FLOYD MEDICAL CENTER
POLICY AND PROCEDURE MANUAL
PATIENT CARE SERVICES

TITLE: Anticoagulation	Policy No.: PCS-06-051
Purpose: To standardize anticoagulation practices to reduce the risk of adverse drug events associated with the use of heparin (unfractionated), low molecular weight heparin (LMWH), warfarin, and other anticoagulants.	**Developed Date:** 6/08 **Review Date:** 2/19 **Revised Date:** 8/08, 1/09, 10/09, 4/10, 5/13, 2/14, 4/15, 5/16, 11/16, 5/17, 5/19
Policy: Anticoagulation will be standardized by following approved protocols that standardize treatment while taking into consideration patient specific parameters.	**Review Responsibility:** Pharmacy and Therapeutics Committee, Executive VP; Chief of Patient Services/CNO, Nursing Leadership, Executive Committee of the Medical Staff
Reference Standards: NPSG.03.05.01	

General Policy Statements

ROLES

Physicians Initiate and discontinue anticoagulant use in patients, order reversal agents when necessary, possesses ultimate responsibility for anticoagulation patients.

Nurses Provide education, administer doses, enter lab orders, observe patients for signs of adverse events, notify physicians and pharmacy of critical lab values, liaison between physicians, dietitians and pharmacists.

Dietitians Provide dietary education to all patients who are either new to Coumadin therapy or have a knowledge deficit identified by nursing service; screens dietary interactions and makes appropriate recommendations, and changes patients to appropriate inpatient diet.

Pharmacists Determine individual doses of warfarin per protocol, determine when to draw labs per protocol, recommend reversal strategies, monitor for drug interactions, notify physicians about dosing changes, and provide a list of warfarin patients to dietary.

MONITORING

The anticoagulation program will be continually monitored and reported quarterly at the Pharmacy and Therapeutics Committee. Anticoagulant adverse drug events and medication errors will be reviewed by the medication error review team who will determine if it should be sent to the Preventable Harm Incident Review team for followup and recommended actions.

EDUCATION

All healthcare professionals involved in the management of anticoagulation will complete defined educational exercises to ensure competency in this area.

Physicians	Will be provided CME approved educational materials concerning warfarin use. Anticoagulation program progress will be reported to the P and T committee.
Inpatient Nurses	Will be provided approved educational materials by the nurse educators.
Hospice Nurses	Will be provided approved educational materials by the nurse educators.
Clinical Pharmacists	Will complete approved required certificate course. Anticoagulation related topics will be added to the annual departmental educational materials.
Outpatient Clinical Staff Pharmacists	Will attend educational sessions on obtaining lab values from the computer system. Anticoagulation related topics will be added to the annual departmental educational materials.

Patients receiving anticoagulation services from the organization will be given approved agent specific educational materials if they are to receive the drug on an outpatient basis.

Procedure

Actions	Key Points
Inpatient Warfarin Management (Main Campus)	
1. All Warfarin doses will be sent to the patient care area in a unit dose packet when available.	1. No splitting of warfarin tablets will occur on the nursing areas.
2. Warfarin will be dosed using the approved warfarin dosing nomogram. Patient specific parameters will be used to determine the appropriate warfarin dose.	2. ♦ Physicians may order warfarin by writing, "Coumadin Protocol," or "Warfarin Protocol."
3. Warfarin will be dispensed for each patient in accordance with established monitoring procedures that are contained in the approved warfarin dosing nomogram.	

