Administration of Tissue Plasminogen Activator (tPA), New Oral Anticoagulants and Reversal
Learner Objectives

At the conclusion of the rt-PA (Alteplase) program, learners will be able to recall the:

• Pharmacology of rt-PA (Alteplase)
• Criteria for use of rt-PA (Alteplase) in ischemic stroke
• Treatment window for ischemic stroke interventions
• Contraindications for the administration of rt-PA (Alteplase)
• Appropriate dosing for rt-PA (Alteplase) Specific considerations related to rt-PA (Alteplase) administration
tPA = Alteplase = Activase®

- Initiates local fibrinolysis by binding to fibrin in a thrombus (clot) and converts entrapped plasminogen to plasmin
tPA = Alteplase = Activase®

- Half life is 5-10 minutes and is cleared by the liver
- Evidence has shown t-PA is effective in treating ischemic stroke. This kind of stroke is caused by blood clots that block blood flow to the brain
Fibrinolytic (Coagulation) Pathway

A simplified illustration demonstrates clot breakdown (fibrinolysis), with blue arrows denoting stimulation, and red arrows inhibition.
Stroke

• Stroke kills almost 130,000 Americans each year - that’s 1 in every 19 deaths.
• On average, one American dies from stroke every 4 minutes.
• Every year, more than 795,000 people in the United States have a stroke. About 610,000 of these are first or new strokes. One in four are recurrent strokes.
• Stroke is a leading cause of serious long-term disability.

www.cdc.gov/stroke/facts
Stroke

- Stroke is the 4th leading cause of death in the United States; however it is the 1st cause of disability
- About 87% of all strokes are ischemic
- Ischemic strokes are the only type that may receive fibrinolytics (rt-PA) if the patient meets the criteria
- The National Institute of Health Stroke Scale (NIHSS) is considered the standard, routine in-hospital measure of neurologic function for acute strokes
National Institute of Health Stroke Scale (NIHSS)

- Systematic assessment tool that provides a quantitative measure of stroke-related neurologic deficit
- Also widely used as a clinical assessment tool to
  - Evaluate acuity of stroke patients
  - Determine appropriate treatment
  - Predict patient outcome.
National Institute of Health Stroke Scale (NIHSS)

- NIHSS is a 15-item neurologic examination stroke scale used to evaluate the effect of acute cerebral infarction on
  - The levels of consciousness
  - Language
  - Neglect
  - Visual-field loss
  - Extraocular movement
  - Motor strength
  - Ataxia
  - Dysarthria
  - Sensory loss
National Institute of Health Stroke Scale (NIHSS)

- A trained observer rates the patient’s ability to answer questions and perform activities.
- Ratings for each item are scored with 3 to 5 grades with 0 as normal, and there is an allowance for untestable items.
- A single patient assessment requires less than 10 minutes to complete
Stroke

- It takes an interdisciplinary approach to care for a stroke patient
- The effectiveness of this organized stroke care will reduce:
  - Mortality
  - Institutionalization
  - The dependency in activities of daily living
- Organized stroke care is intended for JHS to use the best resources to minimize, or prevent when possible, the complications of a stroke through rapid identification of symptoms, appropriate interventions and patient education
Clinical Trial Patient Selection

- Presentation <3 hours after initial symptoms (NINDS, 1995)
  - Exclusion: Time of symptom onset unknown, rapidly improving or minor symptoms, major surgery within 2 weeks, GI or urinary tract hemorrhage within 3 weeks, aggressive treatment required to lower blood pressure, glucose level <50 or >400 mg/dL, and arterial puncture at a noncompressible site or lumbar puncture within 1 week.
Clinical Trial Patient Selection

• Presentation 3-4.5 hours after initial symptoms (ECASS-III; Hacke, 2008)
  – Exclusion: Age >80 years, time of symptom onset unknown, rapidly improving or minor symptoms, current use of anticoagulants regardless of INR, glucose level <50 or >400 mg/dL, aggressive intravenous treatment required to lower blood pressure, major surgery or severe trauma within 3 months, baseline National Institutes of Health Stroke Scale (NIHSS) score >25, and history of both stroke and diabetes.
FDA approved rt-PA for use within 3 hours from symptom onset

AHA/ASA recommended rt-PA for use up to 4.5 hours from symptom onset
Stroke Diagnosis

