


Title CSOP 009 Spinal Injury

Version No: 2.4

Effective date: 11/04/2023

APPROVALS

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HISTORY

Effective Date	Version No.	Summary of Amendment
14/12/12	2.0	Reviewed, no changes, reformatted into new format
Feb 2014	2.1	Updates
Oct 2017	2.2	Review
24/11/17	2.3	Update of advice re patients with neck pain on page 4.
23/09/2022	2.4	Review and addition of expanded extrication section

APPENDICES

Document Reference Number	Document Title
Appendix A	Canadian C Spine rules algorithm
Appendix B	JRCALC Spinal Immobilisation algorithm



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1. Purpose / Scope

This CSOP provides guidance on spinal immobilisation and the management of patients with suspected spinal cord injury.

2. Definitions/Acronyms:

Abbreviations	Definitions
CSOP	Clinical Standard Operating Procedure
JRCALC	Joint Royal College Ambulance Liaison Committee
RSI	Rapid Sequence Induction
TAAS	The Air Ambulance Service
PRF	Patient Report Form
TARN	Trauma Audit Research Network
NICE	National Institute for Health and Care Excellence

3. Introduction

Spinal cord injury after trauma is described in around 2% of patients on the TARN database, and data from Victoria, Australia gives a figure of 0.5% of patients who are immobilised pre hospital. Driven by traditional teaching and dogma around the need for cervical spine immobilisation, and perceived medicolegal concerns, UK practice around immobilisation has become extraordinarily conservative.

4. Clinical Decision Rules

Current JRCALC clinical practice guidelines describe an algorithm for spinal injury management including immobilisation and clearance and this has been reproduced in Annex A. This algorithm appears to be a hybrid of the Canadian C Spine and NEXUS rules. These are clinical decision rules used to assess the need for cervical spine radiography in Emergency Departments.

NICE Spinal Injury guidelines 2016 (1) advocate the use of the Canadian C Spine rules in the pre hospital setting, and the Canadian C Spine rules have been validated for use by paramedics (2). **In line with NICE, it is acceptable for TAAS clinical staff to apply the Canadian C Spine rule in their TAAS practice (appendix for algorithm), allowing C Spines to be 'cleared' at scene.**



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NICE acknowledges that the use of the Canadian C spine rules in children may be difficult and that their developmental age should be considered. Current APLS guidance has de-emphasised the use of cervical collars in children.

The concept of a 'distracting injury' invalidating the clinical assessment of the cervical spine has been disproved in the literature and should not routinely influence practice. (3)

5. Spinal Immobilisation

The perceived aim of spinal immobilisation is to reduce the risk of causing, or worsening, spinal cord injury by the movement of unstable spinal fractures. Precautions taken to promote immobilisation include:

- Manual in-line stabilisation
- The application of a rigid cervical collar
- A transfer / transport device that maintains the patient in-line (e.g. scoop stretcher or vacuum mattress)
- Head blocks and tape
- Patient handling with the aim of maintaining the spine in-line

However, spinal immobilisation is not a benign intervention; it can cause:

- Pain or discomfort
- Obstruction to cerebral venous return and raised intracranial pressure
- Airway compromise
- Increased aspiration risk
- Pressure areas
- Obscuring significant scalp wounds
- Reduced ventilatory ability
- Catastrophic deterioration in patients with a fixed spinal deformity such as ankylosing spondylitis
- Distraction of personnel on scene from life threatening issues
- Potential over-investigation in ED as evidence suggests patients in a c spine collar are more likely to receive a CT scan (4)

Furthermore, there is no high quality evidence to suggest that this practice reduces secondary cord injury amongst the small proportion of trauma patients with spinal injury. (5,6, 7)



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Clinicians should therefore consider the possibility of spinal injury in every trauma patient and make a dynamic assessment as to the appropriateness of spinal precautions for individual patients.

The following offers guidance as to appropriate practice by TAAS crews:

- 1. Alert and cooperative patients with no neck symptoms – no indication for immobilisation**
- 2. Alert and cooperative patients with neck symptoms - consider blocks for transfer on scoop stretcher for patient comfort**
- 3. 3. Alert and cooperative patients with clear neurological signs of spinal cord injury - gentle manual in line stabilisation during primary survey, blocks for transfer on scoop stretcher.**
- 4. Agitated / confused / decreased GCS patients – no indication for immobilisation as liable to increase agitation and confusion, put cervical spine under more force and expose patient to more risks from side effects of immobilisation**
- 5. Anaesthetised or sedated patients where neck injury is suspected – gentle manual in line stabilisation during primary survey, and airway interventions (8)Blocks for transfer on scoop stretcher.**

Unnecessary movements of the spine should be avoided in all patients in the pre-hospital phase.

