1. Introduction and who guideline applies to

Cervical spine injuries (CSI) – mainly fractures and more rarely injuries to other structures, with or without associated spinal cord injury (SCI) - are uncommon but potentially life-changing events. Clinicians dealing with trauma patients have a responsibility to apply evidence-based guidance so that the risk of missing CSI on one hand and unnecessary investigations on the other are both minimised. There is currently a paradigm shift from dogmatic cervical spine immobilisation in all patients with suspected CSI to the concept of 'restriction of cervical spine motion' (ROCSM) in selected patients with a high pre-test probability of CSI. [1] It may be said that '**patients with CSI may come to harm from failure to image, but rarely from failure to immobilise**'. [2]

This guideline describes the clinical circumstances under which CSI from blunt trauma in adults should be suspected as well as the process of clinical management and - where indicated - radiological investigation, up to the point at which clinically important CSI has either been ruled out or confirmed. It applies to all UHL staff involved in the management of such patients, mainly those presenting to the Emergency Department (ED) but also those who sustain injuries while cared for elsewhere within UHL (e.g. on a medical ward). Additional information regarding the latter scenario is available from the UHL Policy on Falls Management for Adult Inpatients. [3] Penetrating trauma is outside the scope.

2. Guideline standards and procedures

2.1 Following blunt trauma, CSI should be suspected in any of the scenarios below:

- Patient brought to the ED with ROCSM applied
- Altered level of consciousness **AND** evidence of trauma above clavicles
- New limb weakness (**NB**: This is of particular relevance in older people, who may have significant cervical spine injuries despite the absence of pain)
- Alert patient complaining of posterolateral neck pain
- Alert patient with the following triad of features (see ED proforma shown in Appendix A, box 2) even if neck pain is absent [4]:
  - Evidence of trauma above the clavicles
  - Not ambulatory since injury
  - Trigger mechanism (see ED proforma shown in Appendix A, box 3)

2.2 Initial clinical assessment and determining the need for imaging

- Patients attending the ED with injuries more than 48h old and reattenders should undergo individualised assessment by a senior ED doctor (ST3 equivalent or above)
- In all other patients, ED assessment to determine either clinical clearance or need for imaging should be performed using the NICE-compliant [5,6] proforma shown in Appendix A and Appendix B (**NB**: Proforma may also be used by other departments)
- In those patients, imaging should only be requested following proforma completion

2.3 Restriction of cervical spine motion (ROCSM) during initial assessment and imaging

- Use manual in-line stabilisation (MILS) during the initial assessment of any unstable patients and during airway manoeuvres, including intubation
- In patients requiring cervical spine imaging, ongoing ROCSM will be applied if one or more of the following criteria apply:
  - New neurological deficit consistent with CSI
  - Patient unstable as per Appendix A, box 1
  - Dangerous mechanism as per Appendix A, box 4 unless patient able to walk
  - Known spinal problem as per Appendix A, box 5 unless patient able to walk
- Place patients with ROCSM on a scoop stretcher or transfer trolley mattress (as available) to minimise manual handling during transfer onto and off the CT examination table; **NB**: if scoop is used, remove this after imaging

- Use only head blocks and tape to provide ongoing ROCSM but **DO NOT** apply rigid collar: Rigid cervical collars have been shown not to improve motion restriction over and above head blocks and tape alone [7] and have the potential to cause harm - including raised intracranial pressure, agitation and reduced pulmonary function. [8]
- Illustrations of how to perform MILS and apply ROCSM are shown in Appendix C
- Patients not requiring ROCSM should be allowed to assume a position of comfort. **NB**: Not all patients will want to lie down. Some patients (including those who, very rarely, may attend the ED supporting their head with their hands) *may* also find ROCSM helpful and reassuring but should not be forced into accepting it.
- Patients undergoing ROCSM / MILS require protection of the whole spine; they should be managed lying flat on their back and log-rolled if any turning is necessary

2.4 Antiemetic prophylaxis for patients with ROCSM

Back to 1st page

- Vomiting in patients with ROCSM often necessitates unplanned rapid intervention, is distressing to patient and staff and can cause aspiration and airway compromise. Patients with one or more of the following high-risk factors should therefore receive pre-treatment with antiemetics:
  - Age >70
  - Weight >105kg
  - Instability as per Appendix A, box 1
  - Receiving opiate analgesia
- Pre-treatment should consist of
  - Ondansetron melts 16mg PO for all patients with ROCSM
  - Additional metoclopramide 10mg IV if patient is already nauseated or has vomited

2.5 Processes supporting safe, effective imaging

Back to 1st page

- All jewellery should be removed from relevant body areas in ED / by the referring team
- CT is the standard imaging modality of the cervical spine in all adult trauma patients [6]
- Patients with ROCSM in situ will be escorted to the imaging department by an appropriately trained nurse. In the ED, this will be a nurse who has attained the NMTNG (National Major Trauma Nursing Group) Level One adult standards of education and competencies (includes upper airway suctioning, manual in-line stabilisation and log-rolling).

