# Head Injury in Anticoagulated Patients Guideline

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We thank the members of the Hospital Technical Advisory Committee and representatives from many of Washington State's designated trauma services for their participation in the development of this guideline.

The Washington State Department of Health distributes this guideline on behalf of the Emergency Medical Services and Trauma Care Steering Committee to assist trauma care services with providing care to injured patients.

The Department of Health does not mandate the use of this guideline. The department recognizes the varying resources of different services, and approaches that work for one trauma service may not be suitable for others. The decision to use the content in this guideline depends on the independent judgment of program administrators. We recommend trauma services who choose to use this guideline consult with the department regularly for any updates to its content. The department appreciates receiving any information regarding program experience using the guideline and comments can be directed to traumadesignation@doh.wa.gov.

The content in this guideline was adapted from professional literature and the expertise of the trauma community. The guideline was reviewed, and input sought from program administrators throughout Washington state, and used that input to make changes. Both the Emergency Medical Services and Trauma Care Steering Committee and the Department of Health, Office of Resilience and Health Security, Emergency Care Systems endorsed the guideline.

# Contents

# Background

Chronic anticoagulation and antiplatelet therapy is used in managing a variety of clinical conditions including chronic atrial fibrillation, pulmonary embolus, deep vein thrombosis, prosthetic heart valves, and procoagulant states. Warfarin and other direct oral anticoagulants are increasingly prescribed to elderly patients who are at risk of falling. The use of anticoagulant and antiplatelet medications is a significant predictor of mortality in patients with traumatic intracranial hemorrhage. Patients that initially present with no or minimal neurological symptoms and minor intracranial hemorrhage can progress and ultimately result in fatal hemorrhage while awaiting diagnosis and initiation of treatment. Rapid confirmation of intracranial hemorrhage with expedited head computed tomography (CT) scan combined with prompt reversal of anticoagulation may decrease progression of intracranial hemorrhage and reduce mortality.

Goal: To rapidly identify intracranial hemorrhage in anticoagulated patients and reduce the time from presentation to reversal of anticoagulation.

# Criteria

Inclusion Criteria:
Include adult patients (18 or older) who are using anticoagulant or antiplatelet medication that have a mechanism of injury which places them at risk for intracranial injury. This includes all patients with blunt mechanisms of trauma, including falls from same level (ground-level fall), who have one of the following:

- Any loss of consciousness.
- Any mental status changes.
- History of direct impact to the head or neck.
- Any signs of external injury to head or neck such as abrasion or ecchymosis.
- Falls from one level to another level.

Exclusion Criteria:

- Hospice patients.
- Patients who are part of the trauma code, hemodynamically unstable, or displaying signs of hemorrhagic shock that may need other life-sustaining procedures. As part of their resuscitation, these patients may need reversal of anticoagulation and may also benefit from prothrombin complex concentrate (PCC) and Idarucizumab (praxbind) at the direction of the treating physician.

# Assessment

- Rapid triage directly to a treatment area.
- Stat labs with coagulation screen including Prothrombin time (PT), international normalized ratio (INR), and type and screen.
- Emergent ordering of head CT scan.
- An initial emergent evaluation by an emergency physician, trauma surgeon, or neurosurgeon.
- Immediate head CT interpretation by the radiologist and communication to treating physician.

# Treatment

- Hold or stop administration of anticoagulant, antiplatelet, or thrombolytic agent.
- Patients without any signs of intracranial hemorrhage on the initial head CT scan are managed based on specific guidelines and/or treating physician discretion, which may include admission for observation or repeat head CT.
- Patients with head CT scan confirmation of intracranial hemorrhage and INR greater than 1.5, consider reversal agent. Follow facility procedure for reversal of anticoagulant, antiplatelet, or thrombolytic agents.
- Appropriate surgical consultation, including neurosurgical consultation, obtained emergently.
- This guideline focuses on the initial rapid process to correct anticoagulation in patients with head injury. Any additional blood product transfusion or patient monitoring is based on hospital guidelines and treating physician discretion.
- The appropriate treatment of trauma patients based on trauma guidelines and advanced trauma life support (ATLS) supersedes this protocol. As such, at the discretion of the treating physicians, life-saving maneuvers, such as endotracheal intubation, and other required treatments, including transfer to a definitive-care site, should not be delayed.

## Vitamin K Antagonists (Warfarin/Coumadin) Pathway

There are several methods described below to reverse the effects of warfarin.

A Prothrombin Complex Concentrate (PCC) four-factor (Kcentra) is the preferred reversal agent in treating patients who are anticoagulated with warfarin and have intracranial hemorrhage. Relative contraindications to PCC use include:

- History of thrombotic or thromboembolic event in the past six weeks (DVT, PE, ischemic stroke, acute coronary syndrome, acute venous/arterial ischemia, etc.).
- Known prothrombotic condition (malignancy, disseminated intravascular coagulation, hypercoagulable condition, hepatic disease, polytrauma, HIT, etc.).
- If any of the above criteria is met or the patient has mechanical heart valve such as aortic or mitral valve replacement, please discuss with the primary treating physician or consultant about the possibility of giving PCC.

