### Purpose:
- Provide advice on a clear standard and consistent approach in the assessment and management of a patient with a suspected spinal injury across Murrumbidgee Local Health District (MLHD)
- Provide a standard for the spinal immobilisation process to decrease variations in immobilisation procedures. Spinal immobilisation in trauma is practiced in the management of potential / actual spinal cord injured patients and is initiated in the pre-hospital setting or the emergency department on arrival and maintained up until the point of medical clearance within the hospital setting.

**NB:** Suspected spinal injury in patients <16 years should be assessed according to the Royal Children’s Hospital Melbourne Cervical Spine Assessment Guideline. Health services should contact NETS on 1300 362 500 and their referral hospital; Sydney Children’s Hospital (Westmead or Randwick) for further advice on the management of the paediatric patient with a potential cervical spine injury. *(Appendix: One)*

### Indication criteria:
Patients presenting to the Emergency department with altered level of consciousness and a history or evidence of traumatic injury / fall that has the potential to cause spinal injuries.

### High risk mechanism of injury is:

| Fall from elevation >3m | Bicycle struck or collision |
| Axial load to head | > 65 years of age and cervical spine pain post traumatic injury |
| Motor vehicle collision (MVC) at high speed | Patients presenting with paraesthesia’s in extremities post traumatic incident |
| Motorised recreational vehicles | |
| MVC with rollover or patient ejection | |

### Aims of care:
The main aims of care for trauma patients with potential spinal injuries are:
- Prevention of possible further spinal injury by
  - Application of cervical immobilisation collar
• Instigation of protocols in regards to spinal precautions and restrictions
  o Education and accreditation of staff members in spinal precautions and restrictions

• Prevention of complications of immobilisation by
  o Strict collar care
  o Frequent turning and pressure area care
  o Upright positioning as soon as possible (ie. based on imaging)

• Early spinal clearance by
  o Timely completion of imaging
  o Adequate and timely communication between health professionals/treating teams
  o Appropriate and timely documentation

Guidelines for when to apply Semi-Rigid Cervical Collar

• All multi-trauma patients or patients with a head injury will have a semi-rigid cervical collar applied
• Patients at risk for spinal injury will have a semi-rigid collar applied as per the Canadian C-Spine rule
• Patients assessed not to be at risk for spinal injury; will have a cervical collar removed.
Guideline/Flowchart:

**Canadian C-Spine Rule**

For alert (GCS 15) and stable trauma patient where cervical spine is a concern.

1. Any one of the following **High Risk** factors?
   - Age 65 years or older
   - Dangerous mechanism of injury *
   - Numbness or tingling in extremities
   **NO**
   **YES**

2. Any one of the following **Low Risk** factors which allows for safe assessment of range of motion?
   - Ambulatory at any time at the scene
   - No midline c-spine tenderness
   - Delayed onset of neck pain
   - Simple rear-end motor vehicle collision
     *Excludes: hit by bus or large truck, pushed into oncoming traffic, hit by high speed vehicle >100km/hr*
   **NO**
   **YES**

3. Patient able to voluntarily actively rotate neck 45° left and right, regardless of pain?
   **YES**
   **NO**

**Apply semi-rigid cervical collar**

**Immobilise C-spine**

**Requires radiography**

**Rule not applicable if:**
- Non – trauma case
- GCS < 15
- Unstable vital signs
- Age < 16 years
- Acute paralysis
- Known vertebral disease
- Previous C-spine surgery

* Dangerous mechanism of injury
  - Fall from > 3 feet/1 metre or 5 stairs
  - Axial loading to head e.g. diving, spear tackle
  - MVC or MBC at high speed (>100 km/hr)
  - MVC rollover, ejection
  - Quadbike, motorised all-terrain vehicles
  - Bicycle collision

Once a cervical collar has been applied, full spinal precautions need to be maintained until the C-Spine has been cleared by clinical examination and/or radiographic assessment by a medical officer. This can be facilitated by the use of Telehealth facilities.
Guidelines for Cervical Spine Clearance

