

**UNIVERSITY OF UTAH HEALTH CARE
HOSPITALS AND CLINICS**

PHARMACY AND THERAPEUTICS COMMITTEE

GUIDELINE

Collaborative Practice Agreement: Thrombosis Service Ambulatory Care

Review Date: 12/15/2010 **Revision Date:** 12/15/2010

Chapter or section: Pharmacy and Therapeutics Committee

PURPOSE & GOALS

Purpose

To provide UHC patients with optimal dosing and monitoring of anti-thrombotic therapy in order to prevent new or recurrent thromboembolic events and to avoid adverse drug events in a cost-effective manner.

Goals

To maintain a systematic, coordinated process to monitor anti-thrombotic therapy in order to achieve the best possible outcomes for these patients.

To provide consultative services to providers regarding anti-thrombotic therapy.

To maintain International Normalized Ratios (INRs), for patients on warfarin, in the therapeutic range as consistently as possible, with the INR range specified by the patient's disease state in accordance with national guidelines.

To achieve stable and therapeutic levels of anti-thrombotic medications, other than warfarin, that require monitoring, as specific to the particular agent.

To maximize the benefits of anti-thrombotic therapy while minimizing the occurrence of adverse drug events.

To provide cost-effective service to patients and University of Utah Health Care (UHC) providers, to allow providers increased availability of clinic time for direct patient care.

To improve patient/caregiver understanding and compliance related to anti-thrombotic therapies by providing continuous patient/caregiver education about their prescribed anti-thrombotic medication(s) and associated disease state.

To provide in-service programs for medical, nursing, and pharmacy staff and students regarding appropriate anti-thrombotic therapies.

To serve as an educational site for students and residents.

To provide opportunities for research in the area of anti-thrombotic therapy and associated disease states.

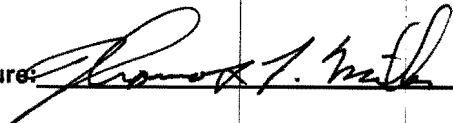
Collaborative Practice Agreement: Thrombosis Service

University Health Care pharmacist(s), according to and in compliance with Article 58-17b-102 of the Utah State Pharmacy Practice Act, may design, implement, and monitor a therapeutic drug plan intended to manage anticoagulation. Services offered by the pharmacist may include education on lifestyle modification, in addition to the drug therapy services listed above. Written educational materials and patient specific information may be provided to improve quality of care.

The pharmacist(s) may initiate, discontinue, or adjust medication for anticoagulation in accordance with current treatment guidelines, may order laboratory tests appropriate to the disease or drug therapy, and may issue prescriptions or prescription renewals on behalf of the referring health care provider. The pharmacist(s) will assure documentation of allergies and adverse drug reactions prior to initiation of medications and, in the course of the above mentioned therapy, shall document all activities appropriately in the medical record. Education at office visits shall include appropriate counseling on all new medications. The results of all lab tests ordered under the protocol shall be reviewed and managed by the pharmacist(s) to assess efficacy of treatment and necessity for medication and/or therapeutic lifestyle change. Lab results will be relayed to clinic patients either by face-to-face, written, or telephone communication.

A patient whose drug therapy is managed under this agreement must have established care with a provider within University Health Care and all aspects of the patient's anticoagulation medication management will be followed in collaboration with the patient's primary care (or referring) provider. In addition, the patient must be seen by their UHC primary care provider at least once per year and cases may be reviewed with clinic medical directors as needed. All issues outside of the scope of anticoagulation medication management shall be referred to the medical director(s) or back to the primary care provider.

Approved by the University Health Care Pharmacy & Therapeutics Committee on 4/15/09 . Referral to this service constitutes agreement by the provider with this collaborative practice agreement and satisfies all state legal requirements of a pharmacist collaborative practice agreement.

Medical Director Signature:  Date: 1/3/11

Authorized Providers under this Collaborative Practice Agreement:

| Pharmacist | License Number |
|--------------------------|-----------------------|
| Britton, Laura | 5412134-1701 |
| DiGregorio, Vicky | 264037-1701 |
| Finlinson, Marianne | 5034471-1701 |
| Hagen, Jolena | 6432999-1701 |
| Holden, Susan | 152435-1701 |
| Jamjian, Marie Christine | 132786-1701 |
| Klophaus, Heidi | 6223303-1701 |
| Lee-Hall, Christine | 337906-1701 |
| Moore, Davis | 5017555-1701 |
| Vazquez, Sara | 6221334-1701 |
| Walker, Amanda | 7030295-1701 |
| Young, David | 330828-1701 |

| Nurse | License Number |
|-----------------------|-----------------------|
| Anderson, Tracie | 378182-3102 |
| Cluff, Karie | 286839-3102 |
| Frederickson, Raelynn | 378181-3102 |
| Proctor, Pamela | 193483-3102 |

SERVICE LOCATIONS AND CONTACT INFORMATION

Location and contact information for anti-thrombotic services and staff is available on the University of Utah Health Care Thrombosis Service website:

<http://healthcare.utah.edu/thrombosis/>

PROCEDURES

Referrals

General Guidelines

- Patients may be referred by their UHC provider to the UHC Thrombosis Service at any stage of therapy.
- All patients must have a written or electronic referral for the Thrombosis Service.
- The referring physician will provide the following information on or accompanying the standard patient referral form. (Abbreviations: BMP - basic metabolic panel, CBC - complete blood count, LMWH - low molecular weight heparin)
 - Indication for anticoagulation
 - Date of initial anticoagulation
 - Expected duration of therapy
 - Desired therapeutic INR range (or other target laboratory range specific to the agent)
 - Current daily anticoagulation dose
 - Most recent INR and prothrombin time (PT) (if applicable) and other pertinent laboratory data
 - Type of artificial heart valve if applicable
 - Baseline CBC and BMP for anti-thrombotic medications as appropriate (e.g. LMWH)
 - History of clinically significant bleeding or thromboembolic events
 - Past pertinent medical history including current prescribed medications
 - Pregnancy test results if applicable
 - Current and complete prescribed anti-thrombotic therapies and anticipated duration
- The physician will notify the Thrombosis Service of any changes in the patient's medication regimen.
- When a patient no longer requires anti-thrombotic therapy:
 - The physician will:
 - Advise the Thrombosis Service that the patient be discharged from the Thrombosis Service (preferably in writing)
 - The thrombosis specialist will:
 - Contact the referring physician or primary care physician (PCP) if the patient has reached their proposed end date of therapy if the physician has not given the clinic instructions OR
 - Refer the patient for evaluation by the anticoagulation medical director for duration of therapy and communicate the results of this evaluation to the referring physician or PCP.
- Patients may be accepted into the Thrombosis Service if they meet the following criteria:

