Denver Health Spinal Cord Injury Clinical Care Guideline

PURPOSE

To optimize the inpatient care of individuals with spinal cord injury.

INCLUSION/ EXCLUSION CRITERIA

Individuals with spinal cord pathology.

SCOPE

A. Physicians and Advanced Practice Providers

B. Nurses

C. Physical Therapists

D. Occupational Therapists

E. Speech Language Pathologists

F. Health Care Partners

DEFINITIONS

A. Allodynia: symptom of touch being experienced as painful, common after SCI

B. Autonomic Dysreflexia: Clinical phenomenon of elevated blood pressure (30 mm Hg over baseline, headache, flushing piloerection and bradycardia in T6 and above SCI caused by noxious stimulus below the level of injury attributed to autonomic nervous system abnormalities.

GUIDELINE

A. Diagnostic Assessments:

1. Perform a baseline neurological assessment on any patient with suspected spinal and/or spinal cord injury (SCI) to document the presence of SCI. If deficits are consistent with SCI, neurosurgical team PMR physician or physical therapist will determine a neurological level and the completeness of the injury. Perform serial examinations at least once daily for the first four weeks to detect neurological deterioration or improvement.

2. Review existing imaging studies (Trauma CT C/A/P, Trauma CT C-spine, etc.) to determine level of injury and screen for additional spine injuries.

3. Perform a formal MRI of the known or suspected level of the SCI.

4. Consider imaging the entire spine, if not already done. Non-contrast MRI is the preferred modality, with CT scan as a secondary option if MRI is contraindicated.

5. Within the first 72 hours post injury, rehabilitation consultant and/or an ASIA competent physical therapist will use the clinical neurological assessment as described by the International Standards for Neurological Classification of SCI (INSCI) to determine the preliminary prognosis for neurological recovery. The INSCI form will be filed in the patient record.

B. Spine Stabilization:

1. The spine neurosurgical team shall be consulted immediately upon identification of a patient with spinal cord injury.

2. Patients with SCI should have unstable spinal injuries stabilized as early as possible in the course of care (goal < 24 hours).

3. Patients with SCI shall be on bedrest until cleared by spine neurosurgery physician.

4. Bedrest precaution should be cleared as soon as possible and in the safest manner possible (this will often require surgical fixation for stabilization).

5. Rigid c-collar for cervical level injuries (change to Philadelphia, Aspen or Miami J collar as soon as possible)

6. Log roll precautions for thoracic level spinal cord injuries

7. Perform a closed or open reduction as soon as permissible on patients with bilateral cervical facet dislocation in the setting of an incomplete spinal cord injury.

8. Consider early surgical spinal canal decompression (within24 hours) as a treatment option for acute traumatic incomplete spinal cord injury.

C. Skin:

1. Transfer the patient with a potential spinal injury as soon as possible off the backboard onto a firm padded surface, while maintaining spinal alignment.

2. Initiate measures to prevent skin breakdown if prolonged time on a backboard or procedural table is anticipated.

3. Perform a baseline skin assessment on admission and as soon as the backboard is removed

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

5. Avoid transfers and patient repositioning that may cause skin shearing.

6. Provide a specialized bed or specialty surface for all patients with spinal cord injury.

7. When a patient is in bed

a. Utilize reverse Trendelenburg up to 30 degrees, combined with head of bed (HOB) to raise HOB up to 30 degrees as clinically indicated.

b. Place positioning pillows or wedges above and below bony or red areas to offload pressure

8. Patients should be turned at least every two hours, unless contraindicated, and supported with positioning pillows or wedges. Turning modules do not provide sufficient repositioning for patients with SCI.

9. Nurses will assess and document, skin condition, risk assessment (Braden Scale), wounds and interventions every shift.

10. Activity orders will be specific. Contraindications to mobility may include: An uncleared spine or skin breakdown (stage 1 or greater) to buttock, low back and or hip areas.

11. Patients with spinal cord injury will be mobilized out of bed into specialty chairs under the supervision of a physical or occupational therapist. While in chair, a full weight shift every 15 minutes for approximately 1-2 minutes is required. Timers may serve as a reminder of when the patient needs repositioning.

D. Cardiac / Autonomic:

1. All patients with SCI T5 and above require continuous HR monitoring for first 72 hours and HR/BP monitoring a minimum of every 4 hours thereafter.

2. Prevent and treat hypotension. Goal MAP > 60 and SBP > 90 mm Hg. Consider maintaining a goal mean arterial pressure of >85 for the first seven days in adult patients.

