Emergency Neurological Life Support® BRAIN Care: Broad Reaching Acute Interventions in Neurocritical Care

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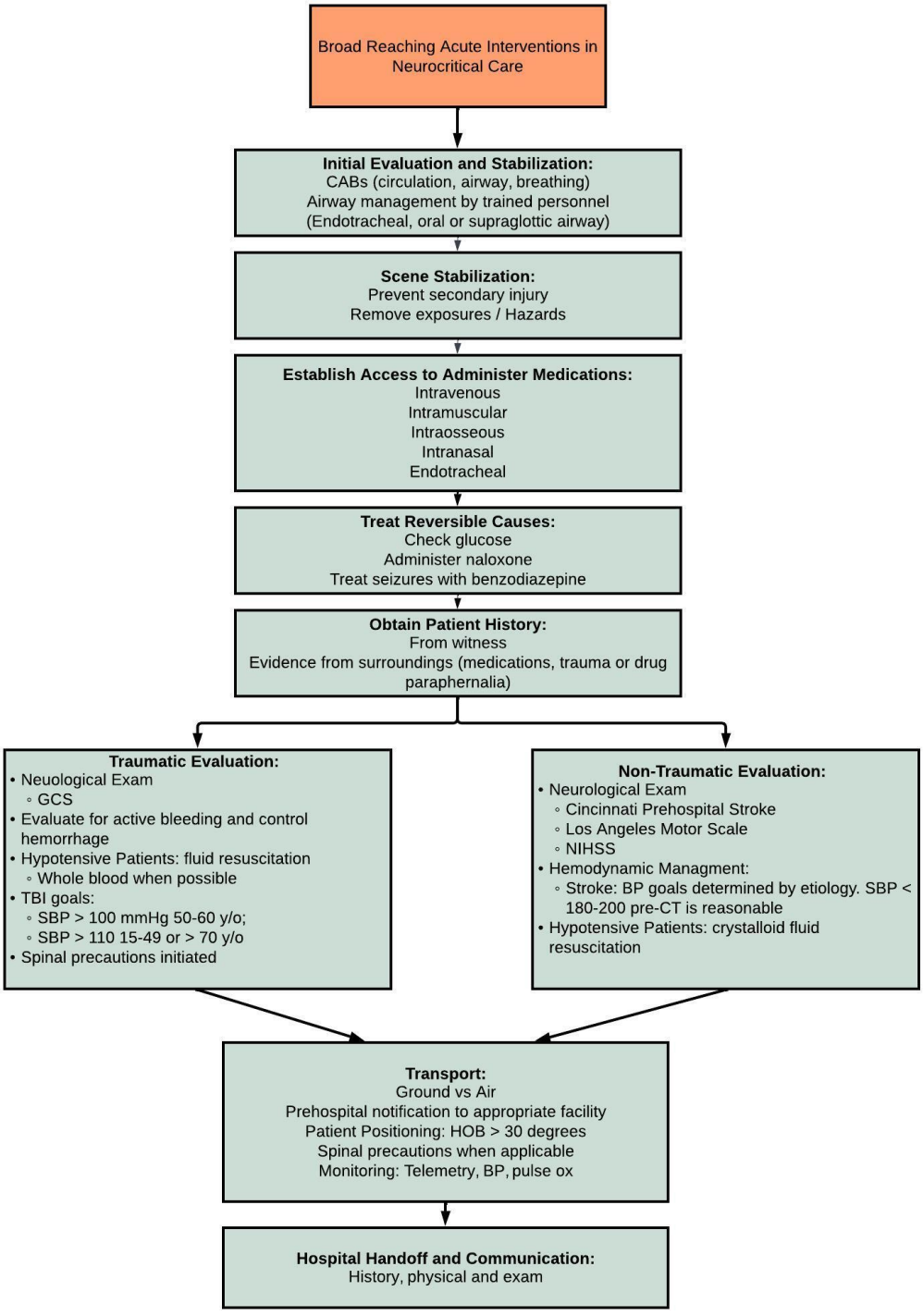
Broad Reaching Acute Interventions in Neurocritical Care Algorithm



INTRODUCTION

These protocols were created to review the early management of patients with acute neurologic conditions that need rapid evaluation, diagnosis, and treatment. They will review the stabilization, resuscitation, and early management of the patient with an undifferentiated neurologic condition and focus on care while prehospital setting and when in the emergency department. The overall theme is management before formal diagnosis

SCENE EVALUATION AND SAFETY

Prior to evaluating a patient in the field, the area surrounding the patient should be screened and cleared to ensure the safety of all personnel. Hazards should be removed and any impediments to care should be addressed prior to the medical evaluation. This can be as simple as scanning the area for threats or as complex as coordinating with law enforcement or firefighters in the case of a mass casualty event. Medical personnel who are evaluating patients in rural or wilderness settings should be wary of any environmental, geographic, or wildlife hazards that may be present.

Part of the scene evaluation also involves obtaining information that may help explain the cause of the patient's neurologic issue. Drug paraphernalia, prescription bottles and environmental clues can potentially point to the etiology of the patient's symptoms.

