Surgical Critical Care.net

ACUTE SPINAL CORD INJURY MANAGEMENT

Evidence Based Medicine Guideline

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SUMMARY
Acute spinal cord injury (ASCI) is a life-altering event. Spinal cord injury management should be multidisciplinary. Early management should avoid hypotension, bradycardia, and hypoxemia. Timely neurosurgical consultation is essential to treat remediable injury and enable the patient to begin early rehabilitation.

RECOMMENDATIONS

- **Level 1**
  - **None**
- **Level 2**
  - **Early intubation and mechanical ventilation are recommended for patients with high cervical injuries (C1-C5).**
  - **Use of high-dose methylprednisolone is not recommended.**
  - **Chemical venous thromboembolism prophylaxis, with unfractionated heparin, should be initiated within 24 hours of injury.**
- **Level 3**
  - **For penetrating ASCI: recommend cefazolin 2 g IV q 8 hrs x 48 hrs.**
  - **Mean arterial pressure (MAP) augmentation with norepinephrine (if needed) is recommended for at least the first 72 hours following injury to a maximum of 7 days.**
    - **Goal MAP ≥ 85 mmHg for blunt / incomplete penetrating injury**
    - **Goal MAP ≥ 65 mmHg for complete penetrating injury**
  - **Early neurosurgical decompression of acute spinal cord compression (< 72 hours) is recommended.**
  - **Consider early tracheostomy (< 7 days) in high cervical injury (C1-C5) patients.**
  - **Rehabilitation should be offered to all patients.**

INTRODUCTION

Overall goals for the care of the ASCI patient include:

1. Confirmation of the ASCI level with communication to the entire healthcare team
2. Prevention of harm events such as hospital acquired infection (HAI), deep venous thrombosis, pressure ulcers, etc.
3. Creation of an environment of safety for the patient with adequate methods to communicate needs, adaptive call system for nurses, and interventions to prevent falls
4. Education of both patient and family regarding injury and plan of care

LEVEL OF RECOMMENDATION DEFINITIONS

- **Level 1:** Convincingly justifiable based on available scientific information alone. Usually based on Class I data or strong Class II evidence if randomized testing is inappropriate. Conversely, low quality or contradictory Class I data may be insufficient to support a Level I recommendation.
- **Level 2:** Reasonably justifiable based on available scientific evidence and strongly supported by expert opinion. Usually supported by Class II data or a preponderance of Class III evidence.
- **Level 3:** Supported by available data, but scientific evidence is lacking. Generally supported by Class III data. Useful for educational purposes and in guiding future clinical research.

5. Facilitation of timely discharge to rehabilitation
6. Prevention of unnecessary readmission

Acute spinal cord injury (ASCI) is a devastating event that requires management using a multidisciplinary team approach. Vehicular trauma and unintentional falls are the leading causes of spinal cord injuries. Due to underlying arthritic and osteoporotic conditions, older adults are more susceptible to spinal injuries, usually secondary to falls.

Prior to hospitalization, patients suspected of spinal cord injury (those with altered mental status, midline neck or back pain/tenderness, numbness/motor weakness, anatomic deformity of the spine, or those with distracting injuries) should be immobilized on a backboard, scoop stretcher, vacuum splint, ambulance cot, or other similar device. Once at the hospital, patients should be rapidly evaluated via ATLS for prompt removal of the spinal mobility restriction device by properly trained individuals (1).

Cervical collars can be removed without additional radiographic imaging in an awake, asymptomatic, adult trauma patient with ALL of the following: a normal neurological exam, no high-risk injury mechanism, free range of cervical motion, and no neck tenderness. Removal of the cervical collar is recommended in adult blunt trauma patients who are neurologically asymptomatic and have a negative helical computed tomography (CT) imaging. A negative cervical CT scan is recommended as sufficient to remove a cervical collar in an adult blunt trauma patient who is obtunded/unevaluable (EAST Level III recommendation). MRI may be selectively performed in patients with neurological deficits and a normal cervical CT scan, patients with pain out of proportion and a normal cervical CT scan, or a cervical CT scan with severe degenerative changes or osteopenia. It is NOT necessary to perform routine MRI for unevaluable patients with a normal cervical CT scan and no apparent neurological deficits to complete screening for spinal injuries (1).

Occipital condyle fractures without neural compression or cranio-cervical misalignment can be managed with a rigid or semi-rigid cervical collar. Cervical fractures are treated on an individual basis, based on fracture type, patient factors, cervical stability, and patient age. Thoracolumbar fractures that are stable and without neurological deficits are treated with pain control and early ambulation without a brace.

