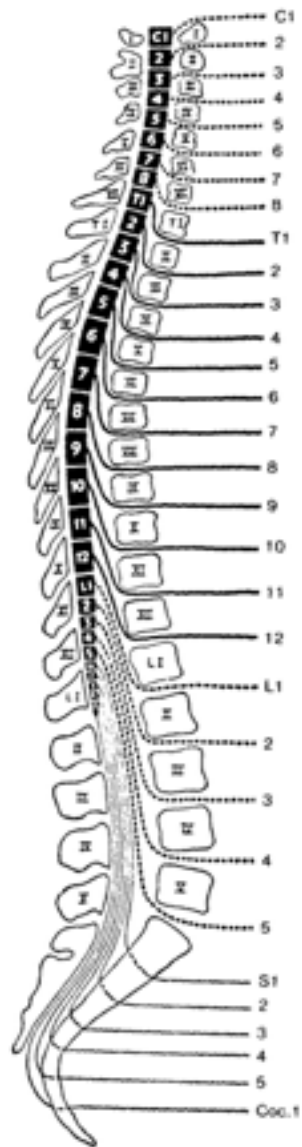
Pulling  
(Tension)



Twisting  
(Torsion and shear)



# Injuries at junctional zones



# What is the result of injury?

- Bone and joint injury
- Ligamentous injury
- Disc injury
- Cord / root injury

# **Describing Structural Failure**



# Milwaukee Brewer's Stadium



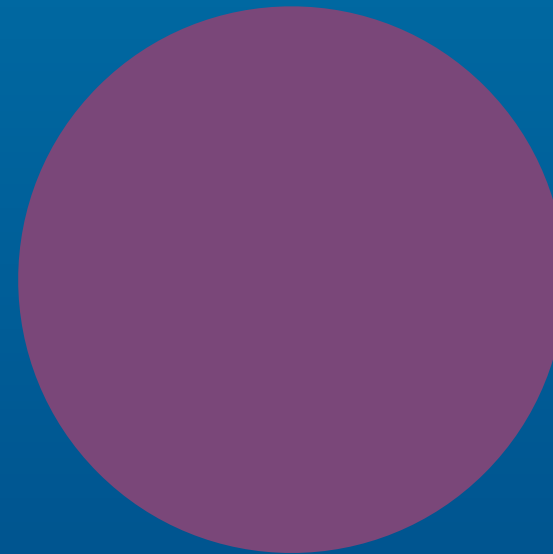
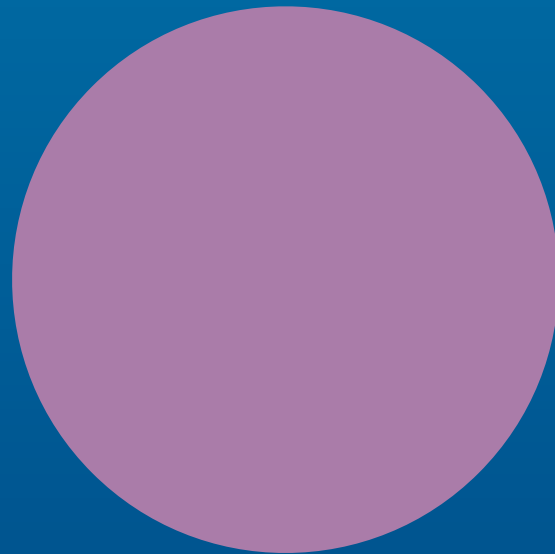
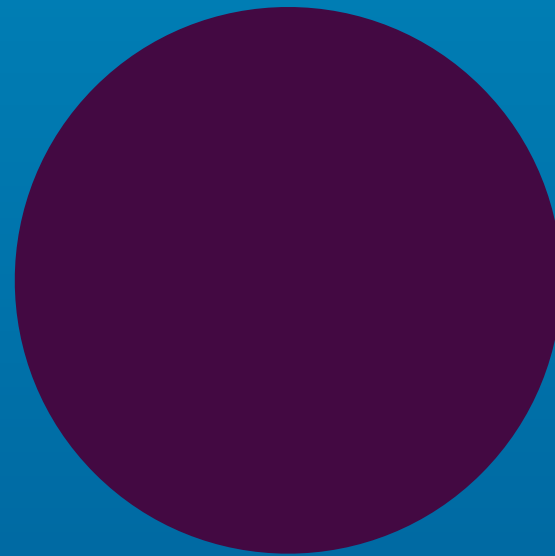
# Describing Structural Failure



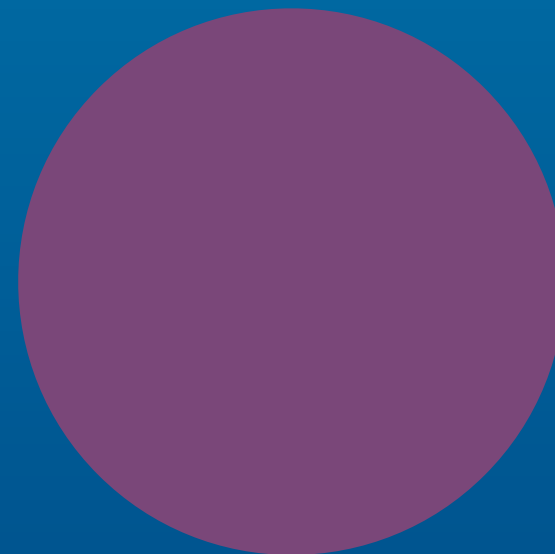
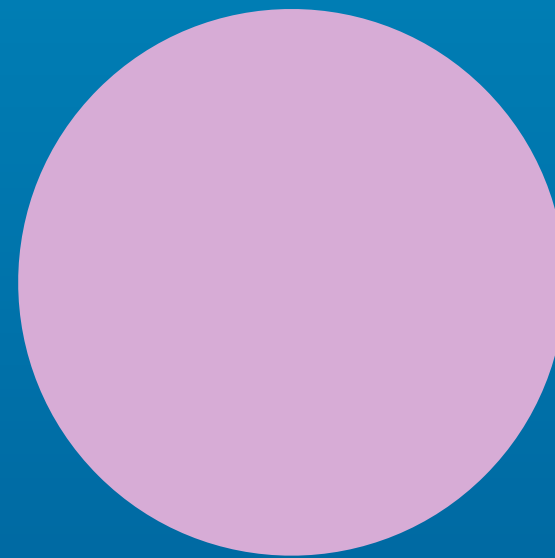
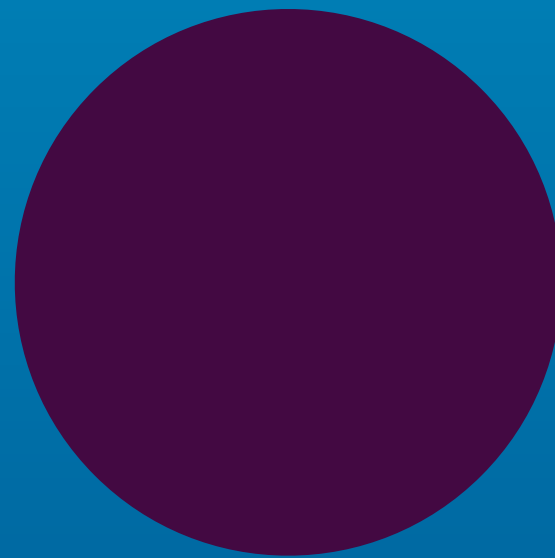
Crane smashed  
Debris  
everywhere



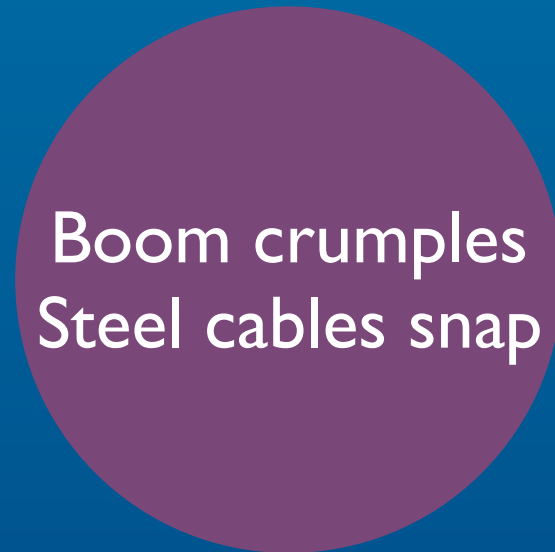
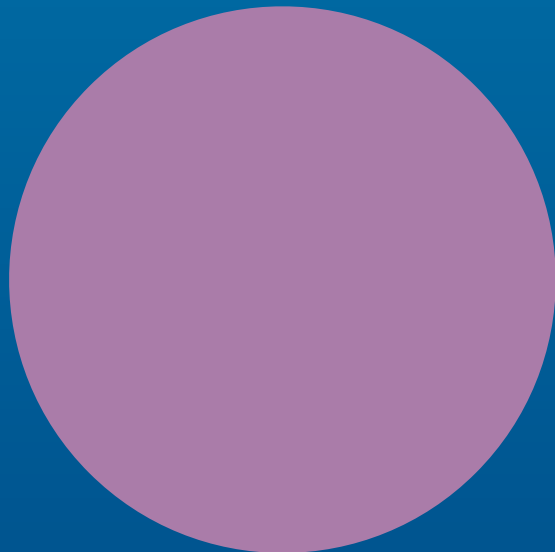
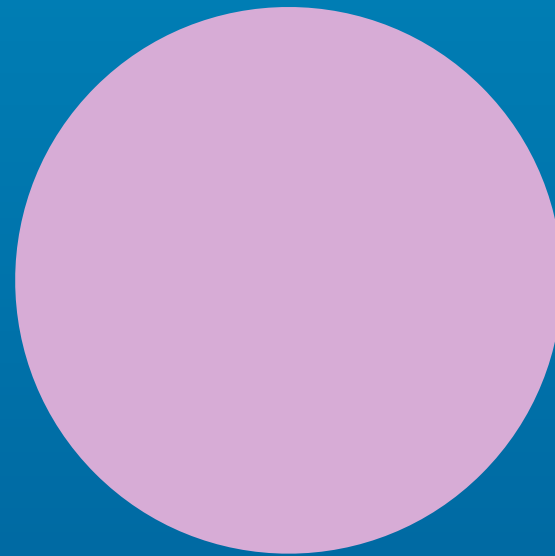
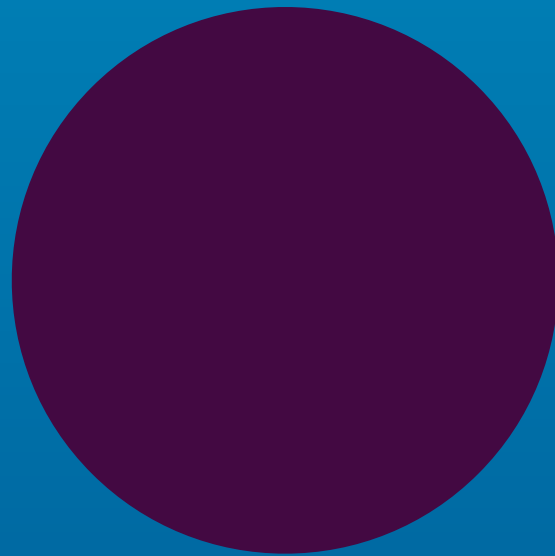
# Describing Structural Failure