Actions	Key Points
4. Patients who are started on warfarin will have a baseline INR drawn on the day of their first warfarin dose (see note about surgery patients). The INR value will be known before the first dose of warfarin can be dispensed from the pharmacy. A current INR will be available and will be used to monitor and adjust therapy. If upon chart review it is discovered that a current INR has not been ordered, clinical pharmacy may order an INR to be drawn.	4. Surgery patients can use their pre-operative INR as their baseline if it has been drawn within the last 7 days.
5. Dietary services will be notified daily of all patients who are receiving warfarin. Dietary services will respond according to its established food/drug interaction program.	5. Reference Dietary Policy Number PCS-06-021
6. The organization will provide warfarin education to patients started on warfarin. Educational materials provided to patients will be standardized, approved educational materials provided by FMC.	6. English and Spanish versions of the educational materials will be available.
7. Staff members will provide warfarin education before the patient's discharge.	7. Education will include the importance of follow-up monitoring, compliance issues, dietary restrictions, and the potential for adverse drug reactions and interactions.
8. Ongoing monitoring will be performed to check for safety and effectiveness.	
9. A progress note will be written in each pharmacy managed patient's chart each day that a change in therapy occurs.	9. Clinical pharmacy will write a progress note each time a change in therapy is made on patients who pharmacy is dosing.
10. Warfarin reversal will be accomplished by use of the approved guidelines for correction of warfarin over-anticoagulation.	10. The patient's nurse will call the attending physician if the patient's INR is greater than 5. Clinical pharmacy will suggest warfarin reversal based on the approved guidelines for correction of warfarin over-anticoagulation.
11. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation.	
12. **Perioperative Management**: See Table B (attached) for guidance on perioperative management.	

Actions	Key Points
13. During the discharge process, patients will be referred back to their primary care physician.	13. Discharge planning includes appropriate follow up at the appropriate time as per protocol.
14. The program will be monitored and reported on at quarterly Pharmacy and Therapeutics committee meetings.	14. A sufficient sample will be taken quarterly and the percentage of INR's above 3.5 and above 5 will be calculated.
Willowbrooke at Floyd Warfarin Management	
1. All Warfarin doses will be sent to the patient care area in a unit dose packet when available.	1. No splitting of warfarin tablets will occur on the nursing areas.
2. If patients are continuing their home warfarin, warfarin will be dosed using the approved warfarin dosing nomogram for outpatients. Patient specific parameters will be used to determine the appropriate warfarin dose.	2. All Willowbrooke at Floyd patients on warfarin will have their warfarin managed by the Clinical Pharmacy Anticoagulation program.
3. Warfarin will be dispensed for each patient in accordance with established monitoring procedures that are contained in the approved warfarin dosing nomogram.	
4. Patients who are started on warfarin will have a baseline INR drawn on the day of their first warfarin dose. The INR value will be known before the first dose of warfarin can be dispensed from the pharmacy. A current INR will be available and will be used to monitor and adjust therapy.	
5. Dietary services will be notified daily of all patients who are receiving warfarin. Dietary services will respond according to its established food/drug interaction program.	5. Reference Dietary Policy Number PCS-06-021
6. The organization will provide warfarin education to patients started on warfarin. Educational materials provided to patients will be standardized, approved educational materials provided by FLOYD.	6. English and Spanish versions of the educational materials will be available.

Actions	Key Points
7. Staff members will provide warfarin education before the patient's discharge.	7. Education will include the importance of follow-up monitoring, compliance issues, dietary restrictions, and the potential for adverse drug reactions and interactions.
8. Ongoing monitoring will be performed to check for safety and effectiveness.	
9. A progress note will be written in the patient's chart each day that a change in therapy occurs.	9. Clinical pharmacy will write a progress note each time a change in therapy is made.
10. Warfarin reversal will be accomplished by use of the approved guidelines for correction of warfarin over-anticoagulation.	10. The patient's nurse will call the attending physician if the patient's INR is greater than 5. Clinical pharmacy will suggest warfarin reversal based on the approved guidelines for correction of warfarin over-anticoagulation.
11. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation.	11. Some reversal treatments will require hospital transfer for inpatient management
12. During the discharge process, patients will be referred back to their primary care physician.	12. Discharge planning includes appropriate follow up at the appropriate time as per protocol.
13. The program will be monitored and reported on at quarterly Pharmacy and Therapeutics committee meetings.	13. A sufficient sample will be taken quarterly and the percentage of INR's above 3.5 and above 5 will be calculated.

