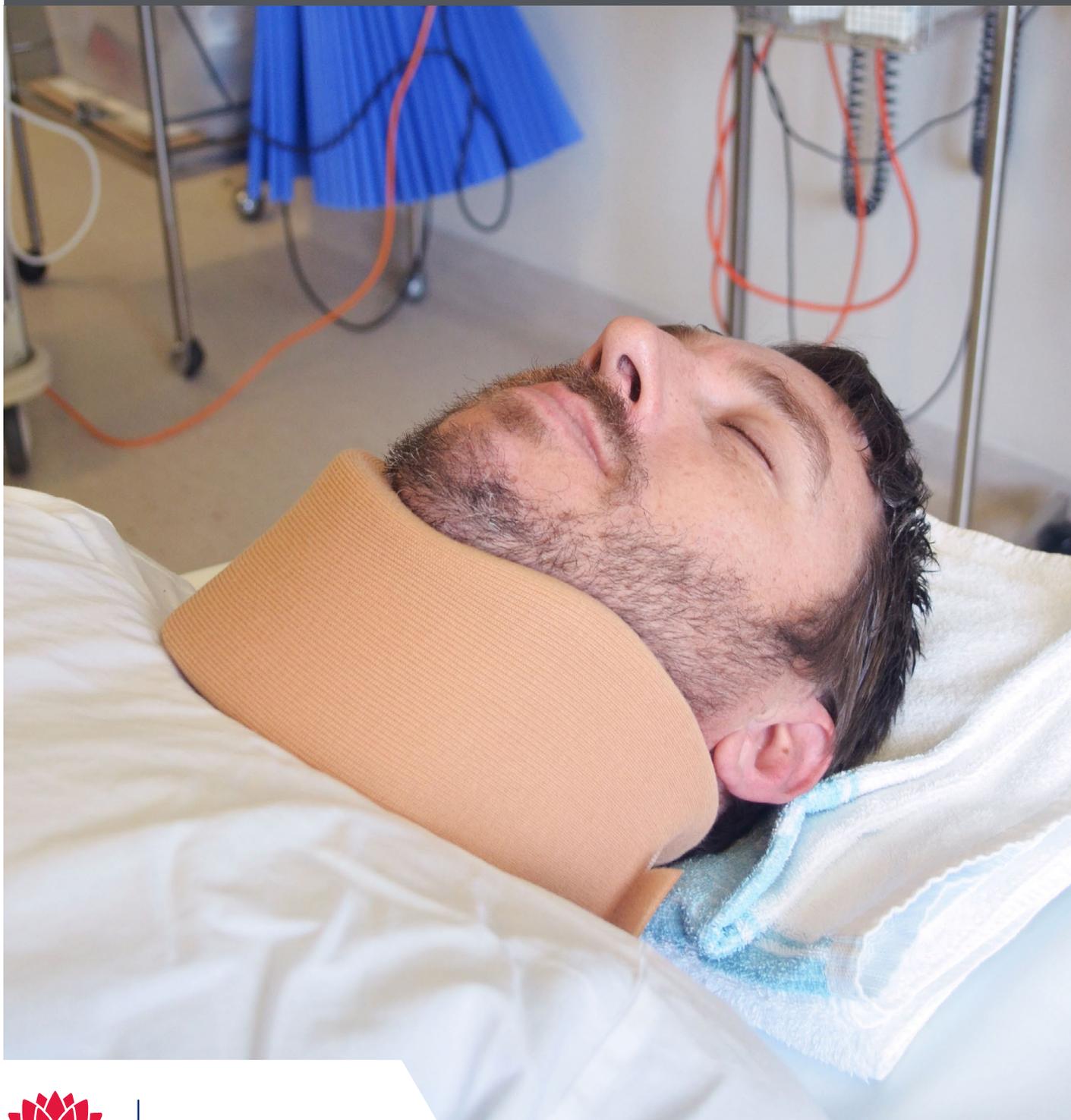


Use of foam collars for cervical spine immobilisation

Initial management principles



The Agency for Clinical Innovation (ACI) works with clinicians, consumers and managers to design and promote better healthcare for NSW. It does this by:

- *service redesign and evaluation* – applying redesign methodology to assist healthcare providers and consumers to review and improve the quality, effectiveness and efficiency of services
- *specialist advice on healthcare innovation* – advising on the development, evaluation and adoption of healthcare innovations from optimal use through to disinvestment
- *initiatives including guidelines and models of care* – developing a range of evidence-based healthcare improvement initiatives to benefit the NSW health system
- *implementation support* – working with ACI Networks, consumers and healthcare providers to assist delivery of healthcare innovations into practice across metropolitan and rural NSW
- *knowledge sharing* – partnering with healthcare providers to support collaboration, learning capability and knowledge sharing on healthcare innovation and improvement
- *continuous capability building* – working with healthcare providers to build capability in redesign, project management and change management through the Centre for Healthcare Redesign.

ACI Clinical Networks, Taskforces and Institutes provide a unique forum for people to collaborate across clinical specialties and regional and service boundaries to develop successful healthcare innovations.

A priority for the ACI is identifying unwarranted variation in clinical practice and working in partnership with healthcare providers to develop mechanisms to improve clinical practice and patient care.

www.aci.health.nsw.gov.au

AGENCY FOR CLINICAL INNOVATION

Level 4, 67 Albert Avenue
Chatswood NSW 2067

PO Box 699 Chatswood NSW 2057

T +61 2 9464 4666 | F +61 2 9464 4728

E aci-info@health.nsw.gov.au | www.aci.health.nsw.gov.au

SHPN (ACI) 180485, ISBN 978-1-76000-898-7.

Produced by: NSW Institute of Trauma and Injury Management (ITIM) and the Emergency Care Institute (ECI)

Further copies of this publication can be obtained from the Agency for Clinical Innovation website at www.aci.health.nsw.gov.au

Disclaimer: Content within this publication was accurate at the time of publication. This work is copyright. It may be reproduced in whole or part for study or training purposes subject to the inclusion of an acknowledgment of the source. It may not be reproduced for commercial usage or sale. Reproduction for purposes other than those indicated above, requires written permission from the Agency for Clinical Innovation.

Version: 0.1

Trim: ACI/D18/672

Date Amended: June 2018

ACI_0087# (06/18)

© Agency for Clinical Innovation 2018

Cover image credit/photographer: Professor Kate Curtis, Illawarra and Shoalhaven Local Health District

Acknowledgements

The content of these key principles was adapted from NSW, Australian and International Trauma Services cervical spine immobilisation guidelines. Specifically this document references content and/or has had input from the following organisations, local health districts (LHDs) and clinicians:

- Agency for Clinical Innovation (ACI)
 - Emergency Care Institute (ECI)
 - Institute of Trauma and Injury Management (ITIM)
 - Trauma Innovation Committee
 - Intensive Care NSW (ICNSW)
 - State Spinal Cord Injury Service (SSCIS)
- NSW Ambulance
- Queensland Ambulance
- South East Sydney Local Health District (SESLHD)
 - Trauma Service, St George Hospital
- Illawarra and Shoalhaven Local Health District (ISLHD)
 - Kate Curtis, Emergency Clinical Nurse Consultant
- National Institute for Health and Care Excellence (NICE), UK
- Spinal Surgeons of NSW
- Australian and New Zealand Committee on Resuscitation.

Glossary

Cervical collar	Medical device used to stabilise/support and limit the movement of a person's cervical spine
Cervical spine (c-spine)	Cervical vertebrae of the spine
ED	Emergency Department
eMR	Electronic medical record
Foam (soft) collar	Disposable single use cervical collar made of soft, open-cell foam plastic with a cotton stockinette cover and touch tape closure
LHD	Local health district
Rigid (stiff-neck) collar	Single-use rigid or semi-rigid cervical collar made of a plastic (plexiglass) foam sandwich composite that is a single piece and requires no assembly
SAC	Severity assessment code
SCI	Spinal cord injury