INITIAL EVALUATION

The initial evaluation focuses on circulation, airway, and breathing, and identifying reversible causes of encephalopathy. Patients who present in cardiac arrest should immediately have high quality chest compressions performed following Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) algorithms.

- Evaluate for airway patency and remove any obstructions
- Check for breathing and determine respiratory rate
- Check for pulses, evaluate skin color and temperature for signs of shock
- Determine level of consciousness and identify potential causes of encephalopathy
- A finger stick glucose test should be obtained whenever the patient has an alteration of consciousness or any focal neurologic deficits
- Thiamine should be given before dextrose whenever possible
- Intravenous access should be established if there is time to do so; many medications can be given by alternative route if needed (e.g., naloxone, midazolam)

If the constellation of signs and symptoms can be explained by a toxidrome, an appropriate antidote should be administered.

- Opioid overdose toxidromes should be given naloxone - intranasal naloxone can be easily administered by bystanders
- Anticholinergic toxidromes can be managed with physostigmine

A complete neurologic exam is not always necessary and can delay care or transport. A focused exam that is relevant to the presentation should be performed:

- Mental status evaluation: Glasgow coma scale in trauma, level of consciousness
- Cranial nerves: pupillary size and reactivity can suggest the etiology of encephalopathy or coma
- Motor examination: abnormal movements (e.g., myoclonus, tremors) or posturing
- Any patient suspected of having a stroke should have a prehospital stroke scale performed and be brought to the closest stroke-capable facility

An unconscious patient or trauma patient should be kept in spine precautions pending further testing and spine clearance.

AIRWAY MANAGEMENT

Hypoxemia and hypotension should be avoided during induction and airway management. For specific details on induction agents, airway management, and sedatives, consult the Airway, Ventilation, and Sedation ENLS module.

If intubation in the prehospital setting or the Emergency Department is needed, the most experienced operator should perform the procedure. Since these patients are often unresponsive, cervical spine precautions may be needed, especially when there is concern for trauma.

Regardless of strategy used, it is essential that hypoxemia and hypotension are avoided as either of these can worsen outcomes in traumatic brain injury (TBI) and stroke. Specific hemodynamic targets and strategies for management can be found in each ENLS disease-specific module.

VITAL SIGNS

Many disease processes have recommended vital sign targets or thresholds. However, it can be challenging to differentiate between some disease states (e.g., hemorrhagic versus ischemic stroke) prior to imaging and caution should be used in modifying vital signs before a diagnosis is made.

Brain Trauma

- Systolic blood pressure (SBP) > 110 mmHg (ages 15 - 49, > 70 years), > 100 mmHg ages 59 - 69
- Oxygen saturation (SpO_2): ≥ 94%

Spinal Cord Injury

- A Mean arterial pressure (MAP) of 85 - 90 mmHg is recommended

The general principle in the early stages of management is to maintain brain perfusion and oxygenation. Refer to specific ENLS modules for more information about vital sign targets for individual disease processes once a diagnosis has been made.

HEMORRHAGE CONTROL AND VOLUME RESUSCITATION

Intracranial hemorrhage is rarely of sufficient volume and severity to, in isolation, produce hemorrhagic shock. However, TBI patients can have concomitant intrathoracic and intra-abdominal injuries which can cause significant internal blood loss. They can also sustain extremity trauma with external blood loss. Scalp lacerations can often cause significant arterial blood loss.

- All trauma patients should have a thorough trauma evaluation to identify and document all injuries
- A tertiary survey performed 12-24 hours after resuscitation and stabilization is important to identify other injuries not readily apparent on the primary and secondary surveys.
- Altered mental status in the setting of a trauma history should prompt a thorough evaluation and workup for traumatic brain injury

Patients with significant blood loss should be resuscitated promptly using a balanced blood product resuscitation strategy

- If whole blood is available, it can be used in lieu of component transfusion
- Fresh frozen plasma (FFP) should be used in balanced ratios with packed red blood cells (PRBC) and platelets

In the United States, only some states permit prehospital blood transfusions, so practices may vary based on location and agency involved. Other regions have their own protocols and policies that are important to consider, as blood product administration may not be feasible or permitted in all regions.

In non-trauma scenarios, careful attention to hemodynamics to ensure normotension is the mainstay of management. Intravenous crystalloid fluids are often administered in response to hypotension. Isotonic fluids should be used whenever there is suspicion of an acute neurologic condition to avoid cerebral edema. Several studies have been performed to look at the optimal fluid for resuscitation in critical illness with a lack of data demonstrating superiority of one product. Colloid resuscitation has been shown to be harmful in traumatic brain injury and crystalloid resuscitation is preferable.

TRANSPORT

There are several choices for transport and this will depend on the region, capabilities and patient care requirements. Geographic restrictions (e.g., islands, mountainous terrain) may mandate a particular mode of transport.

When a patient is being transferred to a higher level of care, the sending clinician should review local protocols and discuss the care required with the accepting facility.