2.8 Imaging timeframes for patients with ROCSM

Back to 1st page

- Patients with ROCSM should be prioritised for imaging, with the aim of completing the imaging process and removing the scoop (where used) within 45min
- Their provisional imaging report should be made available on the UHL Picture Archiving and Communication System (PACS) within 1h from the start of imaging

2.9 Clinical management post-imaging including indications for MRI

Back to 1st page

2.9.1 While the imaging report is awaited

- ED patients with ROCSM must remain in the ED
- ED patients with no indication for ROCSM (see section 2.3) awaiting discharge from ED only pending normal cervical spine imaging may be moved to EDU on the 'Consultant-Only' or 'EPIC' pathway

2.9.2 If imaging is normal

- Patients with new neurological deficit despite normal CT should continue to have ROCSM and be reviewed by the orthopaedic team to determine further management including indication for magnetic resonance imaging (MRI) to identify 'spinal cord injury without radiological abnormality' (SCIWORA)

- Intubated patients should remain immobilised. If clinical reassessment is still not possible after 24h the options are:
  - Radiological clearance using MRI
  - Signed joint statement by consultant intensivist and consultant orthopaedic surgeon that occult CSI and SCIWORA are deemed to be unlikely given that CT has been reported as normal, and that ROCSM can be lifted. [9]
- For all other patients, the cervical spine can be declared 'radiologically cleared' and this should be recorded in the patients' notes
  - ROCSM (if applied) should be removed
  - The 'awaiting cervical spine clearance' sign (if used) should be removed

2.9.3 If CT is abnormal

- Radiologist should inform a senior clinician (for ED patients: EPIC - Emergency Physician in Charge, **Bleep 6702**) immediately of any acute findings
- Patients with confirmed CSI should have ROCSM instituted / continued and be reviewed by orthopaedic team (**Bleep 4046**) to determine further management
- ED patients **MAY** be transferred to a trauma ward prior to orthopaedic review in order to comply with the 4-hour ED timeframe **IF ALL** of the following apply:
  - Orthopaedic middle grade has been notified of transfer
  - Patient is alert
  - Vital signs are normal
  - No significant other injuries (e.g. CT-positive head injury) or acute illness
  - Cervical spine injury not reported as 'unstable' by radiologist
  - Spine assessment (ASIA) chart completed if new neurological deficit found
  - ED clinician has recorded the following statement in the patient's ED notes:
  - '**Spinal stability uncertain - follow spine protection protocol on ward**'
- Consider CT or MR angiography of the neck vessels if the injuries seen on CT (i.e. fractures involving foramina transversaria or lateral processes, or vertebral malalignment) raise suspicion of vascular injury or if patient has features of a posterior circulation stroke

3. Education and training

Back to 1st page

- Mandatory attendance of the regular in-house full-day Trauma Immediate Life Support (TILS) course for all ED nurses to attain NMTNG Level One competencies
- Regular multidisciplinary 'Resus drills' for ER staff and radiographers to practice effective (safe and rapid) transfers of patients with ROCSM onto and from CT examination table
- Regular consultant-delivered face-to-face drop-in sessions for doctors, ACPs and nurses to provide training in the use of the ED proforma to support clinical assessment of adult patients with suspected CSI (for nurses, this includes competency sign-off)

4. Monitoring compliance

Back to 1st page

Key Performance Indicator	Method of Assessment	Frequency	Lead
ED patients with ROCSM are imaged within 45min	Report from NerveCentre	Quarterly	Alasdair Moffat
Report for ED pts with ROCSM is available within 1h of imaging	Report provided by Imaging Department	Quarterly	Alasdair Moffat
ED patients have imaging for suspected CSI requested after completion of the ED 'Suspected CSI' proforma (exception: MRCT)	ED audit	Set by ED audit lead	Martin Wiese
ED incidents relating to CSI	Datix screening	6-monthly	M Wiese