Contents

Introduction	1
Evidence and position statement on the use of cervical collars	2
Scientific evidence on the use of cervical collars	2
Position statement on the use of cervical collars	2
Key principles of spinal care	3
Prehospital	3
Emergency Department	3
Unconscious, intubated patients in the Intensive Care Unit	3
Radiological assessment and imaging	3
Documentation	3
Implementation and monitoring	4
Implementation	4
Monitoring	4
References	5
Appendix: Example of LHD-based policy and procedure document	6

Introduction

A cervical collar is a medical device used to stabilise the neck of a person who has experienced an actual or potential traumatic injury to their cervical spine (c-spine).

There are a range of cervical collars manufactured, from foam (soft) collars to rigid collars.

The ACI Institute of Trauma and Injury Management (ITIM) reviewed relevant scientific literature and clinical network consensus on the use of rigid collars in patients with suspected cervical spinal injury and concluded that the risks of immobilisation with rigid collars outweigh the chance of benefit. The review was carried out in collaboration with the Emergency Care Institute (ECI).

This document outlines the ITIM and ECI position on the use of cervical collars and key principles of foam cervical collar use. It also includes information on monitoring foam cervical collar use in NSW.

The key principles have been developed to support health professionals who assess and treat patients with suspected cervical spinal injury in the prehospital and Emergency Department settings, including medical retrieval teams and Emergency Department clinicians.

The aim is continued patient-centred clinical practice, supporting the improvement of the prehospital and hospital-based management of patients with suspected cervical spinal injury.

The principles represent framework for NSW Ambulance and LHDs to implement foam cervical collars for trauma patients, and can be used to implement local procedures.

Evidence and position statement on the use of cervical collars

Scientific evidence on the use of cervical collars

There is no scientific evidence that any type of cervical collar used in prehospital transport or initial trauma management is effective in stabilising an acutely injured cervical spine or preventing further neurological deterioration in those with spinal cord injury (SCI).¹ However, there is evidence that rigid collars can lead to significant complications and morbidity when used to immobilise the c-spine.²⁻³

Potential complications of rigid collars

There are several clinically important complications associated with the use of rigid collars that are well described in the scientific literature.

- The rate of pressure areas of the scalp and neck associated with rigid collar use has been reported to range from 10-30% depending on the grade of skin compromise and duration of collar application.⁷⁻⁸
- It is well known that pain associated with rigid collar use can adversely affect compliance with immobilisation strategies designed to protect patients from further harm in the prehospital and hospital settings.⁹
- Rigid collar use is associated with impaired jugular venous return and rises in intracranial pressure both in head-injured and healthy people.¹⁰⁻¹² Increases in intracranial pressure described in observational studies and case series of head injured patients range from 4-7mmHg.¹⁰⁻¹² These increases can potentially compromise cerebral autoregulation and worsen outcomes in patients with severe head injury.
- Rigid collars, by restricting neck movement, may also impair respiratory effort and forced expiratory volume, particularly in older patients with chest injury or comorbid respiratory conditions, predisposing these patients to aspiration and pneumonia.⁸

A recent meta-analysis demonstrated increased mortality (RR=2.5, 95% CI 1.07, 5.41) associated with spinal immobilisation in patients with penetrating trauma, with no benefits observed with respect to reversible spinal injury.¹³

Position statement on the use of cervical collars

After consultation with specialist clinicians across NSW and consideration of the available evidence, ITIM and ECI have concluded that the risks of immobilisation with rigid collars outweigh the chance of benefit.

ITIM and ECI are advocating for the adoption of foam cervical collars in the initial management of injured adults and children requiring cervical spine immobilisation being transported by NSW Ambulance and presenting to NSW Health facilities.