3. For hypotension, do not assume neurogenic shock- r/o other causes

- For neurogenic shock:
  - 1st tier therapy: fluid resuscitation to ensure euvolemia
  - 2nd tier therapy: vasopressors and/or inotropes

Establish central access

- Vasopressors of choice:
  - Preferred therapy: Norepinephrine

- 2nd line: Phenylephrine if patient is normocardic
    - Considerations: phenylephrine better for injuries below T5, less concern for bradycardia
- Dopamine not recommended in SCI patients > 60 years.
- After resuscitation, midodrine can be used for blood pressure support.

4. Monitor and treat symptomatic bradycardia. Consider atropine and glycopyrrolate as treatment options. If persistent, consider treatment with aminophylline.

5. Recognize and treat autonomic dysreflexia. Patients with demonstrated autonomic instability should be continuously monitored. See attached algorithm.

E. Respiratory:

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

2. Absolute Indications for Intubation:

Neurologically Complete SCI above C5

Respiratory distress

Persistent hypoxemia

Severe respiratory acidosis

3. Relative Indications for Intubation:

Complaints of shortness of breath

Abdominal breathing

Tetraplegia

Vital capacity (VC) <10 cc/kg or decreasing VC as followed by incentive spirometry (IS)

Monitoring parameters: CO2, VC/IS, NIF

4. If airway and mechanical ventilatory support are not initially required in a patient with tetraplegia or thoracic level paraplegia, evaluation of baseline pulmonary function on admission should be considered with measurement of tidal volume, vital capacity, and negative inspiratory force. Follow-up assessments can be compared with the individual's baseline for early diagnosis of acute respiratory failure.

5. Continuous pulse oximetry for T5 and above for the first 2 weeks of hospitalization and/or while patient is receiving Intravenous (IV) narcotics.

6. For C5 and above injuries consider early tracheostomy.

7. For patients with weak cough, consider treatment with mechanical insufflator / exsufflator and/or manual quad cough assist

8. For acute SCI patients on ventilator support, consider higher tidal volumes of 10-20 cc/ kg if no contraindications.

9. For bronchospasm consider treatment with albuterol, ipratropium and/or low dose terbutaline.

10. For patients with complete tetraplegia C4 and higher, order an in-line speaking valve for trach.

F. Gastrointestinal / Bowel:

1. Initiate stress ulcer prophylaxis in acutely injured patients.

2. Speech language pathologist consult should be initiated to evaluate swallowing function prior to oral feeding in any acute SCI patient with cervical spinal cord injury, halo fixation, cervical spine surgery, prolonged intubation, tracheotomy, or concomitant traumatic brain injury (TBI).

3. Once enteral feeds are started or patient is eating, initiate a bowel program to include a rectal suppository and digital stimulation. See Attachment B - Digital Stimulation for the Spinal Cord Injured Patient.

G. Bladder:

1. Place an indwelling urinary catheter unless contraindicated.

2. Leave indwelling catheter in place until the patient is hemodynamically stable, no longer needing strict attention to fluid status and able to be educated by a rehabilitation physician/nurse team on alternate methods of neurogenic bladder management.

3. Change indwelling catheter every 30 days.

4. Voiding trials may be initiated earlier in AIS D (ambulatory) patients without cauda equina involvement. Bladder scans / post void residuals should be performed every 4 hours for first 48 hours to ensure adequate emptying

5. Follow ID recommended UTI diagnostic / treatment pathway for patients with SCI and indwelling urinary pathway:

General strategy

- Fever PLUS at least one other sign/symptom (see below) □
- Change indwelling urinary catheter if present for at least 7 days □
- Send urinalysis w reflex to culture from newly inserted catheter □

Negative culture or contaminated (≥3 organisms), no treatment

Positive culture, treat for 5-7 days (cystitis) or 5-10 days (pyelonephritis and/or bacteremia) w empiric and definitive antibiotic selection and duration of therapy based upon http://antibiotics.dhha.org

Signs and symptoms of UTI in patients w SCI

- Kidney or bladder tenderness/discomfort
- Increased spasticity
- Autonomic dysreflexia
- Cloudy urine w increased odor
- Malaise or lethargy

H. Venous Thromboembolism (VTE) Prophylaxis:

1. Apply mechanical compression devices early, unless contraindicated by lower extremity trauma.

2. Begin low molecular weight heparin (LMWH) at earliest time-point when considered safe from a hemostasis perspective, no later than 72 hours after SCI. Intracranial bleeding, perispinal hematoma or hemothorax are potential contraindications to the administration of anticoagulants, but these may be appropriate once bleeding has stabilized.