5. Supporting references

Back to 1st page

1. BengerJ and BlackhamJ. Why Do We Put Cervical Collars On Conscious Trauma Patients? Scand J Trauma Resusc Emerg Med. 2009;17:44.
2. Hauswald M et al. Out-of-Hospital Spinal Immobilization: Its Effect on Neurologic Injury. Academic Emergency Medicine 1998;5: 214-9.
3. Falls Management for Adult Inpatients UHL Policy (B15/2014)
4. StiellIG et al. The Canadian c-spine rule for radiography in alert and stable trauma patients. JAMA 2001;286:1841-8.
5. NICE (2014) Head injury: Triage, assessment, investigation and early management of head injury in children, young people and adults. CG176. London: National Institute for Health and Care Excellence.
6. NICE (2016) Spinal injury: assessment and initial management. NG41. London: National Institute for Health and Care Excellence.
7. Holla M. Value of a rigid collar in addition to head blocks: a proof of principle study. Emerg Med J. 2012;29:104–7.
8. KornhallDK, JorgensenJJ, BrommelandT et al. The Norwegian guidelines for the prehospital management of adult trauma patients with potential spinal injury. Scand J Trauma Resusc Emerg Med. 2017;25:2.
9. HarrisonP and CairnsC. Clearing the cervical spine in the unconscious patient. Cont Edu Anaesth, Crit Care & Pain 2008;8:117-20.

6. Keywords

Back to 1st page

Emergency, accident, ED, A&E, trauma, injury, adult, spine, spinal, cervical, vertebra, fracture, restriction, motion, computed tomography, CT, magnetic resonance imaging, MRI, weakness, deficit, immobilisation, neck, neurological, cord, SCI

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title)	**Executive Lead**
Martin Wiese – Emergency Physician	Andrew Furlong, Medical Director

Details of changes made during review:

- Guideline reformatted to comply with current template
- Note regarding the significance of new limb weakness to trigger investigation for CSI even in the absence of neck pain, especially in older people, added
- Changes to cervical spine immobilisation (ROCSM) measures
- Scoop stretchers and transfer trolley mattresses introduced to facilitate transfers onto and from CT examination table
- Plain film radiography removed as an imaging modality (now CT only)
- Section on antiemetics for patients with ROCSM added
- Required competencies for nurse escorts during imaging transfers formalised
- Emergency physician in charge (EPIC) is single point of contact for abnormal c-spine CTs
- Option for selected low-risk patients (not needing ROCSM) to await CT result on EDU added
- New required sections on education and compliance monitoring completed
- References list updated
- Reference to the 'Falls Management for Adult Inpatients UHL Policy (B15/2014)' added
- ED proforma (Appendices A & B) updated to reflect changes above
- Plain film operational process flowchart (old Appendix C) removed
- New Appendix C with demonstrations of cervical spine protection techniques added

Developed by Martin Wiese . Version 92

LRI Emergency Department

Suspected cervical spine injury

Competent ED staff to use in all adult blunt trauma patients presenting with

- **Neck pain**
- **New neurological deficit**
- **Indirect feature triad (see boxes 2 and 3)**
- **Spinal precautions in situ**
- **GCS <15 with any evidence of trauma above clavicles**

Do NOT use if injury >48h old or if repeat presentation

Disclaimer:
This is a clinical template; clinicians should always use judgment when managing individual patients

Re-approved by ED guidelines committee on TBC
Review due: TBC . Trust Ref: C65/2016