- Sign clinic agreement and are willing to follow the service's therapeutic plan.
 - Have transportation to the facility or are able to have their INR drawn outside the facility (home health care (HHC), etc) when applicable and are accessible by telephone.
 - Have a therapeutic plan (e.g. target INR or other specified anti-thrombotic therapy) that has been communicated and agreed upon between the referring provider and the Thrombosis Service.
 - Patients may be denied admission into the Thrombosis Service for the following reasons:
 - a. Inappropriate reason for anti-thrombotic medications.
 - b. Therapeutic goals which are not consistent with best clinical practices (NOTE: These cases may be referred to the medical director for review as necessary).
 - c. Medical contraindication (risks of anti-thrombotic therapy outweigh the benefits)
 - Anti-thrombotic therapy is contraindicated in any localized or general physical condition or personal circumstance in which the hazard of hemorrhage might be greater than the potential clinical benefits, such as:
 1. History of non-compliance
 2. Pregnancy
 3. Hemorrhagic tendencies
 4. Blood dyscrasias
 5. Uncontrolled or severe hypertension (HTN)
 6. Bleeding diathesis
 7. Alcoholism
 8. Active peptic ulcer disease (PUD)
 9. History of recent major bleeding episode (gastrointestinal, genitourinary, soft tissue, or oropharynx)
 10. Unexplained anemia
 11. Uncontrolled psychiatric conditions
 12. Increased falling risk (occupational, medical, etc.)
- NOTE: These cases may be referred to the medical director for review as necessary.
- d. Lack of ability for appropriate follow-up.
 - e. Inability of the Thrombosis Service to manage additional patients due to time, space, or personnel limitations.
 - f. No UHC provider.
 - g. Refusal to sign clinic agreement
 - h. Refusal to follow clinic plan

Referral of Patients Discharged to Rehabilitation/Skilled Nursing/Long-Term Care Facilities

Patients who reside either temporarily or permanently in a skilled nursing or long-term care facility will not be managed by the UHC Thrombosis Service unless an exception is made by the Service with approval of both the Pharmacy Supervisor (or designee) and the Medical Director.

UHC patients who are anticoagulated with warfarin and who are transferred to a rehabilitation/skilled nursing/long-term care facility after discharge from the hospital should be referred to the UHC Thrombosis Service prior to transfer.

Physician orders should be written for the rehabilitation facility to contact the appropriate thrombosis provider/clinic when the patient is being discharged from the rehab facility to home, to assist in continuity of care.

The thrombosis provider/clinic will contact the facility weekly to determine whether the patient is still in the facility or has been sent home. If the patient has been sent home, the provider/clinic will contact the patient at home to establish anticoagulation monitoring, if still needed.

Telemanagement

Patients referred to Redwood Anticoagulation Clinic, and those unable to come to a UHC Thrombosis Services Clinic to have INRs drawn on an ongoing basis, will be considered telemanaged or "home care" patients. These patients include those that are unable to come to the Thrombosis Services Clinic due to physical limitations, transportation issues, dialysis or other chronic illness, or who do not live in the local geographical area. This designation is to include patient's currently receiving Home Health Care (HHC) or Hospice Services but not exclusive to this population.

All telemanaged patients will receive the same level of care, including safety and efficiency, as patients who physically come to the clinic.

Telemanaged warfarin patients will be requested to attend clinic for orientation and education at or near the time of initial referral and then periodically thereafter, as determined by thrombosis specialist. Patients who cannot come to clinic will be oriented and educated via the telephone or via a home care nurse, if applicable.

Every effort will be made to contact the patient directly through an agreed upon format of communication. Telemanaged patients will be required to be available by telephone or to grant permission for the thrombosis specialist to leave instructions on voicemail, an answering machine, email, web-based format, or with another designated person. All patients will be instructed to contact the clinic within 2 business days of their INR if they do not receive instructions.

If a telemanaged patient is repeatedly unavailable or unresponsive to above mentioned venues of agreed upon communication, then the patient may be eligible for discharge by the clinic due to non-compliance with protocol.

Patients who live out of Utah may be managed by the UHC Thrombosis Service temporarily until more local care can be provided. Special situations will be considered on a case by case basis with approval of both the Pharmacy Supervisor (or designee) and the Medical Director.

Responsibilities

Thrombosis Specialist

- Follow all aspects of the patient's anti-thrombotic therapies in collaboration with the patient's primary care provider or referring physician and the service medical director.
- Initiate, adjust, or renew orders appropriate for the patient's anti-thrombotic therapies, which include anti-thrombotic medications, vitamin K, PT/INR, CBC, urinalysis, basic metabolic panel (BMP), and other related laboratory tests, per established guidelines.

- Educate the patient (using verbal and/or written communication) on the safe and appropriate use of anti-thrombotic medication, which includes the following:
 - Indication
 - Duration
 - Drug - how it works
 - Dosing and instructions for use (timing, missed dose, tablet ID, brand vs. generic, storage)
 - For warfarin -INR monitoring and target INR early blood draws to facilitate same day follow-up
 - For warfarin-INR pocket card use
 - Compliance and follow-up
 - Complications - bleeding and clotting
 - Pregnancy precautions if WOCBP
 - For warfarin-Food and vitamin K
 - Medication, vitamin, and herbal interactions; alcohol use
 - Pain medications - avoid aspirin (as clinically indicated), ibuprofen, and naproxen. Acetaminophen is the preferred over the counter pain medication
 - Activity
 - Illness - need to minimize injury, fall risk. Head injury - need for evaluation
 - Medic alert - not applicable if short term therapy
 - Procedures and surgery - need to contact warfarin provider
 - Bridging if applicable
- Address each patient's PT/INR (or other anti-thrombotic related laboratory result), assess the efficacy of treatment, and determine if therapeutic goals have been achieved. Specifically:
 - Identify patient-related variables that affect therapy and evaluate the stability of each individual result.
 - Make appropriate changes to anti-thrombotic therapy (See Injectable Anticoagulant Dosing Guideline and/or Warfarin Dosing Nomogram for Maintenance Therapy) when the therapeutic goals of treatment are not being met. Dosing adjustments may deviate from the given guidelines based on provider's clinical experience and patient's individual case factors.
 - Educate the patient/caregiver on therapeutic results, any dose changes, and any anti-thrombotic issues as determined per thrombosis specialist.
 - Assign a date for follow-up monitoring (if applicable).
 - If the patient's INR (or laboratory parameter specific to the anti-thrombotic therapy) is unstable (not yet at steady state), the patient will be followed at least once to twice weekly as needed.
 - The monitoring interval will be increased at one-week intervals, as the INR (or laboratory parameter specific to the anti-thrombotic therapy) becomes more stable.
 - Patients who have a stable INR (or laboratory parameter specific to the anti-thrombotic therapy) may be followed every four to six weeks.
 - Refer to the *Anticoagulant Dosing Guidelines for Outpatients* for dosing and monitoring recommendations.
 - Seek physician consultation for INRs greatly out of range as outlined in section on physician consultation.
- Assess all drug-related problems and communicate findings to primary care of referring physician as outlined in section on physician consultation.
- Manage any clinically significant drug interactions and contact the physician as needed.