The neurological level of injury is determined from the assessment of sensory and motor levels of injury. For patients with suspected ASCI, a complete neurological examination must be clearly documented. The International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) is a clinical documentation tool published by the American Spinal Injury Association (ASIA). It is recommended to use this tool to document the level and severity of ASCI (See Appendix I). The Neurological Level of Injury (NLI) is defined as the levels where motor function and sensation are both intact bilaterally. This is defined as the most distal or caudal level at which the motor function is intact (minimum strength of 3 bilaterally with all levels proximally being 5) PLUS the most distal level where sensation is intact to light touch and pinprick with all proximal levels being intact. The injury is considered to be incomplete when sacral sparing exists (light touch and pinprick are intact at S4/S5 level and deep anal pressure and voluntary anal contraction are present. An ASIA Impairment Scale (AIS) is assigned based on whether the injury is complete (ASIA-A) or incomplete (ASIA-B, C, or D) based on the preservation of sensory (ASIA-B) and/or motor function and the number of key muscle groups with partial preservation (ASIA-C or ASIA-D) (1).

Penetrating spinal cord injuries usually result in ASIA-A injuries. Those that are due to gunshot injuries typically require surgical stabilization. Research does not support surgery to remove a bullet from the spinal canal to prevent pain, to reduce infection risk, to prevent migration, or to prevent development of syrinx. Surgery, however, may be indicated for treatment of persistent cerebrospinal fluid (CSF) leak. Lead poisoning from retained bullets is exceedingly rare, however, if concerned the patient's lead level can be monitored for one year; if lead levels are rising, one could consider treatment with chelation agents or removal of the bullet fragment (1). Steroids are NOT recommended in the treatment of penetrating spinal cord injuries. Blood pressure augmentation does not have sufficient data to be recommended for penetrating ASCI. Antibiotics can be considered for 2-10 days (1).

Injuries to the cervical and high thoracic spine cause vasoplegia and neurogenic shock due to a loss of sympathetic tone. Hypotension should be avoided in ASCI patients. Treatment of hypotension due to neurogenic shock includes volume resuscitation followed by vasopressor therapy. Though there is insufficient data regarding the duration of blood pressure augmentation, mean arterial pressure (MAP) goals of 85-90 mmHg can be considered up to 7 days (1). Use of these MAP goals must be weighed against the use of vasopressors, prolonged immobilization, need for invasive monitoring, and the consumption of critical care resources. Treatment with a vasopressor with both alpha-

and beta-adrenergic activity is recommended to treat both hypotension and bradycardia associated with symptomatic denervation (1).

LITERATURE REVIEW

Trauma Alert / Admission

- Advanced Cardiac Life Support (ACLS) protocol if needed
- Advanced Trauma Life Support (ATLS) protocol evaluation
    - Airway/Breathing
        - Goal: avoid hypoxia (SpO2 <92%)
        - Assess need for intubation
            - If needed, Rapid Sequence Intubation per protocol with Hi-Lo Evac endotracheal tube
            - Sedation (*if intubated*): Fentanyl drip 50 mcg/hr IV continuous – titrate to maintain Richmond Agitation Sedation Score (RASS) 0 to -1
    - Circulation
        - Goal: avoid hypotension and bradycardia
            - MAP goal ≥ 85 mmHg for blunt & incomplete penetrating ASCI injury
            - MAP goal ≥ 65 mmHg for complete penetrating ASCI injury (ASIA A)
        - Hypotension
            - Initial response: fluid challenge with a maximum 2 L NS bolus
            - Persistent hypotension: Norepinephrine 0.05 mcg/kg/min titrated to maintain MAP goals
- Immobilize the spine of all patients with a potential spinal injury (1)
- Remove backboard as soon as possible; transfer onto a firm, padded surface/mattress while maintaining spinal alignment (1)
- Complete detailed history/physical
- Obtain initial labs: Trauma Labs (CBC, CMP, Magnesium, Phosphorus, TEG, INR/PT/PTT), arterial blood gas (ABG)
- Baseline chest radiograph
- Baseline EKG
- Baseline respiratory mechanics *(non-intubated patient)*: negative inspiratory force (NIF), forced vital capacity (FVC), tidal volume (TV) (1,10)
- Pain management (*non-intubated patient*): Fentanyl 25-50 mcg IV q 1 hr prn pain OR Morphine 2-5 mg IV q 1 hr prn pain
- Admission orders
    - Utilize the “Spinal Cord Injury Admission Order Set” in addition to Admission Order Set
        - Addresses all systems (respiratory, cardiovascular, skin, venous thromboembolism prophylaxis, gastrointestinal, bowel regimen, standard ICU orders)

Admission Units

- All traumatic ASCI patients are admitted to designated neuro/trauma ICU or intermediate level of care units (at ORMC this includes NSICU (N4E), TICU (N4W), TSD (N8W), NSD (N8E), S4A or N10W/N10E only)
- All cervical ASCI patients with deficits are initially admitted to a trauma/neuro ICU setting (at ORMC this is NSICU (N4E) or TICU (N4W) only for close respiratory monitoring)
- Lower ASCI patients (thoracic/lumbar) with deficits are admitted to appropriate neuro / trauma unit depending on clinical stability and need for monitoring

