Complete Summary

GUIDELINE TITLE

Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals.

BIBLIOGRAPHIC SOURCE(S)

Consortium for Spinal Cord Medicine. Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals. J Spinal Cord Med 2008;31(4):403-79. [331 references] PubMed

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
CONTRAINDICATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY

SCOPE

DISEASE/CONDITION(S)

Acute spinal cord injury

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Prevention
Risk Assessment
Treatment

CLINICAL SPECIALTY

Critical Care
Emergency Medicine
Neurological Surgery
Neurology
Nuclear Medicine
Nutrition
Orthopedic Surgery
Physical Medicine and Rehabilitation
Psychology
Pulmonary Medicine
Radiology
Surgery

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Dietitians
Emergency Medical Technicians/Paramedics
Health Care Providers
Hospitals
Nurses
Occupational Therapists
Physical Therapists
Physician Assistants
Physicians
Psychologists/Non-physician Behavioral Health Clinicians
Respiratory Care Practitioners
Social Workers
Speech-Language Pathologists

GUIDELINE OBJECTIVE(S)

To provide both individuals with spinal cord injury and the health-care providers with the best and most up-to-date information on acute injury management

TARGET POPULATION

Adults with acute (the first 72 hours) spinal cord injuries

INTERVENTIONS AND PRACTICES CONSIDERED

1. Prehospital triage
2. Transfer of patient to a Level I trauma center
3. Spinal stabilization during emergency transport and early in-hospital immobilization following spinal cord injury
4. 'ABCs' and Resuscitation
    - Airway and ventilatory support in patients with high tetraplegia
    - Prevention and treatment of hypotension
    - Fluid resuscitation
    - Recognition and treatment of neurogenic shock
    - Treatment of symptomatic bradycardia

    - Temperature monitoring and regulation
5. Pharmacologic neuroprotection, including steroids (considered but not recommended)
6. Clinical neurologic assessment for spinal cord injury
7. Radiographic evaluation of patients following spinal cord injury:
    - Multislice computed tomography (CT) protocol of the entire spine
    - Three views of all the regions of the spine with conventional antero–posterior and lateral plain radiographs
    - Magnetic resonance imaging (MRI) of the known or suspected area(s) of spinal cord injury
8. Comprehensive tertiary trauma survey for associated conditions and injuries
9. Surgical procedures (decompressing surgery or reduction)
10. General anesthesia with an endotracheal tube
11. Management of hypotension and bradycardia and maintaining normothermia
12. Analgesia and sedation
13. Prevention of secondary skin breakdown
14. Prevention and treatment of venous thromboembolism (VTE):
    - Low molecular weight heparin
    - Unfractionated heparin plus intermittent pneumatic compression
    - Placement of a vena cava filter only in case of active bleeding anticipated to persist for more than 72 hours
15. Respiratory management:
    - Monitoring closely for respiratory failure
    - Tracheotomy
    - Manually assisted coughing ("quad coughing"), pulmonary hygiene, mechanical insufflation-exsufflation
    - Protocol to prevent pneumonia
16. Placement of an indwelling urinary catheter
17. Gastrointestinal tract management:
    - Stress ulcer prophylaxis
    - Evaluation of swallowing function
18. Bowel care
19. Provision of adequate enteral nutrition
20. Glycemic control
21. Rehabilitation interventions:
    - Education of patients and families about the rehabilitation process
    - Physical therapy
    - Occupational therapy
    - Speech and language pathology
    - Assessment and treatment of psychosocial and family issues, including strategies for suicide prevention
22. Considerations for special mechanisms of spinal cord injury
23. Considerations for hysterical paralysis

MAJOR OUTCOMES CONSIDERED

- Sensitivity and predictive value of diagnostic assessments
- Incidence of spinal cord injury in adults
- Secondary complications
- Neurological outcome
- Emotional and psychological outcomes

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Methodology

United BioSource Corporation (UBC) performed a systematic review of the literature published since 1995 that describes early acute management of spinal cord injuries in the adolescent and adult population. Procedures for this review followed the best methods used in the evolving science of systematic review research. Systematic review is a scientific technique designed to minimize bias and random error by employing a comprehensive search process and a preplanned process for study selection.

Literature Search

The literature search included both electronic and manual components. Medline (via PubMed) was searched back to 1995 for citations using the following Medical Subject Heading [MeSH] terms and keywords:

1. Spinal cord injuries [MeSH] OR paraplegia/rehabilitation OR quadriplegia/rehabilitation
2. Acute OR early OR intensive care units [MeSH] OR trauma centers [MeSH] OR emergency medicine [MeSH] OR neuroprotective agents/therapeutic use OR emergency treatment [MeSH] OR emergency medical service [MeSH]
3. #1 AND #2 limits: publication date from 1995 to 2006 English, human, NOT reviews, letters, editorials

In addition, two strategies were used to identify papers that may not have been indexed on Medline by the time of the search cutoff date. The PubMed search included a keyword search for the prior 6 months, using terms indicating spinal cord injury and early acute management, with no limits; and Current Contents was searched for the past year, using similar search terms.