• Critical to determine the type of stroke in progress because treatment is different for ischemic stroke or a hemorrhagic stroke
• Time = Brain
• Based on Medical History, physical neurological examination, blood tests, diagnostic tests
• Rule out conditions with similar symptoms like: seizures, fainting, migraine, heart problems
AHA/ASA Acute ischemic stroke guidelines

The "Golden Hour" Door-to-needle time ≤ 60 minutes

Processes and Procedures

Assess CT / EKG / Lab

Timeframe

10 15 25 45 60 60+

Results

IV t-PA

Neuro IA…
Patient Selection

- Obtain baseline CT to exclude intracranial hemorrhage and other risk factors
- Review patient history for potential contraindications
- The earlier the initiation the better
IV rt-PA Inclusion Criteria

- Diagnosis of ischemic stroke causing measurable neurological deficit
- Onset of symptoms <3 hours before beginning treatment
- Aged ≥18 years
Contraindications

- Evidence of ICH
- Suspicion of SAH
- Recent intracranial surgery/head trauma/stroke
- Uncontrolled HTN (>185 SBP or >110 DBP)
- Seizure at the onset of stroke
- Significant head trauma in previous 3 months

- Active internal bleeding
- Intracranial neoplasm/AV malformation/aneurysm
- Known bleeding
  - Current use of oral anticoagulants, INR>1.7 or PT > 15 seconds
  - Administration of heparin within 48 hours preceding with elevated PTT
  - Platelet count <100,000
Contraindications

- Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (such as aPTT, INR, platelet count, and ECT; TT; or appropriate factor Xa activity assays)

- Blood glucose concentration <50 mg/dL (2.7 mmol/L)
- Intracranial neoplasm, arteriovenous malformation, or aneurysm
- CT demonstrates multilobar infarction (hypo density >1/3 cerebral hemisphere)
Warnings

• Patients with severe neurological deficit (NIH Stroke Scale >22), there is an increased risk of ICH

• Patients with major early infarct signs on CT (massive edema, midline shift, mass effect)
Relative exclusion criteria

Recent experience suggests that under some circumstances—with careful consideration and weighting of risk to benefit—patients may receive fibrinolytic therapy despite 1 or more relative contraindications:

- Only minor or rapidly improving stroke symptoms (clearing spontaneously)
- Pregnancy
Relative exclusion criteria

- Seizure at onset with post-ictal residual neurological impairments
- Major surgery or serious trauma within previous 14 days
- Recent gastrointestinal or urinary tract hemorrhage (within previous 21 days)
- Recent acute myocardial infarction (within previous 3 months)
Extended Window period: Use of IV rt-PA 3-4.5 hours from symptom onset

- Relative exclusion criteria:
  - Aged >80 years
  - Severe stroke (NIHSS >25)
  - Taking an oral anticoagulant regardless of INR
  - History of both diabetes and prior ischemic stroke

- IMPORTANT: Written consent is needed for IV rt-PA between 3-4.5 hours from onset of symptoms
Evaluation elements recommended by AHA/ASA

- Patient history
- Physical examination
- NIHSS
- Non-contrast CT scan of the brain
- Diagnostic tests include, but are not limited to:
  - Electrocardiogram (ECG)
  - Prothrombin time (PT)/ international
  - Blood glucose normalized ratio (INR)
  - Serum electrolytes/renal function tests
  - Activated partial thromboplastin time (aPTT)
  - Complete blood count, including platelet count
  - Oxygen saturation
Dosing for Ischemic Stroke

- 0.9 mg/kg; maximum dose 90 mg
- 10% of the total dose administered as an IV bolus over 1 minute
- Remaining 90% infused over 60 minutes
Administration of tPA

- tPA is to administered through a dedicated intravenous line
- Once infusion of tPA dose is complete, line should be flushed with 50mL of 0.9% NaCl
Nursing Considerations Prior to Drug Preparation

- If your patient only has one IV line, it is advisable to start a second line prior to TPA administration.
- However, starting a 2nd line should NOT be a reason to delay rt-PA administration.
- Once rt-PA starts limit urinary catheter insertion and venipunctures to emergencies for 24 hours post infusion
- Verify consent for rt-PA treatment if given within the 3.5 – 4.5 hours of onset of symptoms

Only unnecessary procedures should be avoided
Nursing Considerations Prior to Drug Preparation

- Who administers TPA?
  - The nurse does after the order is entered by the Neurologist.
  - NEVER accept t-PA orders as a verbal order.