Use of High-Dose Methylprednisolone in Blunt Spinal Cord Injury
See the Methylprednisolone in Acute Spinal Cord Injury guideline • The use of high-dose methylprednisolone is **NOT** recommended. The risks associated with high-dose steroids outweigh any potential limited benefit (7,8,9)

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg
Neurologic Goals: • Define level of injury (ISNCSCI tool – See Appendix A) (6) • Set a baseline for sensory, motor, & reflex status (4)	• Consider use of the Rotorest bed for patients who will require prolonged spine immobilization • Document sensory, motor, and reflex status within first 24 hours to ICU and then daily x 3 days • Neurosurgery/Attending to communicate level of injury to patient and family • Neurosurgery – consider early surgical stabilization (<72 hours post-injury) (2) ○ Urgent for bilateral locked facets with incomplete ASCI ○ Urgent for acute neurologic deterioration • Basic neurologic assessment by nursing per unit protocol (3) • Repeat neuro assessments after any transfer for reduction movements	• Continue current care • Basic neuro assessment by nursing per unit protocol
	Phase 1 - Critical Care Unit	**Phase 2 – Step-down or Med/Surg**
Respiratory Goals: • Decrease/prevent atelectasis • Enhance clearance of secretions (14-18) • Prevent pneumonia	Monitoring: (per ICU protocol) (5,10) • Fever (temperature > 38.5°C) • Change in respiratory rate • Increased work of breathing • Increased pulse rate • Increase or change in secretions (color, quantity, consistency) • Declining respiratory mechanics • Decrease in SaO_2	Monitoring: (per ICU protocol) • Quadriplegic patients leaving the ICU should be transferred to trauma/neuro specific units with dedicated respiratory therapy support (at ORMC this is TSD (N8W) or NSD (N8E)) • Same as Phase 1 • Respiratory & Speech Therapy to assess need for in-line Passy Muir Valve (PMV)
	Standard Monitoring Orders: • Respiratory: FVC, NIF, & peak flow Q shift (10) • Vital signs per ICU protocol • Non-intubated: Incentive spirometer readings q 1 hr	Standard Monitoring Orders: • Respiratory: FVC, NIF, & peak flow Q shift (decrease to daily if stable x 72 hours) • Vital signs per unit protocol • Non-intubated/trach: Incentive spirometry q 1 hr while awake
	Ventilator Orders: • Mechanical ventilation per protocol • Consider using higher tidal volumes (10-15 ml/kg) to resolve or prevent atelectasis (10) • Begin weaning ventilator per protocol (including SAT/SBT if patient meets criteria) • Consider diaphragmatic pacer placement to facilitate ventilator weaning for tetraplegic patients (10)	Ventilator Orders: • Continue weaning per protocol • Consider larger TV ventilation

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg
<u>Respiratory</u> Goals: • Decrease/prevent atelectasis • Enhance clearance of secretions (14-18) • Prevent pneumonia	**Standard Respiratory Care for all VENTILATED ASCI patients:** • VAP protocol (oral care q 4 hrs (12), HOB > 30°, etc.) • Chlorhexidine (Peridex®) oral rinse 15 mL swish & suction q 12 hrs (12) • Metaneb q4 hrs • Cough Assist q4 hrs following Metaneb if PEEP < 5 cm H_20 • Consider Vest Therapy q 4 hours if can't tolerate Metaneb • Albuterol 2.5mg/3 mL nebulized q 4 hrs (13) • Abdominal binder when OOB to chair • Assess need for respiratory suctioning frequently to avoid mucous plugs • Consider early tracheostomy (within days (11)) even in setting of anterior cervical spinal stabilization procedure	**Standard Respiratory Care for all VENTILATED ASCI patients:** • Continue current care • If minimal to no secretions, change albuterol to PRN • Discontinue chlorhexidine (Peridex®) when patient is tolerating oral diet
	Standard Respiratory Care for all NON-VENTILATED ASCI Patients WITHOUT evidence of respiratory compromise/ disease: • Monitor for need for mechanical ventilation (respiratory failure, intractable atelectasis on CXR, weakening voice, etc.) • Incentive Spirometry q 1-2 hrs • EZ-PAP q 4 hrs • Cough Assist Device q 4 hrs following EZ-PAP • Albuterol 2.5 mg/3 mL nebulized q 4 hrs PRN increased secretions / wheezing (13)	**Standard Respiratory Care for all NON-VENTILATED ASCI Patients WITHOUT** evidence of respiratory compromise/ disease: • Continue current care • Discontinue albuterol if not needed for > 72 hrs
	NON-VENTILATED ASCI Patients "aggressive protocol" WITH history of smoking/respiratory disease **OR** increased secretions / change in pulmonary function: • Assess need for NT suctioning • Discontinue EZ-PAP • Metaneb q 4 hrs • Cough Assist Device q 4 hrs following Metaneb • Albuterol 2.5mg/3mL nebulized q 4hrs (13) • Abdominal binder when OOB to chair	**NON-VENTILATED ASCI Patients** on "aggressive protocol" • Assess need for NT suctioning • Continue current care • When improved mechanics, switch Metaneb to EZ-PAP • If minimal to no secretions, change albuterol to PRN
	Thick Secretions • Heated humidification to ventilator circuit • 3% Saline nebulized q 8 hrs after albuterol and before cough assist (14) • Consider bronchoscopy/BAL (10)	Thick Secretions • Continue current therapy • Discontinue mucolytics when secretions become thin (14)

