PURPOSE:
To define life threatening neurosurgical emergencies that warrant the response of a Neurosurgical Service within 30 minutes of notification. Cary Hospital neurosurgical emergencies require teleconsultation of a Neurosurgical Service from a Level I Trauma Center. Inclusive to this guideline is the "off-site radiology interpretation policy".

Contributing Specialties:
- Neurosurgery
- Trauma surgery

Guideline:

I. Emergent, Urgent, and Non-Urgent consult definitions & procedures:

a. Emergent definition- Injured patients with the presence of any of the following should be evaluated on an emergent basis by a neurosurgeon on trauma call.
   i. Threatened loss of life because of a neurosurgical injury: examples include but not limited to:
      1. GCS≤8 with abnormal head CT
      2. Open or depressed skull fracture
      3. Spinal Cord Injury

b. Emergent consult procedure- The neurosurgeon should initiate active evaluation and review the case (ranging from remote radiographic review to in person evaluation as determined by direct discussion between the neurosurgical and trauma attending) and be available to be present for active participation in resuscitation and treatment in the hospital within 30 minutes of notification, upon request of the trauma attending. The time of return call shall be documented in the medical record.

c. Urgent definition- Injured patients with the following require urgent attention and triage but do not meet the threshold for emergent evaluation and should be evaluated on an urgent basis by a neurosurgeon on trauma call.
   i. Injured patients with the following should be considered for urgent neurosurgical consultation:
      1. GCS 9-12 with abnormal head CT (hematoma, contusion, edema or compressed basal cisterns).
         a. ICP monitoring may be indicated after neurosurgical evaluation and/or ICU level care.
      2. GCS<8 with normal head CT with no clear etiology for altered mental status
         a. ICP monitoring may be indicated after neurosurgical evaluation and/or ICU level care.

d. Urgent consult procedure- The neurosurgeon should initiate active treatment to deliver appropriate and timely care to the injured patient. This includes radiographic review, communication with the trauma service regarding a treatment plan, and preparation for definitive operative management as warranted. The neurosurgical consultant must be available for direct evaluation and treatment in the hospital within 12 hours or as deemed necessary between services.

e. Non-Urgent- The neurosurgeon on call will also be consulted for other neurosurgical injuries. The timeliness of the neurosurgical response should be based on discussion between the trauma team and the neurosurgeon team in each case.

f. The trauma performance improvement program will monitor the appropriateness and timeliness of emergent neurosurgical consults. Compliance will be tracked, and results presented at the trauma performance improvement committee with an expectation of ≥80% compliance.

Guidelines of Care:

II. Anticoagulation Reversal:
- a. Reversal for anti-platelet medication (ASA, Plavix, Brillinta, Effient)
  - i. None required
- b. Reversal for Coumadin
  - i. Non-life-threatening hemorrhage
    1. FFP
  - ii. Life-threatening hemorrhage
    1. 4 factor PCC (active bleeding or going to the OR)
- c. Reversal of novel anticoagulants (Xarelto, Eliquis, Pradaxa)
  - i. Non-life-threatening hemorrhage
    1. None required
  - ii. Life-threatening hemorrhage
    1. Praxbind or 4 factor PCC (active bleeding or going to the OR)
  - iii. Discussion with Neurosurgery warranted

III. Pharmacologic Prophylaxis for DVT:
- a. Lovenox in normal prophylactic doses may start if items below are met or as directed by neurosurgery
  - i. On HD#2 or >24 hours from injury
  - ii. Stable CT with no new or increase in size of bleed

IV. Seizure Prophylaxis:
- a. Keppra will be administered prophylactically for 7 days if:
  - i. Acute trauma with SDH or cortical hemorrhage
  - ii. Not to be given in SAH or hemorrhage in the deep structures and cerebellum

V. Ventriculostomy Use- Raleigh Campus:

a. Monitoring will be strongly considered for patients with a GCS <8 and a motor score of <4
b. Ventriculostomy will be strongly considered over parenchymal monitors
c. Repeat head CT in patients in whom it is deemed indicated
    i. 6 hours after injury
    ii. < 6 hours at request of Neurosurgery

VI. TBI management (when concerns for increased ICP)- Raleigh Campus:
a. Consider intracranial monitoring device
b. Avoidance of hypoxemia or hypotension
c. Avoidance of hyponatremia (Na<140)
    i. Utilize 3% hypertonic saline infusion
d. Avoidance of use of free water and dextrose
e. Elevate head of bed >45°
f. Remove c-collar as soon as possible
    i. May buttress sides of neck if indicated
g. Maintain normo-carbia (except in acute herniation syndrome)
h. Provide adequate pain control and sedation
    i. Prefer Fentanyl and Propofol
    ii. Benzodiazepines should be avoided unless medically indicated and in consultation with neurosurgery
i. Utilize hypertonic bolus
    i. If Na <160 mEq/L give 23% saline
    ii. Mannitol should not be used simultaneously with hypertonic saline
j. In the case of persistent increased intracranial pressure on adequate sedation
    i. Utilize neuromuscular blockade

VII. Cary Hospital
a. TBI management:
    i. Avoidance of hypoxemia or hypotension
    ii. Avoidance of use of free water and dextrose
    iii. Remove c-collar as soon as possible
        1. May buttress sides of neck if emergent
    iv. Provide adequate pain control
        1. Avoid benzodiazepines
        2. Minimal sedation unless medically indicated and with consultation with neurosurgery

b. Acute Spine Injury:
    i. No neurological deficits
        1. Consult Spine on call
    ii. Neurological deficits
        1. If due to spinal cord injury consult Spine on call and initiate transfer to Level I trauma center
        2. If possibly due to nerve root or peripheral nerve damage (e.g. brachial

plexus) then consult Spine on call and discuss if can be managed at WakeMed Cary (if other injuries also allow).