

MOVING AND HANDLING PATIENTS WITH ACTUAL OR SUSPECTED SPINAL CORD INJURIES (SCI)

Produced by the Spinal Cord Injury Centres
of the United Kingdom and Ireland

Initiated by
Multidisciplinary Association of
Spinal Cord Injury Professionals

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FOREWORD

The integrated care pathway for acute spinal cord injuries (SCI) patients involves numerous transfers between surfaces, wards and departments or even between different hospitals before eventual admission to a specialist care facility. Wherever there is a reasonable suspicion of acute SCI, the aim is to maintain full spinal alignment during any moving and handling activity. Careful handling, positioning and turning, on every occasion, can prevent or significantly reduce patient pain and discomfort. It will also reduce the potential for skin damage and secondary spinal cord trauma (Harrison 2007).

These pictorial guidelines are provided as a resource for moving and handling trainers to support the promotion of best practice. There are numerous scenarios associated with the initial management of acute patients presenting within hospital with 'actual', 'potential' or 'uncleared' spinal cord injuries

The management of this project was coordinated between the Multidisciplinary Association of SCI Professionals (MASCIP) and the Spinal Injuries Association (SIA) with sponsorship provided by Huntleigh Healthcare. The clinicians within the project team that developed this resource combined the knowledge, skills and experiences of healthcare professionals employed within the 12 UK and Irish SCI Centres. They were supported by clinicians representing Emergency Departments, Critical Care, Orthopaedic and Neurosciences Departments within District General and University Teaching Hospitals. Additional assistance was also provided by medical device manufacturers to showcase the generic range of equipment available to support the moving and handling of SCI patients.

The initial review of these guidelines was principally undertaken by members of the UK and Irish Forum for SCI Multi-professional Education (SCIMPE), the SIA Academy and Moving and Handling Specialists with appropriate post graduate qualifications. The final review was undertaken by a broad spectrum of practicing healthcare professionals and members of university nursing schools with a role responsibility for teaching moving and handling of patients.

Please note that these pictorial guidelines focus on specific key elements associated with the moving and handling of 'actual', 'potential' or 'uncleared' SCI patients. These guidelines make no reference to the fundamental practical, professional, and legislative principles of safe moving and handling practices, which should already be implicit. These guidelines must therefore be used with reference to the organizations moving and handling safe of systems of work, operational guidelines / policies, current equipment provision and national legislation.

KEY POINTS FOR TRAINERS

Up to six members of staff may be required to work together in order to undertake routine turning and transfer procedures and they must have supreme confidence in their ability to work as a team. This can provide challenging within teams consisting of members of different disciplines. All moving and handling must be coordinated by a nominated team leader and undertaken with a quiet confidence in the team's ability. Gaining the attention, confidence and co-operation of the conscious patient before attempting any manoeuvre will enhance the team's efforts to maintain spinal alignment throughout the procedure.

The team leader for any manoeuvre will always be identified as the person in the position closest to the patient's head from where the patient's alignment throughout the manoeuvre can be monitored. The team leader is also responsible for checking and recording the patient's sensory and motor function in all four limbs at the beginning and end of a manoeuvre.

A properly justified, implemented and sustained programme of two-hourly turning can deliver multi-system benefits to patients with SCI during the acute bedrest stage. These benefits go far beyond the simple prevention of pressure ulcers (Hawkins et al, 1999).

During spinal shock, paralysed limbs are completely flaccid and care should be taken to prevent patients' limbs falling from the surfaces of beds and trolleys or becoming trapped in side rails. A patient whose flaccid arm falls from a bed, trolley or table may suffer disruption of the rotator cuff and shoulder joint, resulting in a second disabling condition. A leg allowed to fall under the same circumstances could pull a paralysed patient onto the floor.

A wide range of equipment is available to facilitate the movement and transfer of a patient with an acute SCI, increasing both staff and patient safety. Before investing in any equipment of this nature, staff in general areas should consult with their specialist peers for advice. Where applicable, manual support of the head and neck should be maintained during any flat surface transfers as an additional safeguard – even if a cervical collar is in situ. If cervical traction is in place, the traction cord should be shortened to maintain the pull of the traction weights during transportation. Alternatively, the traction cord may be tied off to the end of the scoop stretcher or spinal board.