- Document all the following in the patient's medical record:
 - Patient visits and contacts (telephone and clinic)
 - Interventions
 - Lab values
 - Current or potential problems:
 - S/s of bleeding or thrombotic complications, and report as ADR per UHC guidelines
 - Recent changes in diet, medication (including OTC and herbal), or alcohol consumption
 - Changes in lifestyle or health status
 - Compliance to medication regimen
 - Status of the particular medical problem necessitating anticoagulation therapy
 - Patient understanding of disease and treatment and willingness to comply with treatment and clinic visits
- Continue to monitor the patient's anti-thrombotic therapy until the patient's physician discontinues anti-thrombotic therapy or until the patient is discharged from the clinic by other means.

Thrombosis Technician or Support Staff

- Provide the thrombosis specialist with a current list of INR (or laboratory parameter specific to the anti-thrombotic therapy) results to be addressed.
- Assist with coordinating patient care with home health agencies, skilled nursing facilities, and laboratories.
- Examine patient compliance with PT/INR monitoring by generating reports of patient overdue for INRs and contacting these patients in a timely manner by phone and/or letter.
- Assist the thrombosis specialist in notifying patients of INR results (or laboratory parameter specific to the anti-thrombotic therapy) with either letters or phone calls.
- Manage the clinic correspondence with patients and providers.
- Initiate or renew PT/INR and other lab orders for clinic patients using the appropriate anticoagulation diagnosis under the supervision of thrombosis specialist.
- Document any contact or attempted contact with the patient or any agent thereof except for upcoming appointment reminder calls.
- Contact/attempt to contact and follow-up with patients who do not attend scheduled clinic visits, as per clinic guidelines.

Note: In the absence of thrombosis technicians or support staff, the thrombosis specialist will assume the above responsibilities.

Patient

- Follow Thrombosis Service instructions regarding anti-thrombotic dosing and monitoring.
- Contact the Thrombosis Service with any alterations to the dosing and monitoring plan.
- Notify the Thrombosis Service with any changes to medications (including OTC or herbal products), diet, or medical conditions
- Notify the thrombosis specialist with any planned medical testing or intervention so temporary cessation of their anti-thrombotic therapy can be considered.
- Have clinic visit and anticoagulation assessment with UHC referring provider or UHC PCP at least annually.

Physician Consultation

Laboratory values (e.g. INRs) greatly out of range may require **physician consultation**. The thrombosis specialist will:

- Notify the Thrombosis Service medical director or PCP if the patient has an **INR > 6.0**, an INR < 1.7 in a high risk patient (see definition in *Anticoagulant Dosing Guidelines for Outpatients, Special Situations, Treatment of Subtherapeutic INR in Patient with High-Thrombotic Risk*), an active bleeding episode, inability of the Thrombosis Service to maintain the patient in the recommended INR range, or an acute medical condition not covered by the clinic's daily functions and protocols.
- Actively consult the Thrombosis Service medical director on treatment options for all INRs > 8.0.
- Refer patients with emergent medical issues to call 911 or go to the nearest emergency room.
- Communicate information about all drug-related problems and findings (except for minor problems) to the primary care or referring provider such that the patient receives appropriate medical attention. If the PCP or the referring provider cannot be reached in a reasonable amount of time, the medical director of the Thrombosis Service will be consulted or the patient will be sent to the nearest appropriate care facility. All adverse drug reactions (ADRs) or drug errors will be reported per the UHC protocol.

DISCHARGE GUIDELINE

Purpose:

To keep the patient on anti-thrombotic therapy as safe as possible by avoiding serious adverse consequences due to poorly monitored therapy secondary to patient noncompliance.

Definitions:

Discharge: The patient will no longer be able to receive care from the University of Utah Health Care Thrombosis Service for monitoring of anti-thrombotic medications due to non-compliance.

Respond: To have an INR drawn, communicate with, and receive instructions from the Thrombosis Service regarding anti-thrombotic therapy.

Non-compliance: Repeated missed appointments or lab draws, failure to communicate and/or return the clinic's phone calls, or failure to follow clinic instructions.

- A. If the patient misses an appointment or scheduled lab draw, he/she will be rescheduled as soon as possible (within 1-2 weeks of the missed appointment/lab draw, or as appropriate to the patient's monitoring schedule or clinical situation.)
- B. If a patient misses an appointment/lab draw with the service, one of the following actions will be taken:
 1. The patient will receive 3 phone calls on 3 separate days (within 5 business days) or until the patient is rescheduled, whichever comes first, or
 2. The patient will be sent a **friendly reminder letter**.