3. Anticoagulants should be continued until discharge in patients with incomplete injuries, for 8 weeks in patients with uncomplicated complete motor injury, and for 12 weeks or until discharge from rehabilitation for those with complete motor injury and other risk factors (e.g., lower limb fractures, a history of thrombosis, cancer, heart failure, obesity, or age over 70).

4. Decision to start anticoagulation in children 12 years of age and under shall be made jointly by Physical Medicine & Rehabilitation service and the primary service.

5. Hold LMWH morning of surgical fixation of the spine, resume within 24h post-op

I. Rehabilitation Interventions:

1. Consult Physical Medicine and Rehabilitation physician within 24 hours of admission?? .

2. Consult Physical and Occupational therapy within 72 hours of patient admission? .

3. Patient will be mobilized once medical and spinal stability are achieved.

4. Use pharmacologic and non-pharmacologic interventions for orthostatic hypotension as needed.

5. Consult Speech therapy on patients with cervical SCI halo fixation, cervical spine surgery, prolonged intubation, tracheotomy and/ or concomitant TBI within 72 hours.

J. Pain Management:

1. Assess and reassess the patient's pain, using the appropriate pain scale.

2. Provide adequate analgesia and consider use of non-opioid agents directed at neuropathic pain.

3. Minimize the pain of allodynia through thoughtful patient handling.

4. Assess the effects of opioids and sedatives on patient sedation level and respiratory status.

K. Psychosocial:

1. Assess general mental health and risks for psychosocial problems.

2. Foster effective coping strategies, health-promotion behaviors and independence.

a. Use assistive devices such as specialty call lights and communication boards.

b. Medical and evidenced based prognostic information should be presented matter-of-factly, by experienced team members.

c. Respect expression of hope. Avoid direct confrontations of denial concerning probable implications of the injury.

d. Assist the patient and family in identifying effective coping strategies that have aided them in the past.

e. Identify, educate and support parents/guardians, caregivers for pediatric patients.

3. Consult Care Management within 72 hours. Also consider involvement of Psychology, Psychiatry Palliative Care and or chaplain.

4. Consider treatment refusals and requests for withdrawal of treatment very seriously.

a. Acknowledge suffering.

b. Assess and treat underlying psychiatric disorders and evaluate suicide risk.

c. Determine patient's decision making capacity.

d. Identify patient needs jointly and establish a plan of care.

e. Ensure informed consent.

f. Consult Ethics Committee when appropriate.

g. Consult legal counsel if conflict continues or if there is any uncertainty regarding the patient's request

L. Nursing Care:

1. Patients without hand function (SCI C5 and above) should be staffed with a ratio of three patients to one nursing staff member.

2. Patients with T5-C6 injury should be staffed with ratio of four patients to one nursing staff member.

M. Transfer to Spinal Cord Injury Center-facilitate expedient transfer to appropriate rehabilitation setting.

EXTERNAL REFERENCES

Early Acute Management in Adults with Spinal Cord Injury: A Clinical Practice Guideline for Health-Care Professionals. Consortium for Spinal Cord Medicine 2008, Paralyzed Veterans of America. www.pva.org/publications

Neurogenic Bowel Management in Adults with Spinal Cord Injury. Consortium for Spinal Cord Medicine 1998, Paralyzed Veterans of America.

Acute Management of Autonomic Dysreflexia: Adults with Spinal Cord Injury Presenting to Health-Care Facilities. Consortium for Spinal Cord Medicine 1997, Paralyzed Veterans of America.

Pressure Ulcer Prevention and Treatment Following Spinal Cord Injury: A Clinical Practice Guideline for Health-Care Professionals. Consortium for Spinal Cord Medicine 2000, Paralyzed Veterans of America.

Prevention of Thromboembolism in Spinal Cord Injury, Second Edition. Consortium for Spinal Cord Medicine1999 Paralyzed Veterans of America.

Kirshblum, Campagnolo and DeLisa. Spinal Cord Medicine. 2002 Lippincott, Williams & Wilkins.

Clinical Information Access Program (CIAP) New South Wales. www.ciap.health.nsw.gov.au/specialties/

American Spinal Injury Association. www.asia-spinalinjury.org/publications

Respiratory Management During the First Five Days After Spinal Cord Injury, Berlly M; Shem K; J Spinal Cord Med. 2007; 30(4): 309–318.