# Describing Structural Failure



# Describing Structural Failure



# Describing Structural Failure

Location of  
wreckage and  
debris

Stability of  
structure

Damage to  
surroundings

Mechanism

# **Thoracolumbar Spine**

# Thoracolumbar fracture classification

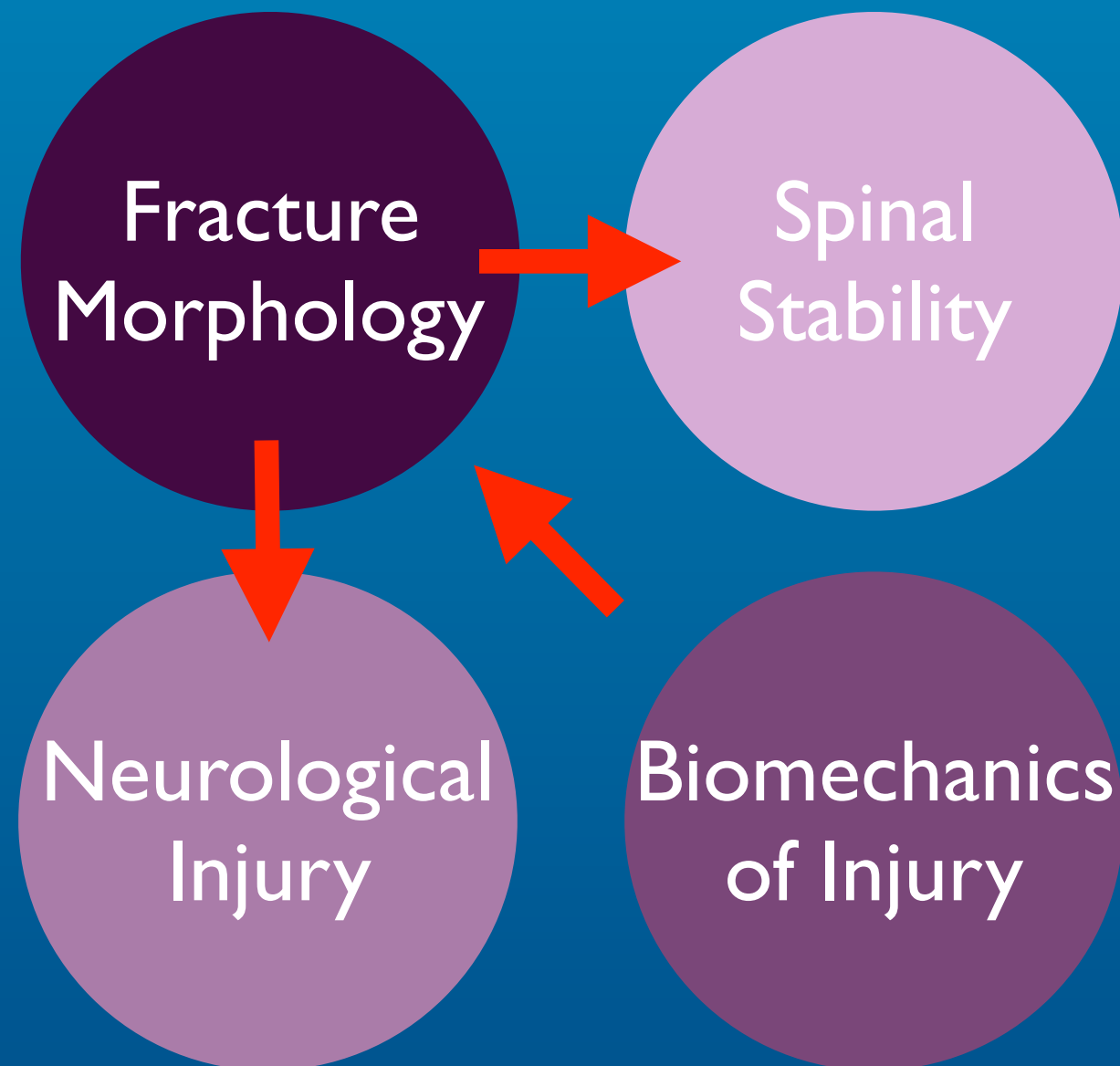
Fracture  
Morphology

Spinal  
Stability

Neurological  
Injury

Biomechanics  
of Injury

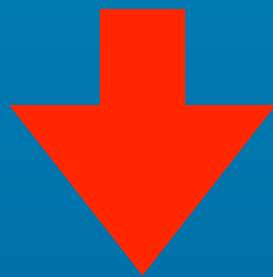
# Thoracolumbar fracture classification



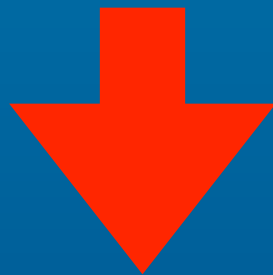
# **Restriction of spinal motion**



# **Initial Immobilisation**



## **Transport**



## **Ongoing Care**

# Initial Immobilisation



## Transport



## Ongoing Care

# Initial Immobilisation



## Transport



## Ongoing Care

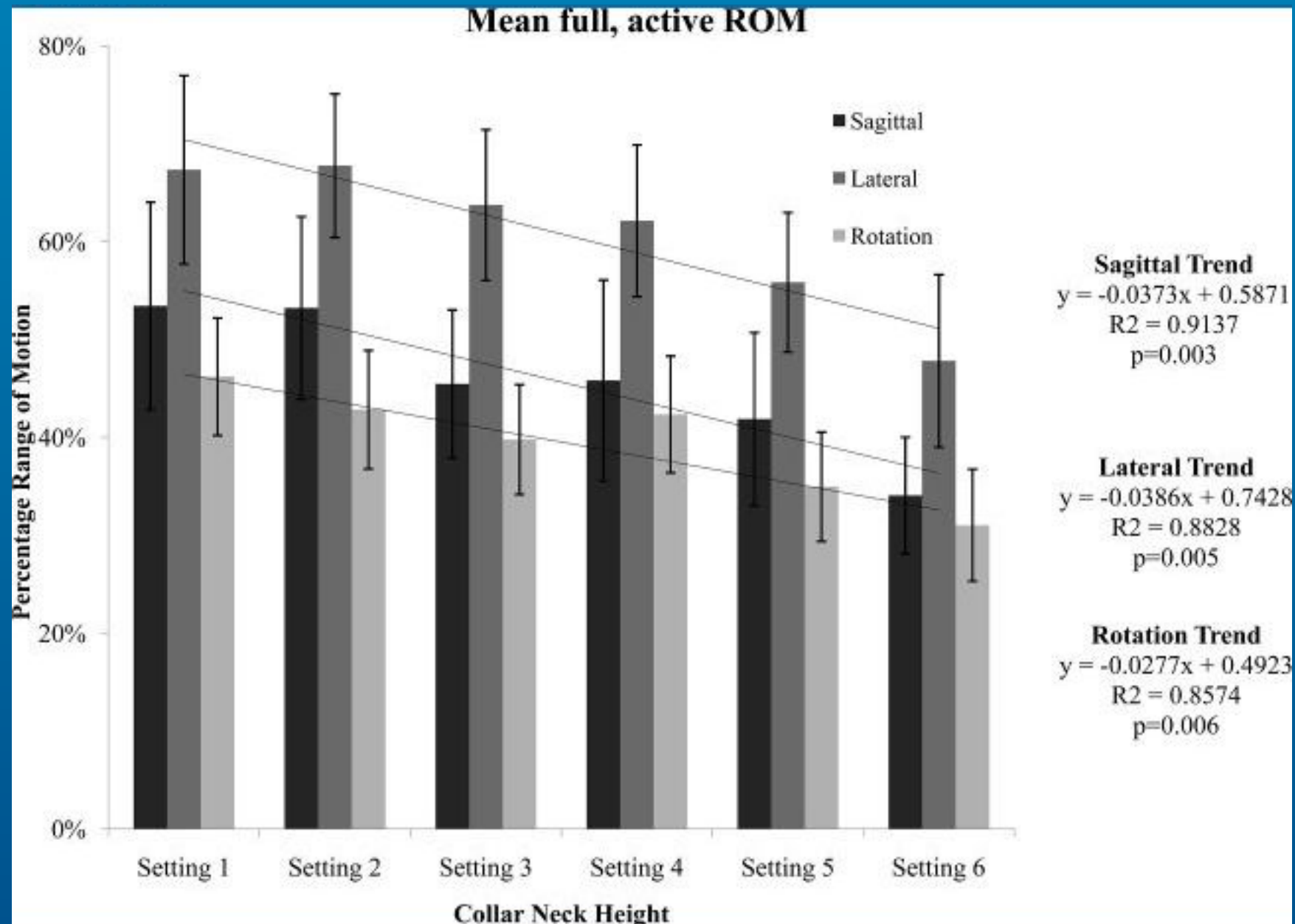


## Rehabilitation

# Immobilisation?



# Neck motion in rigid collar



The Effect of Rigid Cervical Collar Height on Full, Active, and Functional Range of Motion During Fifteen Activities of Daily Living  
Christopher P. Miller, BA; Jesse E. Bible, MD; Kola A. Jegede, BA; Peter G. Whang, MD; Jonathan N. Grauer, MD Disclosures  
Spine. 2010;35(26):E1546-E1552.