- C. A **missed appointment letter** will be sent to the patient the following week if no appointment or lab draw is arranged with the Thrombosis Service after the phone calls or the friendly reminder letter. If a patient gets an INR but fails to communicate with the service to receive instructions, the discharge process continues.
- D. If, within 10 business days of mailing the missed appointment letter, the patient fails to contact the clinic and obtain an INR, the patient will be sent a certified letter stating that the patient will be discharged from the service if they do not reschedule an appointment/lab draw (**pre-discharge letter**.) For patients receiving a pre-discharge letter, all refills for anticoagulant medications prescribed by the Thrombosis Service will be cancelled.
- E. If the patient fails to respond within 10 business days of mailing the pre-discharge letter, a final letter (**discharge letter**) will be sent via certified mail informing the patient that the discharge process has begun. The patient will be directed to contact another provider as soon as possible to make a plan for anticoagulation follow-up. The Thrombosis Service will continue to be available to provide services to the patient for a period of 30 days or until the patient has transferred to a new provider, whichever comes first.
- F. The patient will automatically be discharged from the Thrombosis Service with a single letter of notification (**discharge letter**) sent to the patient if the patient receives a **missed appointment letter**, fails to respond AND has received a **pre-discharge letter** two times within the last year.
- G. If a patient is new to the service and has never established care with the service, a “**never-been-seen letter**” will be sent to the patient if the following occur:
 - 1. The clinic has been unable to reach the patient to schedule an appointment to enroll him/her in clinic after 3 phone calls, on 3 separate business days after receiving the referral.
 - 2. The patient has missed 3 clinic appointments/lab draws and is more than 7 days overdue to have the PT/INR blood test.
- H. Upon enrollment in the Thrombosis Service, patients will be notified that they need to establish and maintain ongoing care with a University Health Care provider within 30 days of enrollment in clinic. If the patient does not establish care with a University provider within 30 days of clinic enrollment, he/she will be discharged IMMEDIATELY, with the mailing of a **discharge letter**.
- I. The Thrombosis Service will notify Risk Management as the discharge process is initiated (i.e. as the pre-discharge letter is sent or before the discharge letter is sent if no pre-discharge letter is sent.)
- J. A copy of each letter will be sent to the patient’s referring physician or PCP and will be posted in the patient’s electronic medical record (EMR.)
- K. Each phone call and letter will be documented in the patient’s EMR.
- L. If a patient misses a rescheduled appointment/lab draw, the discharge process will continue as if the patient had never rescheduled.

- M. If a patient is violent, abusive, or exhibits outright failure to comply with the instructions of the Thrombosis Service staff, the behavior will not be tolerated and will result in immediate discharge from the service.

- N. If a patient is discharged for any of the above reasons from any clinic within the Thrombosis Service at University Health Care, the patient will not be allowed back in the Service. If there are extenuating circumstances, there will be a multidisciplinary review to determine eligibility for reenrollment. A multidisciplinary review will include members of the Thrombosis Service and will involve the Thrombosis Service medical director and Operations manager, if applicable.

ANTICOAGULANT DOSING AND REVERSAL GUIDELINES FOR OUTPATIENTS

| Injectable Anticoagulant Dosing Guideline | | | | |
|--|--|--|---|---|
| Drug | VTE Treatment Dose^a | VTE Prophylaxis Dose^a | Laboratory Monitoring | Reversal Agent^b |
| UFH (unmonitored) | Initial dose of 333 units/kg SC, then 250 units/kg SC every 12 hours ¹ | 5000 units SC every 8-12 hours ² | Baseline CBC with platelets and aPTT ³ | Protamine (IV) ⁴ |
| UFH (monitored) | Initial dose is 17,500 units SC twice daily OR 250 units/kg SC twice daily ¹ | | During first 2 weeks of UFH therapy check platelets every 2-3 days, then every 2-4 weeks ³ | |
| Enoxaparin | 1 mg/kg SC every 12 hours or 1.5 mg/kg SC once daily ^{5c} <i>Dose Adjustment for Renal Dysfunction (CrCl <30 mL/min): 1 mg/kg SC once daily⁵</i> | 30 mg SC every 12 hours OR 40 mg SC once daily ⁵ <i>Dose Adjustment for Renal Dysfunction (CrCl <30 mL/min): 30 mg SC once daily⁵</i> | Baseline CBC with platelets, SCr (calculate CrCl) Check SCr periodically. | Protamine (IV) (will only partially reverse) ⁴ |
| Dalteparin | 200 anti-Xa units/kg SC once daily <i>Dose Adjustment for Renal Dysfunction (CrCl <30 mL/min): Monitor anti-Xa levels (Target range 0.5-1.5 units/mL, levels should be drawn 4-6 hours after 3rd or 4th dalteparin dose)⁶</i> | 5000 units SC once daily ⁶ | Baseline CBC with platelets, SCr (calculate CrCl) Check SCr periodically. | Protamine (IV) (will only partially reverse) ⁴ |
| Fondaparinux | < 50 kg: 5 mg SC once daily (use with caution) 50 – 100 kg: 7.5 mg SC once daily > 100 kg: 10 mg SC once daily ⁷ <i>Dose Adjustment for Renal Dysfunction: CrCl 30-50 mL/min= use with caution CrCl <30 mL/min= contraindicated⁷</i> | 2.5 mg SC once daily ⁷ <i>Dose Adjustment for Renal Dysfunction: CrCl 30-50 mL/min= use with caution CrCl <30 mL/min= contraindicated⁷</i> | Baseline CBC with platelets, SCr (calculate CrCl) Check SCr periodically. | None |

| | | | | |
|-----------|------|--|---|------|
| Desirudin | None | 15 mg SC every 12 hours ⁸ <i>Dose Adjustment for Renal Dysfunction:</i> <i>CrCl 10-15 mL/min=</i> <i>7.5mg SC q24h⁹</i> | Baseline CBC with platelets, aPTT, SCr (calculate CrCl) Check SCr periodically, or daily if renal insufficiency. | None |
|-----------|------|--|---|------|

^aRefer to *Special Populations* section for dosing guidelines in cancer, obese, or underweight patients

^bIf an outpatient is taking an injectable anticoagulant and is experiencing bleeding complications or needs to have the anticoagulant reversed rapidly, the patient should be referred to the emergency department.

^cOnce daily dosing is not FDA-approved for outpatient use and is not recommended in obese patients, patients with active cancer, or patients with ileofemoral DVT

| aPTT Dosing Adjustment Chart for Subcutaneous Unfractionated Heparin Therapy | | |
|---|---|-------------------------------------|
| aPTT (seconds) | Dosing Adjustment (rounded to the nearest 500 units) | Next aPTT |
| < 40 | Increase dose by 36-48 units/kg | 6 hours after a dose in 1-3 days |
| 40-59 | Increase dose by 24-36 units/kg | 6 hours after a dose in 1-3 days |
| 60-100 | No change | 6 hours after a dose every 4-7 days |
| 101-120 | Decrease dose by 6-12 units/kg | 6 hours after a dose in 1-3 days |
| 121-140 | Decrease dose by 12-24 units/kg | 6 hours after a dose in 1-3 days |
| > 140 | Decrease dose by 24-36 units/kg | 6 hours after a dose in 1-3 days |

All calculations shall be made using actual body weight (kg)

aPTT Dosing Adjustment Chart adapted with permission from "Heparin Protocols for UWMC" from the University of Washington Anticoagulation Service.