Respiratory Management in the Patient with Spinal Cord Injury, Vasquez et all; BioMed Research International, Volume 2013, page 1-9

Physiotherapy secretion removal techniques in people with spinal cord injury: a systematic review. Reid ae al. J Spinal Cord Med. 2010; 33(4):353-70.

Pulmonary outcomes following specialized respiratory management for acute cervical spinal cord injury: a retrospective analysis. Zakrasek et al. Spinal Cord. 2017 Jun;55(6):559-565.

Effects of GABA-B Agonist Baclofen on Bronchial Hyperreactivity to Inhaled Histamine in Subjects with Cervical Spinal Cord Injury. Grimm at al. Lung. 1997; 175(5):333-41

Inhibition of bronchial hyperresponsiveness by the GABA-agonist baclofen. Dicpinigaitis et al.Chest. 1994 Sep;106(3):758-61.

Caruso MC. Daugherty MC. Moody SM. Falcone RA. Beirbrauer KS. Geis GL. Lessons learned from administration of high-dose methylprednisolone sodium succinate for acute pediatric spinal cord injuries. J Neurosurg Pediatr. Dec 2017; 20(6): 567-574.

Evaniew N. Belley-Cote EP. Fallah N. Noonan VK. Rivers CS. Dvorak MF. Methyprednisolone for the treatment of patients with acute spinal cord injuries: a systematic review and meta-analysis. J Neurotrauma. Mar 2016; 33(5): 468-481.

Fehlings MG. Wilson JR. Harrop JS. Kwon BK. Tetreault LA. Arnold PM. Singh JM. Hawryluk G. Dettori JR. Efficacy and safety of methylprednisolone sodium succinate in acute spinal cord injury: a systematic review. Global Spine J. Sep 2017; 7(3Suppl): 116S-137S.

Stein DM. Knight WA. Emergency neurological life support: traumatic spine injury. Neurocrit Care. 2017.

Fehlings MG et al. A clinical practice guideline for the management of patients with acute spinal cord injury: recommendations on the use of methylprednisolone sodium succinate. Global Spine Journal. 2017; 7(3S): 203S-211S.

Fehlings MG et al. A clinical practice guideline for the management of patients with acute spinal cord injury and central cord syndrome (<24 hours vs >24 hours) of decompressive surgery. Global Spine Journal. 2017; 7(3S): 195S- 202S.

Sabit B, Zeiler FA, Berrington N. The impact of mean arterial pressure on functional outcome post trauma-related acute spinal cord injury: a scoping systematic review of the human literature. J Intensive Care Med. Jan 2018; 33 (1): 3-15.

Readdy WJ, Whetstone WD, Ferguson AR, Talbott JF, Inoue T, Saigal R, Bresnahan JC, Beattie MS, Pan JZ, Manley GT, Dhall SS. Complications and outcomes of vasopressor usage in acute traumatic central cord syndrome. J Neurosurgery: Spine. Nov 2015; 23 (5): 574-580.

Stein DM. Knight WA. Emergency neurological life support: traumatic spine injury. Neurocrit Care. 2017.

Park JH. Kim JH. Roh SW. Rhim SC. Jeon SR. Prognostic factor analysis after surgical decompression and stabilization for cervical spinal-cord injury. British Journal of Neurosurgery. 2017; Vol 31(2): 194-198.

Dhall, SS. Hadley MN. Aarabi B. Gelb D. Hurlbert J. Rozzelle C. Ryken TC. Theodore N. Walters BC. Deep venous thrombosis and thromboembolism in patients with cervical spinal cord injuries. Neurosurgery. March 2013; 72 (3): 244-254.

Christie S. Thibault-Halman G. Casha S. Acute pharmacological DVT prophylaxis after spinal cord injury. J Neurotrauma. Aug 2011; 28(8): 1509-1514.

Liu Y. Xu H. Liu F. Lv Z. Kan S. Ning G. Feng S. Meta-analysis of heparin therapy for preventing venous thromboembolism in acute spinal cord injury. International Journal of Surgery. July 2017; 3: 94-100.

Groah SL, Schladen M, Pineda CG, Hsieh CH. Prevention of Pressure Ulcers Among People With Spinal Cord Injury: A Systematic Review.PM R. 2015 Jun;7(6):613-36.


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