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg

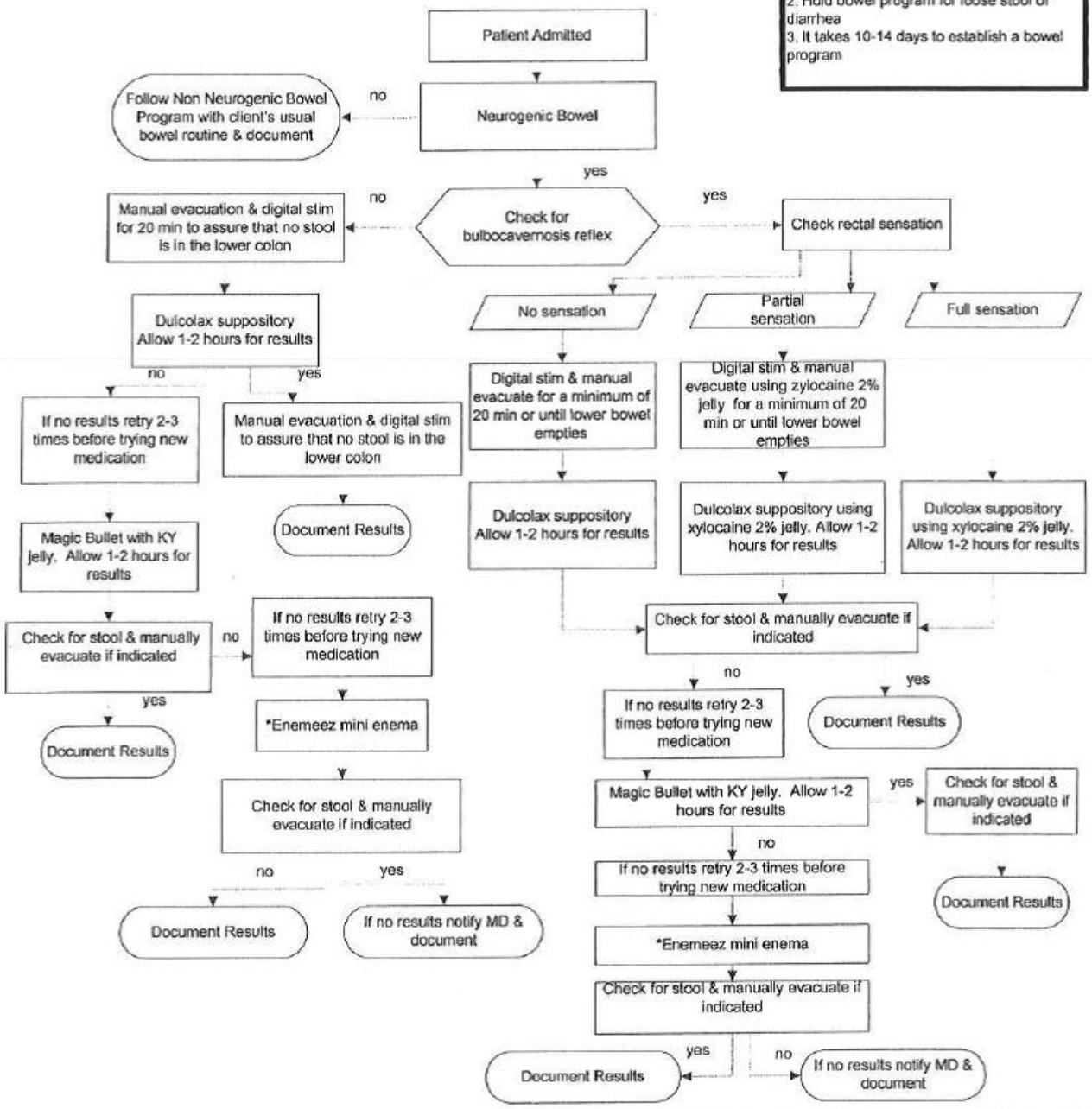
Cardiac
Goals:
• Restore normal hemodynamic parameters (19)
• Avoid hypotension (28-30)
• Avoid symptomatic bradycardia (3,26)
	Hypotension
	• Normal saline (NS) 2L IV – only for trauma bay resuscitation
	• Maintenance of MAP ≥ 85 mmHg for at least 72 hrs in blunt ASCI (to a maximum of 7 days post-injury) (20)
	  ○ Reassess duration based on clinical response
	  ○ Do NOT use for patients with irreversible ASCI
	• Norepinephrine 0.05 mcg/kg/min – titrate to goal MAP (3,20)
	  ○ Blunt ASCI / incomplete penetrating: MAP ≥ 85 mmHg
	  ○ Complete penetrating ASCI: MAP ≥ 65 mmHg (ASIA A) (22)
	• Persistent hypotension – check random Cortisol level
	  ○ Cortisol < 20 mcg/dL and still on norepinephrine = start Hydrocortisone 50 mg IV q 6 hrs or 200 mg IV CI /24 hrs
	• Midodrine 5 mg PO/PT q8 hrs
	  ○ Initiate early for all patients with oral / enteral access requiring MAP augmentation
	  ○ Titrate to maintain goal MAP
	  ○ Maximum 15 mg PO/PT q 6 hrs
	• Apply TED hose and ACE wraps to BLE prior to assisting OOB to chair – remove when back to bed
	• SCDs while in bed
	Bradycardia
	• Assess for presence of mucous plugs (most common cause of acute bradycardia)
	  ○ Ambu-bag with FiO_2 1.0 and suction
	• Atropine 0.5 mg IV q 1 hr PRN heart rate < 40 and/or symptomatic
	