Special Populations

Anticoagulant Considerations in the Setting of Obesity

Obesity is defined as BMI \geq 30. In the absence of large clinical trial data, the clinician may consider the following recommendations (or consult with the Thrombosis Service physician on call):

- VTE prevention
 - Bariatric surgery²
 - enoxaparin 40 mg SC twice daily,^{10,11}
 - dalteparin 5000 units SC once daily^{12,13} or 7500 units SC once daily in patients with morbid obesity (BMI \geq 40)¹⁴
 - Medically ill⁴
 - enoxaparin 0.5 mg/kg SC twice daily¹⁵
 - dalteparin 5000 units SC once daily¹⁶
 - Consider increasing prophylactic LMWH dose by 30% for patients with morbid obesity (BMI \geq 40)¹⁷
- VTE treatment
 - Twice-daily weight-based dosing using actual body weight without a dose cap¹⁷ (i.e. enoxaparin 1 mg/kg twice daily, dalteparin 200 units/kg twice daily)
 - Anti-Xa level monitoring may be useful in patients weighing >190 kg.^{17,18}

Anticoagulant Considerations in Patients who are Underweight

In men and women < 45-55 kg, fixed-dose anticoagulant regimens can produce significantly higher anticoagulant levels when compared with normal weight subjects. Use with caution in this patient population as a dose reduction may be necessary and consider consultation with the Thrombosis Service Medical Staff.^{5,7}

Anti-Xa Level Monitoring for Patients Receiving Low Molecular Weight Heparins (LMWHs)

- For most patients, anti-Xa level monitoring is not recommended.
- Peak anti-Xa levels should be drawn 4 hours after 3rd dose (or at steady state).
- Target range for once daily LMWH treatment dosing = 1.0-2.0 anti-Xa units/mL.
- Target range for twice-daily LMWH treatment dosing = 0.6-1.0 anti-Xa units/mL.
- Target range for PROPHYLACTIC LMWH dosing = 0.1-0.4 anti-Xa units/mL

- To make dose adjustments using anti-Xa level monitoring for twice-daily treatment dosing, consider using the *Peak Anti-Xa Level Adjustments Chart*.

| Peak Anti-Xa Level Adjustments Chart¹⁷ | | | |
|--|---|---------------------|---|
| Anti-Xa Level (units/mL) | Hold the next dose? | Dose change? | Next anti-Xa level |
| < 0.35 | No | Increase dose 25% | 4 hours after the next dose |
| 0.35-0.49 | No | Increase dose 10% | 4 hours after the next dose |
| 0.5-1.0 | No | No | Next day, then within 1 week |
| 1.1-1.5 | No | Decrease dose 20% | Before the next dose |
| 1.6-2.0 | For 3 hours | Decrease dose 30% | Before the next dose and 4 hours after the next dose |
| > 2.0 | Hold until anti-Xa level < 0.5 units/mL | Decrease dose 40% | Before the next dose and every 12 hours until anti-Xa level is < 0.5 units/mL |

Peak Anti-Xa Level Adjustments Chart adapted with permission from "Guidelines for Dosing and Monitoring of Low Molecular Weight Heparin (LMWH)" from the University of Washington Anticoagulation Service.

Venous Thromboembolism Treatment in the Setting of Cancer

Dalteparin can be used for the extended treatment of VTE in patients with cancer. Doses may be grouped according to the chart below:

| Dalteparin Dosing Guideline for VTE Treatment in Cancer Patients⁶ | | |
|---|----------------------|-------------------|
| Body Weight (kg) | First 30 days | Months 2-6 |
| ≤ 56 kg | 10,000 units | 7,500 units |
| 57 to 68 kg | 12,500 units | 10,000 units |
| 69 to 82 kg | 15,000 units | 12,500 units |
| 83 to 98 kg | 18,000 units | 15,000 units |
| ≥ 99 kg* | 18,000 units | 18,000 units |

*For patients with severe obesity (e.g. TBW >125kg) or renal insufficiency consider consultation with the Thrombosis Service or Hematology medical staff

- Do not exceed total daily dose of > 18,000 units.
- Patients with platelet counts between 50,000 and 100,000/mm³: Reduce dalteparin dose by 2,500 units until the platelet count recovers to ≥ 100,000/mm³
- Patients with platelet counts < 50,000/mm³: Discontinue dalteparin until the platelet count recovers to > 50,000/mm³

Warfarin

Initial Laboratory Monitoring

All patients initiating warfarin should have the following baseline labs:

- PT/INR
- CBC with platelets
- Hepatic function panel
- Pregnancy test if female of child-bearing potential
- Frequency of INR testing in hospitalized patients starting warfarin may vary for each patient, but is recommended at least twice weekly until stable.

Warfarin Initiation Dosing

- Most patients should be initiated on a warfarin dose between 5 and 10 mg.¹⁹ See both *5-mg and 10-mg Initiation Dose Nomograms* below.
- A starting **dose of < 5 mg** may be appropriate in the following patient populations:
 - Elderly
 - Malnourished
 - Liver disease
 - Congestive heart failure
 - Recent major surgery
 - Taking medications known to increase warfarin sensitivity.¹⁹
- Regardless of warfarin initiation dose chosen, in the setting of acute thrombosis (e.g. acute VTE) overlap with a rapid acting anticoagulant (i.e. UFH, LMWH, or fondaparinux) for at least 5 days and until the INR is ≥ 2.0 .¹

Option 1: 5-mg Initiation Dose

| 5-mg Initiation Dose Nomogram ²⁰ | | |
|---|---------|---------------|
| Day | INR | Dose |
| 1 | ---- | 5 mg |
| 2 | <1.5 | 5 mg |
| | 1.5-1.9 | 2.5 mg |
| | 2.0-2.5 | 1 – 2.5 mg |
| | >2.5 | 0 |
| 3 | <1.5 | 5 mg |
| | 1.5-1.9 | 2.5 – 5 mg |
| | 2.0-3.0 | 0 – 2.5 mg |
| | >3.0 | 0 |
| 4 | <1.5 | 7.5 – 10 mg |
| | 1.5-1.9 | 5 – 7.5 mg |
| | 2.0-3.0 | 0 – 5 mg |
| | >3.0 | 0 |
| 5 | <1.5 | 7.5 – 10 mg |
| | 1.5-1.9 | 7.5 – 10 mg |
| | 2.0-3.0 | 0 – 5 mg |
| | >3.0 | 0 |
| 6 | <1.5 | 7.5 – 12.5 mg |
| | 1.5-1.9 | 5 – 10 mg |
| | 2.0-3.0 | 0 – 7.5 mg |
| | >3.0 | 0 |

Option 2: 10-mg Initiation Dose

The 10-mg Initiation Dose Nomogram should be reserved for relatively young, otherwise healthy patients, and patients taking medications known to induce warfarin metabolism (e.g. rifampin).