The Cochrane Library and the National Guideline Clearinghouse were searched for any recent systematic reviews of clinical guidelines on the subject that could have been sources for further references. A manual check of the reference lists of all accepted papers and of recent reviews was performed to supplement the above electronic searches. Abstracts from the electronic search were downloaded and evaluated using the literature review process described below.

Study Selection

To be eligible for inclusion in this review, studies contained none of the following exclusion criteria and each of the inclusion criteria:

Exclusion Criteria

- Abstracts, letters, comments, editorials, reviews, or surveys
- Animal and in vitro studies
- Languages other than English
- Study published before 1995
- No trauma (e.g., disease-related spinal cord lesions)
- Studies dealing with radiology protocols for cervical spine clearance

Inclusion Criteria

Studies were included if BOTH of the following criteria were met:

- Traumatic spinal cord injury or suspected spinal cord injury in patients age 13 or older
- Acute (preferably within 72 hours) or subacute (preferably within 1 week) spinal cord injury diagnosis, treatment, or management intervention studies

Search Yield

The searches yielded 1,227 abstracts. After all of the abstracts were downloaded, a level 1 screening was performed, in which abstracts were reviewed for exclusion criteria. The full article was then obtained for all accepted abstracts and for those abstracts for which a clear determination could not be made at level 1 screening. The full articles of 275 accepted studies underwent a level 2 screening, in which inclusion and exclusion criteria were applied. On completion of level 2 screening, all accepted articles were then eligible for data extraction. Any studies rejected at this level were reviewed by two researchers and listed in a reject log.

NUMBER OF SOURCE DOCUMENTS

The literature search process resulted in 60 papers being accepted for data extraction, with an additional 3 papers being linked publications (additional publications for a given cohort of individuals).

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

I. Evidence based on randomized controlled clinical trials (or meta-analysis of such trials) of adequate size to ensure a low risk of incorporating false-positive or false-negative results.
II. Evidence based on randomized controlled trials that were too small to provide level I evidence. These may have shown either positive trends that were not statistically significant or no trends and were associated with a high risk of false-negative results.

III. Evidence based on nonrandomized, controlled or cohort studies, case series, case-controlled studies, or cross-sectional studies.
IV. Evidence based on the opinion of respected authorities or that of expert committees as indicated in published consensus conferences or guidelines.
V. Evidence that expressed the opinion of those individuals who were writing and reviewing these guidelines, based on their experience, knowledge of the relevant literature, and discussion with peers.

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Data Extraction and Database Development

Data extraction forms (DEFs) were designed specifically for this project. Data extraction involves the capturing of various data elements from each study and is performed by one investigator. A second investigator establishes a consensus for all extracted data, and a third party arbitrates disagreements, as necessary. The consensus versions of the DEF were entered into MetaHub™, United BioSource Corporation's (UBC's) relational database of clinical trials information.

After 100% of the entered data were validated against the consensus DEFs and full consistency and logic checks were performed on the database, the data were locked. After the data passed these quality control measures, they were used to generate evidence tables, which were delivered to Paralyzed Veterans for the panel's review.

A series of data elements were extracted, when possible, from each accepted study. These are available on request from Paralyzed Veterans.

Evidence Analysis

All studies accepted for data extraction were graded for level of evidence using the criteria from the Centre for Evidence-Based Medicine (www.cebm.net; accessed January 16, 2008) in Oxford, UK, described in the "Rating Scheme for the Strength of the Evidence." In addition, randomized clinical trials were assessed using the Jadad Quality Score Assessment. Industry sponsorship was also noted.

Evidence Review

The studies' quality ratings and evidence tables were prepared for use by Paralyzed Veterans panel members in their guideline deliberations. Evidence tables consisted of by-study listings of extracted information. Patient, intervention, and outcome combinations were too heterogeneous to permit quantitative synthesis of outcomes data.