	If persistent symptoms of bradycardia, consider starting:
	• Albuterol 2 mg PO/PT q 6 hrs (up to 4 mg q 6 hrs) (24,25)
	• Caffeine 200 mg PO/PT q 12 hrs
	• Robinul 0.1-0.2 mg IV / 1-2 mg PO/PT q 8-12 hrs
	  NOTE: Caution in patients with thick pulmonary secretions
	• External pacing or temporary pacemaker for severe, refractory symptomatic bradycardia (27)
		Hypotension
		• Norepinephrine must be off prior to transfer out of ICU
		• Midodrine 5 mg PO/PT q 8 hrs
		  ○ Titrate to maintain goal MAP; maximum 15 mg PO/PT q 6 hrs
		  ○ Monitor for need / wean dose as tolerated
		• Apply TED Hose and ACE wraps to BLE prior to assisting OOB to chair – remove when back in bed
		• SCDs while in bed
		Bradycardia
		• Same as Phase I
		• If persistent symptoms of bradycardia – call Rapid Response Team (RRT).

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg
Gastrointestinal Goals: • Tolerate diet • Passing stool daily/ every other day (32) • Moderate to large amounts of soft, firm stool • Complete emptying of the rectal vault (32-34) • Bowl evacuation at consistent time of day (32) • Completion of bowel care in less than 30-60 min • Minimal diarrhea / constipation Review OH (Orlando Health) Bowel Training Flow Chart (next page)	**Monitoring Parameters:** • If NG/PEG: check residuals q 4 hrs– Goal < 250 mL • Monitor for signs/symptoms of nausea / vomiting • Goal: 1 bowel movement daily – document on nursing flowsheet • Assess abdomen for signs/symptoms of ileus	**Monitoring Parameters:** • Same as Phase 1
	Stress Ulcer Prophylaxis: • Pepcid 20 mg IV/PT/PO q 12 hrs	**Stress Ulcer Prophylaxis:** • Continue if the patient remains on the ventilator • Discontinue when the patient is off the ventilator and tolerating tube feeds at goal or regular diet x 48 hrs unless another indication (e.g., GERD) to continue therapy
	Gastric Emptying / Tube Feeding Intolerance: • If PEG/NG feeding – change to post-pyloric DHT (placed into the duodenum) • If persistent feeding intolerance, add a prokinetic agent (e.g., metoclopramide, erythromycin, etc.)	**Gastric Emptying / Tube Feeding Intolerance:** • Discontinue prokinetic agent when the patient is at goal tube feeding rate x 48 hrs
	Bowel Regimen – Prevent/Treat Constipation: • Per Tube: Senna 10 mL PT q 12 hrs, Docusate Sodium (Colace) 100 mg PT q12 hrs • Oral: Senna-S 2 tabs PO q 12 hrs • Bisacodyl 10 mg per rectum Daily (2000) with digital stimulation – only discontinue if excessive diarrhea *If No BM by 72 hours after admission:* • Sorbitol 30 mL PO/PT q 12 hrs until 1st bowel movement • Milk of Magnesia 30 mL PO/PT daily (caution in elderly patients) • Increase Bisacodyl (Dulcolax) suppository to q 12 hrs • MiraLAX 17 g PO/PT daily	**Bowel Regimen – Prevent/Treat Constipation:** • If no diarrhea and having daily BM, continue current regimen • Note: change senna / docusate liquid to Senna-S 2 tabs PO q 12 hrs if patient able to swallow pills • Follow Phase 1 recommendations for constipation
	Diarrhea (liquid >500 mL q 8 hrs and/or >3 stools/day for 2 days): • Hold bowel regimen • Metamucil/Benefiber 1pkt PO/PT q 12 hrs • Consider loperamide / Lomotil for 24 hours if persistent diarrhea (>500 mL / 24hr) and other causes of diarrhea ruled out (e.g., C. difficile colitis)	**Diarrhea (liquid >500 mL q 8 hrs and/or >3 stools/day for 2 days):** • Same as Phase 1 • Resume Docusate Sodium (Colace) & Bisacodyl (Dulcolax) 1st – then add Senna if constipation an issue