# Who should be immobilised

- Spinal immobilisation of all trauma patients with a cervical spine or spinal cord injury or with a mechanism of injury having the potential to cause cervical spinal injury is recommended.

# Who should not be immobilised

- Patients with penetrating trauma

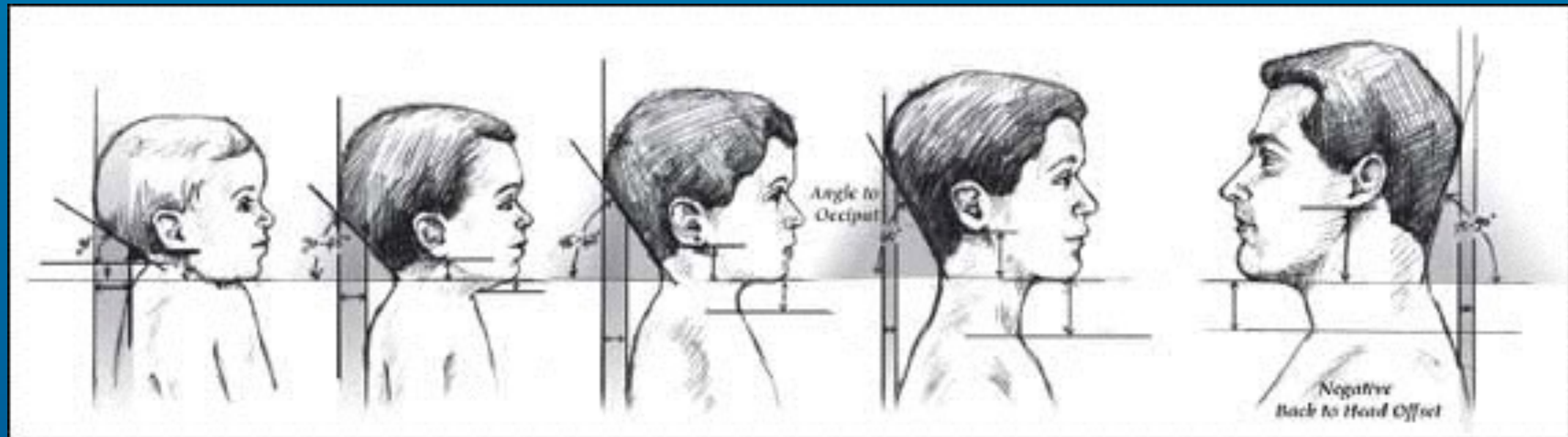


# Who should not be immobilised

- Patients with penetrating trauma
- Structured assessment tools in pre-hospital care?

# **Problems in spinal immobilisation**

# Back to head offset



Day 1 - 09:00h



Male 66 years  
Incomplete  
neurological injury at  
presentation

Day 1 - 10:30h



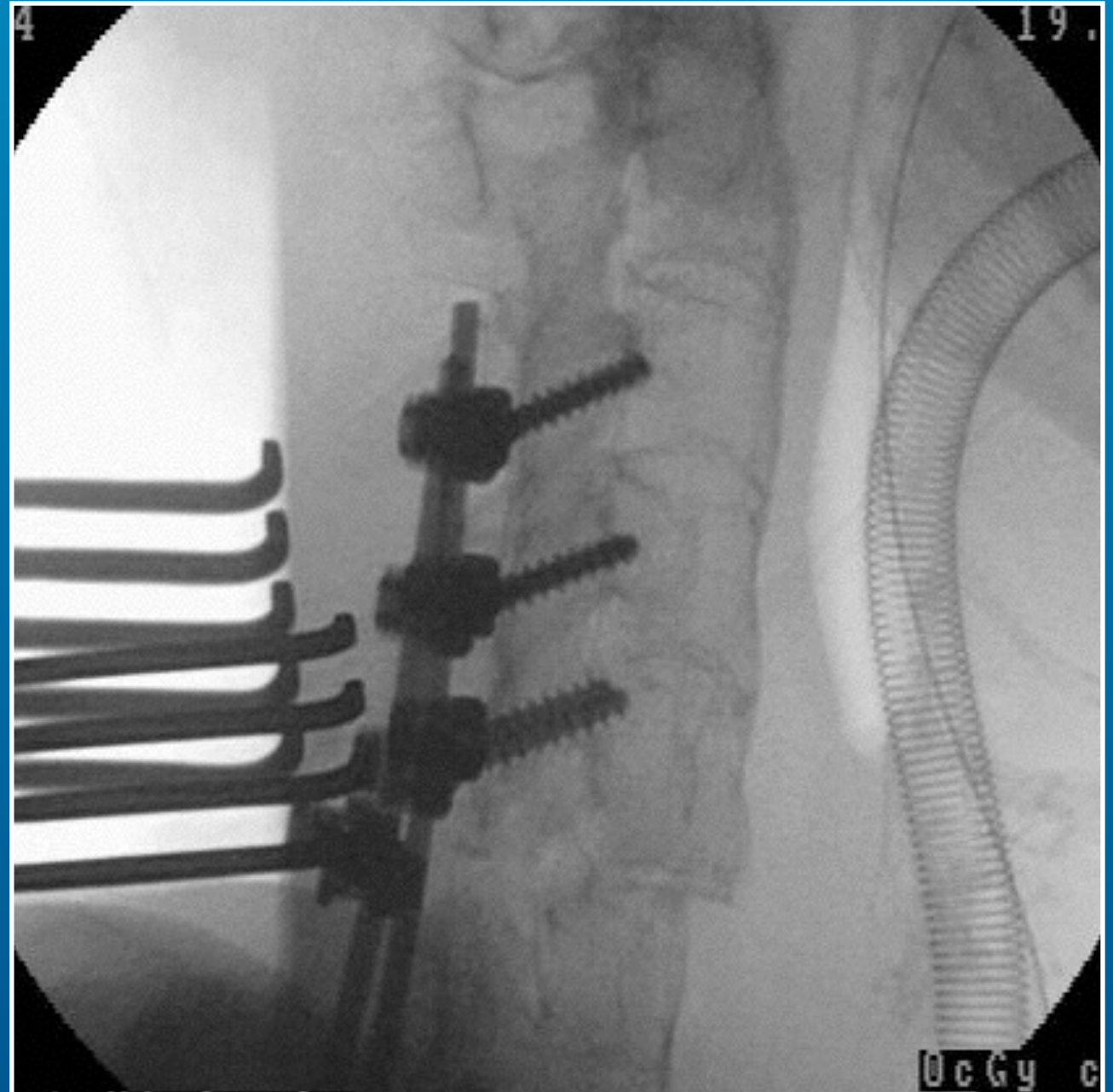
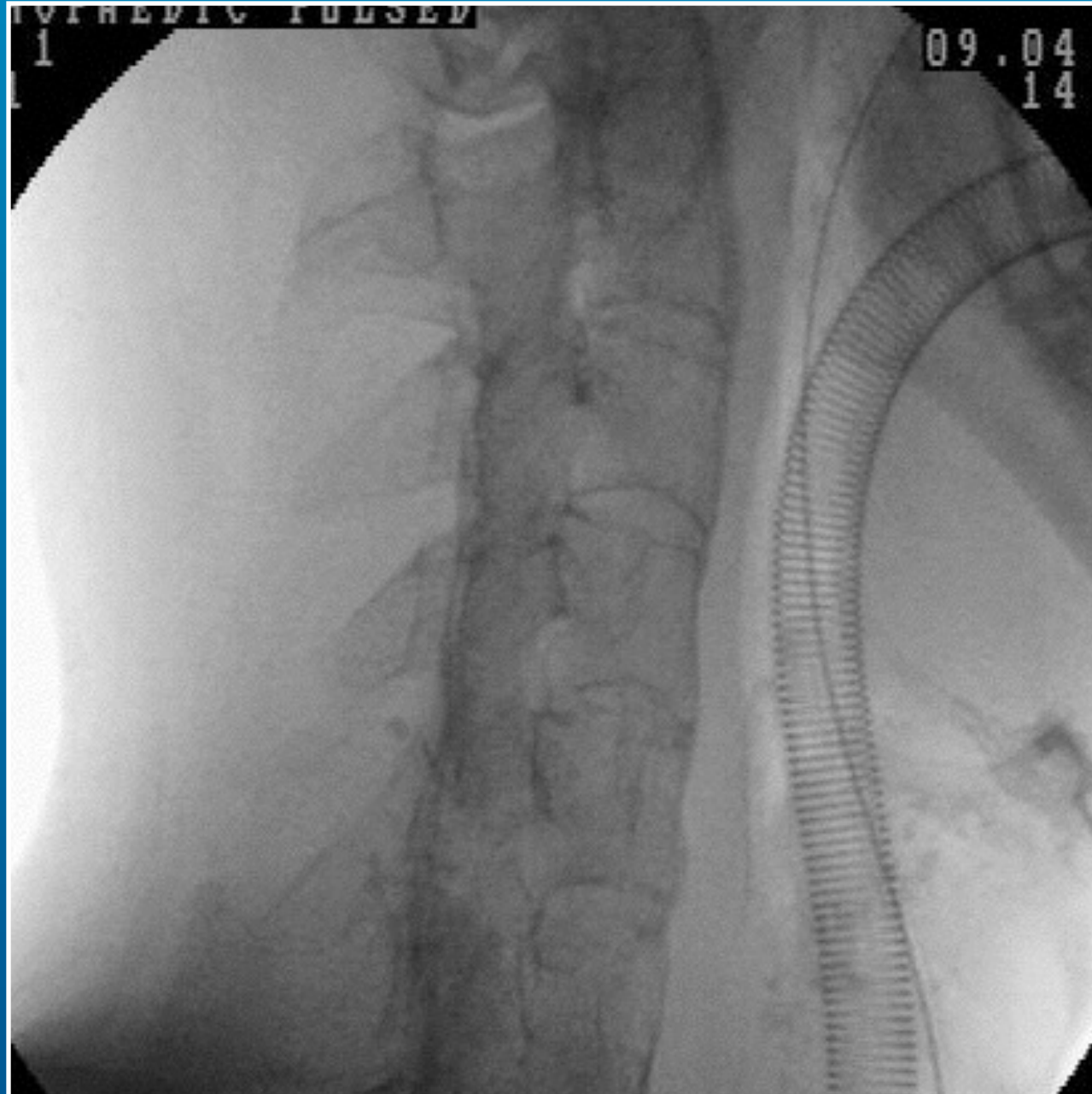
Supine in CT in cervical collar