During the panel deliberations and preparation of the recommendations, it became clear that the expert panel also drew extensively on a substantial literature base, providing support for their recommendations. Often, a recommendation is based on older studies of spinal cord injury (SCI) patients, or on studies of more heterogeneous groups of acutely injured patients with or without SCI, studies that were believed to be generalizable to the early SCI population. UBC independently graded these studies.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The guideline development process adopted by the Consortium for Spinal Cord Medicine consists of twelve steps, leading to panel consensus and organizational endorsement. After the steering committee chooses a topic, a panel of experts is selected. Panel members must have demonstrated leadership in the topic area through independent scientific investigation and publication. Following a detailed explication and specification of the topic by select steering committee and panel members, consultant methodologists review the international literature, prepare evidence tables that grade and rank the quality of research, and conduct statistical meta-analyses and other specialized studies, as needed. The panel chair then assigns specific sections of the topic to the panel members based on their area of expertise. Writing begins on each component using the references and other materials furnished by the methodology support group, with necessary additional references selected by the panel members and graded by the methodologists.

After panel members complete their sections, a draft document is generated during the first full meeting of the panel. The panel incorporates new literature citations and other evidence-based information not previously available. At this point, charts, graphs, algorithms, and other visual aids, as well as a complete bibliography, are added, and the full document is sent to legal counsel for review.

Grading the Guideline Recommendations

After panel members had drafted their sections of the guideline, each recommendation was graded according to the level of scientific evidence supporting it. The framework used by the methodology team is outlined in "Rating Scheme for the Strength of the Recommendations." It should be emphasized that these ratings, like the evidence table ratings, represent the strength of the supporting evidence, not the strength of the recommendation itself. The strength of the recommendation is indicated by the language describing the rationale.

If the literature supporting a recommendation comes from two or more levels, the number and level of the studies are reported (e.g., in the case of a recommendation that is supported by two studies, one a level III, the other a level V, the "Scientific evidence" is indicated as "III/V"). In situations in which no published literature exists, consensus of the panel members and outside expert

reviewers was used to develop the recommendation and is indicated as the "Strength of Panel Opinion."

Grading of Panel Consensus

The level of agreement with the recommendation among panel members was assessed as either low, moderate, or strong. Each panel member was asked to indicate his or her level of agreement on a 5-point scale, with 1 corresponding to neutrality and 5 representing maximum agreement. Scores were aggregated across the panel members and an arithmetic mean was calculated. This mean score was then translated into low, moderate, or strong. A panel member could abstain from the voting process for a variety of reasons, including, but not limited to, lack of expertise associated with the particular recommendation.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Strength of Evidence Associated with the Recommendations (Grade of Recommendation)

A. The guideline recommendation is supported by one or more level I studies.
B. The guideline recommendation is supported by one or more level II studies.
C. The guideline recommendation is supported only by one or more level III, IV, or V studies.

Levels of Panel Agreement with Recommendation (Strength of Panel Opinion)

Low - Mean agreement score 1.0 to less than 2.33

Moderate - Mean agreement score 2.33 to less than 3.67

Strong - Mean agreement score 3.67 to 5.0

COST ANALYSIS

The economic considerations for treatment methods are outlined in Table 3 of the original guideline document.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

After legal analysis to consider antitrust, restraint-of-trade, and health-policy matters, clinical experts from each of the consortium organizations plus other select clinical experts and consumers review the draft document. The review comments are assembled, analyzed, and entered into a database, and the document is revised to reflect the reviewers' comments. The draft document is distributed to all consortium organization steering committee members. Final

technical details are negotiated among the panel chair, members of the organizations' boards, and expert panelists. If substantive changes are required, the draft receives a final legal review. The document is then ready for editing, formatting, and preparation for publication.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Rating schemes for the levels of scientific evidence (I, II, III, IV, V), grade of recommendation (A, B, C) and the strength of panel opinion (Low, Moderate, Strong) are defined at the end of the "Major Recommendations" field.

Triage Protocols and Trauma Systems of Care

Prehospital Triage

1. Develop appropriate guidelines for the evaluation and transport of patients with potential spinal cord injuries based on local resources. Identify regional trauma centers with special resources for the acute management of spinal cord injuries.

   (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

Trauma Center

2. Transfer the patient with a spinal cord injury (SCI) as soon as possible to a Level I trauma center, as defined by the American College of Surgeons or by state statute. Given local triage protocols and guidelines relating to transportation times to trauma centers, consider taking the patient directly to a Level I center if possible in preference to passing through a Level II or III center first.

   (Scientific evidence–II/III/IV; Grade of recommendation–B; Strength of panel opinion–5)

Spinal Cord Injury (SCI) Centers

3. Consider directing spinal cord–injured patients expeditiously to a specialized SCI center that is equipped to provide comprehensive, state-of-the-art care. Discuss pretransfer requirements with the referral center.