Orlando Regional Rehabilitation Institute

Nursing bowel Training Flow Chart

Note:
1. Pt. should be on oral stool softners to allow for formed stool .
2. Hold bowel program for loose stool or diarrhea
3. It takes 10-14 days to establish a bowel program



- Note: digital stimulation is performed by inserting index finger to the first bend in client's rectum and rotating finger in clockwise motion
- Manual evacuation = using index finger, remove stool from the lower bowel
- Document the stool amount, the consistency and odor and the amount of assistance given by the patient
- No patient especially spinal cord patients should be allowed to have unsuccessful bowel programs for more than 48-72 hours. If they do not have autonomic dysreflexia, which is very likely to occur, use 3 Dulcolax tablets or magnesium citrate to clean them out immediately.
- All documentation should be in sunrise on the bowel program and assessment flow sheet or on the bowel program training form and daily flow sheet
- If a patient is having accidents, the bowel program is not effective. Discuss with MD.
- After an accident have patient return to room to stimulate and empty bowel.
- Try all suppositories for 2-3 programs before changing to another
- *If patient experiencing pain and/or dysreflexia with bowel program, use Enemeez Plus mini enema which includes an analgesic

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg

Nutrition
Goals:
• Maintain or improve nutritional status (31)
• Minimize weight loss (32)
	• Consult Speech Therapy for swallow evaluation prior to initiating oral intake in any ASCI patient with cervical spinal cord injury, prolonged intubation, tracheostomy, Halo fixation, or after any cervical spine surgery.
	• Obtain feeding access and initiate enteral support within 48 hrs (31)
	• Dietitian consult for intervention to assess for calorie and protein needs (31)
	• Consider metabolic cart and 24 hr urine studies (31)
	• Maintain euglycemia (blood glucose < 180 mg/dL) (3)
	  ○ Bedside glucose q 4 hrs on enteral nutrition
	  ○ Bedside glucose AC/HS on oral diet
		• Continue current diet orders
		• Dietitian to continue to monitor/intervene as per consult
		• Transition to oral diet with oral supplements when passes swallow study for tracheostomy patients
		• Discontinue sliding scale insulin & bedside glucose measurements if all < 180 mg/dL x 24 hrs on full enteral or oral diet

Bladder Goals: • No CAUTI (Catheter Associated Urinary Tract Infection) • Prevent autonomic dysreflexia (37)	• Insert urinary catheter due to neurogenic bladder (3) • Consider removing urinary catheter when no longer on IVF, total intake is no more than 2 L daily, and no diuresis is present (37) • Begin scheduled straight catheterization q 4-6 hrs • Goal is to obtain no more than 400 ml per straight catheterization • Condom catheter is not recommended • Bladder scanning only recommended for any spontaneous voids in between straight catheter regimen	• Continue Phase I • Assess patient readiness to learn self-straight catheterization daily

Skin Care/Prevention
Goals:
• Place appropriate cervical collar
• Prevent pressure ulcers (3)
	• Cervical collar
	  ○ Remove EMS collar (1)
	  ○ Place Aspen Vista cervical collar or as ordered per neurosurgery
	  ○ Cervical collar care per Orlando Health standard
	• Consult Wound Management
	• Initiate the Pressure Ulcer Prevention Order Set
	• Apply Previlon boots to bilateral lower extremities – remove Q-shift and moisturize skin
	• Place Mepilex sacral silicon dressing to coccyx/sacrum – reassess Q shift and change every 3-5 days and PRN
		• Continue current skin care measures
		• Low air loss/pressure redistribution mattress or as determined by the interdisciplinary team for function and prevention
		• Consult Wound Management for possible specialty bed if concerned for skin breakdown

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg

PT/OT/ST Rehabilitation & Mobility Plan
Goals:
• Increase functional ability
• Minimize contractures, etc.
	• Consult PT/OT/ST (2)
	• Obtain proper environmental controls
	• Post Education sheets in room
	• ASIA score documentation (1)
	• Out of bed to wheelchair (W/C) daily when managing physicians & neurosurgery approves and as patient tolerates
	  ○ Roho cushion at all times in chair when OOB
	  ○ Pressure relief protocol when patient in W/C (recline fully every 30 minutes for 60 seconds and return to full upright)
	• Passy Muir Valve (PMV) trials as soon as patient can tolerate even short periods of wear (or in-line PMV)
	• Participate in family meetings
	• Chest PT when patient sitting on edge of bed
		• PT/OT to assess need for orthotics for UE/LE
		• Respiratory & ST to assess need for in-line PMV
		• Rehab should be offered to patients with acute SCI when they are medically stable and can tolerate the required rehab intensity (2)