Outpatient Warfarin Management of Patients seen by Floyd Medical Center Associated Physicians that Receive their Warfarin from the Floyd Medical Center Outpatient Clinic Pharmacy

Actions	Key Points
1. Warfarin will be dosed using the approved warfarin dosing nomogram for ambulatory patients. Patient specific parameters will be used to determine the appropriate warfarin dose.	1. This policy only applies to patients seen by Floyd Medical Center associated physicians that receive their warfarin from the Floyd Medical Center outpatient pharmacy.
2. Patients who are started on warfarin will have a baseline INR drawn on the day of their first warfarin dose. The INR value will be known before the first dose of warfarin can be dispensed from the pharmacy. A current INR drawn within the last 30 days will be available and will be used to monitor and adjust therapy.	2. If an INR has not been drawn in the last 30 days, then a 3 day supply of warfarin will be dispensed by the pharmacy until a current INR can be obtained. The pharmacy will document that a current INR was verified in a log.
3. The pharmacy will only dispense a month supply of warfarin to a patient at one time.	
4. The organization will provide warfarin education to patients started on warfarin. Educational materials provided to patients will be standardized, approved educational materials provided by FMC.	4. English and Spanish versions of the educational materials will be available.
5. Ongoing monitoring will be performed to check for safety and effectiveness.	
6. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation	
7. **Perioperative Management**: See Table B (attached) for guidance on perioperative management	

Inpatient Hospice Warfarin Management

Actions	Key Points
1. Warfarin will be dosed using the approved warfarin dosing nomogram for ambulatory patients. Patient specific parameters will be used to determine the appropriate warfarin dose.	
2. Patients who are started on warfarin will have a baseline INR drawn on the day of their first warfarin dose. The INR value will be known before the first dose of warfarin can be dispensed from the pharmacy. A current INR will be available and will be used to monitor and adjust therapy.	2. If a patient has a "No labs to be drawn" order and cannot have PT/INRs drawn, then warfarin must be discontinued. Warfarin cannot be given to patients without performing PT/INRs as described in the approved warfarin dosing nomogram for ambulatory patients.
3. The organization will provide warfarin education to patients started on warfarin. Educational materials provided to patients will be standardized, approved educational materials provided by FMC.	3. English and Spanish versions of the educational materials will be available.
4. Ongoing monitoring will be performed to check for safety and effectiveness.	
5. A note will be written in the patient's medical record each day that a change in therapy occurs.	
6. The program will be monitored and reported on at quarterly Pharmacy and Therapeutics committee meetings.	
7. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation.	
8. **Perioperative Management**: See Table B (attached) for guidance on perioperative management.	

Low Molecular Weight Heparin (LMWH) and Fondaparinux

Actions	Key Points
1. Patients receiving LMWH treatment dosing will have a serum creatinine and platelet count every 2 days during the first 14 days of therapy, then once weekly thereafter. Patients receiving prophylactic dosing will have a serum creatinine and platelet count every 3 days during the first 14 days of therapy, then once weekly thereafter.	
2. Doses will be calculated by the pharmacy and will be determined by the patient's diagnosis, current weight, patient specific parameters, the manufacturer's recommendations, and the current medical literature.	2. **Lovenox Prophylaxis:** 40 mg SQ daily for medicine patients and general surgery patients. 30 mg SQ twice daily for orthopedic surgery patients; also for general surgery/medicine patients weighing > 150 kg and with CrCl > 30 ml/min. *Note:* pharmacist to adjust dose based on renal function and if the patient is on dialysis to notify physician and request substitution with unfractionated heparin. **Lovenox Treatment:** 1 mg/kg SQ every 12 hours or 1.5 mg/kg SQ daily. Treatment of ACS: 1 mg/kg SQ every 12 hours. *Note:* pharmacist to adjust dose based on renal function and if the patient is on dialysis to notify physician and request substitution with unfractionated heparin
3 The pharmacy will order anti-Xa levels on LMWH patients that are at risk of treatment failures/adverse events because of patient specific criteria. A pharmacist will contact the physician to assist with dosage adjustments if desired by the physician.	3. Anti-Xa level monitoring recommended for: ♦ Severe renal impairment (CrCl <30 mL/min) ♦ Extremes in weight range (<40kg or >150kg) ♦ Lack of response/continued thrombosis ♦ Unexpected hemorrhage ♦ Prolonged therapy (>10 days) ♦ Pregnancy ♦ Pediatric age
4. Patients on LMWH or fondaparinux will have a serum creatinine and platelet count available from the last 48 hours before the drug can be dispensed. An exception to this time requirement will be for surgical patients where their labs for preop evaluation will be used.	4. Fondaparinux is contraindicated in patients with a CrCl of < 30ml/min or a body weight < 50 kg.