   (Scientific evidence–I/II/III/IV; Grade of recommendation–A; Strength of panel opinion–5)

Spinal Stabilization during Emergency Transport and Early In-Hospital Immobilization Following SCI

4. Immobilize the spine of all patients with a potential spinal injury from the scene of the injury to definitive care.

   (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

5. Emergency medical service (EMS) providers should use the following five clinical criteria to determine the potential risk of cervical spinal injury in a trauma patient:
   - Altered mental status
   - Evidence of intoxication
   - Suspected extremity fracture or distracting injury
   - Focal neurological deficit
   - Spinal pain or tenderness

   (Scientific evidence–I/II/IV; Grade of recommendation–A; Strength of panel opinion–5)

6. EMS providers should use the combination of rigid cervical collar immobilization with supportive blocks on a backboard with straps or similar device to secure the entire spine of patients with potential spinal injury.

   (Scientific evidence–I/II; Grade of recommendation–A; Strength of panel opinion–5)

7. In the emergency department, transfer the patient with a potential spinal injury as soon as possible off the backboard onto a firm padded surface while maintaining spinal alignment.

   (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

8. In cases of confirmed spinal or spinal cord injury, maintain spine immobilization until definitive treatment.

   (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

9. At the extremes of age, or in the presence of a preexisting spine deformity, provide patient care in the position of greatest comfort while maintaining immobilization.

   (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

10. Employ an adequate number of personnel during patient transfers for diagnostic studies and for repositioning to maintain the alignment of a potentially unstable spine and avoid shearing of the skin.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

11. Logroll the patient with a potentially unstable spine as a unit when repositioning, turning, or preparing for transfers.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

12. Consider a specialized bed for the patient with an unstable spine when prolonged immobilization is anticipated.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

13. Initiate measures to prevent skin breakdown if prolonged time on a backboard is anticipated.

    (Scientific evidence–II/IV; Grade of recommendation–B; Strength of panel opinion–5)

14. Perform a baseline skin assessment on removal of the backboard.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

'ABCs' and Resuscitation

15. Provide an airway and ventilatory support in patients with high tetraplegia early in the clinical course.

    (Scientific evidence–IV; Grade of recommendation–C; Strength of panel opinion–5)

16. Prevent and treat hypotension.

    (Scientific evidence–II/IV; Grade of recommendation–B; Strength of panel opinion–4)

17. Determine initial base deficit or lactate level to assess severity of shock and need for ongoing fluid resuscitation.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–4)

18. Exclude other injuries before assigning the cause of hypotension to neurogenic shock.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

19. Recognize and treat neurogenic shock.

(Scientific evidence–III/V; Grade of recommendation–C; Strength of panel opinion–5)

20. Monitor and treat symptomatic bradycardia.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

21. Monitor and regulate temperature.

    (Scientific evidence–I/II/III; Grade of recommendation–A; Strength of panel opinion–5)

Neuroprotection

Pharmacologic Neuroprotection in Patients with SCI

22. No clinical evidence exists to definitively recommend the use of any neuroprotective pharmacologic agent, including steroids, in the treatment of acute SCI to improve functional recovery.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

23. If it has been started, stop administration of methylprednisolone as soon as possible in neurologically normal patients and in those whose prior neurologic symptoms have resolved to reduce deleterious side effects.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

Diagnostic Assessments for Definitive Care and Surgical Decision Making

Clinical Neurologic Assessment for SCI

24. Perform a baseline neurological assessment on any patient with suspected spinal injury or SCI to document the presence of SCI. If neurologic deficits are consistent with SCI, determine a neurological level and the completeness of injury. Perform serial examinations as indicated to detect neurological deterioration or improvement.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

Radiographic Evaluation of Patients Following SCI

25. Image the entire spine in a patient with SCI.

    (Scientific evidence–I/II/IV; Grade of recommendation–A; Strength of panel opinion–5)

26. Perform a magnetic resonance imaging (MRI) of the known or suspected area(s) of SCI.

    (Scientific evidence–I/IV/V; Grade of recommendation–A; Strength of panel opinion–5)

Premorbid Spinal Conditions and the Extremes of Age: The Mobile and the Stiff Spine

27. In patients with SCI, be aware that bony imaging of the spinal column may be negative (i.e., "SCIWORA," or SCI without radiological abnormality).

    (Scientific evidence–II; Grade of recommendation–B; Strength of panel opinion–5)

28. In a patient with a stiff spine and midline tenderness, suspect a fracture. Consider MRI, bone scan, and/or computed tomography (CT) if the plain x-ray is negative for fracture, especially in the presence of spondylosis, ankylosing spondylitis (AS), or diffuse interstitial skeletal hyperostosis (DISH).

    (Scientific evidence–II/III/IV; Grade of recommendation–B; Strength of panel opinion–5)

Stingers and Transient Paresis

29. Every person who complains of symptoms of a "stinger" (i.e., pain and/or electrical feelings radiating down one arm following an impact) should be evaluated on an individual basis in terms of circumstances of injury, symptoms, radiographic findings, and previous history.