| 10-mg Initiation Dose Nomogram ²¹ | | | | | | | | |
|--|------------|-----------|------------|------------|-----------|------------|------------|------------|
| Day 1 Dose | Day 2 Dose | Day 3 INR | Day 3 Dose | Day 4 Dose | Day 5 INR | Day 5 Dose | Day 6 Dose | Day 7 Dose |
| 10 mg | 10 mg | <1.3 | 15 mg | 15 mg | <2.0 | 15 mg | 15 mg | 15 mg |
| | | 1.3-1.4 | 10 mg | 10 mg | 2.0-3.0 | 7.5 mg | 5 mg | 7.5 mg |
| | | | | | 3.1-3.5 | 0 | 5 mg | 5 mg |
| | | | | | >3.5 | 0 | 0 | 2.5 mg |
| | | | | | | | | |
| | | 1.5-1.6 | 10 | 5 | <2.0 | 7.5 mg | 7.5 mg | 7.5 mg |
| | | 1.7-1.9 | 5 | 5 | 2.0-3.0 | 5 mg | 5 mg | 5 mg |
| | | | | | 3.1-3.5 | 2.5 mg | 2.5 mg | 2.5 mg |
| | | | | | >3.5 | 0 | 2.5 mg | 2.5 mg |
| | | | | | | | | |
| | | 2.0-2.2 | 2.5 | 2.5 | <2.0 | 5 mg | 5 mg | 5 mg |
| | | 2.3-3.0 | 0 | 2.5 | 2.0-3.0 | 2.5 mg | 5 mg | 2.5 mg |
| | | | | | 3.1-3.5 | 0 | 2.5 mg | 0 |
| | | | | | >3.5 | 0 | 0 | 2.5 mg |
| | | | | | | | | |
| | | >3.0 | 0 | 0 | <2.0 | 2.5 | 2.5 | 2.5 |
| | | | | | 2.0-3.0 | 2.5 | 0 | 2.5 |
| | | | | | 3.1-4.0 | 0 | 2.5 | 0 |
| | | | | | >4.0 | 0 | 0 | 2.5 |

Assessment of Therapy

- Compliance (missed/extra warfarin doses, correct dose, correct tablet strength/color)
- Diet changes (Vitamin K-containing foods, overall oral intake)
- Disease or general health changes (acute infection, GI illness, exercise/activity level, etc)
- Medication / vitamin / herbal / OTC interactions with warfarin (new starts, or discontinuations)
- Social habit changes – alcohol, tobacco, illicit drugs
- Lab error
- Signs/Symptoms of bleeding
- Signs/Symptoms of thrombosis
- Refer to the *Warfarin Dosing Nomogram for Maintenance Therapy* below for guidance in making dose adjustments.

• **Warfarin Dosing Nomogram for Maintenance Therapy**

| | Dosing Adjustments |
|---|---|
| For Goal INR 2-3 If INR < 1.5 | Consider a booster dose of 1 ½ -2 times daily maintenance dose. Consider resumption of prior maintenance dose if factor causing decreased INR is transient [eg: missed warfarin doses] . If dosage adjustment needed, increase maintenance dose by 10%–20%. |
| For Goal INR 2.5-3.5 If INR < 2.0 | |
| For Goal INR 2-3 If INR 1.5 - 1.8 | Consider a booster dose of 1 ½ – 2 times daily maintenance dose. Consider resumption of prior maintenance dose if factor causing decreased INR is transient [eg: missed warfarin dose(s)]. If dosage adjustment needed, increase maintenance dose by 5-15%. |
| For Goal INR 2.5-3.5 If INR 2.0-2.3 | |
| For Goal INR 2-3 If INR 1.8 – 1.9 | No dosage adjustment may necessary if the last two INRs were in range, if there is no clear explanation for the INR to be out of range, and if in the judgment of the clinician, the INR does not represent an increased risk of thromboembolism for the patient. Consider a booster dose of 1 ½ – 2 times daily maintenance dose. Consider resumption of prior maintenance dose if factor causing decreased INR is transient [eg: missed warfarin dose(s)]. If dosage adjustment needed, increase maintenance dose by 5%–10%. |
| For Goal INR 2.5-3.5 If INR 2.3-2.4 | |
| For Goal INR 2-3 If INR 2.0 – 3.0 | Desired range |
| For Goal INR 2.5-3.5 If INR 2.5-3.5 | |
| For Goal INR 2-3 If INR 3.1 – 3.2 | No dosage adjustment may necessary if the last two INRs were in range, if there is no clear explanation for the INR to be out of range, and if in the judgment of the clinician, the INR does not represent an increased risk of hemorrhage for the patient. Consider continuation of prior maintenance dose if factor causing elevated INR is transient [eg: acute alcohol ingestion]. If dosage adjustment needed, decrease maintenance dose by 5%–10%. |
| For Goal INR 2.5-3.5 If INR 3.6-3.7 | |
| For Goal INR 2-3 If INR 3.8 – 3.9 | Consider holding ½ to 1 dose. Consider resumption of prior maintenance dose if factor causing elevated INR is transient [eg: acute alcohol ingestion]. If dosage adjustment needed, decrease maintenance dose by 5%–10%. |
| For Goal INR 2.5-3.5 If INR 3.6-3.7 | |
| For Goal INR 2-3 If INR 3.5 – 3.9 | Consider holding 1 dose. Consider resumption of prior maintenance dose if factor causing elevated INR is transient [eg: acute alcohol ingestion]. If dosage adjustment needed, decrease maintenance dose by 5%–15%. |
| For Goal INR 2.5-3.5 If INR 4.0-4.4 | |
| For Goal INR 2-3 If INR ≥ 4.0 | Hold until INR < upper limit of therapeutic range. Consider use of minidose oral vitamin K. Consider resumption of prior maintenance dose if factor causing elevated INR is transient [eg: acute alcohol ingestion]. If dosage adjustment needed, decrease maintenance dose by 5%-15%. |
| For Goal INR 2.5-3.5 If INR ≥ 4.5 | |

Warfarin Dosing Nomogram for Maintenance Therapy adapted and used with permission from the University of Washington Anticoagulation Service.

| INR Monitoring Guideline for Warfarin Maintenance Therapy | |
|---|-----------------|
| Action Taken | Next INR |
| Significant dose alteration in patient with INR substantially outside of target INR range | 1-3 days |
| Modest dose change today | 1-2 weeks |
| Dose change < 2 weeks ago | 2-4 weeks |
| Routine follow-up of medically stable & reliable patients who have had at least two consecutive INRs, separated by at least two weeks, in therapeutic range | Every 4-6 weeks |
| Routine follow-up of medically unstable or unreliable patients and those who have not had consecutive therapeutic INRs | Every 1-2 weeks |

INR Monitoring Guideline for Warfarin Maintenance Therapy adapted with permission from "Warfarin" from the University of Washington Anticoagulation Service.