After every manoeuvre, the patient's position and alignment should be checked, and the skin loading adjusted as required, in particular to ensure that the patient's buttocks are not allowed to compress against each other when supine. Manual separation of each buttock from its neighbour at the end of each turn usually suffices.

DEFINITIONS

LEVEL OF INJURY AND EXTENT OF PARALYSIS

Spinal Cord Injured Person (SCI)	An individual with a definitive neurological impairment due to trauma or disease of the spinal cord
Complete Lesion	This term is used to define injuries where no sensation or motor activity is preserved in the lowest part of the spinal cord (S4 / 5) and there is not motor function at least three levels below the cord injury
Incomplete Lesion	This term is used to define injuries where there is some preservation of sensation and / or voluntary movements below the level of the spinal cord injury

Level of injury and extent of paralysis

C4

Injury

TETRAPLEGIA

Results in complete paralysis below the neck



C6

Injury

TETRAPLEGIA

Results in partial paralysis of hands and arms as well as lower body



T4

Injury

PARAPLEGIA

Results in paralysis below the chest

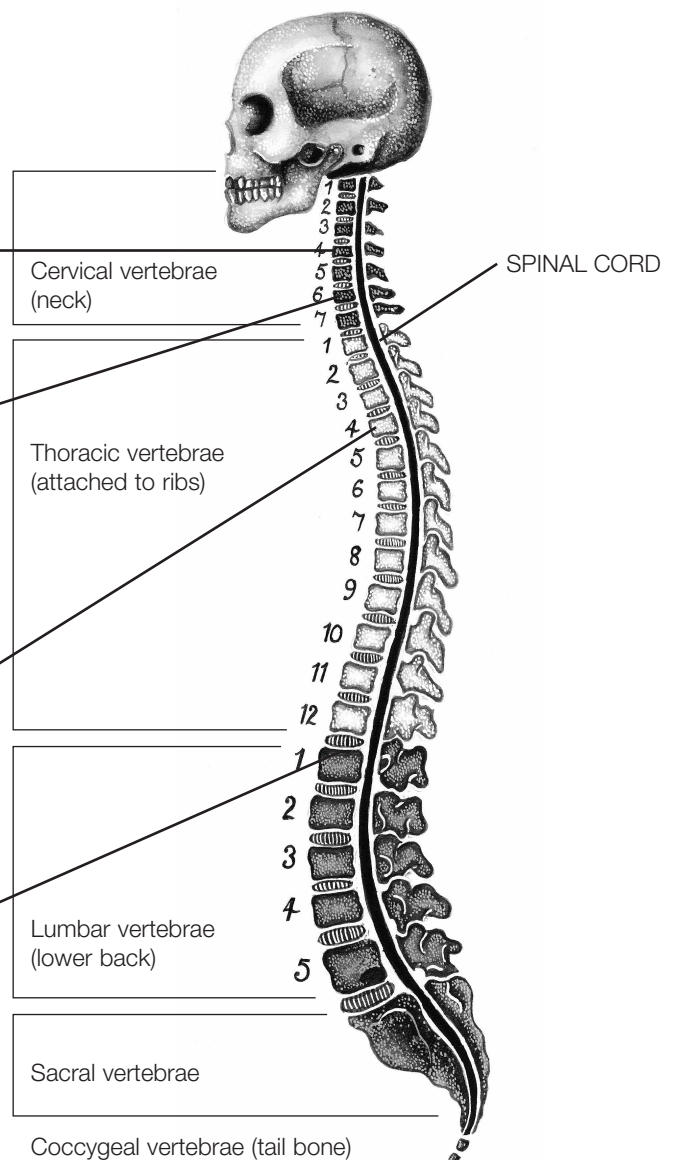


L1

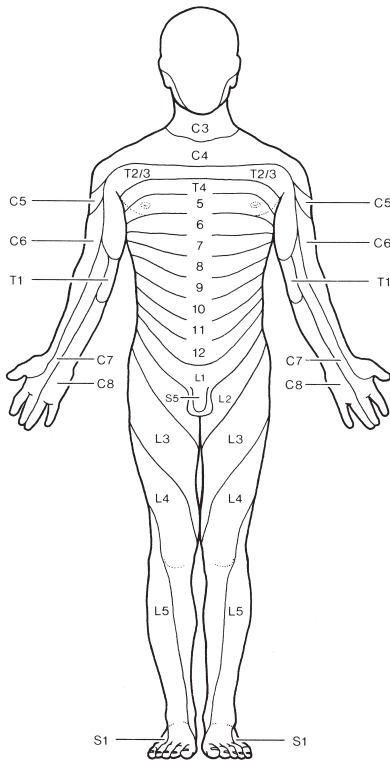
Injury

PARAPLEGIA

Results in paralysis below the waist

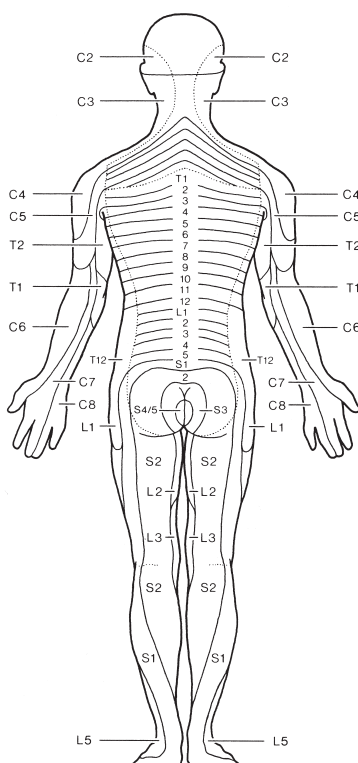


DERMATOME & MYETOME MAPS



Affects of Lesion at Level

SENSORY	
C2-C3	Neck
C4	Upper shoulder Upper anterior chest
C5	Lateral shoulder
C6	Radial forearm Thumb Index finger
C7	Middle finger Median strip of palm Back of hand
C8	Ring and little finger Ulnar forearm
T1-T2	Proximal medial arm Axilla
T2-T12	-
T4	Nipple line
T7	Lower costal margin
T10	Umbilicus
T12	Groin
L1-L2	Proximal anterior thigh