If a decision is made to apply spinal precautions, this should not unduly delay the primary survey or impede the delivery of time-critical interventions. This includes the rapid extrication of a time critical patient, for example from a vehicle.

Children

If treating a child with a suspected spinal injury, a pragmatic approach is required. This may include keeping an infant in a car seat, use of rolled blankets, vacuum mattresses or splints, and family members to assist. (NICE 2016)

Ankylosing spondylitis



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Due to chronic fixed spinal deformity, in the event of suspected c spine injury these patients should be transported in a position of comfort, without a collar. Gentle support of the head with rolled blankets or similar may be appropriate.

Penetrating neck injury

There is evidence of harm by immobilising the cervical spine in patients with penetrating neck injuries. This is unnecessary and should be avoided.

6. Extrication

There have been a number of recent papers on this topic (the EXIT project) (9-13) and subsequently a Delphi study (14) producing recommendations on extrication for pre hospital care providers.

The evidence shows that patients who are trapped are more likely to die, therefore we should assume all trapped patients have time critical injuries. Only 0.7% of trapped patients will have a spinal cord injury, hence the vast majority of patients, many of whom have time critical injuries, will not have a spinal cord injury. Of the patients with a spinal cord injury, half will have significant injuries elsewhere in the body. There is no evidence to support any of the traditional extrication methods that have been commonplace in UK pre hospital care, rather trial data shows that patient self extrication methods consistently produced reduced cervical spine movements compared to the traditional methods.

Operational and clinical team members should work together to develop a bespoke patient centred extrication plan with the primary focus of minimising entrapment time(14). It is suggested that TAAS clinicians working as part of the multidisciplinary team at scene should use the following terminology (14):

- Not injured
- Minor injuries (evidence of energy transfer but no evidence of time-dependent injury)
- Major injury (currently stable but should be assumed to be time-dependent)
- Time critical injured (Time critical due to injury; use fastest route of extrication)
- Time critical hazard (Time critical due to a hazard such as fire)

The overarching principles of extrication should be 'gentle patient handling' rather than strict movement minimisation, and minimising entrapment time (14).



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When there is immediate threat to a person's life and rapid extrication is needed, make all efforts to limit spinal movement without delaying treatment.

In line with the consensus statement from the Faculty of Prehospital Care (7), and the 2022 Delphi study (14), it is recommended that alert and cooperative patients who are not trapped should be invited to extricate themselves from a vehicle and lie on a stretcher to allow assessment. If proceeding with self-extrication, it should be explained to the patient that if they develop any spinal pain, numbness, tingling or weakness, they should stop moving and wait to be moved. The Delphi study (14) goes as far as to consider self-extrication in patients with spinal cord injury symptoms. Contraindications to self-extrication include (14):

- i) an inability to understand or follow instructions
- ii) injuries or baseline function that prevents standing on at least one leg
- iii) Specific injuries include: unstable pelvic fracture, impalement, bilateral leg fracture
- iv) Open book pelvic injuries

Recent evidence (12) suggests that the smallest spinal movements observed in patients who self extricated with no instructions given, with a cervical spine collar in situ. Given uncertainty around the amount of spinal movement associated with applying a collar, and what constitutes clinically meaningful c-spine movement, it is not recommended that TAAS clinicians apply a c spine collar in these circumstances.

Do not transport people with suspected spinal injury on a longboard or any other extrication device. A longboard should only be used as an extrication device.

Drowning

A best BET from 2019 concluded that cervical spine injuries are rare in drowning and near drowning unless there is a history of diving or a fall or signs of trauma. As such cervical spine immobilisation should only be considered in cases where there is a reasonable suspicion of a spinal injury (15).

7. Documentation and handover

When TAAS clinicians have determined that spinal precautions are not necessary this should be clearly documented on the patient report form, in particular the distinction between a non-immobilised, but not cleared neck; versus a non-immobilised, cleared neck.