A four-factor PCC should be able to reverse warfarin anticoagulation without fresh frozen plasma (FFP) administration; therefore, side effects of FFP administration, such as risk for volume overload, may be avoided. However, trauma patients who require fluid resuscitation may benefit from the combined treatment of PCC with administration of two to four units of FFP as the initial treatment. Combined initial treatment (PCC with FFP) can be initiated at the discretion of the treating physician.

- If INR 1.6-1.9, PCC may be considered as described above. Given the scarce evidence and the potential prothrombotic risk of PCC, FFP may be considered as an alternative (see FFP pathway below).
- Check PT/INR (or EHP) at one hour, six hours and 24 hours after PCC administration.
- If PT/INR is still greater than 1.5 after appropriate dosing of PCC in one hour, consider other possible causes such as a low fibrinogen. For patients whose INR does not correct after PCC, please consider switching to the FFP pathway with the empiric administration of two to four units of thawed FFP.

For Kcentra dosing information, follow facility policy and the manufacture recommendations.

When using a three-factor PCC, administration of one unit of fresh frozen plasma is recommended to aid in coagulation.

Vitamin K is often considered either as an oral or intravenous dose. The intravenous dose has a much faster onset and is often administered as a primary reversal agent when rapid reversal is needed. Avoid Vitamin K in patients who have had an anaphylactic reaction in the past.

## FFP Pathway (If PCC not available or decision was made not to use it)

- Immediately transfuse four units universal-donor FFP and request four units of type-specific FFP to be sent as soon as possible.
- Check INR after the first four units of FFP have been administered and follow your hospital guidelines or treating physician discretion for repeat FFP dosing as needed.

## Direct Thrombin Inhibitor Pathway

Patients anticoagulated with dabigatran (Pradaxa) can safely be reversed with Praxbind (idarucizumab). Follow facility policy and the manufacture recommendations for prescribing and administering Praxbind. A follow-up CT scan should be performed after administration.

## Factor Xa Inhibitor Pathway

Anticoagulation with Factor Xa Inhibitors such as Eliquis (apixaban) and Xarelto (rivaroxaban) can be reversed with PCC (Kcentra) or Andexanet (ANDEXXA), if available.

The Andexxa recommended dose (low dose vs high dose) is based on the type of Factor Xa Inhibitor and the last dose of medication. For dosing recommendations, follow facility and manufacturer recommendations.

If the patient is prescribed Arixtra (fondaparinux), consider consulting with a Hematologist regarding the use of rFVIIa.

## Antiplatelet Pathway

Antiplatelet medications include Aspirin, Aggrexon, Plavix, Brilinta, and Effient. Antiplatelet reversal studies have been limited but some show effectiveness of administering Desmopressin (DDAVP), Tranexamic Acid (TXA), or platelet transfusion.

## Low Molecular Weight (LMW) Heparin Pathway

LMW heparins such as Lovenox (enoxaparin) and Fragmin (dalteparin) can be partially reversed with Protamine Sulfate. If it's been longer than 12 hours from the last dose, Protamine may not be helpful.

# Quality Improvement

Head injury in patients who are anticoagulated is a time sensitive emergency. Patients should be rapidly triaged and treated. Performance measures should be developed to evaluate this process as it relates to the time of arrival to the facility; to the time of triage/identification, time to computed tomography (CT), time to CT interpretation, and time to anticoagulation reversal.

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# Figure 1.

## HEAD INJURY IN ADULT ANTICOAGULATED PATIENTS

### Reversal Chart for Patients at Risk for Intracranial Hemorrhage

**Inclusion Criteria:**
Adult (≥18 years old)
Anticoagulated
Risk for intracranial injury

**Exclusion Criteria:**
Hospice patient
Trauma Code
Hemodynamically unstable
Hemorrhagic shock

Provide rapid triage to treatment area.
Stat Head CT (request rapid interpretation).
Rapid coagulation studies and type and screen.

↓

Head CT is positive for intracranial hemorrhage. Not small contusion or SAH. Patient is anticoagulated.

↓

Reversal decision made by attending physician. --- → Reversal Agent Dosing – follow current practice recommendations and facility protocols.

| Antiplatelet | LMW Heparin | Thrombin Inhibitor | Thrombolytics | Vitamin K Antagonist | Factor Xa Inhibitor |
|---|---|---|---|---|---|
| Aggrenox (ASA)<br>Plavix<br>Brilinta<br>Effient<br>Aggrastat (tirofiban)<br>→ Desmopressin<br>→ Platelet Infusion<br>→ Cryoprecipitate<br>Infusion (Aggrastat) | Lovenox (enoxaparin)<br>Fragmin (dalteparin)<br>→ Protamine<br><br>If last dose is > 12 hours, Protamine may not be helpful. | Pradaxa (dabigatran)<br>→ Praxbind | Activase (alteplase)<br>TNKase (Tenecteplase)<br>→ Cryoprecipitate and Tranexamic Acid | Coumadin (warfarin)<br>→ PCC (Kcentra)<br>→ Vitamin K.<br>→ FFP | Xarelto (rivaroxaban)<br>Eliquis (apixaban)<br>→ PCC (Kcentra)<br>→ Andexxa<br><br>Arixtra (fondaparinux)<br>→ rFVIIa |