L3	Anterior knee
L4	Anterior lower leg
L5	Great Toe Medial dorsum of foot
S1	Lateral border of foot Sole
S3, S4, S5	Along Achilles tendon Genitals & saddle area



MOTOR	
C2	Neck muscles
C3	Diaphragm (Phrenic Nerve)
C4	Trapezius
C5	Deltoid, Biceps
T2	Extensor carpi radialis
T1	Triceps
C6	Extensor digitorum
C7	Flexor digitorum
C8	Hand Intrinsic (T2)
L1	Intercostals
L2	-
L3	Abdominals (T7-L2)
L4	-
L5	Ileo-psoas
S1	Adductors (L2)
S2	Quadriceps
S3	Medial hamstrings
S4	Anterior tibialis
S5	Lateral hamstrings
	Posterior tibialis
	Peroneals
	Extensor digitorum
	Extensor hallucis
	Gastrocnemius
	Soleus
	Anal/Bulbocavernosus reflexes (S2,S3,S4)
	Bladder, Lower Bowel

AMERICAN SPINAL INJURY ASSOCIATION STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL INJURY



Patient Name _____

Examiner Name _____

Date/Time of Exam _____

MOTOR

*KEY MUSCLES
(scoring on reverse side)*

	R	L	
C5	<input type="checkbox"/>	<input type="checkbox"/>	Elbow flexors
C6	<input type="checkbox"/>	<input type="checkbox"/>	Wrist extensors
C7	<input type="checkbox"/>	<input type="checkbox"/>	Elbow extensors
C8	<input type="checkbox"/>	<input type="checkbox"/>	Finger flexors (distal phalanx of middle finger)
T1	<input type="checkbox"/>	<input type="checkbox"/>	Finger abductors (little finger)
UPPER LIMB TOTAL			
		<input type="checkbox"/> + <input type="checkbox"/> = <input type="checkbox"/>	
		(25) (25) (50)	

Comments:

	R	L	
L2	<input type="checkbox"/>	<input type="checkbox"/>	Hip flexors
L3	<input type="checkbox"/>	<input type="checkbox"/>	Knee extensors
L4	<input type="checkbox"/>	<input type="checkbox"/>	Ankle dorsiflexors
L5	<input type="checkbox"/>	<input type="checkbox"/>	Long toe extensors
S1	<input type="checkbox"/>	<input type="checkbox"/>	Ankle plantar flexors