- Dosage is verified by another nurse and carefully compared with the MD order. The two nurses must independently verify the following:

- Each nurse must verify the following:
  - Patient’s weight in Kg
  - Discard amount in mL
  - Volume to be infused in mL

All three should match
Keep in mind, that ...

- In the event of an in-patient stroke; the Neurology resident will start the IV rt-PA infusion and will manage the patient until an ICU nurse is available
Preparation of drug

- Alteplase (rt-PA) will need to be reconstituted
- Kit contains:
  - One vial of powdered medication (blue cap).
  - One vial with a 100 ml vial of Sterile Water for injection and a transfer device
- Once spike is attached, invert vial to dissolve. Gently swirl. Do not shake.
- Remove any excess drug and administer the bolus over 1 minute and the remainder over 1 hour
- Document removal and discarding of excess drug
Example

- The patient is 70 kg
- The concentration is 100mg in 100ml
- Total Dose 0.9mg x 70kg = 63mg
- Remove, discard and document 37mg (37mL)
- Loading Dose = 10% of 63 mg will be given IV push over 1 min. So, 6.3mg (6.3ml) would be given.
- The remaining would be given over 60 minutes. So, 56.7mg (56.7ml) would be given over the next hour
Reconstituting tPA

Mixing Alteplase:

tPA comes in a box with two bottles:

- Bottle 1: drug in powder form
- Bottle 2: diluent

A spike for transferring the diluent is in the box.
Reconstituting tPA

Step 1:

• Use the spike provided and insert it in the diluent bottle.

Spike goes in diluent bottle
Reconstituting tPA

Step 2:

- Carefully attach the diluent bottle to the powdered drug bottle by inverting the diluent bottle.
Reconstituting tPA

Step 3

Rt-PA is an Enzyme, Do not shake it!

- Gently swirl bottle until the powder goes into solution.
Reconstituting tPA

Step 4:

- Now verify with another nurse the following:
  1. Patients weight
  2. Discard volume
  3. Volume to be infused (VTBI) for the pump

- Once these 3 numbers have been verified and compare against the order, You are ready to proceed.

It is Crucial that you remove the discard volume from the bottle before hanging
Discarding volume from mixed tPA bottle

Step 4 (cont’d):
Carefully remove the amount that will NOT be used.

1. Insert infusion set
2. Attach appropriate size syringe and withdraw “Discard Quantity”
Bolus dose of tPA

Step 5:
Now that the tPA bottle has the total volume that will be given to the patient you will withdraw the BOLUS amount.

DO NOT bolus from the bottle!

BOLUS Over 1 min IV Push
Infusing tPA

- The nurse should stay in close proximity to the patient during the entire infusion hour.
- Limit IV sticks, lab sticks and foley insertions to emergencies for the duration of the t-PA infusion and 24 hours afterwards.
- Careful and frequent reassessment of any venipuncture sites, visible blood in urine, nose bleed or gum bleeding must be observed.
- NIH Stroke Scale & VS needs to be done every 15 minutes. Any significant changes need to be communicated to the Neurologist right away.
Alteplase (t-PA)

Please note:
Toward the end of the infusion you have to carefully stand in front of the pump and slowly lower the IV tubing spike so that the hole of the spike will remain below the fluid level.
This takes 3-4 minutes before all the fluid has gone into the IV tubing’s chamber.
Alteplase (t-PA)

- When the t-PA bottle is empty hang a 50 mL saline bag and do not change any of the pump settings. There are still 15-30 mLs of t-PA in the tubing. Run out the 50 mL bag
Nursing Assessment

Perform neurological assessments

- Every 15 minutes during infusion
- And every 30 minutes thereafter for the next 6 hours
- Then hourly until 24 hours after treatment

<table>
<thead>
<tr>
<th>Glasgow coma scale</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eye opening</strong></td>
<td></td>
</tr>
<tr>
<td>spontaneously</td>
<td>4</td>
</tr>
<tr>
<td>to speech</td>
<td>3</td>
</tr>
<tr>
<td>to pain</td>
<td>2</td>
</tr>
<tr>
<td>none</td>
<td>1</td>
</tr>
<tr>
<td><strong>Verbal response</strong></td>
<td></td>
</tr>
<tr>
<td>orientated</td>
<td>5</td>
</tr>
<tr>
<td>confused</td>
<td>4</td>
</tr>
<tr>
<td>inappropriate</td>
<td>3</td>
</tr>
<tr>
<td>incomprehensible</td>
<td>2</td>
</tr>
<tr>
<td>none</td>
<td>1</td>
</tr>
<tr>
<td><strong>Motor response</strong></td>
<td></td>
</tr>
<tr>
<td>obeys commands</td>
<td>6</td>
</tr>
<tr>
<td>localises to pain</td>
<td>5</td>
</tr>
<tr>
<td>withdraws from pain</td>
<td>4</td>
</tr>
<tr>
<td>flexion to pain</td>
<td>3</td>
</tr>
<tr>
<td>extension to pain</td>
<td>2</td>
</tr>
<tr>
<td>none</td>
<td>1</td>
</tr>
</tbody>
</table>

