The need to apply a properly sized and fitted hard cervical collar as an aid to spinal protection should always be considered whenever there is evidence or suspicion of actual or potential cervical spinal trauma or spinal cord injury. Cervical collars should only be fitted by suitably qualified and authorised healthcare professional or rescue first aider in accordance with manufacturer’s guidelines and locally established practice guidelines. Due to the potential for hidden spinal metabolic disease or deformity the fitting of a hard cervical collar in a patient aged more than 55 years should be approached with some caution lest it cause or compound a cervical injury.

### APPLICATION OF A ONE-PIECE COLLAR

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In order to maintain a secure position after fitting, collars must be fitted against bare skin. Clothing may need to be moved aside or cut away in order to facilitate this. Jewellery and earrings must be removed before fitting of collar. Check sensory and motor function and positional awareness in all four limbs before application.</td>
<td></td>
</tr>
<tr>
<td>2. Explain to the patient what is happening and why. A suitably qualified and experienced healthcare worker first measures the patient’s neck against anatomical landmarks (picture 1) and then adjusts the collar to the appropriate size against a visual scale in accordance with the manufacturer’s instructions and the collar design.</td>
<td></td>
</tr>
<tr>
<td>3. Prior to the fitting of any collar manual head holding must be in place. Fingers must be positioned to encompass as much of the patient’s head as possible but without obscuring the ears so that patient can hear explanations and instructions throughout the procedure.</td>
<td></td>
</tr>
<tr>
<td>4. With the patient’s head secured, the 1st assistant – team leader gently feeds the back piece of the collar into position, pressing the collar into the mattress surface to prevent friction with the patient’s skin.</td>
<td></td>
</tr>
<tr>
<td>5. The 2nd assistant assists as necessary to manoeuvre the collar back into its correct position.</td>
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</tr>
<tr>
<td>6. The front of the collar is now brought round into position and the velcro strap fastening is secured. Most collars incorporate cutaway panels to ensure visualisation of underlying skin, anatomical structures, dressings etc.</td>
<td></td>
</tr>
<tr>
<td>7. Check sensory and motor function and positional awareness in all four limbs again after application in comparison with pre-application assessment.</td>
<td></td>
</tr>
<tr>
<td>8. Check sizing and fitting of collar for security and patient comfort and make any adjustments prior to any further patient movement.</td>
<td></td>
</tr>
<tr>
<td>9. Carer holding head now moves hands down to patient’s shoulders maintaining tactile contact with collar surface throughout.</td>
<td></td>
</tr>
<tr>
<td>10. Fingers move inwards behind back of collar to encompass collar back and forearms move inwards to secure patient’s head against lateral movements. Manual head hold can now be released unless further movement of patient is required.</td>
<td></td>
</tr>
</tbody>
</table>
APPLICATION OF A TWO-PIECE COLLAR

The application of a properly sized and fitted two-piece cervical collar is usually undertaken within hospital environments as an aid to continued spinal protection in patients with actual or suspected cervical spinal or spinal cord injury. Two-piece collars usually replace extrication collars within the first 48 hours of admission. All models of two-piece cervical collars should only be fitted by suitably qualified and authorised healthcare professional in accordance with manufacturer’s guidelines and locally established practice guidelines. Due to the potential for hidden spinal metabolic disease or deformity the fitting of a two-piece cervical collar in a patient aged more than 55 years should be approached with some caution lest it cause or compound a cervical injury.

1. Cervical Collar Sizing Guide
   Reproduced with kind permission of Aspen Medical Products.

2. Explain to the patient what is happening and why. A suitably qualified and authorised healthcare professional first measures the patient’s neck against anatomical landmarks using a sizing guide provided by the collar manufacturer (see picture 1) and then selects the most appropriate collar in accordance with the manufacturers instructions and the collar design. This collar is also available with a size adjustable front piece.

3. Prior to the fitting of any collar manual head holding must be in place. Fingers must be positioned to encompass as much of the patient’s head as possible but without obscuring the ears so that patient can hear explanations and instructions throughout the procedure.