Voluntary anal contraction (Yes/No)

LOWER LIMB TOTAL	
<input type="checkbox"/> + <input type="checkbox"/> = <input type="checkbox"/>	
(25) (25) (50)	

SENSORY

KEY SENSORY POINTS

0 = absent
1 = impaired
2 = normal
NT = not testable

	R	L	R	L	
C2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
C8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
L1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
L2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
L3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
L4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
L5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
S1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
S2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
S3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
S4-5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Any anal sensation (Yes/No)

PIN PRICK SCORE (max: 112)

LIGHT TOUCH SCORE (max: 112)

NEUROLOGICAL LEVEL <small>The most caudal segment with normal function</small>	R	L	COMPLETE OR INCOMPLETE?	<input type="checkbox"/>	ZONE OF PARTIAL PRESERVATION <small>Caudal extent of partially innervated segments</small>	R	L
SENSORY	<input type="checkbox"/>	<input type="checkbox"/>	<small>Incomplete = Any sensory or motor function in S4-S5</small>	<input type="checkbox"/>	SENSORY	<input type="checkbox"/>	<input type="checkbox"/>
MOTOR	<input type="checkbox"/>	<input type="checkbox"/>	ASIA IMPAIRMENT SCALE	<input type="checkbox"/>	MOTOR	<input type="checkbox"/>	<input type="checkbox"/>

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AMERICAN SPINAL INJURY ASSOCIATION STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL INJURY

MUSCLE GRADING

- 0 total paralysis
- 1 palpable or visible contraction
- 2 active movement, full range of motion, gravity eliminated
- 3 active movement, full range of motion, against gravity
- 4 active movement, full range of motion, against gravity and provides some resistance
- 5 active movement, full range of motion, against gravity and provides normal resistance
- 5* muscle able to exert, in examiner's judgement, sufficient resistance to be considered normal if identifiable inhibiting factors were not present

NT not testable. Patient unable to reliably exert effort or muscle unavailable for testing due to factors such as immobilization, pain on effort or contracture.

ASIA IMPAIRMENT SCALE

- A = Complete: No motor or sensory function is preserved in the sacral segments S4-S5.
- B = Incomplete: Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.
- C = Incomplete: Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.
- D = Incomplete: Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.
- E = Normal: Motor and sensory function are normal.

CLINICAL SYNDROMES (OPTIONAL)

- Central Cord
- Brown-Sequard
- Anterior Cord
- Conus Medullaris
- Cauda Equina

STEPS IN CLASSIFICATION

The following order is recommended in determining the classification of individuals with SCI.

1. Determine sensory levels for right and left sides.
2. Determine motor levels for right and left sides.
Note: in regions where there is no myotome to test, the motor level is presumed to be the same as the sensory level.
3. Determine the single neurological level.
This is the lowest segment where motor and sensory function is normal on both sides, and is the most cephalad of the sensory and motor levels determined in steps 1 and 2.
4. Determine whether the injury is Complete or Incomplete (sacral sparing).
If voluntary anal contraction = No AND all S4-5 sensory scores = 0 AND any anal sensation = No, then injury is COMPLETE. Otherwise injury is incomplete.

5. Determine ASIA Impairment Scale (AIS) Grade:

Is injury Complete?

NO ↓

If **YES**, AIS=A Record ZPP
(For ZPP record lowest dermatome or myotome on each side with some (non-zero score) preservation)

Is injury motor incomplete?

YES ↓

If **NO**, AIS=B
(Yes=voluntary anal contraction OR motor function more than three levels below the motor level on a given side.)

Are at least half of the key muscles below the (single) neurological level graded 3 or better?

