SPINE CLEARANCE ADULTS AND PAEDIATRICS
MACKAY HOSPITAL AND HEALTH SERVICE

1. Purpose

Unrecognised cervical injury can produce serious morbidity and disability.

This procedure describes the processes for Spinal Clearance in all Trauma Patients. Spinal clearance is said to have occurred when the medical team caring for the patient have examined the patient physically and, if deemed necessary, radiographically and have determined that no significant injury exists and immobilisation procedures are ceased.

Delay in spinal clearance, or in the diagnosis and subsequent injury management predisposes the patient to the complications of immobilisation and resultant increase in morbidity therefore the decision to clear or treat a C Spine must be made WITHIN 24 HOURS OF PATIENTS ADMISSION.

2. Scope

This procedure relates to all Medical and Nursing Staff who may be required to care for patients presenting with a potential or actual spinal injury at the Mackay Base Hospital (MBH).

3. Procedure for Spine Clearance Adults and Paediatrics

All trauma patients require spinal immobilisation when the mechanism of injury has the potential for causing spinal injury. Suspected or Proven Spinal Injury is CODE RED trauma Activation Criteria A soft collar +/- sandbags and spinal precautions (supine position, head holding when turning, and log rolling) are appropriate as emergency immobilisation for all acute trauma patients with suspected spine trauma (with or without neurological concerns).

During the initial assessment phase it is acceptable to utilise a stiff neck collar if the patient’s presents with one already in use, but this should be changed to a soft collar +/- sand bags within 4 hours of application under the supervision of the orthopaedic registrar, ED Registrar or SMO.
Procedure: Spine Clearance Adults and Paediatrics

Patient Considerations
Reassurance and explanation of immobilisation should be given to the patient to assist with patient compliance, sedation may be necessary at times. High flow suction must always be available to prevent aspiration in case of vomiting. The scoop stretcher should be used to transfer patients for CT and X-rays. You can CT through this stretcher but not x-ray.

Assessment for Adults
As an adjunct to the clinical judgement of whether radiological investigation is required to clear the C spine the Canadian C-Spine (cervical-spine) Rule (CCR) and the National Emergency X-Radiography Utilization Study (NEXUS) Low-Risk Criteria (NLC) are decision tools used to guide the use of cervical-spine radiography in patients with trauma at MBH.

<table>
<thead>
<tr>
<th>NEXUS Low Risk Criteria</th>
<th>CANADIAN C- Spine Rule</th>
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<tbody>
<tr>
<td>Cervical spine x-ray indicated unless:</td>
<td>X ray indicated if:</td>
</tr>
<tr>
<td>No posterior midline cervical tenderness</td>
<td>High risk factors mandating x ray:</td>
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<tr>
<td>No evidence of intoxication</td>
<td>• Age 65 or over</td>
</tr>
<tr>
<td>Normal level of alertness</td>
<td>• Dangerous mechanism</td>
</tr>
<tr>
<td>No focal neurological deficit</td>
<td>• Paraesthesia</td>
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<tr>
<td>No painful distracting injuries</td>
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Patients are considered to be at extremely low risk of cervical spine injury if there are no indications for x-ray on both the Canadian Rules and the Nexus Criteria and can be cleared without the need for radiographic imaging by the ED SMO or ED Registrar. Should the patient exhibit any of the NEXUS criteria or any high risk factors, clinical examination is unreliable and radiographic assessment of the cervical spine is advised.

A thoracic and lumbar spine injury also needs to be actively excluded in all patients presenting with trauma. Clearance of the thoracic and lumbar spine by clinical examination alone is sufficient in the alert patient with no neurological deficit, distracting injury, back pain or abnormality on log roll. If GCS < than 15 and there is a neurological deficit, distracting injury, back pain or abnormality on log roll.

- **Plain AP and lateral thoracic and lumbar spine films are the mandatory minimum requirement.**
- If adequate plain films are not available, a multislice CT scan of the thoracolumbar spine must be obtained. Both the orthopaedic and radiology consultants must document that no traumatic abnormalities are detected.

A fracture found anywhere on the spine necessitates full spinal imaging to be done.
Procedure: Spine Clearance Adults and Paediatrics

Who can clear the C – Spine in Adults?

1. The conscious patient without radiological abnormalities or neurological deficits can be cleared by an ED PHO/SMO. C-spine clearance and ceasing of position and handling restrictions must be documented clearly in the patient’s notes and/or on the trauma sheet.

2. In the case of the conscious patient with a radiologically identified/suspected spinal injury (with or without ongoing neurological deficits), spinal precautions are to be maintained until an Orthopaedic opinion has been obtained. In this case C-spine clearance and ceasing of position and handling restrictions must be documented clearly in the patient’s notes by the Orthopaedic Registrar. Or if not cleared any spinal injuries and handling restrictions must also be documented by the Orthopaedic Registrar.