Queensland Ambulance Service and a number of specialist trauma and spinal services in NSW, ACT and QLD have adopted the use of the foam cervical collars.⁴⁻⁵ This change in practice has been supported by the Australian and New Zealand Committee on Resuscitation (ANZCOR) and the Spinal Surgeons of NSW.⁶

The change from rigid cervical collars to foam cervical collars is not a downgrading of spinal care and does not mean that the spine is cleared. The adoption of the foam cervical collar is part of holistic spinal care that encompasses the initial care, imaging and diagnosis, ongoing stabilisation and treatment of suspected or actual spinal injuries. This change represents a patient-centred approach, supported both by the scientific literature and medical experts who manage acute bony and spinal cord injuries in adults and children. The following key principles should be considered when reviewing or developing localised spinal care clinical guidelines or procedures.

Key principles of spinal care

Prehospital

- Manage patients (adults and children) in the prehospital setting in accordance with NSW Ambulance *Protocol T5: Spinal Injuries*¹², with the application of a foam cervical collar to indicate that the cervical spine requires further assessment and imaging in the Emergency Department (ED) or on the ward if the spine has not been cleared in the ED.
- Medical retrieval teams should clinically assess the patient's neck for soft tissue and/or vascular injuries before applying the locally agreed cervical spine clearance criteria.
- Manage patients with any cervical collar device at the scene with full spinal precautions.
- When immobilising the cervical spine, tailor the approach to the person's specific circumstances. For example, it may be safer to avoid applying any cervical collar in patients with a pre-existing anatomical deformity or in uncooperative, agitated or distressed people.¹³ Neck bolstering devices, tape and sandbags may be used to provide additional lateral stability where appropriate.
- Only use a rigid backboard for extrication.¹⁵
- Document spinal care and precautions in the ambulance patient case sheet or electronic medical record (eMR) to facilitate safety monitoring.

Emergency Department

- Assess the patient using a decision support tool such as the National Emergency X-Radiography Utilisation Study (NEXUS) cervical spine clearance criteria.¹⁶ If the patient does not meet clearance criteria, apply a foam collar.
- To optimise neutral alignment of the cervical spine, position the adult patient on a bed and consider applying padding under the occiput. In children, consider applying padding under the torso (dependent on size and age).
- Explain to the patient the purpose of the foam cervical collar and the need to maintain alignment.
- Expedite radiological assessment and imaging.
- Maintain cervical spine immobilisation until a management plan has been determined and documented, and further diagnostics have been performed and/or reviewed.
 - If cervical bony injury is identified, or if the patient cannot be cleared in ED due to competing priorities, apply a locally agreed cervical immobilisation collar such as a Philadelphia or Miami J collar, and refer to neurosurgery for advice.

Unconscious, intubated patients in the Intensive Care Unit

- Maintain the cervical collar and apply spinal precautions. The sedated and/or medically paralysed patient will not be able to self-splint in the presence of spinal injury.
- Expedite radiological assessment and imaging.
 - If cervical bony injury is identified or the patient cannot be cleared due to competing priorities or ongoing neurological signs referable to the cervical spine, apply locally agreed cervical immobilisation collar such as a Philadelphia or Miami J collar, and refer to neurosurgery for advice.
 - In circumstances where there is no cervical bony injury identified and there are no ongoing clinical suspicions of cervical injury, a foam cervical collar may be maintained in accordance with local policies until the patient can be assessed further. Evidence suggests that with appropriate neurosurgical expertise, such patients can be safely cleared with no further imaging.¹⁷⁻¹⁸

Radiological assessment and imaging

- Determine the need for radiological assessment of the cervical spine using decision support tools such as the NEXUS criteria,¹⁶ together with clinical evaluation of the patient's clinical presentation, condition, history and examination findings.
- The choice of radiological investigations is influenced by the patient's age, mechanism and suspicion of injury as well as the resources available to the clinician at the time of assessment.
- Decisions regarding the need for and type of radiological assessment of the cervical spine should be made in consultation with senior clinicians and be based on local policies and procedures.
- Imaging for spinal injury should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.¹⁴

Documentation

- Document assessment or imaging results, spinal clearance status or ongoing treatment requirements in the patient notes.
 - If the cervical spine is cleared, documentation needs to state how, by whom, and who the decision was discussed with.
 - If the cervical spine remains uncleared, documentation needs to state why it remains uncleared, how immobilisation is to be maintained, and who the decision was discussed with.