Actions	Key Points
5. Fondaparinux may be therapeutically interchanged to Lovenox when CrCl is < 30mL/min 6. If the patient is to receive a LMWH after discharge, they will receive a patient education kit for the particular agent they are on. Additionally, each patient will receive direct education from a member of the nursing staff. 7. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation. 8. **Perioperative Management**: See Table B (attached) for guidance on perioperative management.	

Argatroban

Actions	Key Points
1. Patients with a history of heparin induced thrombocytopenia who need anticoagulation may be placed on argatroban infusions. 2. Patients on argatroban infusions must have the approved IV argatroban protocol orders entered in the patient's medical record. 3. Patients on agratroban infusions will be monitored as directed by the monitoring guidelines in the IV argatroban protocol orders. 4. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation. 5. **Perioperative Management**: See Table B (attached) for guidance on perioperative management	1. Argatroban should only be used in patients with suspected heparin induced thrombocytopenia(HIT) or have history of HIT.

Heparin

Actions	Key Points
1. All patients receiving continuous intravenous heparin will have their heparin drips managed by one of the two approved weight based protocols.	1. The two approved heparin protocols: ♦ Cardiology Heparin Protocol ♦ Vascular Heparin Protocol
2. Heparin infusions will be dispensed in a standard concentration. Premixed heparin infusions will be used when available.	2. The concentration of the standard heparin drip is 25,000 units heparin in 250 mL of diluent.
3. Heparin drips will be infused using a programmable infusion pump.	
4. Labs will be drawn as outlined in the heparin protocols.	4. Labs: ♦ A baseline platelet count will be known before the infusion begins. ♦ A PTT and CBC will be collected before the infusion begins. ♦ A PTT will be drawn every 6 hours while heparin is infusing until two consecutive PTTs are therapeutic, then a PTT will be drawn every 24 hours. ♦ Daily labs will include: daily PTT, PT if on Coumadin, CBC daily x 3 days, then every 48 hours. Hemocult stools daily for 3 days.
5. Safety steps: Two nurses will verify all calculations when nomogram cannot be used. Two nurses will verify the initial bolus, initial pump set up, subsequent bolus doses, preparation, and infusion pump rate changes.	
6. The physician will be notified if the platelet count < 150,000, or if dropped > 20% from previous value or if the drop is 50% of baseline value.	
7. For subcutaneous heparin (prophylactic dosing) patients will have a platelet count every 3 days during the first 14 days of therapy then once weekly. Patients will have a serum creatinine and platelet count available from the last 48 hours before the drug can be dispensed. An exception to this time requirement will be for surgical patients where their labs for preop evaluation will be used.	7. Prophylactic subcutaneous heparin doses of 5000 units should be adjusted to every 12 hours if the patient is receiving an epidural, **OR** has a creatinine clearance < 30 ml/min **AND** are <50 kg body weight or >75 years of age.

Actions	Key Points
8. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation . 9. **Perioperative Management**: See Table B (attached) for guidance on perioperative management.	

Dabigatran (Pradaxa)

Actions	Key Points
1. Based on indication and renal function, pharmacist will notify prescriber if dose adjustments or discontinuation is warranted as recommended in medical literature.	
2. **Restrictions:** Dabigatran is not to be used in the following populations: Patients with CrCl < 15 ml/min or on dialysis, patients with worsening or unstable renal function with CrCl <30, or patients with ischemic or hemorrhagic stroke within previous 14 days.	2. If an inpatient is in respite or hospice care and has a “No labs to be drawn” order and cannot have required baseline labs drawn, then a pharmacist will call the prescribing physician for the discontinuation of dabigatran to prevent unsafe administration.
3. Routine monitoring of coagulation tests is not required; however, CBC and serum creatinine will be obtained prior to initiation (or resumption) and periodically as clinically indicated. A baseline INR and PTT will be obtained on patients who are beginning dabigatran therapy for the first time. If the INR is > 2, the pharmacist will call the prescriber to clarify when to start dabigatran.	
4. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation of dabigatran.	
5. **Perioperative Management**: See Table B (attached) for guidance on perioperative management	