    (Scientific evidence–II/V; Grade of recommendation– C; Strength of panel opinion–5)

<u>Associated Conditions and Injuries</u>

The Tertiary Trauma Survey

30. Complete a comprehensive tertiary trauma survey in the patient with potential or confirmed SCI.

    (Scientific evidence–II/III/IV; Grade of recommendation–B; Strength of panel opinion–5)

Traumatic Brain Injury

31. In the patient with acute SCI, particularly higher cervical injury, assess and document early and frequently any evidence of traumatic brain injury (TBI) in the form of loss of consciousness and posttraumatic amnesia. Start the assessment in the prehospital setting, if appropriate, or *the emergency department*.

(Scientific evidence–II/III/IV; Grade of recommendation–B; Strength of panel opinion–5)

Limb Injuries

32. Perform early stabilization of extraspinal fractures.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

Chest and Abdominal Injuries

33. Screen for thoracic and intra-abdominal injury in all patients with SCI. Consider placing a nasogastric tube for abdominal decompression.

    (Scientific evidence–I/II/IV; Grade of recommendation–A; Strength of panel opinion–5)

Arterial Injuries

34. In high-energy injuries, consider the possibility of an aortic injury.

    (Scientific evidence–II/IV; Grade of recommendation–B; Strength of panel opinion–5)

35. Consider screening with CT or MR angiography for cerebrovascular injury in patients with a cervical SCI.

    (Scientific evidence–I/III/IV; Grade of recommendation–A; Strength of panel opinion–5)

Penetrating Injuries

36. In the presence of penetrating injuries to the neck or trunk, such as stab or gunshot wounds perform a careful neurological examination and screen for spinal injury.

    (Scientific evidence–I; Grade of recommendation–A; Strength of panel opinion–5)

37. Remove the cervical collar while maintaining inline stabilization to attend to major neck wounds or to perform life-saving procedures after cervical injury (large vessel injury or airway obstruction), as needed.

    (Scientific evidence–IV; Grade of recommendation–C; Strength of panel opinion–5)

38. Administer local wound care to stab and gunshot wounds to the spine. Provide proper antibiotic coverage; bullet fragments usually do not need removal.

(Scientific evidence–II/IV; Grade of recommendation–C; Strength of panel opinion–5)

Surgical Procedures

39. Perform a closed or open reduction as soon as permissible on patients with bilateral cervical facet dislocation in the setting of an incomplete SCI. If traction reduction is not preferred or possible, open reduction should be performed.

    (Scientific evidence–II/III/IV; Grade of recommendation–B; Strength of panel opinion–4.5)

40. Consider early surgical spinal canal decompression in the setting of a deteriorating SCI as a practice option that may improve neurologic recovery, although there is no compelling evidence that it will. Consider early spinal stabilization where indicated.

    (Scientific evidence–II/III/IV; Grade of recommendation–B; Strength of panel opinion–5)

Anesthetic Concerns in Acute SCI

41. Secure the airway, support respiratory status, and consider postoperative ventilatory support.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

42. Maintain mean arterial pressure (MAP) and perfusion with a balance of infusion and inotropes.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–4)

43. Anticipate bradycardia and hypotension during intubation of the tetraplegic patient.

    (Scientific evidence–III; Grade of recommendation–C; Strength of panel opinion–5)

44. Avoid the use of succinylcholine after the first 48 hours post-cord injury.

    (Scientific evidence–V; Grade of recommendation–C; Strength of panel opinion–5)

45. Monitor temperature, warm IV fluids, and use a patient warming device as needed.

(Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

46. Consider the use of intraoperative spinal cord monitoring in the patient with sparing of spinal cord function.

    (Scientific evidence–I/III/IV; Grade of recommendation–A; Strength of panel opinion–4)

Pain and Anxiety: Analgesia and Sedation

47. Minimize the pain of allodynia. Minimize evoked pain through thoughtful patient handling.

    (Scientific evidence–IV; Grade of recommendation–C; Strength of panel opinion–5)

48. Assess the patient's pain, preferably using a self-reported numeric rating scale.
    - Minimize reliance on reports by family members, who may underestimate pain.
    - If using a pain-rating scale based in part on the physiologic manifestations of stress associated with pain, recognize that some people with SCI and higher lesions may be unable to show changes in heart rate and blood pressure assessed by the pain score.
    - Provide adequate analgesia unless specific contraindications exist.
    - Consider short-acting sedation to allow periodic neurologic assessment.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

49. Employ contemporary medical guidelines to manage pain and distress in ventilated patients with SCI.

    (Scientific evidence–I; Grade of recommendation–A; Strength of panel opinion–5)

50. Consider the use of breath-controlled analgesia in the tetraplegic patient.

    (Scientific evidence–IV; Grade of recommendation–C; Strength of panel opinion–5)

Secondary Prevention

Patient Handling and Skin Protection

51. Assess areas at risk for skin breakdown frequently.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

52. Place the patient on a pressure reduction mattress or a mattress overlay, depending on the patient's condition. Use a pressure reducing cushion when the patient is mobilized out of bed to a sitting position.