4. With the patient’s head secured, the 1st assistant – team leader gently feeds the back piece of the collar into position, pressing it into the mattress to prevent friction with the patient’s skin. The 2nd assistant assists as necessary to manoeuvre the collar back into its correct position.

5. The front-piece of the collar is then brought into position by an assistant who brings the collar piece up and under the chin in a straight line. Curling and flexing of the collar piece before fitting ensures a more comfortable fit.

6. The velcro fastenings are then secured. Check sensory and motor function and positional awareness in all four limbs again after application in comparison with pre-application assessment.

7. Picture depicts position of hands during a logroll to facilitate removal of collar back for visualisation or examination of underlying skin or posterior cervical spine. This model of collar has a small window to allow for ventilation but also useful for examining status of any underlying surgical wound or dressing.

8. Head holding as at end position of adapted ATLS logrolling (see ATLS and Tetra logroll). Hand positioning is same whether patient presents with or without collar in situ. This picture also shows an alternative and smaller size of back piece provided for this model of collar and designed to reduce incidence of collar-derived occipital pressure ulcers, particularly within critical care environments.
ADAPTED ATLS HEAD HOLD FOR ACTUAL OR POTENTIAL CERVICAL SPINAL INJURY

Advanced trauma life support manual and training stipulate a standardized approach to head holding in the event of actual or suspected spinal injury. The healthcare worker responsible for head holding is designated as the Team Leader and directs all patient movement. However, the degree of lateral flexion experienced by the Team Leader during logrolling is excessive and this represents an adaptation of the current technique as recommended by American College of Surgeons’ Committee on Trauma (ACS). (2008) Advanced Trauma Life Support Manual for Physicians (8th edition). American College of Surgeons Press, Chicago.

1. Explain to the patient what is happening and why. A suitably qualified and experienced health care worker will be designated as Team Leader. The Team Leader positions self at top of trolley / bed, placing hands either side of patient’s head. With fingers spread wide, slides both hands downwards so the thumb rests either below the jaw or above the clavicle and the fingers are spread behind the neck encompassing C7. If sandbags / headblocks are present an assistant removes them, one at a time and the Team Leader brings each hand into position individually. Forearms are then brought together either side at the back of the head.

2. Prior to rolling the patient, care must be taken to position the bed height at optimum level to reduce excessive forward trunk flexion of the Team Leader. Patient is then rolled on the command of the Team Leader. To accommodate this roll, Team Leader is forced to lean laterally. Note fingers crossed behind cervical spine as described above.

3. In order to maintain a comfortable head hold during the logroll, the Team Leader releases top hand and maintaining contact with the skin throughout, moves hands slowly to the top of the patient’s head with fingers spread wide. They should then adjust base of body and legs to a more comfortable and sustainable position.

4. Shows adapted ATLS head hold from the opposite side showing alignment nose – chin – sternum. A chair can be made available for the Team Leader to sit down during prolonged holding to enable the elbows to be rested on a pillow. The Team Leader must be aware that they are allowed to return the patient to the supine position if they feel the strain of maintaining the turn becomes excessive and beyond their limitations. In patients with broad shoulders, a pillow or pad can be used to support the Team Leader’s underlying arm but it must be of the correct depth to maintain spinal alignment.
ACUTE TETRAPLEGIC SPINAL LOGROLL – Method 1

During an acute tetraplegic logroll the patient’s head and vertebral column must be kept in alignment when rolling from supine to side lying and vice versa. During this manoeuvre the alignment of the vertebral column and the body as a whole is maintained through the manual support provided by the turning team.

(1st assistant – Team leader & acute head hold in accordance with adapted ATLS procedure; 2nd assistant – shoulder level; 3rd assistant – hip level; 4th assistant – lower leg level; 5th assistant – operating the bed controls, supporting arms, checking patient’s skin, placing pillows in situ etc)

Logrolling on a trolley in the Emergency Department or within a ward setting on a normal hospital bed or tilt and turn bed is essential to enable examination of the back and necessary for relieving pressure on the skin, hygiene, bowel care and postural chest drainage. The following technique is applicable in all clinical settings.