Optimal Therapeutic Range and Duration of Anticoagulant Therapy^{1,2,22-25}

| Indication | Target INR Range | Duration | Comment |
|--|--|--|---|
| Deep Vein Thrombosis (DVT)/Pulmonary Embolism (PE) Provoked (Transient risk factors) Unprovoked Unprovoked (after 3 months of conventional therapy) Cancer APAS or 2 or more thrombophilic conditions Recurrent DVT/PE | 2.5 (2.0-3.0) 2.5 (2.0-3.0) (1.5-1.9) 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) | 3 months and reassess 3 months and reassess Indefinite or until cancer resolved. Indefinite Indefinite | Consider indefinite therapy Preferred over stopping therapy for patients who desire less frequent INR monitoring Following LMWH for 3-6mo if possible |
| Orthopedic Thromboprophylaxis THR or hip fracture TKA | 2.5 (2.0-3.0) 2.5 (2.0-3.0) | At least 10 days & up to 35 days post-op At least 10 days & up to 35 days post-op | Then reassess based on mobility Then reassess based on mobility |
| Atrial Fibrillation (AF) or Atrial Flutter (AFL) CHADS ₂ score=0 CHADS ₂ score=1 CHADS ₂ score ≥2 Mitral stenosis Pre-Cardioversion (AF or AFL ≥ 48 hrs or unknown duration) Post-Cardioversion <i>CHADS₂ scoring system: congestive heart failure and/or LV dysfunction (1 point), hypertension (1 point), age>75 (1 point), diabetes (1 point), prior stroke/TIA (2 points)</i> | use ASA 75-325 mg daily 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) | Indefinite Indefinite Indefinite Indefinite 3 weeks 4 weeks | Can use warfarin or ASA, stronger preference for warfarin Or until NSR maintained |
| Cardioembolic Stroke/TIA Following embolic event despite anticoagulation | 2.5 (2.0-3.0) 2.5 (2.0-3.0) | Indefinite Indefinite | Add antiplatelet therapy |
| Myocardial Infarction (MI) Large Anterior MI Left ventricular dysfunction, AF, intracardiac thrombus, history of TE | 2.5 (2.0-3.0) 2.5 (2.0-3.0) | 3 months and reassess 3 months and reassess | All employ use of antiplatelet therapy |
| Valvular Disease Aortic or mitral With mitral valve disease, AF, or h/o systemic embolization Mitral annular calcification | 2.5 (2.0-3.0) 2.5 (2.0-3.0) | Indefinite Indefinite | |

| | | | |
|---|---|--|---|
| With AF or embolic event despite ASA therapy Mitral valve prolapse With AF or h/o systemic embolization With history of TIA despite ASA therapy S/P embolic event despite anticoagulation Rheumatic mitral valve disease With AF, h/o systemic embolization, or LA 5.5cm S/P embolic event despite anticoagulation | 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) | Indefinite Indefinite Indefinite Indefinite Indefinite | Add antiplatelet therapy Add low-dose ASA or increase INR target range to 2.5-3.5 |
| Valve Replacement—Bioprosthetic Mitral Aortic or mitral With LA thrombus With h/o systemic embolization With AF, hypercoagulable state, or low EF History of atherosclerotic vascular disease | 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) 2.5 (2.0-3.0) | 3 months 3 months and reassess 3-12 months Indefinite Indefinite | Followed by ASA Followed by ASA Followed by ASA Add low-dose ASA (unless >80yo or history of GI bleed) |
| Valve Replacement—Mechanical Aortic Bileaflet or Medtronic Hall tilting disk In NSR, normal EF, normal LA size All others Ball and cage Mitral Bileaflet Tilting disk Ball and cage With additional risk factors or following TE | 2.5 (2.0-3.0) 3.0 (2.5-3.5) 3.0 (2.5-3.5) 3.0 (2.5-3.5) 3.0 (2.5-3.5) 3.0 (2.5-3.5) 3.0 (2.5-3.5) | Indefinite Indefinite Indefinite Indefinite Indefinite Indefinite | Add low-dose ASA (unless >80yo or history of GI bleed) |

Reversal¹⁹

| INR | Clinical Presentation | Treatment Options |
|--|--|---|
| Above upper limit of therapeutic range but < 5 | No significant bleeding | Give lower warfarin dose or hold warfarin dose, then adjust warfarin dose as appropriate. Monitor INR more frequently. |
| 5 -<9 | No significant bleeding | <i>Option 1:</i> Hold 1 or 2 warfarin doses. Adjust warfarin dose as appropriate. <i>Option 2:</i> Hold 1 or 2 warfarin doses and give Vitamin K 1-2.5 mg orally if at risk for bleeding. Adjust warfarin dose as appropriate. For both options: monitor INR more frequently. |
| | Rapid reversal required for urgent surgery | Hold warfarin dose Give Vitamin K ≤ 5 mg orally and expect INR to decrease in 24 hours. If INR still elevated, give Vitamin K 1-2.5 mg orally. |
| ≥ 9 | No significant bleeding | Hold warfarin dose Give Vitamin K 2.5 - 5 mg orally, and expect INR to decrease substantially in 24-48 hours. Adjust warfarin dose as appropriate and monitor INR more frequently. May administer additional Vitamin K if necessary. |
| Any INR | Serious or Life-threatening Bleeding | Hold warfarin Refer to emergency department. Give Vitamin K 10 mg by slow IV infusion, supplemented with FFP, PCC, or recombinant factor VIIa May repeat Vitamin K administration every 12 hours for persistent INR elevation. |

Special Situations

Treatment of Subtherapeutic INR in Patient with High Thrombotic Risk

Definitions:

- Subtherapeutic INR defined as INR < 1.7
- Patients with “high” risk for thrombosis:²⁶
 - Mechanical heart valve
 - Mitral mechanical valve
 - Aortic mechanical valve with caged-ball or tilting disc
 - Any mechanical valve with recent stroke or TIA (within 3 months)
 - Atrial fibrillation
 - CHADS₂ score ≥5
 - Recent stroke or TIA (within 3 months)
 - Rheumatic valvular heart disease
 - VTE
 - Recent VTE (within 1 month)
 - Severe thrombophilia (eg, Protein C or S deficiency, antithrombin deficiency, APAS, or multiple thrombophilias)