Day 1 - 13:30h





Day 1 - 14:29h and 19:00h



# Post Op





3 months



# **Structured Assessment**

**NEXUS vs CCR**

# NEXUS

- Focal Neurologic Deficit Present
- Midline Spinal Tenderness Present
- Altered Level of Consciousness Present
- Intoxication Present
- Distracting Injury Present

**If yes to any question -  
image**

# Canadian C-Spine

- Exclusion
  - Age <16
  - GCS <15
  - Unstable vital signs
  - Paralysis
  - Vertebral disease or previous surgery

# Canadian C-Spine

- High Risk Factors?
- Age >65
- Dangerous Mechanism
- Paraesthesia in extremities

**If yes - image**

# Canadian C-Spine

- Low Risk Factors?
- Simple rear-end MVC
- Sitting position in ED
- Ambulatory at any time
- Delayed onset of pain
- Absent midline pain

**If no - image**

# Canadian C-Spine

- Active range of motion
- Able to rotate 45 degrees to right and left

**If unable - image**

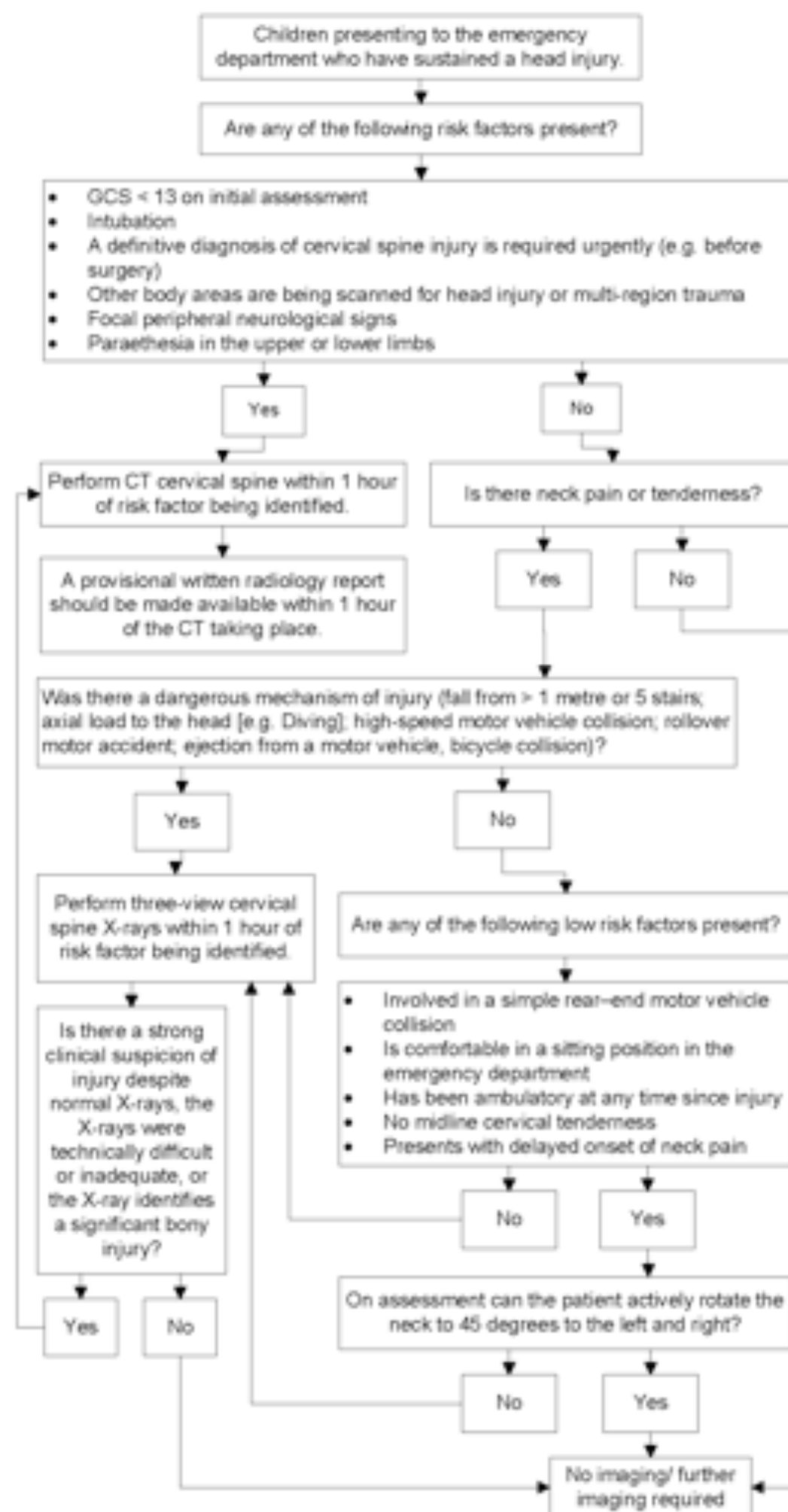
# Imaging - Adults

- CT for:
  - GCS <13
  - Intubated
  - Inadequate plain films
  - Abnormal plain films
  - CT being done for head or multisystem trauma