NO ↓
AIS=C

YES ↓
AIS=D

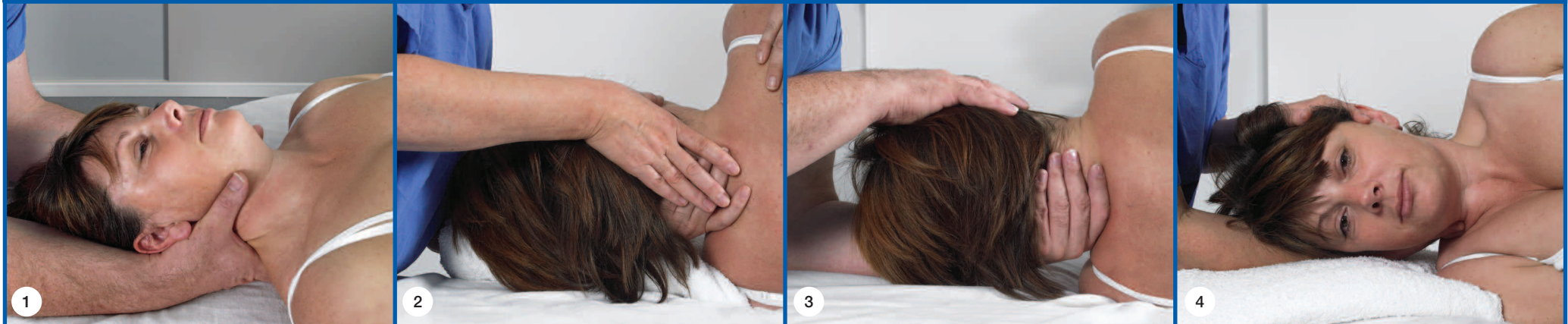
If sensation and motor function is normal in all segments, AIS=E

Note: AIS E is used in follow up testing when an individual with a documented SCI has recovered normal function. If at initial testing no deficits are found, the individual is neurologically intact; the ASIA Impairment Scale does not apply.

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

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 may be required to adopt a side flexed position. 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 their base of support (feet and legs) to a more comfortable and sustainable position while maintaining the head in the aligned 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.

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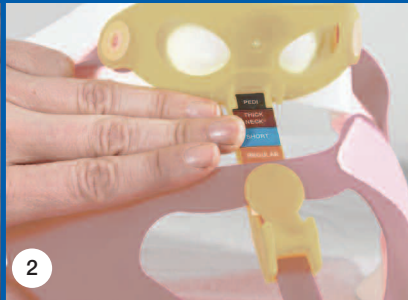
APPLICATION OF A ONE-PIECE COLLAR

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. The person who measures the neck should be the person who sizes the collar. 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.



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.



2

Explain to the patient what is happening and why. A suitably qualified and experienced health care 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.



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 the 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 the collar into the mattress surface to prevent friction with the patient's skin.



5

The 2nd assistant assists as necessary to manoeuvre the collar back into its correct position.



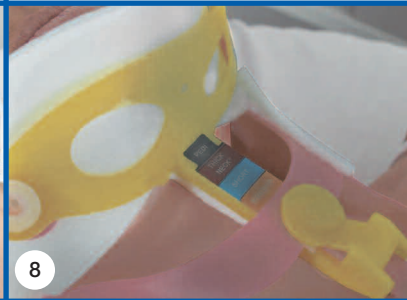
6

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.



7

Check sensory and motor function and positional awareness in all four limbs again after application in comparison with pre-application assessment.



8

Check sizing and fitting of collar for security and patient comfort and make any adjustments prior to any further patient movement.



9

Carer holding head now moves hands down to patient's shoulders maintaining tactile contact with collar surface throughout.



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.

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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. The person who measures the neck should be the person who sizes the collar. 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.

Aspen CERVICAL COLLAR SIZING GUIDE

Pick the Right Size

With the head in the neutral or decubital position, place the guide on the highest point of the trapezius and flat against the side of the head.

Slide an imaginary preperpendicular line from the bottom of the chin back to the guide and select the proper size collar.

Check for a Good Fit

- The chin must be flush with the front of the chin piece.
- The "flaps" on the front and back panels should be flush.
- The collar should be "snug" but not touch the tracheal area.

Extra Tall
Tall
Regular

Aspen Infant & Pediatric Collars
 A Proper Fit as Easy as "1 - 2 - 3"

- Chin Dots Hidden? The chin dots should be flush with the front of the chin piece.
- Velcro Fastenings? The velcro fastenings should be flush with the front of the chin piece.
- Flaps? The flaps should be flush with the front of the chin piece.

Sizing Guidelines - Please Refer Label Carefully!