Maximum score 15
Nursing Assessment

Measure BP

• Every 15 minutes for the first 2 hours after initiation of alteplase
• Then every 30 minutes for the next 6 hours
• Then hourly until 24 hours after initiation of Alteplase.

Increase frequency if a systolic BP is ≥180 mm Hg or if a diastolic BP is ≥105 mm Hg; administer antihypertensive medications to maintain BP at or below these levels.
Nursing Assessment

• Discontinue the infusion and obtain emergency CT scan
  – Severe headache
  – Acute Hypertension
  – Nausea
  – Vomiting

• No heparin or antiplatelet agents for 24 hours
Nursing Assessment

- Avoid invasive lines for 24 hours
  - Examples: Urinary catheter, NG/OG Tube, IM injections

- Call MD immediately for:
  - Evidence of bleeding
  - Pulse rate <50
  - Mental status changes
  - Respiratory rate >26

IMMEDIATELY STOP TPA & NOTIFY MD FOR:
Angioedema/upper airway obstruction/swelling tongue.
Decline in neurological status/worsening of stroke signs.
New or worsening headache, uncontrolled bleeding,
seizure, nausea or vomiting.
Nursing Documentation

- Document on the appropriate medical record:
- Two (2) RNs to document on MAR
  - Discard
  - Patient’s weight
  - Dose
- rt-PA infusion
- Vital signs/neurochecks
  - Every 15 minutes for 2 hours
  - Every 30 minutes for 6 hours
  - Every hour there after
- If BP causes a delay in treatment
Example of tPA Calculation

• Patient wt – 80 kg

• Chart:
  – tPA bolus 7.2 mg
  – tPA infusion 64.8 mg in 64.8 ml given over 60 minutes

  • 0.9mg/kg = 72
  • 72mg in 72 ml (total dose)
  • - 10% = 7.2 mg or ml (bolus dose)
  • 72 - 7.2 = 64.8mg (infusion dose)
Potential Complications

- Bleeding: be alert!
- Check neurological status, monitor for signs of increased ICP
- Maintain blood pressure <185/<110
- Observe for signs of angioedema (1% risk)
ASA 2007 Guidelines for Acute Blood Pressure Management

If *treating with tPA*:

<table>
<thead>
<tr>
<th>BP Level (mm Hg)</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Treatment</td>
<td>Labetolol 10-20 mg over 1-2 minutes or</td>
</tr>
<tr>
<td>SBP &gt;185</td>
<td>Nitropaste 1-2 inches, or</td>
</tr>
<tr>
<td>DBP &gt;110</td>
<td>Nicardipine infusion starting at 5mg/hr</td>
</tr>
<tr>
<td>During &amp; After t-PA</td>
<td>Labetolol 10-20 mg over 1-2 minutes or</td>
</tr>
<tr>
<td>SBP &gt;180</td>
<td>Nicardipine infusion starting at 5mg/hr</td>
</tr>
<tr>
<td>DBP &gt;105</td>
<td></td>
</tr>
</tbody>
</table>

If *not treating with tPA, BP may be left untreated up to*:

SBP 220 mm Hg & DBP 120 mm Hg
JCAHO Guidelines for Stroke Management

- Deep Vein Thrombosis (DVT) Prophylaxis
- Discharged on Antithrombotics
- Patients with Atrial Fibrillation Receiving Anticoagulation Therapy
- Tissue Plasminogen Activator (t-PA) Considered/Administered
- Antithrombotic Medication Within 48 Hours of Hospitalization
JCAHO (continued)

- Lipid Profile During Hospitalization
- Screen for Dysphagia
- Stroke Education
- Smoking Cessation
- A Plan for Rehabilitation was Considered

From JCAHO.org website Primary Stroke Center
Standardized measures
New Oral Anticoagulants and Reversal
New Oral Anticoagulants