Rivaroxaban (Xarelto)

Actions	Key Points
1. Based on indication, pharmacist will adjust dose as recommended in the medical literature and notify physician if creatinine clearance has changed a significant amount to warrant a dose reduction or discontinuation of rivaroxaban.	
2. Routine monitoring of coagulation tests is not required; however, CBC and serum creatinine will be obtained prior to initiation (or resumption) and periodically as clinically indicated. A baseline INR and PTT will be obtained on patients who are beginning rivaroxaban therapy for the first time. If the INR is > 2, the pharmacist will call the prescriber to clarify when to start rivaroxaban.	2. If an inpatient is in respite or hospice care and has a "No labs to be drawn" order and cannot have required baseline labs drawn, then a pharmacist will call the prescribing physician for the discontinuation of rivaroxaban to prevent unsafe administration.
3. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation.	
4. **Perioperative Management**: See Table B (attached) for guidance on perioperative management	

Apixaban (Eliquis)

Actions	Key Points
1. Based on indication, serum creatinine, age, and body weight of patient, the pharmacist will notify provider if dose adjustment is warranted as recommended per medical literature.	
2. Routine monitoring of coagulation tests is not required; however, CBC and serum creatinine will be obtained prior to initiation (or resumption) and periodically as clinically indicated. A baseline INR and PTT will be obtained on patients who are beginning apixaban therapy for the first time. If the INR is > 2, the pharmacist will call the prescriber to clarify when to start apixaban.	2. If an inpatient is in respite or hospice care and has a "No labs to be drawn" order and cannot have required baseline labs drawn, then a pharmacist will call the prescribing physician for the discontinuation of apixaban to prevent unsafe administration.
3. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation.	
4. **Perioperative Management**: See Table B (attached) for guidance on perioperative management.	

Edoxaban (Savaysa)

Actions	Key Points
1. Based on indication, pharmacist will adjust dose as recommended in the medical literature and notify physician if creatinine clearance has changed a significant amount to warrant a dose reduction or discontinuation of edoxaban.	
2. Routine monitoring of coagulation tests is not required; however, CBC and serum creatinine will be obtained prior to initiation (or resumption) and periodically as clinically indicated. A baseline INR and PTT will be obtained on patients who are beginning edoxaban therapy for the first time. If the INR is > 2, the pharmacist will call the prescriber to clarify when to start edoxaban.	2. If an inpatient is in respite or hospice care and has a "No labs to be drawn" order and cannot have required baseline labs drawn, then a pharmacist will call the prescribing physician for the discontinuation of edoxaban to prevent unsafe administration.
3. **Reversal:** See Table A (attached) for guidance on reversal of anticoagulation	3. Use of andexanet alpha, prothrombin complex concentrate (PCC), activated prothrombin complex concentrate (APCC) or recombinant factor VII may be considered but has not been adequately evaluated in clinical trials. Supportive care and control of bleeding site are cornerstones of therapy in patients who have life-threatening bleeding.
4. **Bleeding Management**: Delay or discontinue edoxaban. Supportive care (fluids, blood products, etc.) and control of bleeding site in patients with life-threatening bleeding.	
5. **Perioperative Management**: See Table B (attached) for guidance on perioperative management.	

Table A: Reversal of Anticoagulation (recommendations)