Trauma Patient with Spinal Precautions in situ

Conscious Trauma Patient
- Clinical Examination with NEXUS Criteria (see below)
  - Yes to Any
  - No to All
  - Is a Head CT indicated? (see Canadian CT Head rules appendix 2)
    - Yes
      - Attend Cervical Spine & head CT
        - Films reviewed by ED, or Surgical or Ortho or ICU Senior MO AND Radiologist
        - Imaging Normal
          - Yes
            - C-Spine Cleared by MO or Telehealth order
          - No
            - Review for Transfer to referral Trauma Service of Speciality Unit
    - No
      - AP X-Ray
      - Lateral X-Ray
      - Peg X-Ray
      - Laterally flexes Neck Rotates 45°
      - Flexes and extends neck without any pain or restriction
      - No
      - Yes

Unconscious Trauma Patient
- Resuscitate A.B.C.D emergencies
- Attend Head/Cervical Spine CT
  - If not available
  - Films reviewed by ED or Surgical or Ortho or ICU consultant AND Radiologist
    - Imaging Normal
      - Yes
        - Review for Transfer to referral Trauma Service of Speciality Unit
      - No

Nexus Criteria:
- Patient fully alert GCS – 15
- No midline pain or tenderness on palpation
- No motor or sensory deficit
- No distracting injury
- No evidence of alcohol and/or drug ingestion
- No bruising, deformity or tenderness
- No injury above the clavicle
- No medical conditions requiring extra caution e.g. osteoporosis or rheumatoid arthritis
Information/Key Principles:

- **Equipment & Materials**
  - Standard mattress ( x-ray board optional )
  - Cardiac Monitored bed within direct sight of staff
  - Immediate access for log roll with call notification system in reach
  - Minimum of 3 accredited staff members
  - Cervical Spine immobilisation device - Philadelphia collar
  - Personal protection equipment
  - Hand hygiene material and access
  - Access to X-ray and/ or CT Scanner and/ or MRI

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**National Standard/Criteria:**

1.7 Clinical Practice
3.1 Governance and systems for infection prevention, control and surveillance
8.1 & 8.3 Governance and systems for the prevention and management of pressure injuries

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**Scope:**

Medical Officers, Nursing Staff

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**Key Principles:**

These guidelines were developed to assist the management of suspected cervical spine injuries:

- Stable patients with normal mental status may have their cervical spines cleared using these clinical assessment guidelines without requiring cervical spine imaging.

- Many patients with normal mental status who cannot be initially cleared using clinical assessment guidelines will require a combination of normal adequate cervical spine imaging and senior clinical review before being able to have their cervical spine cleared.

- Inline cervical spine immobilisation must be maintained until clinically able to clear the cervical spine.

- Patients with altered mental status cannot have their cervical spine completely cleared until fully alert regardless of clinical findings

- Clinical judgement is required in applying any guidelines, senior clinicians should be involved if doubt exist.
• Prolonged spinal immobilisation may cause significant complications if not managed appropriately including:
  o Decubitus ulceration, especially related to cervical collars
  o Increased intracranial pressure
  o Increased need for sedation and potential mechanical ventilation weaning delay
  o Enteral feeding intolerance relating to supine positioning
  o Pulmonary aspiration due to supine positioning
  o Deep venous thrombosis
  o Increased respiratory compromise and infection

Adequate Cervical Spine Immobilisation:

The potential spinal patient must be immobilised: fitted with a cervical collar to minimise the risk of additional cervical spinal cord compromise, nursed flat or laterally in anatomical alignment and log rolled for pressure care to minimise potential risk to occiput and thoracic and lumbar spine.

• Patients that arrive at a health care facility in a (Laerdal) “Stiff Neck” Cervical immobilisation collar can have the collar left insitu until clinically cleared of a cervical spine injury (within the 4 hour timeframe) or for a period of no longer than four (4) hours post injury and collar application, whichever comes first.

• Patients that have been in a (Laerdal) “Stiff Neck” cervical immobilisation collar should be changed to a Philadelphia immobilisation collar or simular immobilisation collar if the spine cannot be cleared within the 4 hour timeframe from the application of the collar.