# Imaging - Children

Plain films vs CT vs MRI



# Imaging - Children

Plain films vs CT vs MRI

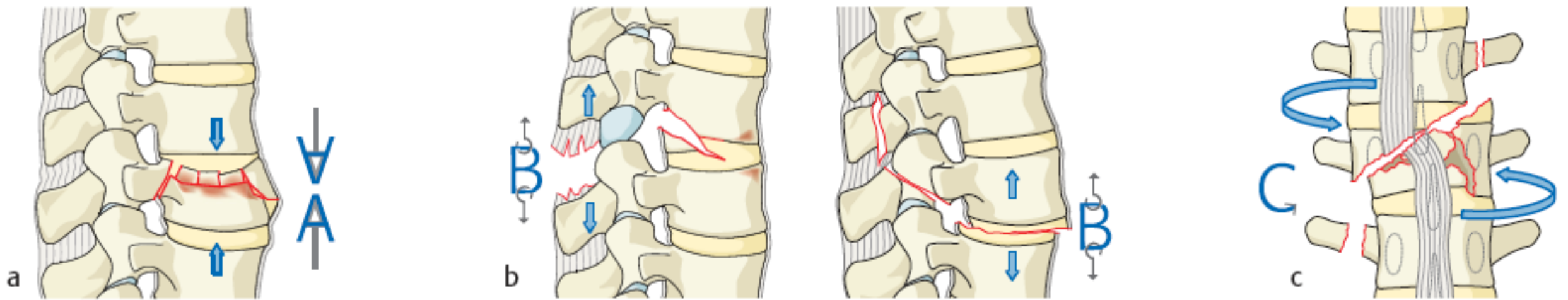
# Imaging


# Radiologists!

# **Spinal Cord Injury**


## **Cauda Equina & Nerve Root Injury**

# Increasing Severity of Injury



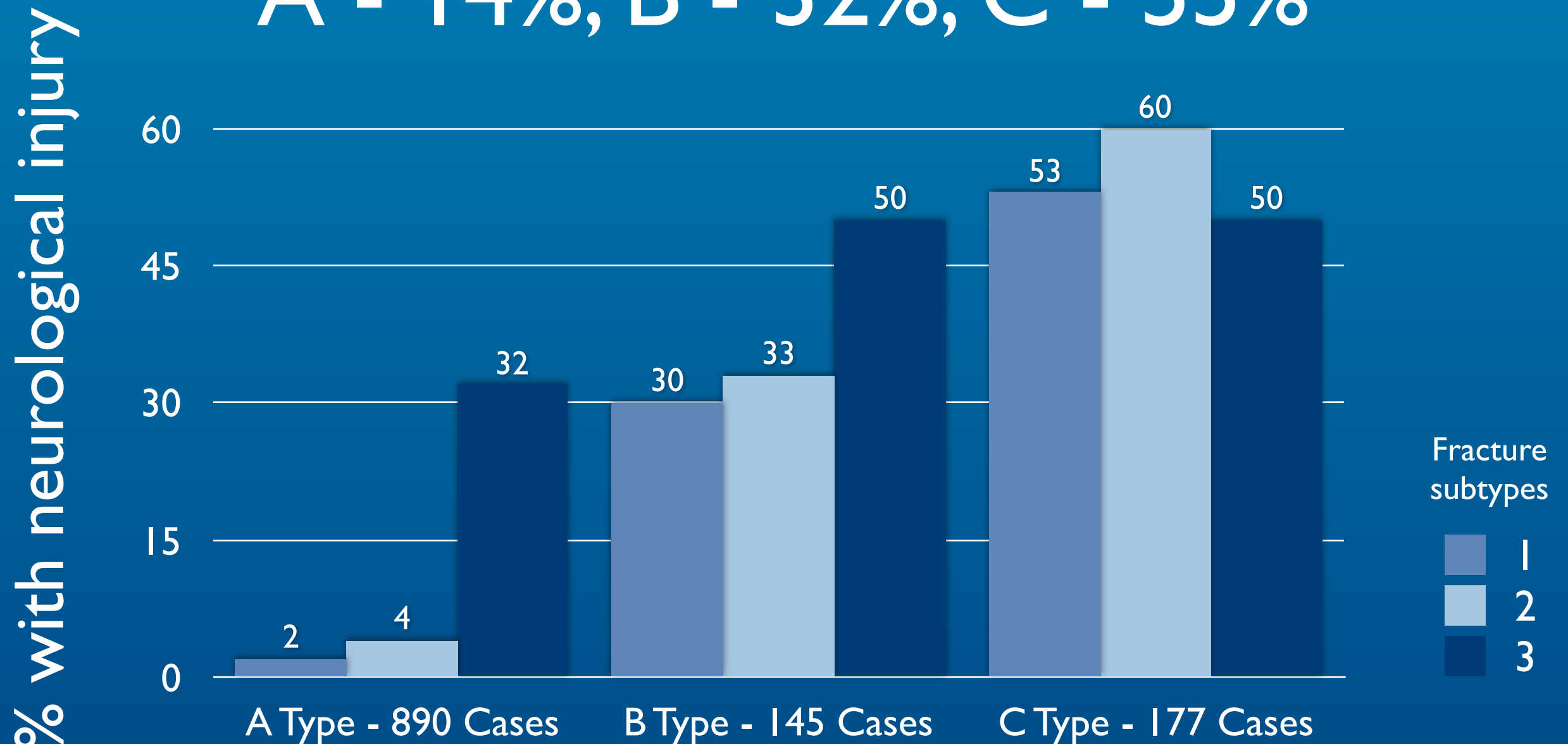
Severity 

<b>A</b>	A1	A2	A3
<b>B</b>	B1	B2	B3
<b>C</b>	C1	C2	C3

 type group

# Neurological Injury

A - 14%, B - 32%, C - 55%



# Neurological Injury

	Frankle	ASIA
A	complete paralysis	"complete" no motor or sensory function in the sacral segments S4-S5
B	sensory function only below the injury level	sensory but not motor function below neurological level and includes the segments S4-S5
C	incomplete motor function below injury level	motor function is preserved below level and >50% key muscles below the level have grade of less than 3
D	fair to good motor function below injury level	motor function is preserved below level and $\geq 50\%$ key muscles below level have grade of 3 or more
E	normal function	"normal" motor and sensory scores are normal



Patient Name \_\_\_\_\_

Examiner Name \_\_\_\_\_ Date/Time of Exam \_\_\_\_\_



# INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY



**MOTOR**  
KEY MUSCLES  
(scoring on reverse side)

	R	L	
C5	<input type="checkbox"/>	<input type="checkbox"/>	Elbow flexors
C6	<input type="checkbox"/>	<input type="checkbox"/>	Wrist extensors
C7	<input type="checkbox"/>	<input type="checkbox"/>	Elbow extensors
C8	<input type="checkbox"/>	<input type="checkbox"/>	Finger flexors (distal phalanx of middle finger)
T1	<input type="checkbox"/>	<input type="checkbox"/>	Finger abductors (little finger)
UPPER LIMB TOTAL (MAXIMUM)	<input type="checkbox"/> + <input type="checkbox"/>	<input type="checkbox"/> + <input type="checkbox"/>	<input type="checkbox"/> (50)

Comments:

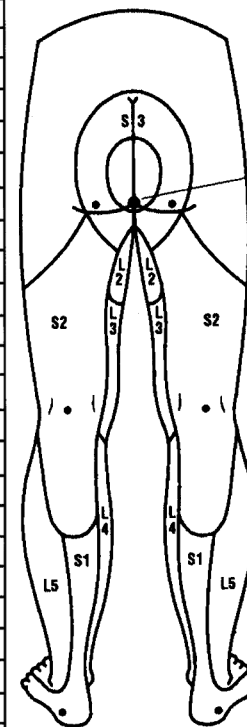
L2	<input type="checkbox"/>	<input type="checkbox"/>	Hip flexors
L3	<input type="checkbox"/>	<input type="checkbox"/>	Knee extensors
L4	<input type="checkbox"/>	<input type="checkbox"/>	Ankle dorsiflexors
L5	<input type="checkbox"/>	<input type="checkbox"/>	Long toe extensors
S1	<input type="checkbox"/>	<input type="checkbox"/>	Ankle plantar flexors

(VAC) Voluntary anal contraction (Yes/No) ☐

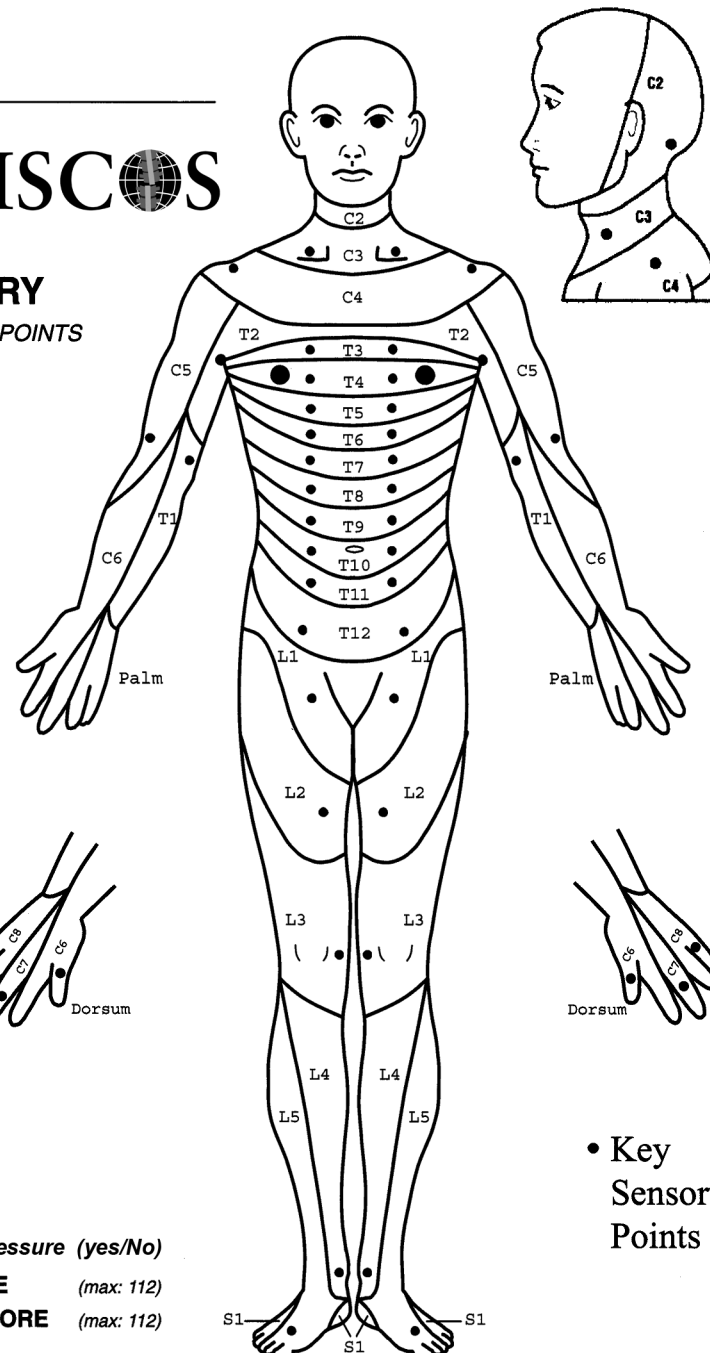
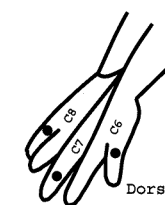
LOWER LIMB TOTAL (MAXIMUM) ☐ + ☐ = ☐ (25) (25) (50)

	LIGHT TOUCH		PIN PRICK	
	R	L	R	L
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				
TOTALS	<input type="checkbox"/> + <input type="checkbox"/>	<input type="checkbox"/> + <input type="checkbox"/>	<input type="checkbox"/> + <input type="checkbox"/>	<input type="checkbox"/> + <input type="checkbox"/>
	(MAXIMUM) (56)	(56)	(56)	(56)

0 = absent  
1 = altered  
2 = normal  
NT = not testable



## SENSORY KEY SENSORY POINTS



• Key Sensory Points

**NEUROLOGICAL LEVEL**  
The most caudal segment with normal function

SENSORY ☐ ☐ MOTOR ☐ ☐

**SINGLE NEUROLOGICAL LEVEL** ☐

**COMPLETE OR INCOMPLETE?** ☐  
Incomplete = Any sensory or motor function in S4-S5  
**ASIA IMPAIRMENT SCALE (AIS)** ☐

(In complete injuries only)  
**ZONE OF PARTIAL PRESERVATION**  
Most caudal level with any innervation