- New oral anticoagulants and their use for stroke prophylaxis in patients with atrial fibrillation, venous thromboembolism (VTE), and acute coronary syndrome (ACS).
- Vitamin K antagonists such as warfarin have historically been used to reduce the risk of stroke in patients with atrial fibrillation
  - Atrial Fibrillation is responsible for 15% of strokes in people of all ages and 30% in people over 80
New Oral Anticoagulants

- The three new oral anticoagulants are
  - Dabigatran
  - Rivaroxaban
  - Apixaban
- To date, the US Food and Drug administration (FDA) has approved dabigatran and rivaroxaban for stroke prevention in patients with non-valvular atrial fibrillation
New Oral Anticoagulants

- One of the most attractive features of these novel drugs is that routine laboratory monitoring is not necessary.
- All three drugs are administered orally and are partially excreted by the kidneys; therefore, they need dose adjustments in patients with renal insufficiency.
New Oral Anticoagulants

• One potential problem with these new oral anticoagulants is the inability to monitor their activity or drug levels, especially in emergency situations such as overdose or overt bleeding.
• No antidote exists for these three drugs if reversal is indicated. Therefore, it is important to be able to quickly and reliably assess coagulation function in patients with overt bleeding.
New Oral Anticoagulants

- There are many targets for novel anticoagulants in the coagulation pathway:
  - Tissue factor pathway inhibitor (TFPI) bound to Factor Xa inactivates the tissue factor (TF)–Factor VIIa complex, preventing initiation of coagulation
  - Activated protein C (APC) degrades Factors Va and VIIIa, and thrombomodulin (soluble; sTM) converts thrombin (Factor IIa) from a procoagulant to a potent activator of protein C
New Oral Anticoagulants

- Fondaparinux and idraparinux indirectly inhibit Factor Xa, requiring antithrombin (AT) as a cofactor
- Direct (AT-independent) inhibitors of Factor Xa include rivaroxaban (BAY 597939), LY517717, YM150 and DU-176b (all orally available), and DX-9065a (intravenous)
- Oral, direct thrombin inhibitors include ximelagatran (now withdrawn) and dabigatran
New Anticoagulants

**ORAL**
- TTP889
- Rivaroxaban
- Apixaban
- LY517717
- YM150
- DU-176b
- Betrixaban
- TAK 442

**PARENTERAL**
- TFPI (tifacogin)
- APC (drotrecogin alfa)
- sTM (ART-123)
- Fondaparinux
- Idraparinux
- DX-9065a

Adapted from Weitz & Bates, J Thromb Haemost 2007
Direct Thrombin inhibition

- XIIa
- Xla
- IXa
- Xa
- II

Tissue factor

Factor IIa

Dabigatran

Factor Xa (thrombin)
Direct Factor Xa inhibition

Factor II (prothrombin)

Fibrinogen → Fibrin clot

XIIa
Xla
IXa

VIIa

Tissue factor

Rivaroxaban
Apixaban
YM150
DU-176b
LY517717
Betrixaban
TAK 442
Key features of new oral anticoagulants

Dabigatran etexilate

- Oral direct thrombin inhibitors
- Prodrug rapid biotransformation to active drug
- Inhibit free and fibrin-bound FIIa activity
- Fixed dosing - no coagulation monitoring required
- Max inhibition of FIIa after 1–4 h
- T½: dabigatran, 12–17 h
- Few food/drug interactions
- Renal excretion: 80%
Key features of new oral anticoagulants

Apixaban and Rivaroxaban

- Oral direct FXa inhibitors
- Directly acting compound — no biotransformation
- Inhibit free and fibrin-bound FXa activity, and prothrombinase
- Fixed dosing - no coagulation monitoring required
- Max inhibition of FXa after 1–4 h
- $T_{1/2}$: apixaban 12 h; rivaroxaban 6–9 h
- Few food/drug interactions
- Renal excretion: 25%, 66% resp
# Reversal with recombinant Factor VIIa

## Jackson Memorial Hospital Approved Off-Label Uses of Factor VIIa (rFVIIa)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracerebral Hemorrhage Secondary to Oral Anticoagulation, Coagulopathy, or Traumatic Brain Injury</td>
<td>1 mg IV x1 dose</td>
</tr>
</tbody>
</table>

## Requirements Prior to rFVIIa Approval Intracerebral Hemorrhage Secondary to Oral Warfarin or Antiplatelets, Coagulopathy, or Traumatic Brain Injury