Implementation and monitoring

Implementation

This NSW ACI position statement represents endorsement based on a review of relevant scientific literature and clinical network consensus. It therefore represents a framework for NSW Ambulance and LHDs to implement foam cervical collars for trauma patients being transported to ED.

The ACI will collaborate with NSW Ambulance to support statewide implementation of foam cervical collar use. This will involve seeking approval from relevant NSW Ambulance governance committees.

LHDs and trauma services will be notified of proposed changes to NSW Ambulance and emergency practice at least one month prior to implementation.

This document may be used to develop or revise local procedures for the implementation of foam cervical collars in ED (see [Appendix](#) for an example of a local procedure).

Implementation may involve:

- education of clinicians and paramedics
- a public awareness campaign to inform the community about the change in practice
- identification of foam cervical collars supplies, which can be recorded on a NSW stock registry to allow sites to ensure stores are available
- monitoring collar use and compliance through established and routine data collection and clinical governance.

Monitoring

Data on foam cervical collar use and any complications associated with major trauma patients will be monitored by ITIM through the NSW Trauma Registry and the ITIM Clinical Review Committee. The ACI will also use linked data from NSW Ambulance.

Data on prehospital and hospital use of foam collars will be tracked using the prehospital and hospital procedure coding sections on the NSW Trauma Registry, entered by trauma services across NSW.

The ITIM Clinical Review Committee will monitor and report on any severity assessment code (SAC) 1 or 2 incidents associated with cervical collar use in trauma patients presenting to ED.

An interim report on the implementation of foam cervical collars will be prepared by the ACI one year after the implementation of the key principles and presented for peer review.