SENSORY ☐ ☐ MOTOR ☐ ☐

Patient Name \_\_\_\_\_

Examiner Name \_\_\_\_\_ Date/Time of Exam \_\_\_\_\_



# INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY



**MOTOR**  
KEY MUSCLES  
(scoring on reverse side)

	R	L	
C5	<input type="checkbox"/>	<input type="checkbox"/>	Elbow flexors
C6	<input type="checkbox"/>	<input type="checkbox"/>	Wrist extensors
C7	<input type="checkbox"/>	<input type="checkbox"/>	Elbow extensors
C8	<input type="checkbox"/>	<input type="checkbox"/>	Finger flexors (distal phalanx of middle finger)
T1	<input type="checkbox"/>	<input type="checkbox"/>	Finger abductors (little finger)
<b>UPPER LIMB TOTAL</b> (MAXIMUM)	<input type="checkbox"/> + <input type="checkbox"/>	<input type="checkbox"/> + <input type="checkbox"/>	<input type="checkbox"/> (50)

Comments:

L2	<input type="checkbox"/>	<input type="checkbox"/>	Hip flexors
L3	<input type="checkbox"/>	<input type="checkbox"/>	Knee extensors
L4	<input type="checkbox"/>	<input type="checkbox"/>	Ankle dorsiflexors
L5	<input type="checkbox"/>	<input type="checkbox"/>	Long toe extensors
S1	<input type="checkbox"/>	<input type="checkbox"/>	Ankle plantar flexors

(VAC) Voluntary anal contraction (Yes/No) ☐

**LOWER LIMB TOTAL**  
(MAXIMUM) ☐ + ☐ = ☐ (50)

**SENSORY**  
KEY SENSORY POINTS

0 = absent  
1 = altered  
2 = normal  
NT = not testable

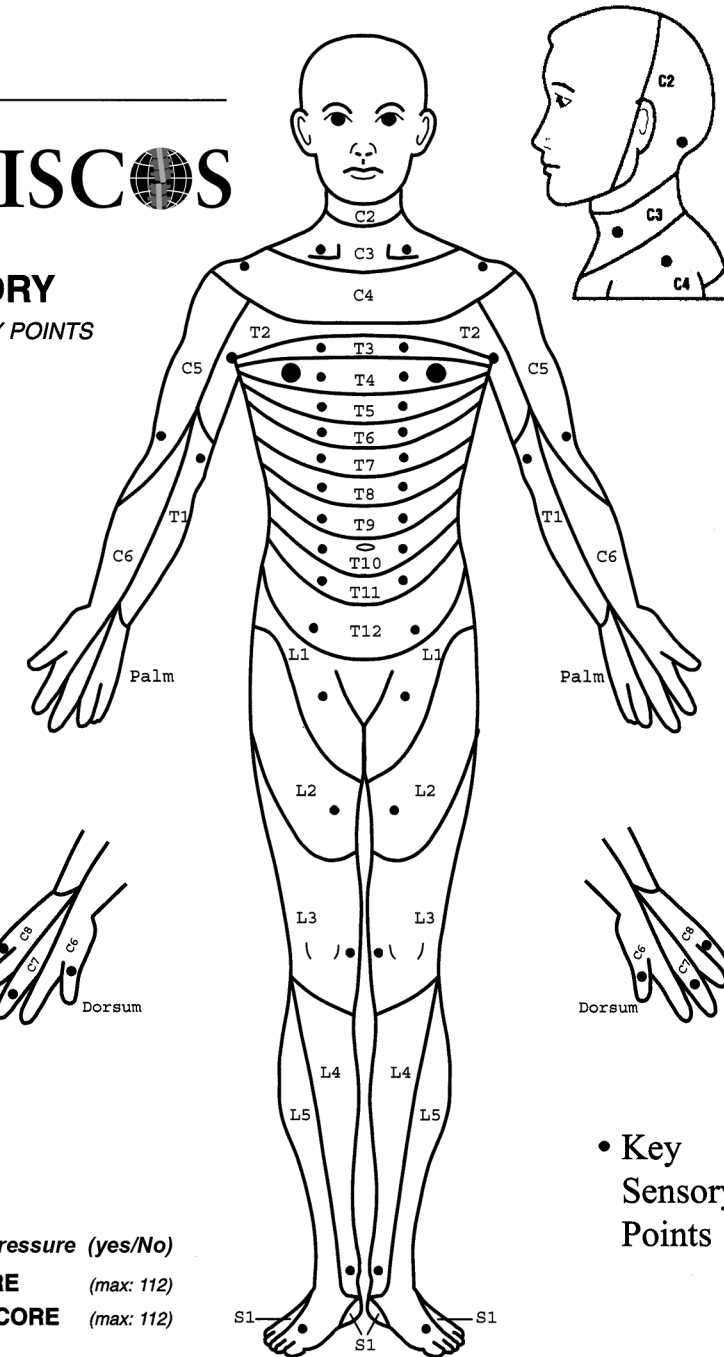
	LIGHT TOUCH		PIN PRICK	
	R	L	R	L
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				

**TOTALS** { ☐ + ☐ = ☐ (56) } { ☐ + ☐ = ☐ (56) } { ☐ + ☐ = ☐ (56) }

(DAP) Deep anal pressure (yes/no) ☐

**PIN PRICK SCORE** (max: 112) ☐

**LIGHT TOUCH SCORE** (max: 112) ☐



• Key Sensory Points

**NEUROLOGICAL LEVEL**  
The most caudal segment with normal function

**SENSORY** ☐ ☐

**MOTOR** ☐ ☐

**SINGLE NEUROLOGICAL LEVEL** ☐

**COMPLETE OR INCOMPLETE?** ☐  
Incomplete = Any sensory or motor function in S4-S5

**ASIA IMPAIRMENT SCALE (AIS)** ☐

(In complete injuries only)  
**ZONE OF PARTIAL PRESERVATION**  
Most caudal level with any innervation

**SENSORY** ☐ ☐

**MOTOR** ☐ ☐



# Guidelines for initial spinal management of sedated and ventilated trauma patients

University Hospital Southampton **NHS**  
NHS Foundation Trust

**Full spinal precautions**

Unknown mechanism of injury or fall greater than patient's own height or high energy impact or age >50

Yes ☐ No ☐

**1** Full Trauma CT or CT Head & Cervical spine & thoracolumbar imaging

CT Head & Cervical spine

Bony injury of C-Spine → Thoracolumbar spinal imaging

Signed: \_\_\_\_\_  
Print: \_\_\_\_\_  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Hospital No: \_\_\_\_\_  
DOB: \_\_\_\_\_  
Surname: \_\_\_\_\_  
First name: \_\_\_\_\_

ADDRESSOGRAPH LABEL

**Consultant radiologist report**

Report of spinal imaging to include:  
?any inadequacy of imaging  
?fracture ?alignment (dislocation)  
?soft tissue swelling indicative of spinal injury

Cervical (C-spine) imaging report  
Consultant name: \_\_\_\_\_

Thoracolumbar (T&L spine) imaging report  
Consultant name: \_\_\_\_\_

**2** Injury reported on imaging of spine

No ☐ Yes ☐

Signed: \_\_\_\_\_  
Print: \_\_\_\_\_  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

A normal CT does not exclude ligamentous injury.

**A**  
No hard collar  
Patient sat up  
Normal turns

☐

**Consultant spinal Surgeon** Name: \_\_\_\_\_

Management plan / nursing care to ensure alignment maintained

Stable C-spine  
Stable T&L spine

**B**  
No hard collar  
Bed tilted head up  
Full spinal turns

☐

Stable C-spine  
Unstable T&L spine

**C**  
Hard collar  
Patient sat up  
Normal turns with head hold

☐

C-spine stable in hard collar  
Stable T&L spine

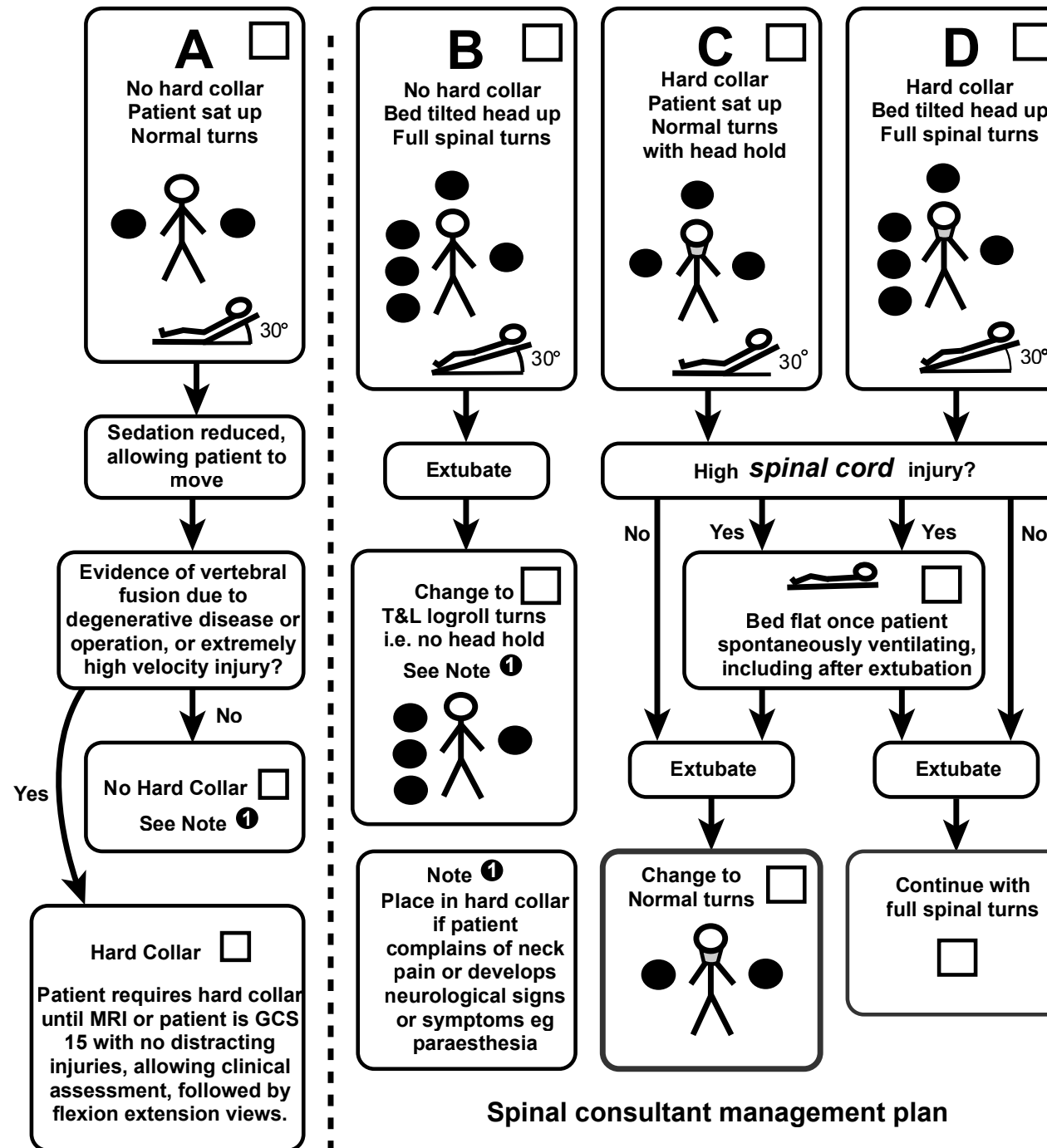
**D**  
Hard collar  
Bed tilted head up  
Full spinal turns