Collar Size	Age Group	Weight Range (kg)	Length Range (cm)
PD 1	1 - 18 months	11-22 kg, average 17.5 kg	21-33 cm, average 27 cm
PD 2	9 - 24 months	22-33 kg, average 27.5 kg	29-37 cm, average 33 cm
PD 3	1 - 3 years	11-22 kg, average 16.5 kg	29-37 cm, average 33 cm
PD 4	3 - 5 years	22-33 kg, average 27.5 kg	33-42 cm, average 37.5 cm
PD 5	5 years and up	33-42 kg, average 37.5 kg	37-46 cm, average 41.5 cm
ADULT	Adult	50-110 kg, average 80 kg	42-51 cm, average 46.5 cm

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 manufacturer's 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.

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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)



1

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.



2

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.



3

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.



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 under the ankle of the same leg.



6

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

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ACUTE PARAPLEGIC SPINAL LOGROLL

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)



1
 Logrolling of acute paraplegic patients in whom the possibility of accompanying cervical spinal injury has been excluded. Following a risk assessment a single pillow under the head may be used particularly 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.



2
 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 under the ankle of the same leg.



3
 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.



4
 Logrolling within a ward setting is necessary for relieving pressure on the skin, hygiene and bowel care.



5
 With patient supported in a logroll one pillow is positioned to support the patient's back.



6
 Two pillows are positioned to support the upper leg in a side-lying position.



7
 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. Fully operational suction equipment should be available at all times.

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.

A patient can only be removed from the spinal board or placed in side lying if initial screening does not identify spinal cord trauma. To maintain airway protection 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.

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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 manufacturer's instructions and locally established practice guidelines.



1

Emergency Department staff prefer wherever possible not to have trauma patients arriving on vacuum mattresses direct from the scene of an accident 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.



2

Positioning a patient with actual or suspected spinal injury in a vacuum mattress (not illustrated). The patient is scoop transferred 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.



3

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.



4

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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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.



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.

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LATERAL TRANSFER USING SCOOP STRETCHER

Scoop stretchers were primarily designed to be used to recover patients from the floor at the scene of an accident but they have also proven a useful resource, along with spinal boards 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. Some models can also be combined with a flat-lifting hoist to reduce some of the physical stress experienced by the transfer team members.



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. 5th assistant, after checking integrity of scoop stretcher, stands ready to place first half of scoop stretcher into position. If using a size-adjustable model of scoop stretcher, 5th member to ensure that stretcher is measured appropriately against the patient before turning. Wherever staffing numbers and experience allow, team members should reassemble in different positions to reduce potential for repetitive strain.



2 Team leader gives command to roll and team turn patient in unison onto chosen side. In patients with cervical injury it is often preferable to turn patient on to right side to avoid inducing vaso-vagal cardiac syncope. 5th member places first half of scoop stretcher in position. Team leader gives command to return patient to supine position and checks alignment. Any necessary adjustments in position are made before team reassemble to logroll patient to the opposite side to allow 5th person to insert second half of scoop stretcher. A lateral transfer board can be placed at the same time the second half of scoop is inserted, to slide the patient to the desired surface **if a stretcher hoist is not available**.



3 Team leader maintains position at the head whilst trolley is removed and bed brought into position. Because this procedure only requires the patient to experience vertical ascent and descent it removes the potential for the stretcher to swing during an attempt to move the hoist and stretcher across a floor between surfaces. During hoisting the patient may experience anxiety, vertigo or nausea so the team member operating the hoist remains within the patient's view throughout the hoist transfer and informs the patient when hoisting or lowering commences.



4 Team leader maintains position at the head throughout the lifting operation. With the patient properly positioned and aligned in the scoop stretcher, the team leader checks with the 5th member that the connecting parts of the scoop stretcher are securely locked before ordering lifting of the patient to commence. Patients with retained sensation should be told that they may feel a slight flexing of the plastic blades during hoisting, which is normal.



5 With bed now in position, the patient is lowered onto the mattress and the turning team reassembles to remove the patient from the scoop stretcher. Raised bed sides can sometimes provide patients with extra reassurance during lowering onto the mattress but should be lowered before commencing any patient turning activity.



6 Team leader maintains position at the head during lowering but as team reassembles it may be appropriate to change position with another team member to reduce the risk of postural strain. Unless it is essential to visualise the patient's underlying skin after transfer, the patient can be removed from the scoop stretcher without further logrolling by unlocking the scoop and gently sliding each half out from under the patient in turn. The 3 members of the turning team are required to apply counter traction to the patient during removal of the scoop stretcher.

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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)



1 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.



2 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.



3 Once the patient has achieved 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.



4 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.