Medication	Elimination Half-Life	Removed by HD	Reversal/Minimization of Drug Effect
Apixaban (Eliquis)	8 – 15 hours (longer in renal impairment)	No	• Activated oral charcoal (if ingested within 2 – 4 hours of presentation) **OR** • Andexanet alfa (AndexXa) for life-threatening bleeding **OR** • 4-factor unactivated prothrombin concentrate (PCC) – i.e. Kcentra for life-threatening bleeding.
Argatroban	40 – 50 minutes	~ 20%	• Turn off infusion • Degree of reversal can be assessed with PTT and/or plasma-diluted thrombin time.
Dabigatran (Pradaxa)	12 – 17 hours (severe renal impairment ~ 28 hours)	~ 57%	• Activated oral charcoal (if ingested within 2 – 4 hours of presentation) **OR** • Idarucizumab (Praxbind) 5 gm IV for life-threatening bleeding or emergency surgery.
Dalteparin (Fragmin)	3 – 5 hours	NO	• Protamine for partial reversal agent (~60%). ○ < 8 hours since last dose = 1mg protamine per 100 units of dalteparin. Do not exceed 50 mg/dose. ○ 8 – 12 hours since last dose = 0.5 mg protamine per 100 units of dalteparin. Do not exceed 25 mg/dose.
Enoxaparin (Lovenox)	4.5 – 7 hours	NO	• Protamine for partial reversal agent (~60%) ○ < 8 hours since last dose = 1 mg protamine per 1mg of enoxaparin administered. Do not exceed 50 mg/dose. ○ 8 – 12 hours since last dose = 0.5 mg protamine per 1mg of enoxaparin administered. Do not exceed 25 mg/dose.
Edoxaban (Savaysa)	10 – 14 hours (longer in renal impairment)	NO	• Activated oral charcoal (if ingested within 2-4 hours of presentation) **OR** • 4-factor unactivated prothrombin concentrate (PCC) – i.e. Kcentra for life threatening bleeding.

Medication	Elimination Half-Life	Removed by HD	Reversal/Minimization of Drug Effect
Fondaparinux (Arixtra)	17 – 21 hours (significantly longer in renal impairment and in the elderly)	~ 20%	• For patients with life-threatening bleeding, activated prothrombin complex concentrate (aPCC), factor eight inhibitor bypassing agent (FEIBA), recombinant activated factor VII (rFVIIa), or andexanet alfa may be considered; however, there is no data on the use of these agents with fondaparinux-associated bleeding.
Heparin	30 – 90 minutes (dose dependent)	NO	• Protamine for complete reversal (100%) o For immediate reversal, < 30 min since last dose of heparin, dose = 1 mg protamine per 100 units/heparin. Do not exceed 50 mg/dose. o 30 minutes – 2 hours since last dose of heparin, give 0.5 mg protamine for each 100 units/heparin. o > 2 hours since last dose of heparin, give 0.25 mg protamine for each 100 units/heparin.
Rivaroxaban (Xarelto)	5 – 9 hours Elderly: 11 – 13 hours	NO	• Activated oral charcoal (if ingested within 2-4 hours of presentation) **OR** • Andexanet alfa (AndexXa) for life-threatening bleeding **OR** • 4-factor unactivated prothrombin concentrate (PCC) – i.e. Kcentra for life-threatening bleeding.

Warfarin (Coumadin)	**INR**	**Clinical Scenario**	**Management**
	<4.5	No bleeding	• Hold warfarin until INR in therapeutic range.
		Rapid reversal required	• Hold warfarin. • Consider vitamin K 2.5 mg oral.
	4.5 – 10	No bleeding	• Hold warfarin until INR in therapeutic range. • Consider vitamin K 2.5 mg oral.
		Rapid reversal required	• Hold warfarin. • Give vitamin K 2.5 mg oral or 1 mg IV infusion.
	>10	No bleeding	• Hold warfarin until INR in therapeutic range. • Give vitamin K 2.5 mg oral or 1 – 2 mg IV infusion over 30 minutes, and repeat every 24 hours as needed.
		Rapid Reversal required	• Hold warfarin. • Give vitamin K 1 – 2 mg IV infusion over 30 minutes, and repeat every 6 – 24 hours as needed.
	Any INR	Serious or life-threatening bleeding	• Hold warfarin. • Give vitamin K 10 mg IV infusion over 30 minutes. • Give 4 units FFP/plasma **OR** consider 4-factor PCC(Kcentra) if INR > 1.5.

Table B: Perioperative Management of Anticoagulation (recommendations)

Perioperative management must be individualized by the physician based on thromboembolic risk, bleeding risk for patient and procedure type, determining timing of anticoagulation interruption (see table below), and whether to use bridging anticoagulation.

Key Practice Recommendations

1. The use of periprocedural bridging with antithrombotic agents should be reserved for high thrombotic risk patients.

2. Each antithrombotic agent has individual recommendations for how long it should be held pre-procedure, so advanced planning (in a non-emergent situation) is recommended.

3. Antithrombotic therapy should be resumed post procedure when hemostasis is achieved and the risk for bleeding has minimized.