3. In the case of the unconscious or intubated patients with normal C-spine imaging (reviewed by radiologist), spinal precautions should be maintained until the imaging has been reviewed by the Orthopaedic Consultant. If imaging confirmed by Consultant radiologist to be normal and no evidence of C-Spine injury in available history and clinical exam by orthopaedic consultant, the cervical spine can be cleared. Collar can be taken off. C-spine clearance and ceasing of position and handling restrictions must be documented clearly in the patient’s notes by the Orthopaedic Consultant. Spinal injuries and handling restrictions must also be documented by the Orthopaedic Consultant.

The decision to clear or treat a C Spine must be made WITHIN 24 HOURS OF PATIENTS ADMISSION.

Documentation of C- Spine Clearance

C Spine assessment needs to be well documented in IEMR. Preferably labelled C spine assessment.

If the C spine is cleared documentation needs to state how and by whom.

If the C spine remains uncleared documentation needs to state why it remains unclear and how immobilisation is to be maintained.

Care of the patient with the Uncleared Spine

If a patient’s C – Spine or Thoracic/Lumbar spine is unable to be cleared and spinal precautions are to be maintained please follow link to GUIDELINES FOR CARE OF PATIENTS WITH SPINAL FRACTURES;


The following chart illustrates the Decision Support Tool for clearing the C Spine in Adults at MBH.
Trauma patient with suspected cervical spine injury → Conscious Patient

Unconscious Patient → Orthopaedic Consult

Orthopaedic Consult → CT whole cervical spine with sagittal reconstructions

CT whole cervical spine with sagittal reconstructions → Normal results reported by Radiologist and seen by Orthopaedic Consultant and no documented neurological deficit

Normal results reported by Radiologist and seen by Orthopaedic Consultant and no documented neurological deficit → C SPINE CLEARED

Normal results reported by Radiologist and seen by Orthopaedic Consultant and no documented neurological deficit → C SPINE CLEARED

Abnormal CT Result or Neurological Deficit → Depending on grade of instability and general condition, Ortho Team will determine the Indication for MRI Type of spinal precaution Indication for transfer to spinal unit

Abnormal CT Result or Neurological Deficit → NO

NO → Abnormal CT Result or Neurological Deficit

NO → C SPINE CLEARED

NO → C SPINE CLEARED

YES → Normal Results Adequate Imaging No Neurological Deficit

Normal Results Adequate Imaging No Neurological Deficit → C SPINE CLEARED

Normal Results Adequate Imaging No Neurological Deficit → C SPINE CLEARED

YES → C SPINE CLEARED

YES → No Imaging necessary C SPINE CLEARED

No Imaging necessary C SPINE CLEARED → C SPINE CLEARED

No Imaging necessary C SPINE CLEARED → C SPINE CLEARED

*Highly Suspicious of C SPINE INJURY OR ELDERLY PATIENT WITH DEGENERATIVE CHANGES MAY MAKE IT DIFFICULT TO INTERPRET PLAIN FILMS IT IS REASONABLE TO GO STRAIGHT TO CT
Cervical Spine Clearance in Children

Traumatic injuries of the cervical spine are uncommon in children. However as the consequences of missing a spinal injury may be dire, it is prudent to assume there is a cervical spine injury until clinical examination +/- radiological examination proves otherwise. The Lady Cilento Children’s Hospital (LCCH) now uses 8 high risk factors to determine the need for C Spine imaging. This is based on a retrospective study by PECARN; at least one of these high risk factors was present in 97% of 540 children with C spine Injury.

1. High –risk MVA
2. Diving or other axial load
3. Conditions predisposing to CSI
4. Substantial Torso Injury
5. Altered Mental Status
6. Focal Neurological Deficit
7. Neck Pain
8. Torticollis

Mechanisms of Injury associated with Paediatric C Spine Injury

- High risk MVA – head-on collision, roll over, ejected from the vehicle, death in the same crash, or speed > 88kph
- Axial load to any part of the head or neck, e.g. diving or falling from a height
- Rugby forced hyperflexion as can occur from a scrum collapse predisposes the player to a particular type of injury(facet joint dislocation +/- spinal cord injury)

Medical Conditions that may Predispose to CSI Include

Down syndrome, Klippel-Feil syndrome, achondrodysplasia, mucopolysaccharidosis, Ehlers-Danlos syndrome, Marfan syndrome, osteogenesis imperfecta, Larsen syndrome, juvenile rheumatoid arthritis, juvenile ankylosing spondylitis, renal osteodystrophy, rickets, history of CSI or cervical spine surgery.

Pain vs. Tenderness:

A traumatic cervical spine injury like any other traumatic deformation causes the conscious infant, child or adolescent to be acutely aware of pain and dysfunction, and to protect the area with muscle spasm. The PECARN study found a complaint of posterior neck pain to be a significant risk factor for true PSCI, rather than “midline tenderness" which was not a good discriminator between true PSCI and controls without PCSI. Asking the conscious, verbal injured child where they are sore and assessing mobility and tenderness in pre-verbal children with this in mind, can help discernment.