Logrolling on a trolley in the Emergency Department or within a ward setting on a normal hospital bed or tilt and turn bed is essential to enable examination of the back and necessary for relieving pressure on the skin, hygiene, bowel care and postural chest drainage. The following technique is applicable in all clinical settings.

1. Team leader undertakes acute initial head hold in accordance with adapted ATLS procedure. 5th assistant passively positions patient’s arms across chest but above diaphragm. This is important as the arms are paralysed and may fall down causing injury to the shoulder joint.

2. 2nd assistant reaches over patient. First hand on shoulder and second hand on top of hip. 5th assistant supports patient’s arm during this action.

3. Close up of hand positions – ensure all parties are in contact with the patient's natural skeletal landmarks and not just adipose tissue.

4. 3rd assistant positions hands. First hand at hip level alongside the 2nd assistant, and second hand underneath furthest thigh.

5. 4th assistant positions hands. First hand under the knee of the furthest leg, and second hand below the ankle of the same leg.

6. 5th assistant passively positions patient’s arms across chest but above diaphragm. This is important as the arms are paralysed and may fall down causing injury to the shoulder joint.
ACUTE TETRAPLEGIC SPINAL LOGROLL – Method 2

Logrolling of SCI patients occurs with some frequency in a ward setting. Logrolling is necessary for relieving pressure on the skin, medical examination, postural chest drainage, physiotherapy, routine hygiene and bowel care. Where appropriate, some of the physical effort associated with the manual logroll can be reduced through the use of a mechanical turning bed. (1st assistant – Team leader; 2nd assistant – shoulder level; 3rd assistant – hip level; 4th assistant – lower leg level; 5th assistant – operating the bed controls, supporting arms, checking patient’s skin, placing pillows in situ etc)

A team of five health care workers are required to logroll a patient with acute tetraplegia. All commands come from the team leader who also takes responsibility for protecting the patient’s cervical spine. Team leader takes position first applying an adapted ATLS head hold. 2nd assistant in line holds shoulders and hip, 3rd assistant holds hip and under upper thigh, 4th assistant holds under knee and under ankle. 5th assistant is responsible for operating bed controls, checking patient’s skin and placing pillows in situ.

On the command of the team leader, the 5th assistant presses the control button to start the bed turning towards the turning team. As the angle of turn increases, the turning team members provide support for the patient’s body as required, to maintain spinal alignment. The team leader adjusts their position in accordance with the increasing turning angle in order to prevent excessive lateral leaning.

Once the patient has achieve a suitable side lying position the team leader orders the 5th assistant to stop turning the bed any further and then orders the turning team to hold the patient in position while the 5th assistant returns the bed to flat position again. During this part of the turn, the 4th assistant must ensure that the patient’s upper leg is kept in alignment with the lower leg throughout the turn. To maintain lateral alignment, the outer malleolus should be maintained at a height level with the upper trochanter.

With the bed now flat again the 5th assistant inspects the patient’s skin for any signs of pressure damage. Additional cares such as bowel care, hygiene, and sheet changing can also be performed while the patient is in this position.

With the patient supported in a logroll one pillow is positioned to support the patient’s back and two pillows are positioned to support the upper leg in a side-lying position.

On the command of the team-leader the patient is lowered down onto the pillows by the turning team and their position adjusted to ensure proper alignment. Legs are positioned to prevent hyperextension of the knees, a bed end is placed in situ and additional pillows placed at the end of the bed to support the patient’s feet in neutral to prevent foot drop. The heels are left “floating” free from pressure to prevent skin breakdown (not illustrated).
MECHANISED TURN FOR POSTURAL CHANGE

The availability of a mechanical turning bed can enhance the experience of turning in alignment for patients with actual or suspected spinal injury. This is particularly beneficial for tetraplegic patients, patients with multiple trauma and acute chest complications, as well as for patients whose size causes a significant risk for staff during routine manual turning.

(1st assistant – Team leader & acute head hold in accordance with adapted ATLS procedure; 2nd assistant – shoulder level; 3rd assistant – hip level; 4th assistant – operating the bed controls, supporting arms, checking patient’s skin, placing pillows in situ etc)

Team leader undertakes acute initial head hold in accordance with adapted ATLS procedure. 2nd assistant provides contact guard against inappropriate patient movement. 3rd assistant positions pillow between to maintain hip abduction.