• Patients that arrive in a health care facility without cervical immobilisation and are assessed to need cervical spine immobilisation should be placed in a Philadelphia immobilisation collar until clinically cleared.

Adequate Cervical Spine Imaging:

Adequate cervical spine imaging may require x-rays, computed tomography scan (CT scan), or magnetic resonance imaging (MRI).

The clinician must visualise C1 and the entire odontoid peg and lateral masses of C1, then from C1 down to C7-T1 interface of the thoracic vertebrae, and all the spinous processes of cervical vertebrae

• Adequate three (3) plain view x-rays involve a lateral view, a peg view and an anterior-posterior view of the above mentioned anatomy

• If plain x-ray views are inadequate or inconclusive, focused CT scanning is required.

• If the patient is attending a CT head scan the clinician must suspect a cervical spine injury and therefore conduct CT Imaging of both the head and cervical spine.

• MRI may be required for identifying spinal cord injury or ligamentous injury.

Assessment:

Stable patients with normal mental status may have their cervical spines cleared using the NEXUS assessment guidelines without cervical spine imaging. (See flowchart)
The NEXUS low-risk criteria constitute a decision tool for use in the initial assessment of conscious patients to indicate those at very low risk of cervical spine injury following blunt trauma, and therefore those who may not require radiography.

Explanations regarding the NEXUS criteria are suggested as a guide only, and are subject to the interpretation of the assessing clinician.

**Clearance without Medical Imaging:**

Based on the NEXUS criteria cervical spine injury can be excluded if the patient is fully alert - GCS 15 and not experiencing:

- Midline pain and or tenderness upon palpation of the cervical spine.
- Motor or sensory deficit e.g. weakness, numbness or paraesthesia.
- Distracting painful injury that may mask symptoms of a cervical injury (e.g. long bone fracture, significant visceral injury, crush injury or burns).
- Evidence of alcohol and/or drug ingestion.

If all these criteria are met clinical examination may proceed and there is no evidence of:

- Bruising, deformity or tenderness.
- Medical condition that requires extra caution (e.g. osteoporosis, rheumatoid arthritis)

The cervical spine can be clinically cleared without radiographic imaging and the cervical collar removed.

If the NEXUS criteria is not met the clinician is to proceed along the clinical guideline. (However clinical examination is unreliable under these circumstances.)

**Management:**

- Early clinical assessment and decision regarding need for c-spine imaging
- Early c-spine imaging if required
- Initial lateral c-spine in ED unless specified by Medical Officer
- Supportive care of ABCDEs
- Cervical Spine Immobilisation

**Documentation:**

- Documentation of the collar size and application time should be recorded in the patient’s medical record.
- Cervical immobilisation and spinal precautions are to be documented clearly in treatment plan in the patient’s medical record.
- Clearance of Cervical Spine injury is to be documented in the patient’s medical record in accordance.

**Contra Indications:**

Use in non-trauma patients
Risks/Alerts:
Cervical spine injury must be considered a possibility in any patient with significant trauma to the head or upper, torso, in major deceleration injuries and falls. These patients should have a cervical (Philadelphia) collar fitted and spinal precautions maintained (immobilisation, log rolling & head holding) until clinical/radiological examination establishes that the collar can be removed.

Delayed neck pain following trauma should be assessed to exclude cervical spine injury in accordance with acute presentations.

Falls and low risk injuries may also result in serious cervical spine injury.

A normal imaging finding following cervical spine trauma cannot completely exclude a significant injury. Imaging should be assessed in conjunction with the patient's clinical presentation.

Outcome Measures:
Patient and staff are educated in this guideline.
100% compliance with this guideline.
Suspected cervical spine injuries are immobilised.
Demonstrated decreased risk of secondary injury to the patient from management.
Demonstrated decreased risk of complication from cervical spine immobilisation.

Terminology
Rigid Stiffneck Collar:
The hard or “Stiffneck” collar is a one piece polyethylene ridged collar available in six sizes stocked by Ambulance Service NSW.