4. Most antithrombotic agents should not be given during neuraxial anesthesia.

5. Each antithrombotic agent has individual recommendations for how long it should be held pre and post spinal epidural catheter placement and removal, so a medication review of both active and inactive antithrombotic medications is recommended.

Pre-Procedural Planning

Agent	**Minor Surgery – Standard bleed risk**	**Major Surgery or high bleed risk**
Warfarin Check INR at least 7 days before non emergent surgery. Check INR within 24 hours of surgical procedure to ensure that INR goal has been attained.	Warfarin may be continued during procedures where bleed risk is low.	If timing does not allow for gradual reduction of INR from withholding warfarin alone, administration of phytonadione (vitamin K), fresh frozen plasma, or prothrombin complex concentrates may be necessary.
	(holding for non-emergent surgery)	
INR 2 – 3	Stop 5 days before procedure.	
INR 3 – 4.5	Stop 6 days before procedure.	
INR >4.5	Stop 6 – 7 days before procedure and consider rechecking INR after 2 – 3 days of held doses – if indicated consider vitamin K.	

Pre-Procedural Planning (continued)		
Agent	**Minor Surgery – Standard bleed risk**	**Major Surgery or high bleed risk**
Apixaban		
Scr < 1.5mg/dL	Stop 24 hours before procedure.	Stop 48 hrs before procedure.
Scr>or= 1.5mg/dL	Stop 48 hours before procedure.	Stop 72 hrs before procedure.
Dabigatran		
CrCl >or= 50 mL/min	Stop 1 to 2 days before procedure.	Stop 2 to 4 days before procedure.
CrCl < 50 mL/min	Stop 3 to 5 days before procedure.	Stop >= 5 days before procedure.
Edoxaban		
CrCl >or= 50 mL/min	Stop 24 hours before procedure.	Stop 48 hours before procedure.
CrCl < 50 mL/min	Stop 48 hours before procedure.	Stop 72 hours before procedure.
Rivaroxaban		
CrCl > 30 mL/min	Stop 24 hours before procedure.	Stop 48 hours before procedure.
CrCl<= 30 mL/min	Stop 48 hours before procedure.	Stop 72 hours before procedure.
Parenteral Agents	**Any bleed risk surgery**	
Argatroban		
Normal hepatic function	Stop 3 hours before procedure.	
Child-Pugh Score >6	Stop 9 hours before procedure.	
Enoxaparin		
Prophylactic Dosing	Stop 12 hours before procedure.	
Therapeutic Dosing	Stop 24 hours before procedure.	
Fondaparinux		
CrCl >or= 50 mL/min	Stop 3 days before procedure.	
CrCl < 50 mL/min	Stop 5 days before procedure.	
Unfractionated Heparin		
Prophylactic Dosing	May give the morning before procedure.	
Therapeutic Dosing	Stop 4 – 6 hours before procedure.	

Post-Procedural Planning		
Agent	**Minor Surgery – standard bleed risk**	**Major Surgery or high bleed risk**
Warfarin	Resume warfarin within 24 hours after surgical procedure or on postoperative day 1 if hemostasis is achieved and if approved by surgeon.	
Apixaban	Resume within 24 hours if approved by surgeon.	Resume within 72 hours if approved by surgeon.
Dabigatran	Resume within 24 hours if approved by surgeon.	Resume within 72 hours if approved by surgeon.
Edoxaban	Resume within 24 hours if approved by surgeon.	Resume within 72 hours if approved by surgeon.
Rivaroxaban	Resume within 24 hours if approved by surgeon.	Resume within 72 hours if approved by surgeon.
Argatroban	Resume within 12 hours if approved by surgeon.	Resume within 24 hours if approved by surgeon.
Enoxaparin	Resume within 24 hours if approved by surgeon.	Resume within 72 hours if approved by surgeon.
Fondaparinux	Resume within 24 hours if approved by surgeon.	Resume within 72 hours if approved by surgeon.
Unfractionated Heparin	Resume within 12 hours if approved by surgeon.	Resume within 24 hours if approved by surgeon.