    (Scientific evidence–III; Grade of recommendation–C; Strength of panel opinion–5)

53. Provide meticulous skin care:
    - Reposition to provide pressure relief or turn at least every 2 hours while maintaining spinal precautions.
    - Keep the area under the patient clean and dry and avoid temperature elevation.
    - Assess nutritional status on admission and regularly thereafter.
    - Inspect the skin under pressure garments and splints.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

54. Educate the patient and family on the importance of vigilance and early intervention in maintaining skin integrity.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

Prevention and Treatment of Venous Thromboembolism

55. Apply mechanical compression devices early after injury.

    (Scientific evidence–I/II; Grade of recommendation–A; Strength of panel opinion–5)

56. Begin low molecular weight heparin, or unfractionated heparin plus intermittent pneumatic compression, in all patients when primary hemostasis becomes evident. Intracranial bleeding, perispinal hematoma, or hemothorax are potential contraindications to the administration of anticoagulants, but anticoagulants may be appropriate when bleeding has stabilized.

    (Scientific evidence–I/IV; Grade of recommendation–A; Strength of panel opinion–5)

57. Consider placing a vena cava filter only in those patients with active bleeding anticipated to persist for more than 72 hours and begin anticoagulants as soon as feasible.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

Respiratory Management

58. Monitor patients closely for respiratory failure in the first days following SCI.

- Obtain baseline respiratory parameters (vital capacity, forced expiratory volume in 1 second [FEV1]) and arterial blood gases when patients are first evaluated and at intervals until stable.
- Consider mechanical ventilation for patients with tetraplegia.
- Admit patients with complete tetraplegia and injury level at C5 or rostral to an intensive care unit.

(Scientific evidence–II/III/IV; Grade of recommendation–B; Strength of panel opinion–5)

59. Perform a tracheotomy early in the hospitalization of patients who are likely to remain ventilator dependent or to wean slowly from mechanical ventilation over an extended period of time, unless the treating center has special expertise in the use of noninvasive ventilation.

    (Scientific evidence–IV/V; Grade of recommendation–C; Strength of panel opinion–5)

60. Treat retained secretions due to expiratory muscle weakness with manually assisted coughing ("quad coughing"), pulmonary hygiene, mechanical insufflation-exsufflation, or similar expiratory aids in addition to suctioning.

    (Scientific evidence–IV/V; Grade of recommendation–C; Strength of panel opinion–5)

61. Initiate a comprehensive protocol to prevent ventilator-associated pneumonia in patients with acute SCI who require mechanical ventilation for respiratory failure.

    (Scientific evidence–I/II/IV; Grade of recommendation–A; Strength of panel opinion–5)

Genitourinary Tract

62. Place an indwelling urinary catheter as part of the initial patient assessment unless contraindicated. If contraindicated, use emergent suprapubic drainage instead.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

63. Leave indwelling urinary catheters in place at least until the patient is hemodynamically stable and strict attention to fluid status is no longer needed.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

64. Priapism is usually self-limited in acute SCI and does not require treatment. There is no evidence to support avoidance of a urethral catheter in the presence of priapism secondary to acute SCI.

(Scientific evidence–II; Grade of recommendation–B; Strength of panel opinion–5)

Gastrointestinal Tract

65. Initiate stress ulcer prophylaxis.

    (Scientific evidence–I/III/IV; Grade of recommendation–A; Strength of panel opinion–5)

66. Evaluate swallowing function prior to oral feeding in any acute SCI patient with cervical SCI, halo fixation, cervical spine surgery, prolonged intubation, tracheotomy, or concomitant TBI.

    (Scientific evidence–I/II/III/IV; Grade of recommendation–A; Strength of panel opinion–5)

Bowel Care

67. Initiate a bowel program as recommended in the NGC summary of the clinical practice guideline Neurogenic Bowel Management in Adults with Spinal Cord Injury.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

Nutrition

68. Provide appropriate nutrition when resuscitation has been completed and there is no evidence of ongoing shock or hypoperfusion.
    - Use enteral nutrition rather than parenteral nutrition.
    - Feed a standard, polymeric enteral formula initiated within 24 to 48 hours after admission, using the semirecumbent position when possible to prevent aspiration.
    - Determine the caloric requirements for nutritional support in acute SCI using a 30-minute energy expenditure measurement by indirect calorimetry (metabolic cart).