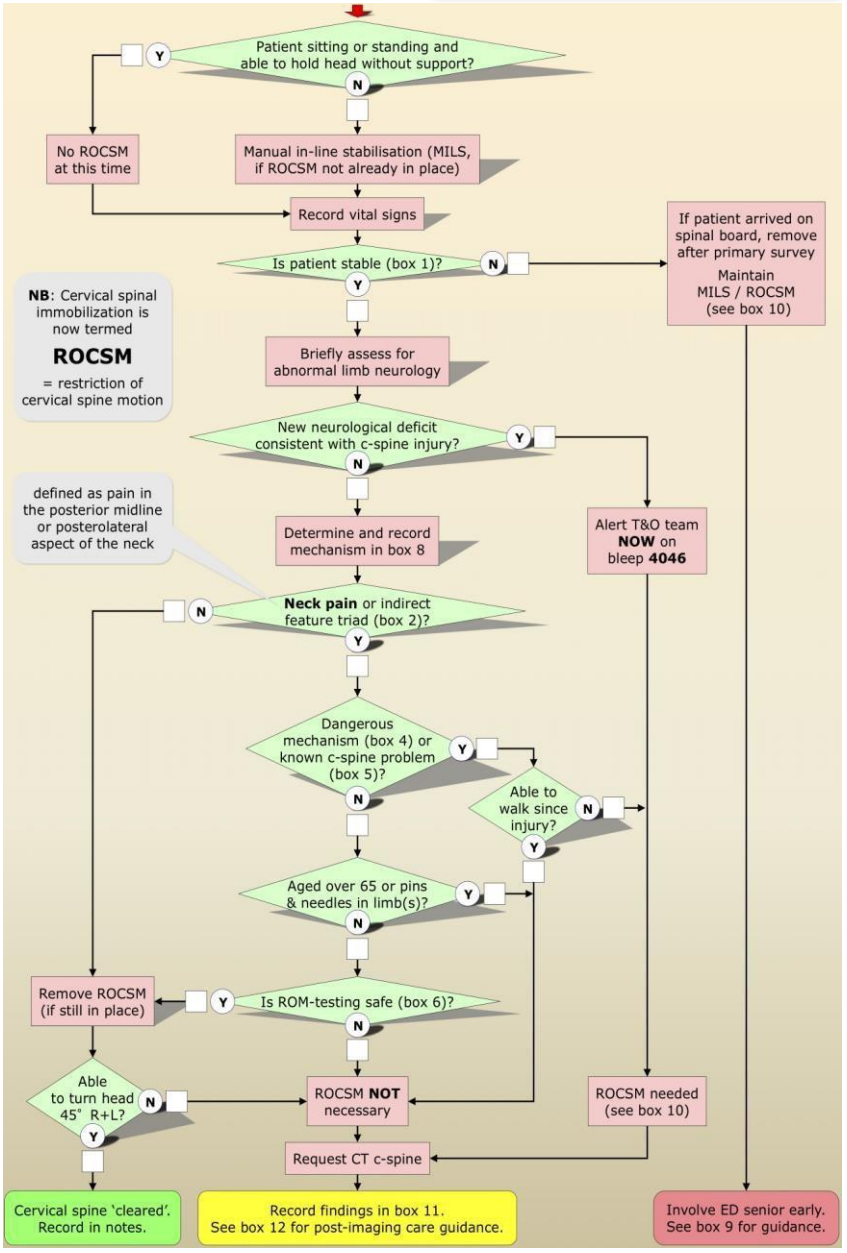
Patient details

Full name

DoB

Unit number

(use sticker if available)



Assessed by

Print name | Signature | Job role | Date | Time completed

① Is patient stable?

☐ **No**, as at least one of the below

GCS	<15	☐
Respiratory rate	<10	☐
Respiratory rate	>24	☐
Systolic BP	<90	☐

☐ **Yes**, as none of the above

② Indirect feature triad?

☐ **Yes**, as **ALL THREE** of the below

Evidence of trauma above clavicles ☐

record details below

AND not ambulatory since injury ☐
AND 'triad trigger' incident (box 3) ☐

☐ **No**, as only two or less of the above

③ 'Triad trigger' incident?

☐ **Yes** - one of the below

- Fall ≥3 feet or ≥5 steps ☐
- Diving injury ☐
- Contact sport with axial load to head ☐
- Motor vehicle (incl. motorcycle) collision ☐
- Pedestrian hit by motor vehicle ☐
- Bicycle collision ☐

☐ **No** - none of the above

④ Dangerous mechanism?

☐ **Yes** - one of the below

- Fall ≥3 feet or 5 steps ☐
- Axial load to head, e.g. diving ☐
- Crash with motorized recreational vehicle (e.g. quad bike) ☐
- Motor vehicle collision at ≥65mph, rollover or ejection ☐
- Bicycle collision ☐

☐ **No** - none of the above

⑤ Known c-spine problem?

☐ **Yes** - one or more of the below

- Rheumatoid arthritis ☐
- Ankylosing spondylitis ☐
- Cervical spinal stenosis ☐
- Previous c-spine surgery ☐

☐ **No** - none of the above

⑥ Is ROM-testing safe?

☐ **Yes**, as one or more of the below

- Ambulatory at any time after injury ☐
- Sitting position in the ED ☐
- Onset of pain not immediate ☐
- Simple rear-end MVC (see box 7) ☐
- No midline c-spine tenderness ☐

☐ **No**, as none of the above

⑦ Simple rear-end MVC?