2nd and 3rd assistant provide contact guard against inappropriate movement of the patient during mechanical turning of the bed. Team leader gives the command when all the team are in position to commence the turning of the bed.

4th assistant checks inclinometer fitted to the bed and stops the bed at the required degree of tilt.

Team insert pillows under both arms and legs for patient comfort and alignment.

Legs are positioned to prevent hyperextension of the knees, a bed end is placed in situ and additional pillows placed at the end of the bed to support the patient’s feet in neutral to prevent foot drop. The heels are left ‘floating’ free from pressure to prevent skin breakdown (not illustrated).
Logrolling within a ward setting is necessary for relieving pressure on the skin, hygiene and bowel care. With patient supported in a logroll one pillow is positioned to support the patient’s back. Two pillows are positioned to support the upper leg in a side-lying position. Legs are positioned to prevent hyperextension of the knees, a bed end is placed in situ and additional pillows placed at the end of the bed to support the patient’s feet in neutral to prevent foot drop. The heels are left "floating" free from pressure to prevent skin breakdown.

Logrolling of acute paraplegic patients in whom the possibility of accompanying cervical spinal injury has been excluded and the patient is usually allowed a single pillow under the head (more for patients demonstrating spondylitis). This logroll requires only 4 members of staff as the patient is able to support and control his own head movements although extreme cervical flexion or sudden rotation of the head should be discouraged as these may cause pain at the injury site in patients with upper thoracic injuries.

Positioning of hands is important and utilises natural skeletal landmarks for security of hold and patient comfort. 1st assistant reaches over patient. First hand on shoulder and second hand on top of hip, 2nd assistant positions hands. First hand at hip level alongside 1st assistant and second hand underneath furthest thigh, 3rd assistant position hands. First hand under the knee of the furthest leg, and second hand below the ankle of the same leg.

Following the logroll, the patient’s upper leg must be kept in alignment with the lower leg throughout the turn to prevent any flexion movement being relayed to the thoraco-lumbar spine. To maintain lateral alignment, the outer malleolus should be maintained at a height level with the upper trochanter.
POSTURAL ALIGNMENT

Physical landmarks are visualised to demonstrate postural alignment of the spine during turning and positioning of SCI patients.

During all patient movements all commands come from the team leader who also takes responsibility for monitoring the physical alignment of the patient’s spine during and after turning and transfer procedures by monitoring the alignment of body landmarks.

From their sight position at the patient’s head they can monitor the alignment of the nose, sternum and pubic symphysis. They can also observe lateral alignment of shoulders, ribcage, hips and legs for signs of spinal rotation. When at rest, the head should be supported to maintain mid-line position using pads or blocks.

The accompanying pictures illustrate correct postural alignment of SCI patients following turning and transfer procedures. Upper limbs should be supported in a position that guards against contractures of elbow, wrist and fingers until the patient is assessed for splints.

Legs are positioned to prevent hyperextension of the knees, a bed end is placed in situ and additional pillows placed at the end of the bed to support the patient’s feet in neutral to prevent foot drop. The heels are left ‘floating’ free from pressure to prevent skin breakdown.

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AIRWAY PROTECTION

Traumatic SCI occurs without warning and casualties often present having recently eaten or, more often, having drunk a significant amount of alcohol prior to the accident. Vomiting is common following SCI and usually occurs at the scene or during transportation to hospital. Vomiting is a particular hazard in children and those experiencing near-drowning following aquatic SCI incidents. The risk of aspiration is highest whilst the SCI patient is positioned supine as they are unable to adequately protect their own airway.

As this picture illustrates, paramedical and emergency care staff are trained in turning patients secured appropriately on spinal boards using minimum numbers of staff initially. This turning technique is enabled by first bearing down on the near side of the spinal board with one hand to induce a rolling movement before reaching across to the opposite side with the other hand to facilitate turning.

Once the patient has been removed from the spinal board, rapid logrolling by 4 health workers with an additional person needed to perform suctioning is the usual response to a vomiting SCI patient in A&E but the availability of staff can delay an immediate response or compromise spinal alignment.