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

Glycemic Control

69. Maintain normoglycemia in critically ill mechanically ventilated patients.

    (Scientific evidence–I/II/III/IV; Grade of recommendation–A; Strength of panel opinion–5)

Prognosis for Neurological Recovery

70. Within the first 72 hours, use the clinical neurological assessment as described by the International Standards for Neurological Classification of SCI to determine the preliminary prognosis for neurological recovery.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

71. If the clinical exam is unreliable, MRI findings or electrodiagnostic studies may be useful for determining prognosis.

    (Scientific evidence–I/III/IV; Grade of recommendation–A; Strength of panel opinion–5)

Rehabilitation Intervention

72. Develop protocols that allow rehabilitation specialists to become involved early in the management of persons with SCI, immediately following injury during the acute hospitalization phase.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

73. Prescribe interventions that will assist the recovery of persons with SCI, including preventive measures against possible secondary complications. Educate patients and families about the rehabilitation process and encourage their participation in discharge planning discussions.

    (Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

74. Use nonpharmacologic and pharmacologic interventions for orthostatic hypotension as needed. Mobilize the patient out of bed to a seated position once there is medical and spinal stability. Develop an appropriate program for out-of-bed sitting. Limit in-bed and out-of bed semireclined sitting, as this often produces excessive skin shear and predisposes to pressure ulcer formation.

    (Scientific evidence–III; Grade of recommendation–C; Strength of panel opinion–5)

Psychosocial and Family Issues

75. Assess mental health in general and possible risk for psychosocial problems after admission and throughout acute care stay. Involve members of the health-care team as needed. Pay particular attention to the following factors:
    - Current major depression, acute stress disorder/posttraumatic stress disorder (PTSD), or substance intoxication and withdrawal
    - Social support network (or lack thereof)
    - Cognitive functioning and learning style

- Personal and cultural preferences in coping style and social support
- Concurrent life stressors
- Concomitant health problems, medical conditions, medications, and history of TBI
- History of mental illness, including major depression, PTSD, substance abuses
- Use of psychiatric medications

(Scientific evidence–NA; Grade of recommendation–NA; Strength of panel opinion–5)

76. Foster effective coping strategies, health promotion behaviors, and independence through a variety of ongoing interventions.
    - Use assistive devices, such as head-controlled call bells, bed controls, prism glasses, and communication boards.
    - Acknowledge that feelings of gratitude, uncertainty, loss, and helplessness may be present simultaneously.
    - Provide medical and prognostic information matter-of-factly, yet at the same time leave room for hope.
    - Respect expressions of hope. Avoid direct confrontations of denial concerning probable implications of the injury.
    - Help the patient and family to identify effective coping strategies that have aided them in the past.
    - Develop a partnership of patient, family, and health-care team to promote involvement in the treatment plan and optimize patient outcomes.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

77. Detect suicidal ideation and requests for assisted suicide. Take treatment refusals and requests for withdrawal of treatment very seriously.
    - Acknowledge the patient's suffering.
    - Assess for and treat any underlying depression, substance abuse, or other chronic condition.
    - Determine the patient's decision-making capacity.
    - Identify patient needs jointly and establish a plan of care.
    - Ensure informed consent.
    - Consult the institution's ethics committee when appropriate.
    - Consult legal counsel if the conflict continues or if there is any uncertainty regarding the patient's request.

    (Scientific evidence–I/III/IV/V; Grade of recommendation–A; Strength of panel opinion–5)

Special Mechanisms of Injury

78. Screen for SCI in the patient with high-voltage electrical injury.

    (Scientific evidence–II/IV; Grade of recommendation–B; Strength of panel opinion–5)

79. Suspect SCI in any scuba or commercial diver presenting with neurologic symptoms. Consult with and consider urgent transfer to a hyperbaric unit.

    (Scientific evidence–III/IV; Grade of recommendation–C; Strength of panel opinion–5)

Hysterical Paralysis

80. Consider the diagnosis of hysterical paralysis in patients with marked inconsistencies in neurologic findings.
    - Repeat the neurologic exam with great care.
    - Consider using the Spinal Injuries Center test and review base screening imaging, such as plain x-rays.
    - Consult in person or by phone with a spinal cord injury specialist before making this diagnosis.
    - Encourage the patient gently to resume normal function, minimizing disability.
    - Resort to more intensive tests, such as MRI or motor-evoked potential testing, if the patient fails to start improving in 2 to 3 days.