References

1. Miller CP, Bible JE, Jegede KA, Whang PG, Grauer JN. Soft and rigid collars provide similar restriction in cervical range of motion during fifteen activities of daily living. *Spine* (1976). 2010;35(13):1271–8.
2. Quinn J, Enraght-Moony E, Queensland Ambulance Service. QAS spinal immobilisation evidence review [Internet]. Queensland Ambulance Service; 2015. Available from: https://prehospitalandretreivalmedicine.files.wordpress.com/2015/05/spinal-immobilisation-evidence-review_170314_v3_eem.pdf
3. Kwan I, Bunn F. *Effects of prehospital spinal immobilization: A systematic review of randomized trials on healthy subjects*. Vol. 20, Prehospital and Disaster Medicine. 2005. p. 47–53.
4. Queensland Government, Queensland Ambulance Service. *Clinical practice procedures: trauma/cervical collar*. 2016.
5. Curtis K, St George & Sutherland Hospitals. *Cervical collars for suspected cervical spine injury in the Emergency Department*. 2016.
6. Australian and New Zealand Committee on Resuscitation. *Guideline 9.1.6 – Management of Suspected Spinal Injury*. 2016.
7. Ham W, Schoonhoven L, Schuurmans MJ, Leenen LP. Pressure ulcers from spinal immobilization in trauma patients: a systematic review. *J Trauma Acute Care Surg*. 2014 Apr; 76(4):1131–41. doi: 10.1097/TA.000000000000153.
8. Peck GE, Shipway DJH, Tsang K, Fertleman M. Cervical spine immobilisation in the elderly: a literature review. *Br J Neurosurg*. 2018 Feb 28;1–5. doi: 10.1080/02688697.2018.1445828.
9. Myers LA, Russi CS, Hankins DG, Berns KS, Zietlow SP. Efficacy and compliance of a prehospital spinal immobilization guideline. *Int J Emerg Med*. 2009 Apr;2(1):13–7. doi: 10.1007/s12245-009-0082-2. Epub 2009 Feb 14.
10. Ho AM, Fung KY, Joynt GM, Karmakar MK, Peng Z. Rigid cervical collar and intracranial pressure of patients with severe head injury. *J Trauma*. 2002 Dec; 53(6):1185–8.
11. Maissan IM1, Ketelaars R, Vlottes B, Hoeks SE, den Hartog D, Stolker RJ. Increase in intracranial pressure by application of a rigid cervical collar: a pilot study in healthy volunteers. *Eur J Emerg Med*. 2017 Jul 19. doi: 10.1097/MEJ.000000000000490.12
12. NSW Ambulance. Protocol T5: Spinal Injuries [intranet]. Available at: <http://intranet.ambulance.nsw.gov.au/asintranet/clinical/Clinical+Procedures/Protocols+and+Pharmacology/NSW+Ambulance+Protocol+and+Pharmacology>
13. Mobbs RJ, Stoodley MA, Fuller J. Effect of cervical hard collar on intracranial pressure after head injury. *ANZ J Surg*. 2002 Jun; 72(6):389–91.
14. Velopulos CG, Shihab HM, Lottenberg L, Feinman M, Raja A, Salomone J, Haut ER. Prehospital spine immobilization/spinal motion restriction in penetrating trauma: A practice management guideline from the Eastern Association for the Surgery of Trauma (EAST). *J Trauma Acute Care Surg*. 2018 May;84(5):736–744. doi: 10.1097/TA.0000000000001764.
15. National Institute for Health and Care Excellence. Spinal injury: assessment and initial management [Internet]. 2016. Available from: <https://www.nice.org.uk/guidance/ng41/resources/spinal-injury-assessment-and-initial-management-pdf-1837447790533>
16. Hoffman JR, Mower WR, Wolfson AB, Todd KH, Zucker MI. Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma. *N Engl J Med*. 2000 Jul 13;343(2):94–9.
17. Patel MB, Humble SS, Cullinane DC, Day MA, Jawa RS, Devin CJ, Delozier MS, Smith LM, Smith MA, Capella JM, Long AM, Cheng JS, Leath TC, Falck-Ytter Y, Haut ER, Como JJ. Cervical spine collar clearance in the obtunded adult blunt trauma patient: a systematic review and practice management guideline from the Eastern Association for the Surgery of Trauma. *J Trauma Acute Care Surg*. 2015 Feb; 78(2):430–41. doi: 10.1097/TA.0000000000000503.
18. Lukins TR, Ferch R, Balogh ZJ, Hansen MA. Cervical spine immobilization following blunt trauma: a systematic review of recent literature and proposed treatment algorithm. *ANZ J Surg*. 2015 Dec; 85(12):917–22. doi: 10.1111/ans.13221.

Appendix: Example of LHD-based policy and procedure document

The following information has been adapted with permission from the SESLHD and ISLHD procedure on the use of foam collars in the suspected cervical spine injured patient, titled Foam Collars: Guide to the use of in patients with suspected cervical spine injury in the prehospital and Emergency Department setting.

Statement

A cervical collar is an orthopaedic device that may be used to physically and consciously acknowledge the potential for cervical spine injury. There is a lack of evidence for the efficacy of spinal immobilisation in the prevention of spinal cord injury (SCI). There is evidence however that rigid cervical collars lead to significant complications and morbidity when used to immobilise the cervical spine. These complications and difficulties with rigid cervical collars include: significant discomfort, time delays, tissue ulceration, increased intracranial pressure, impaired respirations, and in some cases the rigid cervical collar actually causing spinal injury.

The ACI (Institutes of Trauma and Emergency Care) are following the lead of Queensland's state-wide tertiary referral centre for spinal injuries, the Queensland Ambulance Service, major Trauma centres in NSW, ACT and the Australian and New Zealand Committee on Resuscitation. These sites, as well as many senior clinicians throughout NSW have considered all the available evidence and concluded the adverse event rate of rigid stiff neck collars significantly outweighed the potential benefits of this form of immobilisation.

The foam cervical collar is a disposable single use device made from soft, open-cell foam plastic with a cotton stockinette cover and touch tape closure. It is recommended services supply foam collars in small (40cm/7.5cm), medium (50cm/10cm) and large (52cm/12.5cm) sizes.

Aim

To describe the process of assessing suitability and applying a foam collar.