Children with none of the eight risk factors identified are considered to have had their C-spine clinically cleared. No imaging or immobilisation is required.

If any of the eight risk factors outlined above is found on history or examination, C-spine immobilisation and spinal precautions during transfer and handling should commence or continue.

This includes the following measures;
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- Maintain Soft Collar and spinal precautions (in line mobilisation of the whole spine – "logrolling" and immobilisation of the cervical spine by a second person in case collar needs to be removed for procedures) until assessed by an orthopaedic surgeon.
- Maintain spinal precautions and collar and perform repeated neurological examinations for the next 24 hours (orthopaedic team on call and ICU team on call).
- If the patient has a return to normal mental status, the cervical spine can be cleared according to the protocol for clearance in alert and cooperative patients.
- If the patient remains unconscious, an MRI should be performed, preferably within 24 hours after admission.

Children under the age of 8 who are on a flat trolley of mattress will tend to have a degree of flexion of the C spine. A thoracic elevation device should be used to improve neutral positioning for spine and airway.

The paediatric spine differs from the adult spine in respect of the higher incidence of SCIWORA (spinal cord injury without radiological abnormalities). It is more common in children < 8 years with spinal cord injuries. Several studies showed that the incidence of SCIWORA can be as high as 30%. Signs can develop as late as four days after the injury. The hypothesis behind SCIWORA is that of ligamentous laxity and bony immaturity allowing the transfer of forces through to the spinal cord resulting in myelopathy without bony injury. In modern times, SCIWORA has become a misnomer as most of these patients have a radiological abnormality on MRI. True SCIWRA is now exceedingly rare.

If clinical suspicion still exists that there is a c-spine injury even though the plain films and CT are normal, don't forget to rule out a spinal cord injury without radiological abnormality (SCIWORA) with an MRI.

The cervical spine CANNOT be cleared in unconscious children, with NO abnormalities on plain AP and lateral x-rays and/or on multi slice CT of the cervical spine.

Please click on link below for Royal Children’s Hospital Trauma Guidelines – Cervical Spine Injuries;

4. Supporting Documents

This original protocol has been based on current orthopaedic trauma radiology literature review, including spinal clearance Management Protocol, The Alfred, Melbourne, Australia, JAAO, September 2007, Volume 14, Clearing the Paediatric Cervical Spine Following
Procedure: Spine Clearance Adults and Paediatrics

Injury, and on discussion during the Mackay Base Hospital Emergency, ICU, Radiology and Orthopaedic Department meeting on 15th June 2007.


Current Literature Review
Cervical Spine Clearance in Obtunded Blunt Trauma Patients: A Prospective Study. The Journal of TRAUMA® Injury, Infection, and Critical Care Volume 68, Number 3, March 2010

The Townsville Hospital Adult Thoracolumbar Spine Imaging Guidelines in Trauma Developed November 2007

The Princess Alexandra Hospital (2011) Spinal Clearance Protocol and Emergency Department Clinical Module Spinal Injury

The Mackay Base Hospital Trauma Manual (Updated March 2014)

Darling Downs - West Moreton Health Service District Cervical Spine Clearance in the Adult Trauma patient


5. Procedure Revision and Approval History

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<tr>
<th>Date</th>
<th>Amendment</th>
<th>Authorised by</th>
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<tr>
<td>September 2008</td>
<td>Policy completely rewritten by orthopaedic team</td>
<td>Dr Trost, Dr Drobetz, Dr Kolarik</td>
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<tr>
<td>February 26th 2010</td>
<td>Change to flowchart to now read MSCT *Reconstruction Cervical Spine Changes to protocol to reflect MSCT on pages 2 and 3 Add rigid collar to page 2 and 3</td>
<td>Dr H Drobetz</td>
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<tr>
<td>22/11/2011</td>
<td>Three year review - Changes to wording and flowchart updated Note wording of green from notification References updated</td>
<td>Trauma Review Committee meeting on 15/11/2011</td>
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<tr>
<td>November 2014</td>
<td>Policy completely rewritten by Dr Drobetz and Melanie Clark</td>
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<tr>
<td>February 2015</td>
<td>Minor changes to document after review by Dr Drobetz and Trauma committee</td>
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<tr>
<td>June 2015</td>
<td>Spelling error corrected</td>
<td>Melanie Clarke Trauma</td>
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<tr>
<td>November 2015</td>
<td>Royal Children’s Hospital changed to Lady Cilento Children’s hospital and flowchart made legible</td>
<td>Nurse</td>
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6. Audit Strategy

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<td>Audit strategy</td>
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<td>Audit responsibility</td>
<td>Trauma Committee</td>
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<tr>
<td>Key Elements / Indicators / Outcomes</td>
<td>Patients who present with a potential or actual spinal injury will be managed using these guidelines with no adverse events reported</td>
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