

## **Society of Trauma Nurses Guideline For The Care of the Geriatric Patient Taking Anti-Coagulants Who Sustains A Traumatic Brain Injury**

### **Guiding Principles**

Those patients who suffer a traumatic brain injury (TBI) and are taking an anti-coagulant will require a rapid reversal of that agent. Anticoagulants are taken by many patients and especially geriatric patients to avoid a life-threatening event, but once a traumatic injury occurs, these agents may increase their mortality due to the disruption of the clotting factors. This protocol will assist trauma providers by decreasing the risk of a life-threatening hemorrhage in geriatric trauma patients who are on anticoagulation therapy.

### **Background:**

Trauma is one of the leading causes of death in the United States. Every day traumatic injuries are sustained, individuals become disabled and death occurs. Many of those injured, are over the age of 65 years.

TBI is on the decline in younger individuals (> 15 years and < 65 years) due to the institution of preventative measures such as seatbelt use and protective head gear when participating in sporting or athletic activities. However in the elderly population, where falls constitute a leading cause of brain injury, this decrease has not been seen.

The **elderly** are defined in this document will be those greater than 65 years, and are a rapidly growing population in the United States. The number of people age 65 and over is projected to increase from 35 -39 million in 2010 to 53-69 million by the year 2020. This increase is attributed to the extended life expectancy when the surviving Baby Boomers will be over 65 years. About 20 percent of the total population of the United States will be over 65 in 2030, compared to approximately 13 percent now.

TBI whether from blunt or penetrating trauma can result in mechanical damage to the parenchyma of the brain. The initial insult occurs when force is transmitted to the brain tissue, which leads to cellular damage. The ensuing cascade of cellular changes can lead to cerebral edema and the secondary injury, which occurs over hours to days after the traumatic event. In addition to the direct parenchymal damage, the mechanical forces can lead to hemorrhage and elevations in ICP, threatening further secondary brain injury.

Anticoagulation is a high-risk therapy, which is sometimes needed for patients with a wide variety of medical and surgical issues. Warfarin is a commonly used oral anticoagulant that, via competitive antagonism of vitamin K interferes with the gamma carboxylation of clotting proteins, II, VII, IX, and X. The functional levels of these proteins are thus titrated lower with an anticoagulant effect.

For coagulation to occur, the clotting factors require carboxylation of glutamic acid to allow the factors to bind to phospholipid surfaces in the blood vessels and on the vascular endothelium. The enzyme that carries out the carboxylation of glutamic acid is gamma-

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glutamyl carboxylase. The carboxylation reaction will only occur if the carboxylase enzyme is able to convert a form of vitamin K (vitamin K hydroquinone) to vitamin K epoxide reductase (VKOR) at the same time. The VKOR is in turn recycled back to vitamin K and vitamin K hydroquinone by another enzyme, the VKOR. Warfarin is responsible for inhibiting VKOR<sup>[10]</sup> which decreases the availability of vitamin K and vitamin K hydroquinone in the tissues and affects the carboxylation activity of the glutamyl carboxylase. When this occurs, the coagulation factors are inactivated and unable to bind to the endothelial surface of blood vessels. This process occurs over several days. The disruption of the clotting cascade prevents clot from forming. When a patient taking warfarin suffers a TBI, reversal of the anticoagulant becomes a priority.

### **Assessment Parameters:**

All trauma patients should be asked about any pre-existing medical conditions or surgeries that they might have had. This should include any prescription or over the counter medications that they are taking, paying specific attention to prescribed anticoagulants (i.e. warfarin, aspirin (ASA), Plavix, Lovenox, etc). If anticoagulants are being taken by the patient, it is important to determine the reason for their use.

Those on warfarin may present with small intracranial bleeds that ultimately progress to a larger hemorrhage. The patients taking ASA on a daily basis will usually have small bleeds and other comorbid conditions. The risks and benefits of anticoagulant use must be reevaluated once a traumatic intracranial hemorrhage occurs. For those patients on anticoagulants for atrial fibrillation the rates of a thrombotic event are 1 in 500 and 1 in 1300 as compared to 1 in 2 risk of death following an intracranial hemorrhage. Patients on Plavix are at risk for a thrombotic event somewhere between the ASA group and the warfarin group with regards to progression of their bleed.

### **Suggested Care Strategies:**

#### **Criteria to triage to a trauma facility:**

Determine the patient's Glasgow Coma Scale (GCS), combined with the patient's age, gender and pre-existing medical conditions (including the use of anti-coagulants). If the sending facility is able to calculate an Injury Severity Score (ISS) then utilize that information. <sup>11</sup>

- For minor injury and an ISS < 9, the mortality for 65 years and older is increased
- For moderate injury and an ISS 9-24, the mortality for 45 years and older is increased

#### **Upon arrival at a trauma facility:**

1) Obtain a GCS and vital signs at time of triage: Initial **GCS** and a complete neurological examination should be done at time of triage then reevaluated at a minimum of every hour. During the initial observation period, the neurological exam should be

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repeated frequently. Clinical signs of increased ICP include declining mental status, headache, vomiting, varying respirations, and bradycardia. Changes in the pupillary response or the components of the GCS score can signal worsening brain injury. Medical management of TBI is focused on preventing secondary insult.

2) Lab work including an INR should be obtained on any elderly person on anticoagulation therapy with a mechanism of injury consistent with TBI. Therapeutic and supratherapeutic INRs should be treated with fresh frozen plasma (FFP) and vitamin K or Factor VIIa in any patient with TBI. The INR should be maintained less than 1.4.

3) Obtain a CT scan of the head.