Semi Rigid Philadelphia Collar:
The Philadelphia collar is a two piece, closed cell foam hypoallergenic collar available in the 3 Paediatric or small adult sizes or one adjustable size that is currently being stocked by the MLHD.

Spinal Injury:
Major trauma patients are considered to have sustained a spinal cord injury until proven otherwise and must therefore have appropriate immobilisation procedures applied as a precaution. This ensures that further catastrophic neurological insult is prevented. Trauma to the vertebral column may result in:
Skeletal fractures, Subluxation or dislocation injuries including locked facet joints, Disc injuries, Ligamentous injuries, Spinal cord injuries.

Spinal Clearance
Spinal clearance is said to have occurred when relevant clinicians have examined the patient physically and/or as well as radio-graphically, and have determined that no significant injury exists, and immobilisation procedures are no longer required.
The process of spinal clearance is the application of an assessment framework for the evaluation of spinal status in those patients considered to be at risk for spinal injury. This assessment process is concluded with either a validation that excludes spinal cord injury and potential injury from unstable fractures, via mechanism of injury history, examination and investigation, or the diagnosis and subsequent management of an injury.

**Immobilisation:**
Involves the fitting of a cervical collar as a means of minimising the risk of cervical spinal cord compromise, nursing the patient in a supine or lateral position with wedge support, and log rolling during transfer and pressure area care to minimise the risk to the thoracic and lumbar cord. Failure however to achieve prompt clearance, i.e. within 72 hours of injury, may result in increased mortality and morbidity.

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**Nexus Criteria Terminology**

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

**Reduction in conscious state/alertness**
Altered neurologic function is present if any of the following is present: a) Glasgow Coma Score 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) any focal deficit on motor or sensory examination. Patients with none of these individual findings should be classified as having normal neurologic function.

**Intoxication**
Patients should be considered intoxicated if they have either of the following: a) a recent history of intoxication or ingestion; or b) evidence of intoxication on physical examination. Patients many also be considered to be intoxicated if test of bodily secretions are positive for drugs that affect level of alertness, including a blood alcohol level greater than .08mg/dl (0000.8gm%) 

**Distracting Injury**
Patients should be considered to have a distracting painful injury if they have any of the following: a) a 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.

**Focal Neurological Injury**
Focal neurological deficit may not develop until some hours after injury. Patients should be reassessed prior to removal of the collar.
The 5 Moments for Hand Hygiene are:

| Moment 1: | Before touching a patient |
| Moment 2: | Before a procedure *(immediately before)* |
| Moment 3: | After a procedure or body fluid exposure risk *(immediately after)* |
| Moment 4: | After touching a patient |
| Moment 5: | After touching a patient’s surroundings |

Implementation & Communication Plan:

<table>
<thead>
<tr>
<th>Risk Rating (refer to MoH Risk Matrix)</th>
<th>EXTREME</th>
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<th>Who is responsible?</th>
<th>Timeframe</th>
<th>Review/Evidence</th>
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<tbody>
<tr>
<td>List outcome measure/KPI</td>
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**Staff read document**
- Trauma CNC Emergency & Critical Care Services CNC
- Timeframe: 3 months
- Review/Evidence: All staff providing care to trauma patients with the potential for spinal injury have signed to indicate they have read and understood the procedure

**Training requirements (e.g., in-service, orientation, workshops)**
- CNC Emergency Services
- CNE’s Emergency, ICU, Surgical, Trauma
- Timeframe: 6 months

**Resource requirements (e.g. promotional material, signage,)**
- Facility Managers
- Review/Evidence: Facilities to have adult and paediatric single use Philadelphia collars in stock to replace the Semi-Rigid “Stiffneck” collars

**System requirements (e.g. IT support, supervision,)**
- Andrea Clark
- District policy officer
- Procedure to be ratified and uploaded onto staffnet policy and procedure page