☐ **No**, as at least one of the below

- Pushed into oncoming traffic ☐
- Hit by high speed vehicle ☐
- Rollover ☐
- Hit by bus or large truck ☐

☐ **Yes**, as none of the above

⑧ Mechanism of injury

☐ **Fall**
- ☐ down stairs *distance in steps:*
- ☐ from height *distance in feet:*
- ☐ on level ground
- ☐ riding incident

☐ **Motor vehicle collision (MVC)**

Seatbelt worn	☐ Yes	☐ No
Did vehicle roll over	☐ Yes	☐ No
Was patient ejected	☐ Yes	☐ No

Patient vehicle type *(please circle)*

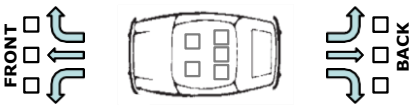
Other

Object of collision *(please circle)*

Other vehicle type or object

None

Collision schematic
- *Indicate patient's position in vehicle*
- *Tick direction of travel*
- *Draw an arrow to indicate point & direction of impact with object*



Patient vehicle speed *(mph)*

Colliding vehicle speed *(mph, if applicable)*

Combined speed (mph; if frontal impact with other vehicle)

☐ **Pedestrian hit by motor vehicle**
☐ **Bicycle crash**
☐ **Diving injury**
☐ **Contact sport + axial load to head**
☐ **Other**

⑨ C-spine assessment if unstable (see box 1)

Arrange CT if
- ☐ GCS less than 13 on arrival in ED
- ☐ Intubated
- ☐ Meets criteria for CT head
- ☐ Other body areas require CT
- ☐ Focal peripheral neurological deficit
- ☐ Urgent need to evaluate c-spine integrity (e.g. before surgery)

If none of the above AND alert but abnormal vital signs

→ Reassess patient after effective resuscitation
- ☐ Stabilized patients - continue down flowchart on reverse
- ☐ Persistent instability – CT body regions of concern **AND** c-spine

If none of the above AND stable vital signs but GCS 13 or 14

→ Use clinical judgment; select from the following options
- ☐ ROCSM (see box 10) and reassessment at 2h from injury (if GCS then 15 continue down flowchart on reverse; CT if not)
- ☐ Early CT c-spine (**AND** head) if ROCSM is poorly tolerated

⑩ ROCSM with consideration of antiemetics

- Use manual in-line stabilisation (MILS) during initial assessment of unstable patients and during airway manoeuvres, including RSI
- ROCSM = head blocks & tape only (DO NOT use cervical collar), on scoop or transfer trolley mattress (as available); if a scoop is used, patient should be scanned and off the scoop within 45min
- Offer ondansetron melts 16mg PO routinely if any of the below:
  - Age >75
  - Weight >105kg
  - Vital signs or GCS abnormal
  - Patient receiving opiates
- Offer both ondansetron melts 16mg PO **AND** metoclopramide 10mg IV to all patients with ROCSM who are already nauseated or have vomited

⑪ CT c-spine results

- ☐ Normal
- ☐ Abnormal

NB: Consider CT or MR angiography of the neck vessels if injuries seen on CT (fractures involving foramina transversaria or lateral processes, or vertebral misalignment) raises suspicion of vascular injury or if patient has features of a posterior circulation stroke.

⑫ Post-imaging care guidance

- ☐ **Acute CT abnormality or new focal neurological deficit** → ROCSM necessary. Refer to orthopaedic team. **NB**: If focal peripheral neurological deficit despite normal CT, MRI can show 'spinal cord injury without radiological abnormality'(SCIWORA).
- ☐ **Neither of the above but patient intubated and ventilated** → ROCSM necessary. If reassessment not possible after 24h, options are MRI or lifting of ROSCM if agreed by 2 consultants.
- ☐ **All other patients can be declared 'radiologically cleared'** → Discontinue ROCSM and record outcome in the notes

Appendix C. **Cervical spine protection techniques** Back to 1st page

Manual in-line stabilisation (MILS)

MILS is a useful option for protecting the cervical spine, particularly during

- Initial assessment
- Airway manoeuvres
- Log-rolling
- Surface transfers
  (e.g. from trolley to CT table or bed)

Note that the ears should be kept unobstructed to ensure communication with the patient is not impaired, as shown

Restriction of cervical spine motion (ROCSM) using blocks and tape

ROCSM can be achieved using a range of commercially available devices, such as head blocks and adhesive tape

Please ensure that the adhesive tape is

- Folded back on itself over forehead and chin so it does not stick to the patient
- Secured to a hard, fixed structure at either end (rather than the mattress)

NB: Ensure that c-spine protection is maintained by reverting back to **MILS BEFORE** removing head blocks and tape e.g. for log-rolls or transfers, or to allow better access for airway manoeuvres

ROCSM using rolled-up blankets and tape

Rolled-up blankets can be used in wards and areas where head blocks are not normally available

Our thanks to Jake Fudge, ED multimedia technologist, for being the model in these photographs