4) A Neurosurgical consultation should be obtained if the scan is positive for blood as there will be a reversal of the anticoagulant initiated in patient's diagnosed with intracranial hemorrhage.

4) Contact the blood bank to begin thawing FFP and administer the FFP once the scan has been reviewed and an intracranial hemorrhage confirmed.

5) Repeat head CT scan in 6 hours.

6) Once reversal of the anticoagulant has started, the patient will need to be closely monitored for neurological changes and potential complications from the reversal ( i.e. emboli phenomenon). Elderly patients anticoagulated with mild TBI, including those with neurological examination and normal CT scans should be hospitalized for at least 24 hours for observation by either a trauma surgeon or a neuro surgeon.

7) Anticoagulation should not be reinitiated in a patient with an ICH until it is deemed appropriate by a neurosurgeon. Typically, ASA and Plavix can be restarted sooner than warfarin, but the plan needs to be initiated in consultation with a neurosurgeon.

### **Suggested Anticoagulation Reversal Guideline**

Inclusion Criteria: Trauma patients with a history of pre-morbid anticoagulation therapy

#### **1. Procedure for trauma patients on Warfarin:**

- Every effort will be made to obtain an anti-coagulation history on all trauma patients prior to and/or on arrival to the hospital.

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- If a reliable history is not available, coagulation studies will be obtained with the initial trauma laboratory panel.
- Evaluate for co-morbidities or significant medical history which would serve as a predictor of anticoagulant use such as atrial fibrillation, valvular replacement, deep vein thrombosis, stroke, etc. Consider the potential morbidity and mortality of anticoagulation reversal if not able to reinitiate an anti-coagulate or alternative therapy within 24 hours.
- For patients with life-threatening hemorrhage, consider activated Factor VII or Prothrombin Complex Concentrate (PCC aka Fix Concentrate).
- If history confirms or suggests that the patient has been injured and **is on warfarin, the following will be done:**
  - **coagulation labs and a stat request for FFP will be sent.**
- Definitive treatments should not be delayed while waiting for result of coagulation studies.
- **Vitamin K should be given immediately for patients with the following:**
  - Proven significant hemorrhage
  - Proven intracranial hemorrhage
  - Significant pulmonary contusions

(The preferred dose of Vitamin K with a life threatening hemorrhage is **10 mg intravenously given slowly i.e., less than 1 mg/min, and then the dose may be repeated every 12 hours**)
- **2 units of FFP will be given ASAP in the following situations:**
  - Altered level of consciousness
  - Hemodynamic instability
  - Positive F.A.S.T. (Focused Assessment with Sonography for Trauma) scan (should also consider Recumbent FVIIa (rFVIIa) or PCC)
  - Pulmonary contusion on chest radiographic
  - Significant pulmonary contusion on CT scan
  - Any intracranial hematoma or hemorrhage on CT scan
  - INR > 2.0 (should also consider rFVIIa or PCC)
- **4 more units of FFP will be thawed and ready for transfusion for the following patients:**
  - Confirmed elevated INR >3.0
  - Confirmed significant hemorrhage
  - Intracranial hemorrhage
  - Pulmonary contusion

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- As a half-life of FFP is less than warfarin, **INR should be re-checked every 4 hrs until discontinued** by the trauma service.
  - If INR 1.0-1.4, reversal is complete
- Consider the potential morbidity of anticoagulation reversal, especially in patients with mitral valve issues
- When contemplating use of blood products, consider the religious preferences of the patient (i.e. a practicing Jehovah's Witness), the patient and family's end of life issues, etc.

## **2. Guideline for all trauma patients on Clopidogrel (Plavix), Aspirin or Ticlopidine (Ticlid):**

- No pharmacologic reversal agent is available for ASA, Plavix or Ticlid
- If patient is known/suspected to be **taking Plavix, ASA or Ticlid within the last 7 days, platelet transfusion should be considered in the following situations:**
  - Hemodynamic instability
  - Positive F.A.S.T.
  - Pulmonary contusion on chest radiograph
  - Significant pulmonary contusion on CT scan
  - Any intracranial hemorrhage on CT scan
  - GCS < 14 with clinical evidence of closed head injury

### **Evaluation of Expected Outcomes:**

Patient outcomes will be evaluated to determine whether implementation of these guidelines influence the neurological outcome of geriatric patients who are taking anticoagulation medications at the time that they sustain a TBI. Outcomes should be measurable and quantifiable. They should be documented in the patient record.

1. Patients who has sustained a TBI while on anti-coagulants, have been predicted to have the following outcomes:<sup>11</sup>
  - a) If the patient is 65 years or older, with a GCS  $\leq 8$  a dismal prognosis is likely. If there is no change within 72 hours consider limiting further or more aggressive interventions.
  - b) The degree/type of shock and resuscitation needs should be determined by obtaining an arterial blood gas within 1 hour of admission. **Based deficit:** (*mild*-3to-5) (*moderate*-6 to-9) and (*severe*-10)<sup>11</sup>
2. A geriatric patient who does not survive their hospitalization should have documented in their chart what the primary cause of death was along with as complete listing as

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possible of their injuries was so that the relationship between their anti-coagulation status and the primary cause of death can be determined.

3. If it is possible, an autopsy should be performed to determine if there were any missed injuries, complications, etc.

4. Of those patients who survive, it is necessary to determine whether they were able to return to their previous level of cognitive and physical functioning as evidenced by:

- a) ability to return to activities of daily living
- b) return to their previous living situation (live in their home, assisted living, etc)
- c) no evidence of decline in cognitive level of functioning
- d) no permanent disability

**Further research:**

Ongoing clinical trials are needed determine the best interventions for reversing anticoagulants when patients sustain traumatic intracranial hemorrhage.

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