5 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.



6 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).

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MECHANISED TURN FOR POSTURAL CHANGE

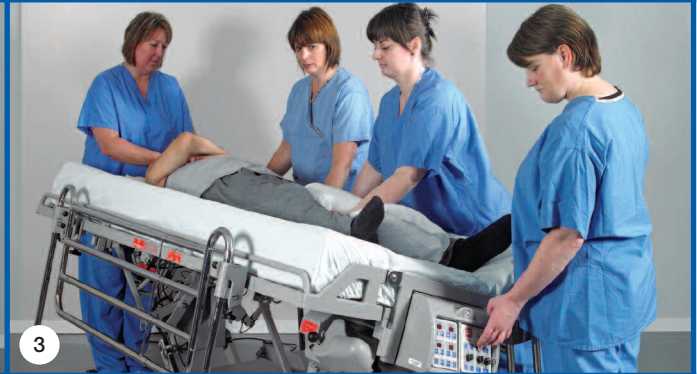
The availability of a mechanical turning bed can enhance the experience of turning in alignment for patients with actual or suspected spinal injury. This is particularly beneficial for tetraplegic patients, patients with multiple trauma and acute chest complications, as well as for patients whose size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



1 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 the legs to maintain hip abduction.



2 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.



3 4th assistant checks inclinometer fitted to the bed and stops the bed at the required degree of tilt.



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

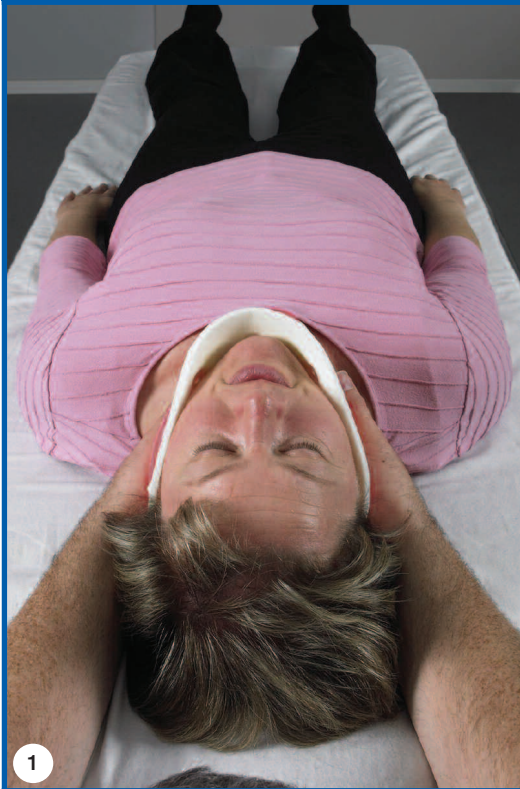


5 Legs are positioned to prevent hyperextension of the knees, a bed end is placed in situ and additional pillows placed at the end of the bed to support the patient's feet in neutral to prevent foot drop. The heels are left 'floating' free from pressure to prevent skin breakdown (not illustrated)

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POSTURAL ALIGNMENT

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



1

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.



2



3

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.



4



5

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.



6



7

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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ADJUSTING SKIN LOADING

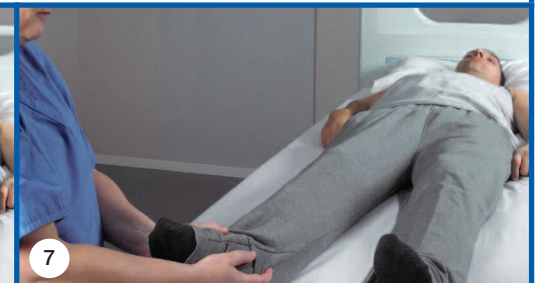
At the end of a turning and positioning episode, the SCI patient has a tendency to place undue pressure upon the underlying bony surfaces and weight-bearing areas as they are unable to adjust the loading pressure upon their skin without assistance.



Adjusting skin loading should form part of the routine at the end of a turn or transfer. The adjusted skin loading needs to initially focus on the buttocks, to ensure the natal cleft is separated, this is a two-person procedure and in the acute stage a third person may be used to stabilise the site of injury also. Once the buttock skin loading has been adjusted and 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 limb 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 patients 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.

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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.



1
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.

2
 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.

3
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.

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