**PART 2: Key Performance Indicators:**

1. n/a
Acknowledgements:
Canberra Hospital – Standard operating procedure – Spinal precautions and Care of Adult Patients with Potential Spinal Injuries
St George Hospital – Practice Guideline – Care and Fitting of Cervical Collars.
The Alfred Spinal Clearance Management Protocol November 2009

References:
3. American College of Radiology. ACR appropriateness criteria on suspected spine trauma. Available at www.acr.org
12. Michaleff ZA, B.AppSc, Maher CG, PhD., Verhagen AP, PhD., Rebbeck T, PhD., Lin CC, PhD. Accuracy of the canadian C-spine rule and NEXUS to screen for clinically important


Appendices:

1. Clinical Practice Guideline – Cervical Spine Assessment Flowchart
2. Canadian CT Head Rule
# Consultation Process / List:

<table>
<thead>
<tr>
<th>Title / Position</th>
<th>Title/Position Responded</th>
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</table>
| Executive Director of Medical Services  
Dr Bruce Warton | No |
| Executive Director of Nursing and Midwifery  
Karen Cairney | No |
| Director of Critical Care - Dr Trish Saccasan Whelan | Yes |
| Director of Trauma Services - Oran Rigby | Yes |
| A/Director Operations - Ken Hampson |  |
| A/Director of Clinical Governance - Jill Reyment | Yes |
| Director of Emergency Department WWBH  
Shane Curran | No |
| Director Emergency Department GBH  
Emmanuel Jeyarajah | No |
| Rural Group Manager (Border)  
Rosemary Garthwaite | No |
| Rural Group Manager (Riverina) – Maria Roche | No |
| Rural Group Manager (MIA) – Ken Hampson |  |
| Emergency and Critical Care CNC - Audas Grant | No |
| MLHD Intensive Care CNC - Kylie Pleming | Yes |
| NUM ICU Griffith Base – Julie Henderson | Yes |
| MLHD Infection Prevention & Control Consultant – Sharon Maher | Yes |

## Created By:
Anne Hawkins CNC MLHD CNC Emergency/Critical Care Services  
(Benjamin Hall – Rural Trauma CNC)
Appendix one

Clinical Practice Guideline – Cervical Spine Assessment Flowchart
(http://www.rch.org.au/clinicalguide/guideline_index/Cervical_Spine_Injury/)

Traumatic injuries of the cervical spine are uncommon in children. However in many circumstances it is prudent to assume there is a cervical spine injury until examination and radiological investigationrove otherwise.

![Flowchart: Assessment of the Cervical Spine](https://www.rch.org.au/clinicalguide/guideline_index/Cervical_Spine_Injury/)

- Abnormal neurology OR ventilated
  - Yes → Urgent Neurosurgery Consult
  - No → Midline cervical bony tenderness OR Distracting injuries
    - Yes → X-ray cervical spine: AP, lateral and peg
    - No → Assess active range of movement of the neck
      - Normal → Normal
      - Abnormal → Abnormal

- Posterior bony tenderness or other neck concern.
- Immobilise in two-piece collar. Discuss with ED consultant or appropriate surgical team.

Cervical Spine Immobilisation and Management
National Standard 1, 3 & 8
January 2015
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Appendix: Two

Canadian CT Head Rule


High Risk (for Neurological Intervention)

1. GCS score < 15 at 2 hrs after injury
2. Suspected open or depressed skull fracture
3. Any sign of basal skull fracture*
4. Vomiting ≥ 2 episodes
5. Age ≥ 65 years

Medium Risk (for Brain Injury on CT)

6. Amnesia before impact ≥ 30 min
7. Dangerous mechanism ** (pedestrian, occupant ejected, fall from elevation)

*Signs of Basal Skull Fracture
- hemotympanum, ‘racon’ eyes, CSF otornhea/ rhinorhea, Battle’s sign

** Dangerous Mechanism
- pedestrian struck by vehicle
- occupant ejected from motor vehicle
- fall from elevation ≥ 3 feet or 5 stairs

Rule Not Applicable If:
- Non-trauma cases
- GCS < 13
- Age < 16 years
- Coumadin or bleeding disorder
- Obvious open skull fracture