Resource-Limited ENLS
Traumatic Spinal Cord Injury

Initial stabilization and transport: In many resource-limited settings, early stabilization of patients with traumatic spinal injury (TSI) must be performed by family or other bystanders due to underdeveloped systems for pre-hospital care and non-availability of trained emergency medical personnel. If ambulance services are available and equipped to stabilize the patient's circulation, airway, and breathing, and spine, the standard ENLS algorithm should be followed. In the event that an ambulance is unavailable, all feasible efforts should be made to maintain spine stability with flat positioning and cervical motion restriction. If a rigid collar is unavailable, sandbags or pillows may be placed on either side of the patient's head to maintain midline positioning, or manual stabilization of the cervical spine may be provided by personnel traveling in the vehicle. Caution should be taken with these improvised measures to ensure that the patient's airway is not obstructed. Patients should be transported to the nearest health care facility. The ideal setting for patients with spinal cord injury is a referral hospital with capacity for endotracheal intubation, CT, neurosurgical and critical care expertise, and an intensive care unit (ICU). If the distance to a referral center will require prolonged transport time, the patient should be brought to the nearest health care facility capable of delivering basic stabilizing care and coordinating transfer to a higher-level facility.

Emergency department care: On arrival to the emergency department, patients who have not been assessed by medical personnel in the field should be evaluated for stability of their circulation, airway, and breathing, maintaining strict cervical spine motion restriction, ideally with a rigid collar as available. Patients with suspected cervical spine injury or other concern for unstable airway or breathing should be promptly intubated with spinal precautions and blood pressure support with isotonic fluids or vasopressors to maintain mean arterial blood pressure above 85 mmHg. If possible, a targeted motor and sensory examination should be performed to localize the level of spinal cord injury before induction of anesthesia, though intubation should not be delayed for this in patients with unstable airway or respiratory status. Prompt interdisciplinary evaluation by emergency medicine, neurosurgery, and/or orthopedic spine staff should be performed to expedite spine imaging and determine indications for surgical intervention.

Imaging: In many resource-limited settings, access to acute spine imaging may be limited by high inpatient demand, scanner down times, and direct out-of-pocket costs that patients must furnish before imaging. For patients deemed potential surgical candidates, every effort should be made to shorten time to imaging in order to facilitate surgical decision making and planning. CT of the cervical spine is the initial study of choice (often obtained alongside CT head for patients with concern for concurrent brain injury), though a 3-view cervical spine radiograph may be obtained if delay to CT imaging is expected. If CT or X-ray fail to clarify the patient's structural pathology, MRI of the cervical, thoracic, and lumbar spine (or a subset of these depending on the patient's clinical exam and suspected level of injury) should be obtained as soon as possible.

Triage and critical care management: Patients with acute TSI should ideally be managed in an ICU, though ICU capacity may be limited in many resource-limited settings. Highest priority for ICU admission should be given to intubated patients and patients who require surgical management to monitor for clinical deterioration and perioperative complications. Vital signs should be monitored at the maximum feasible frequency to monitor for hypotension and trigger blood pressure augmentation interventions such as IV fluids or vasopressors as available. If vasopressors are available, targeting a mean arterial pressure of 85mmHg with vasopressors for 7 days should be considered, but triage to the ICU for this purpose alone should be weighed against bed availability and ability to

administer vasopressors safely with close blood pressure monitoring given the lack of high-quality clinical trial data to support hemodynamic augmentation in this patient population.