Table C: Conversion between Anticoagulants (recommendations)

Converting Apixaban

Warfarin to apixaban	Stop warfarin and start apixaban when INR <2.
Apixaban to warfarin	Start warfarin and stop apixaban 3 days later, or stop apixaban, begin a parenteral anticoagulant (UFH or LMWH) and warfarin at the time apixaban would have been due, and then stop LMWH or UFH when INR therapeutic.
LMWH/fondaparinux to apixaban	Stop LMWH/fonda and start apixaban 0 – 2 hours before next LMWH/fonda dose is due.
Heparin to apixaban	Stop heparin and start apixaban at the same time.
Apixaban to LMWH/UFH	Stop apixaban and start LMWH/UFH at the time when apixaban would have been due.
Apixaban to oral anticoagulant other than warfarin	Stop apixaban and begin the other agent at the time when the next scheduled dose of apixaban would have been due.

Converting Dabigatran

Warfarin to dabigatran	Stop warfarin and start dabigatran when INR <2.
Dabigatran to warfarin	CrCl >50 mL/min: Start warfarin and stop dabigatran 3 days later. CrCl 31 – 50 mL/min: Start warfarin and stop dabigatran 2 days later. CrCl 15 – 30 mL/min: Start warfarin and stop dabigatran 1 day later.
LMWH/fondaparinux to dabigatran	Stop parenteral anticoagulant and administer dabigatran 0 – 2 hours before the next parenteral dose would have been administered.
IV heparin to dabigatran	Administer first dose of dabigatran at the time of discontinuation of IV heparin infusion.
Dabigatran to LMWH/UFH	CrCl >30 mL/min: Start 12 hours after the last dose of dabigatran. CrCl <30 mL/min: Start 24 hours after the last dose of dabigatran.
Dabigatran to oral anticoagulant other than warfarin	Stop dabigatran and begin the other anticoagulant at the time when the next dose of dabigatran would have been due.

*Dabigatran may alter INR results

Converting Rivaroxaban

Warfarin to rivaroxaban	Stop warfarin and start when INR <2. However, the manufacturer advises when INR <3.
Rivaroxaban to warfarin	Start warfarin and stop rivaroxaban 3 days later, or stop rivaroxaban, begin LMWH/UFH and warfarin at same time when the next dose of rivaroxaban would have been given, and then stop LMWH/UFH when INR is acceptable.
LMWH/fonda to rivaroxaban	Stop LMWH/fonda and start rivaroxaban 0-2 hours before the next dose of LMWH/fonda would have been given.
IV heparin to rivaroxaban	Administer first dose of rivaroxaban at the same time as d/c heparin.
Rivaroxaban to LMWH/fonda	Stop rivaroxaban and administer at the time when the next dose of rivaroxaban would have been given.
Rivaroxaban to oral anticoag other than warfarin	Stop rivaroxaban and begin the other anticoagulant at the time when the next scheduled dose of rivaroxaban would have been administered.

Converting Edoxaban

Warfarin to edoxaban	Stop warfarin and start edoxaban with INR < lower limit of therapeutic range (manufacturer recommends when INR < 2.5).
Edoxaban to warfarin	• for patients taking 60 mg, reduce edoxaban to 30 mg and start warfarin concomitantly. Stop edoxaban when INR > or = 2. • for patients taking 30mg, reduce edoxaban to 15 mg and start warfarin concomitantly. Stop edoxaban when INR > or = 2. OR if continuous , uninterrupted anticoagulation is necessary. • stop edoxaban. • begin both a parenteral anticoagulant (LMWH/fondaparinux or UFH) and warfarin at the same time that the next dose of edoxaban would have been given). Stop the parenteral anticoagulant when the INR is > or = 2 .

LMWH/Fondaparinux to edoxaban	Stop LMWH/Fondaparinux and start edoxaban at the same time that the next dose of LMWH/fondaparinux would have been given.
IV heparin to edoxaban	Stop IV heparin and start edoxaban simultaneously.
Edoxaban to parenteral anticoagulant	Stop edoxaban and start the parenteral anticoagulant at the same time that the next dose of edoxaban would have been given.
Edoxaban to oral anticoag other than warfarin	Stop edoxaban and start the other anticoagulant at the same time that the next scheduled dose of edoxaban would have been given.

Approved by the Executive Committee of the Medical Staff