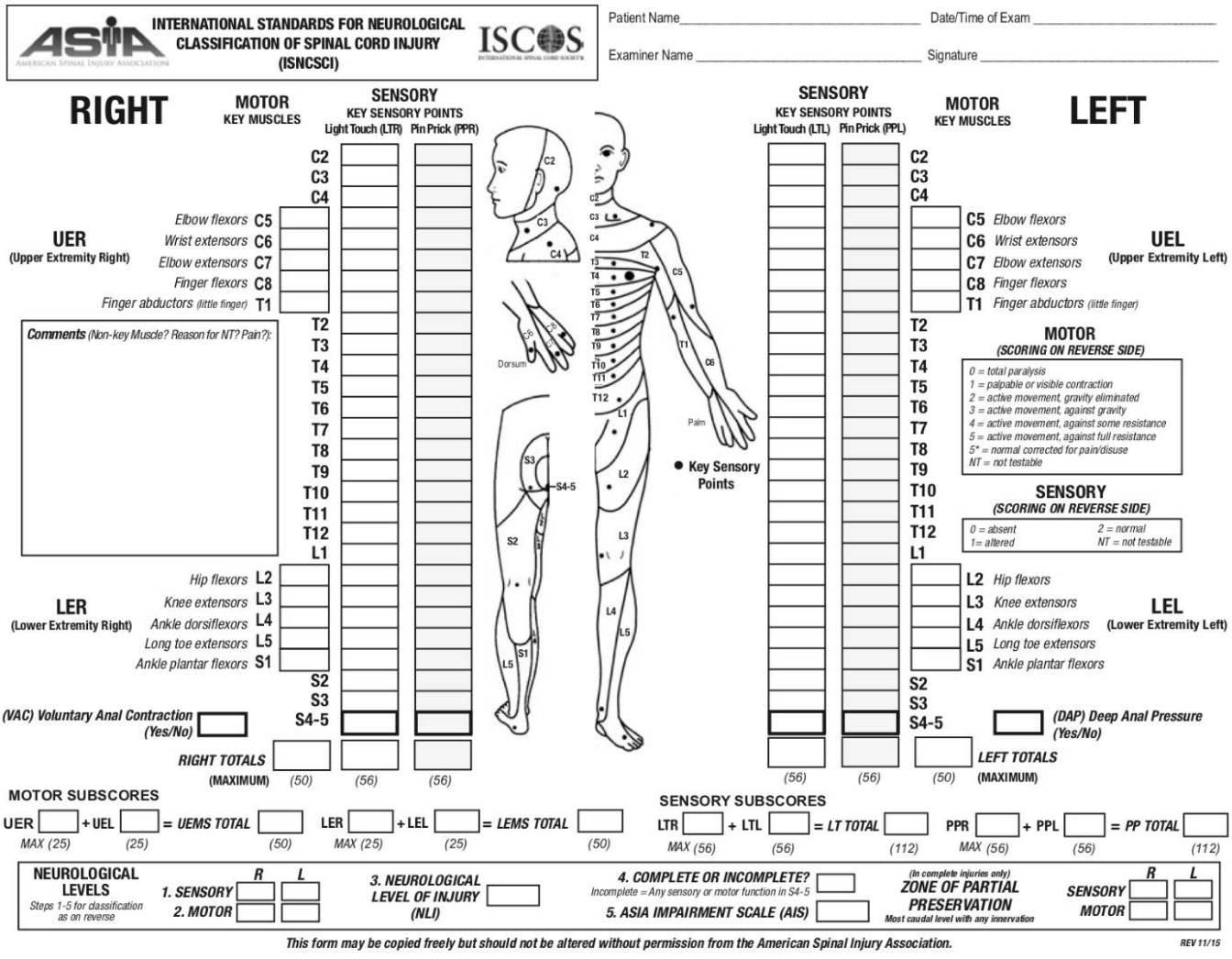
VTE Prevention
Goal:
• Prevent VTE (38-49)
	• SCD's to bilateral lower extremities while in bed (2)
	• Initiate unfractionated heparin on admission - Heparin 5000 units SQ q 8 hrs (7500 units if BMI ≥ 35)
	• Transition to enoxaparin 72 hrs post-operative or immediately if non-operative (3)
	  ○ BMI < 30: Enoxaparin 40mg SQ q 12 hrs
	  ○ BMI ≥30: Enoxaparin 0.5 mg/kg SQ q 12 hrs
	  ○ Check Anti-Xa 4 hours after 4th or 5th (Goal anti-Xa = 0.2-0.5)
	• For high-risk patients that cannot be started on chemoprophylaxis started within 72 hours, consider Duplex ultrasound imaging to rule out DVTs until adequate therapy can begin
	• Consider IVC filter placement for high-risk patients that are unable to receive chemical prophylaxis (3), currently no evidence that IVC filters decrease rates of PE in ASCI patients– no quad coughing for 3 days after placement
		• Continue SCDs while in bed
		• Continue chemical DVT prophylaxis
		• Insufficient evidence for use of direct oral anticoagulants (DOACs) for chemoprophylaxis in ASCI population
		• Insufficient evidence to support a standard duration of treatment with chemoprophylaxis