☐

**3** ICU Consultant signature: \_\_\_\_\_  
Print: \_\_\_\_\_  
Date: \_\_\_\_\_  
Time: \_\_\_\_\_

**Trauma Patient Spinal Management**

## Management plan for when sedation is reduced



## Spinal consultant management plan

Name of spinal consultant:

Comments

☐ Hard collar for ..... weeks

☐ Halo jacket

☐ Extension brace

**ALL PATIENTS**

Side lie ALL patients to prevent pressure sores, unless specifically contra-indicated. Eg unstable pelvis

☐ Contra-indicated

Reason.....

4

ICU Consultant signature:  
Print:

Date:  
Time:



**The Future...**

# Guidelines for initial spinal management of sedated and ventilated trauma patients

University Hospital Southampton **NHS**  
NHS Foundation Trust

Full spinal precautions

Unknown mechanism of injury or fall greater than patient's own height or high energy impact or age >50

1

Yes ☐

No ☐

Full Trauma CT or CT Head & Cervical spine & thoracolumbar imaging

CT Head & Cervical spine

Bony injury of C-Spine

Thoracolumbar spinal imaging

Signed: \_\_\_\_\_

Print: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Consultant radiologist report

Report of spinal imaging to include:  
?any inadequacy of imaging  
?fracture ?alignment (dislocation)  
?soft tissue swelling indicative of spinal injury

Cervical (C-spine) imaging report  
Consultant name: \_\_\_\_\_

Thoracolumbar (T&L spine) imaging report  
Consultant name: \_\_\_\_\_

2

Injury reported on imaging of spine

No ☐

Yes ☐

Signed: \_\_\_\_\_

Print: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

A normal CT does not exclude ligamentous injury.

Consultant spinal Surgeon  
Name: \_\_\_\_\_

Management plan / nursing care to ensure alignment maintained

Stable C-spine  
Stable T&L spine

Stable C-spine  
Unstable T&L spine

C-spine stable in hard collar  
Stable T&L spine

Unstable C-spine +/-  
Unstable T&L spine

A

No hard collar  
Patient sat up  
Normal turns

☐

B

No hard collar  
Bed tilted head up  
Full spinal turns

☐

C

Hard collar  
Patient sat up  
Normal turns with head hold

☐

D

Hard collar  
Bed tilted head up  
Full spinal turns

☐

3

ICU Consultant signature: \_\_\_\_\_

Print: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Trauma Patient Spinal Management

Sept 2012, Version 4.2

Mark identical box A-D over the page →



# Guidelines for initial spinal management of sedated and ventilated trauma patients

University Hospital Southampton **NHS**  
NHS Foundation Trust

Full spinal precautions

Unknown mechanism of injury or fall greater than patient's own height or high energy impact or age >50

Hospital No:  
DOB:  
Surname:  
First name:

ADDRESSOGRAPH LABEL

1

Yes ☐

No ☐

Full Trauma CT or CT Head & Cervical spine & thoracolumbar imaging

CT Head & Cervical spine

Bony injury of C-Spine

Thoracolumbar spinal imaging

Signed: \_\_\_\_\_

Print: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Consultant radiologist report

Report of spinal imaging to include:  
?any inadequacy of imaging  
?fracture ?alignment (dislocation)  
?soft tissue swelling indicative of spinal injury

Cervical (C-spine) imaging report  
Consultant name: \_\_\_\_\_

Thoracolumbar (T&L spine) imaging report  
Consultant name: \_\_\_\_\_

2

Injury reported on imaging of spine

No ☐

Yes ☐

Signed: \_\_\_\_\_

Print: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

A normal CT does not exclude ligamentous injury.

Consultant spinal Surgeon

Management plan / nursing care to ensure alignment maintained

Stable C-spine  
Stable T&L spine

Stable C-spine  
Unstable T&L spine

C-spine stable in hard collar  
Stable T&L spine

Unstable C-spine +/-  
Unstable T&L spine

A

No hard collar  
Patient sat up  
Normal turns

☐

B

No hard collar  
Bed tilted head up  
Full spinal turns

☐

C

Hard collar  
Patient sat up  
Normal turns with head hold

☐

D

Hard collar  
Bed tilted head up  
Full spinal turns

☐

3

ICU Consultant signature: \_\_\_\_\_

Print: \_\_\_\_\_

Date: \_\_\_\_\_

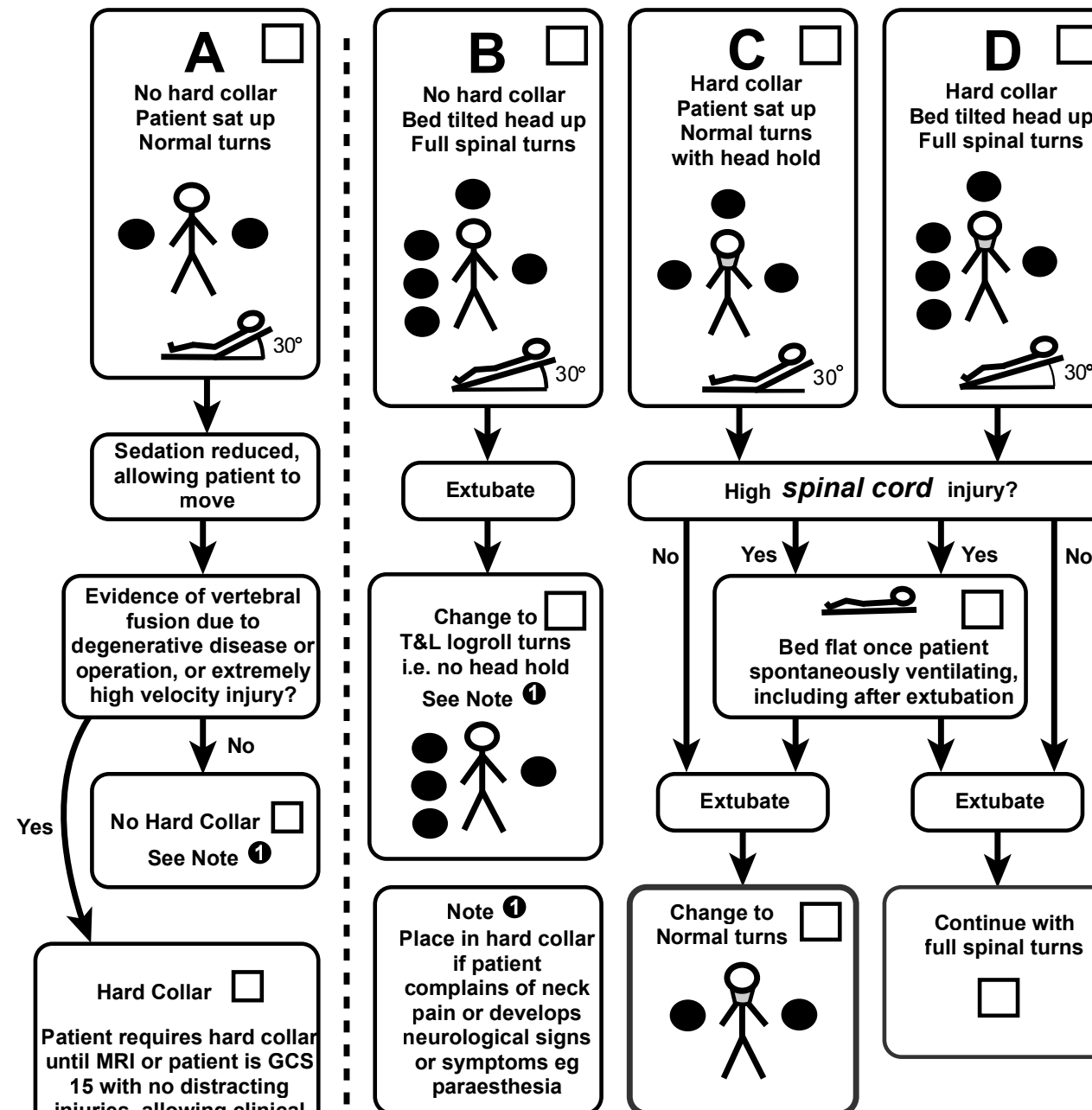
Time: \_\_\_\_\_

Trauma Patient Spinal Management

Sept 2012, Version 4.2

Mark identical box A-D over the page →

## Management plan for when sedation is reduced



## Spinal consultant management plan

Name of spinal consultant:

Comments

- ☐ Hard collar for ..... weeks
- ☐ Halo jacket
- ☐ Extension brace

**ALL PATIENTS**

Side lie ALL patients to prevent pressure sores, unless specifically contra-indicated. Eg unstable pelvis