- Appropriate surgical measures must be taken to control bleeding
- Temp >36°C or 96.8°F
- Must be ordered by an attending physician
- pH >7.2, Acidosis renders rFVIIa ineffective
- Must transfuse at least 4-6 units (15-20 mL/kg) of FFP
- Fibrinogen >100 mg/dL, If <100 mg/dL must give 10 units Cryoprecipitate
- Platelets >70,000/mm³, If Plts <70,000/mm³ must give 10 units Plts

## Requirements Prior to rFVIIa Approval Intracerebral Hemorrhage Secondary to Dabigatran

- Appropriate surgical measures must be taken to control bleeding
- Temp >36°C or 96.8°F
- Must be ordered by an attending physician
- pH >7.2, Acidosis renders rFVIIa ineffective
- Consider transfusing at least 2-4 units (10 mL/kg) of FFP
- Fibrinogen >150 mg/dL, If <150 mg/dL must give 10 units Cryoprecipitate
- Platelets >100,000/mm³, If Plts <100,000/mm³ must give 10 units Plts

## Recommended Adjunctive Hemostatic Therapies prior to administering rFVIIa in Intracerebral Hemorrhage 2° to Oral Anticoagulation or Coagulopathy

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin K (If on prior warfarin therapy)</td>
<td>10 mg IV infused over 30 minutes</td>
</tr>
<tr>
<td>DDAVP (If on prior antiplatelet therapy)</td>
<td>0.3 mcg/kg IV x 1 dose (Dilute in 50 mL NS, infuse over 15-30 min)</td>
</tr>
</tbody>
</table>
# Reversal with Prothrombin Complex Concentrate

**Jackson Memorial Hospital Approved Off-Label Uses of Prothrombin Complex Concentrate (PCC)**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracerebral Hemorrhage, Peri-operative Intractable Hemorrhage, or Severe Multiple Trauma (Secondary to Oral Anticoagulation, Coagulopathy, or Traumatic Brain Injury)</td>
<td>25 - 50 units/kg (see below dosing algorithm)</td>
</tr>
</tbody>
</table>

## Requirements Prior to PCC Approval

- Appropriate surgical measures must be taken to control bleeding
- Temp >36°C or 96.8°F
- Must be ordered by an attending physician
- pH >7.2. Acidosis renders PCC ineffective

- Must transfuse at least 2-6 units (10-20 mL/kg) of FFP
- Fibrinogen >150 mg/dL. If <150 mg/dL must give 10 units Cryoprecipitate
- Platelets >100,000/mm³. If Plts <100,000/mm³ must give 10 units Plts

*Oral anticoagulation = Warfarin (Coumadin®, Jantoven®), Dabigatran (Pradaxa®), Rivaroxaban (Xarelto®), Apixaban (Eliquis®)*

## Recommended Adjunctive Hemostatic Therapies prior to administering PCC

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin K (If on prior warfarin therapy)</td>
<td>10 mg IV x1 dose (Dilute in 50 mL NS, infuse over 15-30 min, may repeat x1 in 8 hours)</td>
</tr>
<tr>
<td>DDAVP (If on prior antiplatelet therapy)</td>
<td>0.3 mcg/kg IV x1 dose (Dilute in 50 mL NS, infuse over 15-30 min)</td>
</tr>
</tbody>
</table>

## Dosing Algorithm for INR > 1.3 (Dose will be rounded to the nearest vial size by pharmacy)

<table>
<thead>
<tr>
<th>INR</th>
<th>Vitamin K</th>
<th>FFP</th>
<th>PCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4 - 1.9</td>
<td>10mg IV</td>
<td>2 - 4 units</td>
<td>----</td>
</tr>
<tr>
<td>1.4 - 1.9</td>
<td>10mg IV</td>
<td>2 - 4 units</td>
<td>25 IU/kg IV</td>
</tr>
<tr>
<td>2 - 4</td>
<td>10mg IV</td>
<td>4 - 6 units</td>
<td>35 IU/kg IV</td>
</tr>
<tr>
<td>&gt; 4</td>
<td>10mg IV</td>
<td>4 - 6 units</td>
<td>50 IU/kg IV</td>
</tr>
</tbody>
</table>

*Clinical situation may require the use of PCC (e.g. fluid restriction, timely reversal not achieved with FFP)*
References

• Lexi-Comp ONLINE™ - updated 7/12/2010