Psychosocial Goal(s): • Foster effective coping strategies • Provide ASCI education to patient & family (3)	• Consult Clinical Psychosocial Counseling • Consult Chaplain • Consult Music Therapy • Provide patient & family with a packet on ASCI education, communication, and steps of grief (3) • Ensure proper call bell is within reach at all times	• Complete a baseline assessment of coping skills/ adjustment to injuries • Show "Understanding Spinal Cord Injury" video • Child life for patient (if <18 yrs) or family (if siblings) • Pet Therapy • Volunteer Services for distraction • Adaptive equipment • Promote rest between 2200 and 0600

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg
Pain/Spasticity Treatment Goals: • Attain adequate pain control (35-37) • Minimize side effects associated with analgesic agents • Decrease post-ASCI spasticity (37) • Improve participation with PT/OT/ST/ADL	Monitoring Parameters • Pain score via visual/analogue scale or CPOT (3) • Spasticity – compliance with PT/OT	Monitoring Parameters • Same as Phase 1
	Neuropathic Pain • Gabapentin (3) 300 mg PO/PT q 8 hrs; start at 100 mg PO/PT q 8 hrs age > 65 years (maximum dose 2400 mg/d) *OR* • Pregabalin (3) 75 mg PO q 12 hrs, may increase to max 300 mg PO q 12 hrs over 1-2 weeks (adjust for renal dysfunction) Consider the following if also treating depression (35): • Duloxetine 30 mg PO daily; increase to 60mg after 1 week (cannot crush) *OR* • Amitriptyline 25 mg PO q HS, may increase to max 100 mg over 1 week (may crush)	**Neuropathic Pain** • Continue to titrate medication as needed to specified maximum doses; if symptoms improve, consider weaning • Gabapentin and pregabalin should be weaned off over 1-2 weeks before discontinuing
	Generalized Pain Mild pain: • Acetaminophen 650 mg PO/PT/PR q 6 hrs PRN pain Moderate pain: • Enteral: Lortab elixir 10-15 ml PT q 4 hrs PRN pain • PO: Hydrocodone 5/325 mg 1-2 PO q 4 hrs PRN pain Severe pain: • Enteral: Oxycodone 5-10 mg PT q 4 hrs PRN pain • PO: Percocet 5/325 mg 1-2 PO q 4 hrs PRN pain	**Generalized Pain** • If severe, intractable pain, may increase opioid dose – the goal, however, is to achieve control with lowest possible dose • Continue current therapy with the goal to wean or discontinue opioids and/or benzodiazepines as quickly as possible to minimize respiratory & GI side effects (35) • De-escalate patients (EX: from Percocet to tramadol) as soon as possible
	Spasticity • Baclofen 10 mg PO q 8 hrs (while awake) – max 120 mg/day (35,36)	**Spasticity** • Monitor response to therapy (flexibility, ability to participate in PT/OT) • Initiate or titrate therapy as appropriate per Phase 1 recommendations If no response to baclofen: • Dantrolene 25 mg PO daily – may titrate every 7 days to a max of 400 mg/day
	Muscle Relaxants • Tizanidine (Zanaflex®) 2 mg PO q 8 hrs (max: 36 mg/day) • Methocarbamol (Robaxin®) 750-1000 mg PO/IV q 8 hrs	**Muscle Relaxants** • Continue current therapy • Monitor response to therapy • Titrate to lowest possible dose

	Phase 1 - Critical Care Unit	Phase 2 – Step-down or Med/Surg
D/C Planning/Consults Goals: • Decrease readmissions (1) • Increase capture rate • Decrease length of stay (1)	• Consult Care Coordinator on admission • Educate patient and family on goals/progress/plan • Multidisciplinary team huddle weekly ○ Address on-going patient, family, and interdisciplinary team issues to better facilitate ASCI patient care ○ Educate patient & family on goals, progress, plan ○ Prior to transfer from one level of care to another, incorporate team members from the next level	• Continue discharge planning • Multidisciplinary team huddle weekly (CNS / CNL Trauma-Stepdown to coordinate) ○ Address on-going patient, family, and interdisciplinary team issues to better facilitate ASCI patient care ○ Educate patient & family on goals, progress, plan ○ Prior to transfer from one level of care to another, incorporate team members from the next level

Appendix A: ASIA ISNCSCI Tool (6)



Available at: [ISNCSCI Worksheet - American Spinal Injury Association (asia-spinalinjury.org)]

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