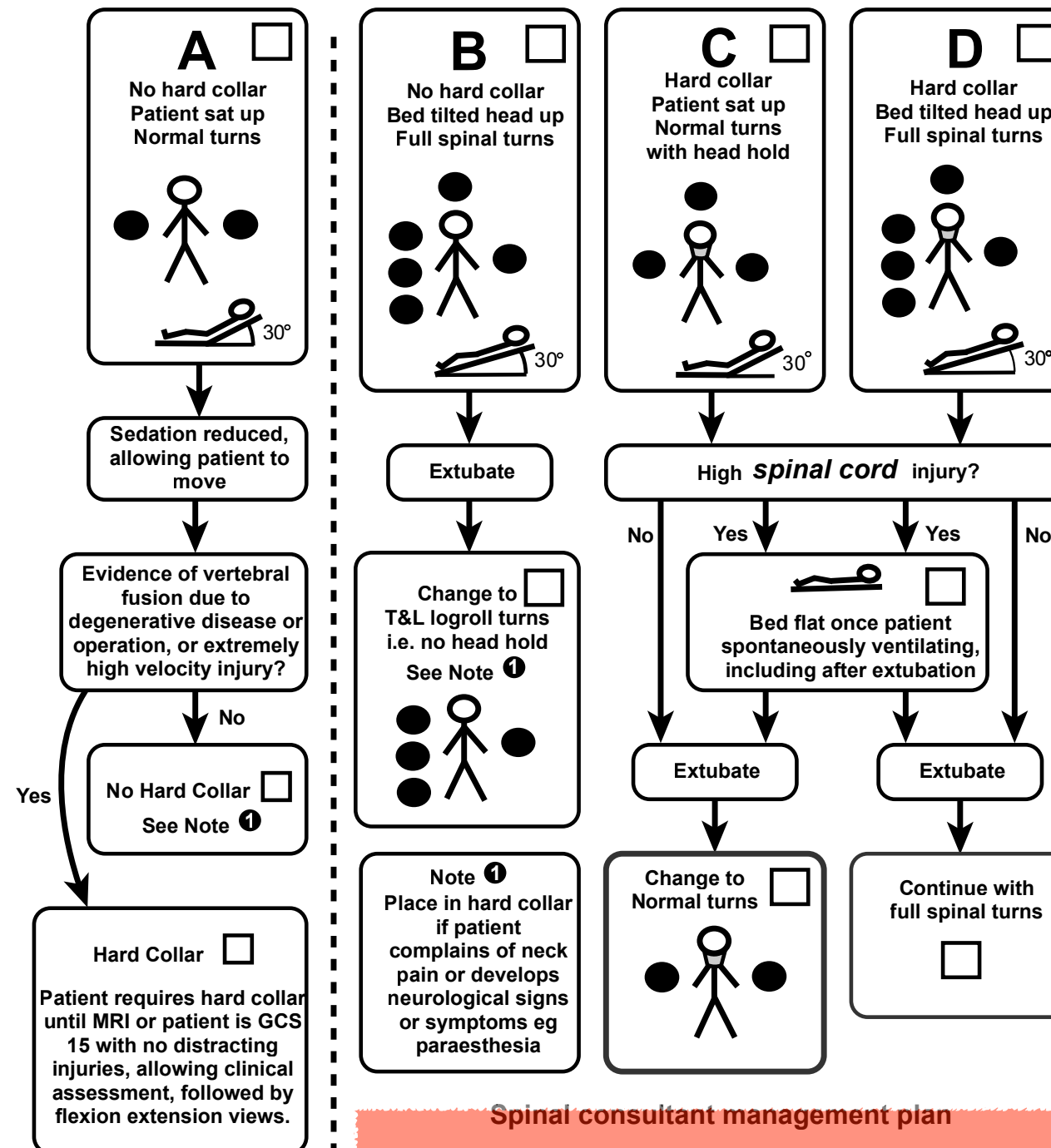
☐ Contra-indicated  
Reason.....

4

ICU Consultant signature:  
Print:

Date:  
Time:

## Management plan for when sedation is reduced



### Spinal consultant management plan

Name of spinal consultant:

Comments

- ☐ Hard collar for ..... weeks
- ☐ Halo jacket
- ☐ Extension brace

**ALL PATIENTS**

Side lie ALL patients to prevent pressure sores, unless specifically contra-indicated. Eg unstable pelvis

☐ Contra-indicated  
Reason.....

4

ICU Consultant signature:  
Print:

Date:  
Time:

**Questions?**

# Suggested Reading

Guidelines for the Management of Acute Cervical Spine and Spinal Cord Injuries

**Neurosurgery**, March 2013 - Volume 72 - supplement 2,

<http://journals.lww.com/neurosurgery/toc/2013/03002>

Thoracolumbar spinal fractures: review of anatomy, biomechanics, classification and treatment

**Orthopaedics and Trauma**, April 2014; 28(2):70–78

Rudol, G and Gummerson, N

**END**

**Motor and descending (efferent) pathways (red)**

**Pyramidal tracts**

- Lateral corticospinal tract
- Anterior corticospinal tract

**Extrapyramidal Tracts**

- Rubrospinal tract
- Reticulospinal tracts
- Olivospinal tract
- Vestibulospinal tract

**Sensory and ascending (afferent) pathways (blue)**

**Dorsal Column Medial Lemniscus System**

- Gracile fasciculus
- Cuneate fasciculus

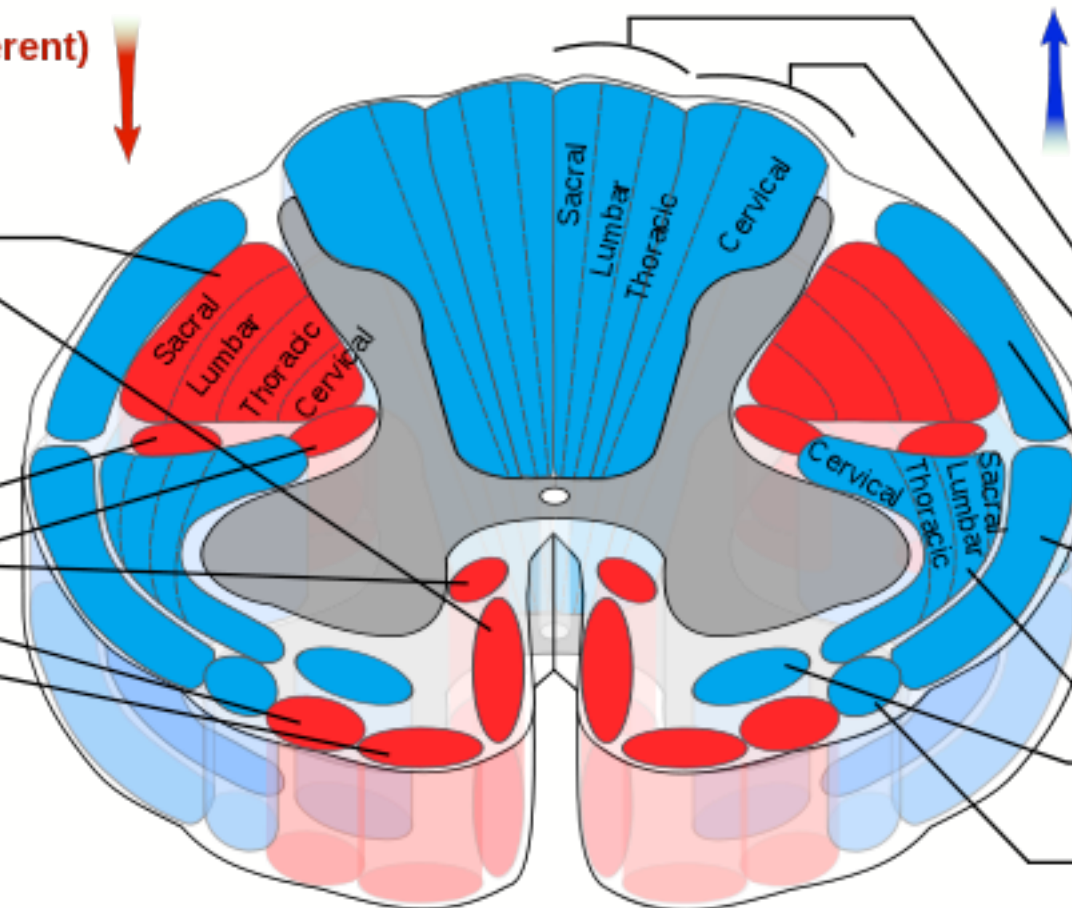
**Spinocerebellar Tracts**

- Posterior spinocerebellar tract
- Anterior spinocerebellar tract

**Anterolateral System**

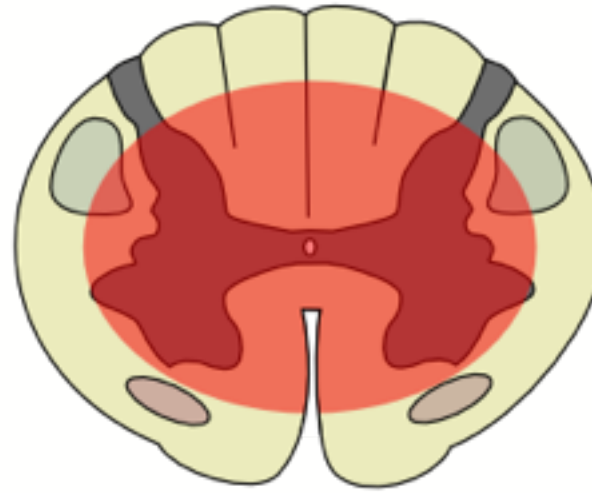
- Lateral spinothalamic tract
- Anterior spinothalamic tract

Spino-olivary fibers



# Incomplete lesions of the spinal cord

## Central Cord Syndrome



## Anterior Cord Syndrome



## Brown-Séquard Syndrome