Whenever a significant risk of vomiting exists it is preferable to retain the patient on a spinal board until primary screening and examinations have been completed and the patient can then be positioned on a trolley or in a bed in a lateral side-lying position to improve airway clearance. Management of the vomiting SCI patient will also include administration of an appropriate anti-emetic and gastric decompression via nasogastric tube.
ADJUSTING SKIN LOADING

At the end of a turning and positioning episode, the SCI patient has a tendency to place undue pressure upon the underlying bony surfaces and weight-bearing areas as they are unable to adjust the loading pressure upon their skin without assistance.

Adjusting skin loading should form part of the routine at the end of a turn or transfer. Once the patient has been aligned to the satisfaction of the team leader, the team will disperse to their other duties. However one nurse remains to perform the procedure. Adjusting skin loading is better learnt as a practical technique so this poster serves only as an illustration.

There is no lifting involved in this technique. The carer places both of their hands under the patient’s shoulder blade with palms uppermost and gently draws them out towards them, allowing the natural resistance of the patient’s bodyweight to create a slight traction that redistributes the surface area of the skin as the hands are withdrawn.

Keeping their hands in the same position the carer now moves their hands under the patient’s arm and hand until they move out from under the patient’s body completely.

The carer now moves to the patient’s lower body and places both hands palms uppermost under the patient’s buttock. Carer must ensure that they avoid any twisting or prolonged stooping of their trunk during this procedure.

Again moving slowly and without attempting to lift upwards, the carer begins to draw their hands along under the patient’s buttock and down the leg until they again move out from under the patient’s body completely.

The carer then moves to the opposite side of the bed and repeats the procedure for the other side of the patient’s body. After completion, any pillows necessary to maintain patient alignment are placed in situ, the patient made comfortable and the bed space restored.

The benefit of this technique is firstly that it ensures the broadest distribution of underlying skin pressure in patients who are unable adjust their position independently. Secondly, with an increasing incidence of SCI patients with incomplete sensory loss, it reduces patient discomfort during periods of enforced bed rest, reducing the number of requests by the patient to care staff for additional and unplanned turning and repositioning during the day.
LATERAL TRANSFER USING A SPINAL BOARD

Although spinal boards were primarily designed to be used during the extrication and evacuation of casualties to hospital, they still serve a useful purpose after admission, along with scoop stretchers to protect the patient’s spine from lateral forces experienced during sliding transfers between flat surfaces, in accordance with manufacturer’s guidelines and locally established practice guidelines.

1. Team assemble and team leader explains procedure and confirms all team members understand individual role in procedure. Team leader applies adapted ATLS head hold if appropriate and rest of turning team take position for logrolling patient. Before logrolling commences, 5th assistant places spinal board in position. Note board held in angle position for insertion and not flat.

2. Team leader gives command to roll and team turn patient in unison onto chosen side. Whilst it is most common to turn patient onto left side to facilitate medical examination (as picture above) but in patients with cervical injury it is often preferable to turn patient on to their right side to avoid inducing vaso-vagal cardiac syncope. 5th member places spinal board in situ angled against the patient’s back.

3. Team leader gives command to return patient to supine position and checks alignment. Any necessary adjustments in position to maintain alignment are made before head blocks and straps are applied. If the patient might require to be tilted on the spinal board for pressure relief or there is a risk of vomiting, additional padding is inserted to prevent inappropriate lateral movement.

4. With the patient now secured, team members should reassemble in different positions before undertaking the transfer to reduce the potential for postural strain. This may not always be possible due to staffing numbers and the experience of the staff available at the time.

5. The new team leader continues to provide manual support for the cervical spine as rest of team prepare to insert a patient transfer board beneath the spinal board. By bearing down on the edge of the spinal board, the two team members on the left of the picture can induce a slight raising of the spinal board on the opposite side allow for an easier insertion of a sliding aid. If appropriate, a sliding sheet or patient roller can also be introduced beneath the spinal board at this time.

6. The team leader gives the command to slide the patient across between the two flat surfaces in gradual stages. Never attempt to transfer the patient across in one movement.