The aim of the foam cervical collar is to act as a marker for staff to apply spinal care principles whilst minimising equipment related adverse events.

Target audience

Prehospital, medical and nursing staff assessing and caring for patients with a potential cervical spine injury in the prehospital and Emergency Department settings.

Responsibilities

The following indications and contraindications should be considered by the ambulance officer, nurse or medical officer assessing the patient. The most common scenarios are outlined below.

	Indications <ul style="list-style-type: none">• Suspicion of a cervical spine or spinal cord injury
	Contraindications <ul style="list-style-type: none">• Surgical airway• Penetrating neck trauma
	Complications <ul style="list-style-type: none">• Discomfort• Anxiety.

Scenario and course of action

1. Patient is managed in the prehospital setting and has a foam collar placed because of suspicion of or known spinal cord injury (SCI) → leave foam collar in place and manage with full spinal precautions → when definitive imaging/diagnosis made, apply locally agreed collars such as Philadelphia or Miami J collars.
2. Patient arrives via ambulance with rigid collar → transfer to ED bed → apply padding under occiput (adults) or under torso (paediatrics) → expedite assessment using decision support tools → if unable to clear the cervical spine, change to foam cervical collar.
3. Unconscious patient arrives via ambulance with rigid collar → transfer to ED bed → apply padding under occiput (adults) or under torso (paediatrics) → likely to undergo expedited imaging → if cervical bony injury identified on CT, apply Philadelphia collar and refer to neurosurgery for advice → if no cervical bony injury identified, apply foam cervical collar and lateral support (sandbags). Once patient in ICU – follow ICU protocol.
4. Patient has obvious spinal cord injury (limb weakness/deficit) or bony injury identified on imaging → apply Philadelphia collar → apply padding under occiput/torso – await neurosurgical advice.
5. Patient presents to ED/UPCC with no collar → does not meet NEXUS / c-spine clearance criteria → apply foam cervical collar → position patient supine on bed and apply padding under occiput/torso.

Applying a foam cervical collar means to continue spinal care precautions

(log roll with inline stabilisation +/- sandbags)

Additional information

1. The ends of a correctly sized collar should meet/slightly overlap at the back of the patient's neck.
2. The foam collar can be trimmed to fit and re-covered with the additional cover supplied.
3. In adults, padding under the head (approximately 2cm) may optimise the neutral position.
4. In children, padding under the torso (dependent on size and age) may optimise the neutral position.
5. If not contraindicated (e.g. pelvic or thoracolumbar spine fractures), the head of the bed should be elevated 30 degrees to aid comfort, swallowing and respiratory function.



Source: Used with permission courtesy of Professor Kate Curtis, SESLHD

Measurement and application

1. Gently align the patient's head to a neutral anatomical position or position of greatest comfort.
2. Measure the distance between the base of the chin and the suprasternal notch.

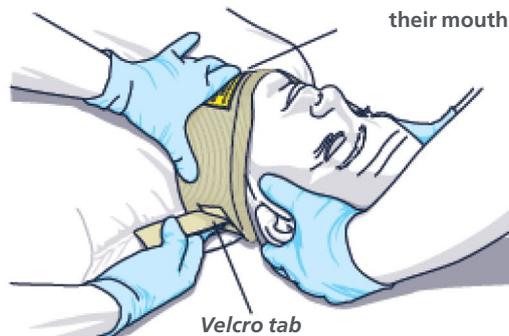


3. Select the appropriate size collar using a tape measure or by comparing patient's neck measurement to the width of the soft collar's chin support.

4. Slide the collar under the patient's neck (right to left) until the adhesive Velcro strap is clearly visible.



5. Mould the soft collar around patient's neck and secure the Velcro tabs.



6. Ensure the patient's chin rests on top of the collar and they are able to open their mouth.

Source: Queensland Ambulance Service. Clinical Practice Procedures: Trauma/Cervical collar
https://www.ambulance.qld.gov.au/docs/clinical/cpp/CPP_Cervical%20collar.pdf