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Be aware that ambulance crews working to JRCALC may find it difficult to hand over patients to a hospital where a decision has been made by a TAAS clinician at the scene. It should also be noted that the JRCALC clinical practice guidelines followed by personnel from tasking ambulance services mandate that when spinal precautions are applied these should be 'full', i.e. the whole spine should be immobilised not just the neck or back. If TAAS clinicians have determined that selectively immobilising only part of the spine is clinically appropriate then they should clearly document this in the patient report form. **Spinal Cord Injury – Clinical Presentation**

Spinal cord injury may present with the following symptoms and signs in conscious patients:

- Neck or back pain
- Loss of movement or sensation in limbs
- Sensation of burning or electric shocks may be experienced in the trunk or limbs.
- Breathing does not feel normal
- Patient may not experience pain even from significant injury
- Diaphragmatic or abdominal breathing
- Hypotension with bradycardia
- Warm peripheries and vasodilatation despite having a low blood pressure
- Flaccid muscles with absent reflexes
- Partial or complete priapism

8. Assessment of Spinal Cord Injury

As part of the disability assessment for all trauma patients, movement of all four limbs should be assessed and documented (especially prior to any sedation or RSI). Remember that your documentation may be essential for clinical or legal purposes at a later date.

Where a spinal fracture or cord injury is suspected the assessment should consider if the patient:

- has any spinal pain
- has any hand or foot weakness (motor assessment)
- has altered or absent sensation in the hands or feet (sensory assessment)


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- has priapism (unconscious or exposed male)
- has a history of past spinal problems, including previous spinal surgery or conditions that predispose to instability of the spine.

(NICE 2016)

9. Suspected thoracic and lumbar injuries

Where any of the factors below are present, NICE recommend full spinal immobilisation with a scoop stretcher. This is the recommended approach at TAAS, mostly as it will facilitate an easy transfer to the Emergency Department trolley with minimal patient movement. It is acceptable for TAAS clinicians not to extend this immobilisation to the neck, instead managing the patient according to the above guidance.

- age 65 years or older and reported pain in the thoracic or lumbosacral spine
- dangerous mechanism of injury (fall from a height of greater than 3 metres, axial load to the head or base of the spine – for example falls landing on feet or buttocks, high-speed motor vehicle collision, rollover motor accident, lap belt restraint only, ejection from a motor vehicle, accident involving motorised recreational vehicles, bicycle collision, horse riding accidents)
- pre-existing spinal pathology, or known or at risk of osteoporosis – e.g. steroid use
- suspected spinal fracture in another region of the spine
- abnormal neurological symptoms (paraesthesia or weakness or numbness)
- on examination:
 - abnormal neurological signs (motor or sensory deficit)
 - new deformity or bony midline tenderness (on palpation)
 - bony midline tenderness (on percussion)



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- midline or spinal pain (on coughing)
- pain or abnormal neurological symptoms on mobilisation

This should all be clearly recorded on the PRF and communicated in the handover at hospital.

10. Treatment of Spinal Cord Injury (SCI)

Several clinical series of human patients with acute SCI managed in an aggressive fashion with attention to blood pressure, oxygenation, and hemodynamic performance report no deleterious effects of therapy and suggest improved neurological outcome. (17)

A

Consider intubation for ventilation if the patient has respiratory failure, bearing in mind that SCI patients can be extremely difficult to wean later in their clinical course.

B

The spinal cord can suffer secondary injury (in the same manner as a head injury) and therefore hypoxia must be avoided.

Ask the patient if their breathing feels normal and observe for diaphragmatic breathing as this may indicate a high cervical spine injury. Check the SaO₂, and check the EtCO₂ of the non-intubated patient- an abnormally high or increasing level may indicate impending ventilatory failure.

C

Hypotension must be corrected. High quality evidence is lacking in terms of a target blood pressure, although many authors advocate a mean arterial blood pressure of 85-90mmHg (17,18). Vasopressors should be used early and consideration given to treating a symptomatic bradycardia. (useful drugs include ephedrine, adrenaline or metaraminol). Excess fluid administration can lead to morbidity.

In the polytrauma patient, look for causes of hypotension, e.g. tension pneumothorax, hypovolaemia, tamponade, etc. and treat as per standard procedures. When all other causes have been excluded or treated and the patient is thought to be euvolaemic it may be appropriate to initiate inotropic support.



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D

Ensure a full neurological examination has been performed and documented. Pay close attention to patient handling with the aim of preventing further neurological injury. Spinal-injured patients are at high risk of pressure sores from an early stage.

E

Temperature control - patients with spinal cord injury loses the ability to thermo-regulate and therefore must be kept warm.

11. Triage and transfer – spinal cord injury

As with any other Major Trauma patient the regional Major Trauma Triage Tool should be applied. Do not transfer patients with suspected spinal cord injury direct to the regional Spinal Injuries unit. These patients should be triaged to a Major Trauma Centre. Remember that paralysis may mask other traumatic injuries.

FURTHER READING / REFERENCES

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