7. The team reassembles to logroll the patient again to remove the spinal board. Again, wherever staffing numbers and experience allow, team members should reassemble in different positions before undertaking the final logroll to reduce the potential for repetitive strain. As an alternative to reduce the incidence of logrolling during transfers, a patient can be transferred onto and off of a spinal board using a flat lifting scoop stretcher hoist.

8. As the spinal board is removed, the 5th member of the team takes the opportunity to inspect the patient’s underlying skin for signs of pressure damage after transfer.
The SIA Academy is the training arm of the Spinal Injuries Association which promotes training, education, social research, Spinal Cord Injury awareness and best practice in living with spinal cord injury.

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REMOVAL FROM VACUUM MATTRESS

The vacuum mattress is the preferred device to provide spinal protection during inter-hospital transfers of critically-ill patients or those with serious trauma such as acute spinal or spinal cord injuries, in accordance with manufacturers instructions and locally established practice guidelines.

Emergency Department staff prefer wherever possible not to have trauma patients arriving on vacuum mattresses as removal requires additional logrolling of a patient in pain and with unknown injuries. In addition, the vacuum mattress is not suitable to use as a splint for patients with acute pelvic fractures unless they have other means of pelvic splinting in situ. If the fracture is unstable the patient may continue to “bleed out” on releasing the mattress and collapse.

Positioning a patient with actual or suspected spinal injury in a vacuum mattress (not illustrated). The patient is scooped onto the mattress at the scene. And the mattress folded around their body and secured with straps. The mattress is filled with tiny silicone beads which vacuum mould to the patient when all of the air is pumped out. The mattress is then loaded onto a spinal board or scoop stretcher because it lacks a suitably rigid base. Special care is required to ensure that the head and cervical spine are properly supported throughout these operations. Once in hospital, the vacuum mattress can be used to continue to protect the patient during flat surface-to-surface transfers and the patient can even be x-rayed or scanned with the vacuum mattress in place if required.

Removing a patient with actual or suspected spinal injury from a vacuum mattress.
First apply manual cervical spinal protection whether or not a cervical collar is in situ before undoing all of the mattress straps. Do not cut any straps. Now open the air valve on the outer mattress surface to let the air reinflate the mattress. The mattress sides will now become flexible again so that they can be unwrapped from around the patient. The air is then pumped out of the mattress again providing a flat surface from which the patient can then be retrieved using a flat lifting scoop stretcher hoist.

A flat lifting scoop stretcher hoist is the preferred transfer method. An alternative option is to use a lateral transfer board and sliding sheet to transfer a patient on a scoop stretcher between surfaces.

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ASSISTED COUGH

Paralysis of the abdominal muscles causes severe impairment of forced expiration. The cough mechanism will be altered in SCI patients with a neurological level of T11 and above. The higher the level of lesion the more likely the patient will require assistance with coughing. Patients with complete cervical spinal cord lesions are at greatest risk of respiratory complications. Medical advice should always be sought first before attempting assisted coughing in new SCI patients, those with chest injuries, cardiovascular disease, abdominal trauma or disease or who are pregnant.

Two-person technique: Clear verbal direction and co-ordination between the person(s) helping and the patient is essential for these techniques to be successful. Stand on either side of the bed. Each person places their hands on the upper and lower ribs of the same side with their fingers spread and pointing upwards and centrally. As the patient attempts to cough, push inwards and upwards simultaneously. This method may not be suitable for a patient who has an unstable spine because if the actions are not performed simultaneously it introduces rotation of the thorax.

This two person method is preferred if spinal stability is a consideration as both people are pushing bilaterally which will minimise rotation. Stand on either side of the bed. Each person places one forearm across the upper abdomen of the patient with their other hand on the upper or lower ribs of both sides of the chest. As the patient attempts to cough, push inwards simultaneously.

Single person technique: spread your hands anteriorly around the lower rib cage and upper abdomen. With your elbows extended push inwards and upwards with both arms as the patient attempts to cough. Arms must be kept extended for this technique to work effectively, it may therefore not be appropriate to use if the patient’s bed does not lower to a suitable height.