    (Scientific evidence–III/IV/V; Grade of recommendation–C; Strength of panel opinion–4)

81. Consider referral to rehabilitation professionals once confident of the hysterical paralysis diagnosis.

    (Scientific evidence–IV; Grade of recommendation–C; Strength of panel opinion–5)

Definitions:

Levels of Evidence

I. Evidence based on randomized controlled clinical trials (or meta-analysis of such trials) of adequate size to ensure a low risk of incorporating false-positive or false-negative results.
II. Evidence based on randomized controlled trials that were too small to provide level I evidence. These may have shown either positive trends that were not statistically significant or no trends and were associated with a high risk of false-negative results.
III. Evidence based on nonrandomized, controlled or cohort studies, case series, case-controlled studies, or cross-sectional studies.
IV. Evidence based on the opinion of respected authorities or that of expert committees as indicated in published consensus conferences or guidelines.
V. Evidence that expressed the opinion of those individuals who were writing and reviewing these guidelines, based on their experience, knowledge of the relevant literature, and discussion with peers.

Strength of Evidence Associated with the Recommendations (Grade of Recommendation)

A. The guideline recommendation is supported by one or more level I studies.
B. The guideline recommendation is supported by one or more level II studies.
C. The guideline recommendation is supported only by one or more level III, IV, or V studies.

Grades of Recommendation (Strength of Panel Opinion)

Low - Mean agreement score 1.0 to less than 2.33

Moderate - Mean agreement score 2.33 to less than 3.67

Strong - Mean agreement score 3.67 to 5.0

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is specifically stated for each recommendation (see "Major Recommendations" field).

A list of references is provided in the original guideline document, which includes all sources used by the guideline development panel to support their recommendations. It provides the level of scientific evidence (I-V) for each graded article.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Early acute management of spinal cord injuries will limit the extent of injury, manage acute consequences of injury, and will enable initiation of measures to prevent predictable complications.

POTENTIAL HARMS

Instrumentation—such as attempting placement of a urethral catheter—can further exacerbate urethral injury, which can lead to long-term complications, such as stricture or difficulty voiding.

CONTRAINDICATIONS

CONTRAINDICATIONS

- Intracranial bleeding, perispinal hematoma, or hemothorax are potential contraindications to the administration of anticoagulants.

- The presence of a vena cava filter is a relative contraindication to manually assisted cough ("quad coughing") for clearance of bronchial secretions because the filter may become dislodged; use of a modified assisted cough technique with lateral compression may be a safer choice.
- The use of 45-degree head-of-bed elevation may be contraindicated in patients with spinal cord injury due to the risk of pressure ulcer formation from skin shearing; however, frequent repositioning may minimize skin problems when the head of the bed is elevated.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- This guideline has been prepared based on the scientific and professional information available in 2006.
- Users of this guideline should periodically review this material to ensure that the advice herein is consistent with current reasonable clinical practice. The websites noted in this document were current at the time of publication; however, because web addresses and the information contained therein change frequently, the reader is encouraged to ensure their accuracy and relevance.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Chart Documentation/Checklists/Forms

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Consortium for Spinal Cord Medicine. Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals. J Spinal Cord Med 2008;31(4):403-79. [331 references] PubMed

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2008 May

GUIDELINE DEVELOPER(S)

Consortium for Spinal Cord Medicine - Private Nonprofit Organization
Paralyzed Veterans of America - Private Nonprofit Organization

GUIDELINE DEVELOPER COMMENT

Consortium for Spinal Cord Medicine Member Organizations: American Academy of Orthopaedic Surgeons, American Academy of Physical Medicine and Rehabilitation, American Association of Neurological Surgeons, American Association of Spinal Cord Injury Nurses, American Association of Spinal Cord Injury Psychologists and Social Workers, American College of Emergency Physicians, American Congress of Rehabilitation Medicine, American Occupational Therapy Association, American Paraplegia Society, American Physical Therapy Association, American Psychological Association, American Spinal Injury Association, Association of Academic Physiatrists, Association of Rehabilitation Nurses, Christopher and Dana Reeve Foundation, Congress of Neurological Surgeons, Insurance Rehabilitation Study Group, International Spinal Cord Society, Paralyzed Veterans of America, Society of Critical Care Medicine, U. S. Department of Veterans Affairs, United Spinal Association

SOURCE(S) OF FUNDING

Consortium for Spinal Cord Medicine

Paralyzed Veterans of America

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Guideline Development Panel

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the Paralyzed Veterans of America (PVA) Web site.

Print copies: Available from the Consortium for Spinal Cord Medicine, Clinical Practice Guidelines, 801 18th Street, NW, Washington, DC 20006.

AVAILABILITY OF COMPANION DOCUMENTS

A form for the standard neurological classification of spinal cord injury is available in the original guideline document.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI Institute on August 13, 2009.

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