Patient with high risk for thrombosis presents with an INR < 1.7:

1. Evaluate patient for new, sudden onset signs or symptoms of thrombosis:
 - a. Stroke –weakness on one side of the body, difficulty speaking, vision changes, headache, dizziness, syncope
 - b. Pulmonary embolism – difficulty or painful breathing, chest pain, back pain, shoulder pain, dyspnea, hemoptysis, upper abdominal pain, syncope
 - c. Deep vein thrombosis – sharp pains in leg (or arm), skin discoloration, edema, tenderness, skin warm to the touch or erythematous
 - d. If strong clinical suspicion of thrombosis, refer patient to the ER for evaluation and notify Thrombosis Service Medical Director
2. Evaluate lab result for possible error.
3. Adjust warfarin dose as appropriate (see *Warfarin Dosing Nomogram for Maintenance Therapy*)
4. Evaluate patient for LMWH therapy or if contraindicated, other appropriate antithrombotic therapy
 - a. Evaluate renal function—calculate creatinine clearance for patient using a serum creatinine within the past 6 months. Refer to *Injectable Anticoagulant Dosing Guideline*.
 - b. Evaluate the patient's CBC with platelets to rule out contraindications to LMWH/UFH therapy.
 - c. Evaluate patient's ability to pay for LMWH and obtain any necessary insurance authorization or consider unmonitored SC UFH (see *Injectable Anticoagulant Dosing Guideline*).
 - d. Evaluate patient's or caregiver's ability to administer injections and provide education if needed.
 - e. Call prescription for LMWH to the patient's pharmacy and ensure the LMWH is in stock at the pharmacy.
5. Document action taken in the patient's electronic medical record (EMR).
6. Recheck INR every 2-4 days until therapeutic and continue LMWH therapy until INR in therapeutic range.
7. Contact Thrombosis Service Medical Director or referring physician as needed for consultation.

PERI-PROCEDURAL ANTICOAGULATION

Peri-procedural anticoagulation is a controversial area with little prospective data and varied consensus opinion. This guideline is designed to emphasize several points in management decisions:

- First, there are low risk procedures that can be identified where no interruption of oral anticoagulant therapy is needed.
- Second, it should be emphasized that in those instances with a recent thromboembolic event (<2-4 weeks) and/or reversible factors, the surgery/procedure should be delayed if possible, as the recurrent TE risk will decrease over time with OAC therapy and reversal of risk factors.
- Finally, **for the majority of patients who fall in between these extreme groups, careful and individualized assessment of TE risk and bleeding risk with incorporation of the patient's and the proceduralist's involvement is prudent.**

1. Determine the **bleeding risk of the procedure** and if interruption in OAC is necessary in order to safely perform the procedure without major bleeding complications.
 - Examples of “low-bleeding risk” procedures in which OAC can be safely continued without interruption:²⁶
 - Minor dental procedures (eg, single or multiple tooth extractions, root canals)
 - Minor dermatological procedures (eg, excisions of basal and squamous cell carcinomas, actinic keratoses, malignant or pre-malignant nevi)
 - Minor ophthalmologic procedures (eg, cataract extraction)
 - Examples of “high-bleeding risk” procedures in which OAC should be discontinued (with the use of parenteral anticoagulant bridging therapy determined by individual patient's thromboembolic risk):²⁶
 - Major thoracic surgery
 - Intracranial or spinal surgery

- Aortic aneurysm repair
- Peripheral artery bypass and other major vascular surgery
- Major orthopedic surgery (hip or knee replacement)
- Reconstructive plastic surgery
- Major cancer surgery
- Prostate and bladder surgery
- Renal biopsy
- Gastrointestinal Polypectomy

2. If the procedure is considered “high-bleeding risk” and/or the proceduralist desires INR ≤ 1.5 , then determine the **patient’s thromboembolic risk while off anticoagulation (See Risk Stratification for Peri-Procedural Thromboembolism Chart).**

| Risk Stratification for Peri-Procedural Thromboembolism Chart Based upon the American College of Chest Physicians Evidence-based Guidelines (Note that alternate approaches may be appropriate depending on a patient’s unique clinical scenario. Thrombosis MD staff is available for consultation)²⁶ | | | | |
|--|--|---|---|---|
| Indication for Anticoagulation Therapy | | | | |
| Risk Level | Mechanical Heart Valve | Atrial Fibrillation | VTE | Peri-Procedural Strategy |
| High | Any mitral mechanical valve Aortic mechanical valve with caged-ball or tilting disc Any mechanical valve with recent stroke or TIA (within 6 months) | CHADS ₂ score ≥ 5 Recent stroke or TIA (within 3 months) Rheumatic valvular heart disease | Recent VTE (within 3 months) Severe thrombophilia (eg, Protein C/S or antithrombin deficiency, APAS, or multiple thrombophilias) | Discontinue warfarin 5 days prior to procedure Initiate therapeutic dose LMWH* 3 days prior to procedure Last LMWH dose is 50% of the total daily LMWH dose and should be administered 24 hours prior to procedure Check INR 1-2 days prior to procedure, and if INR ≥ 1.5 consider giving low-dose oral Vit K (1-2 mg) Resume warfarin 12-24 hours post-procedure Depending on adequate hemostasis, resume LMWH* 24 hours post-procedure (may delay resumption of LMWH for major or high-bleeding risk surgery) Continue both warfarin and LMWH until INR therapeutic |

| | | | | |
|----------|--|---|---|--|
| Moderate | Bileaflet aortic mechanical valve + one of the following: AF, prior stroke/TIA, HTN, DM, CHF, age>75 | CHADS ₂ score 3-4 | VTE within the past 3-12 months Non-severe thrombophilias (heterozygous Factor V Leiden or prothrombin 20210A) Recurrent VTE Active cancer (treated within 6 months or palliative) | Discontinue warfarin 5 days prior to procedure Initiate therapeutic dose (or may consider low-dose) LMWH* 3 days prior to procedure Last LMWH dose is 50% of the total daily LMWH dose and should be administered 24 hours prior to procedure Check INR 1-2 days prior to procedure, and if INR ≥1.5 consider giving low-dose oral Vit K (1-2 mg) Resume warfarin 12-24 hours post-procedure Depending on adequate hemostasis, resume LMWH* 24 hours post-procedure (may delay resumption of LMWH for major or high-bleeding risk surgery) Continue both warfarin and LMWH until INR therapeutic |
| Low | Bileaflet aortic mechanical valve without AF and no other risk factors for stroke | CHADS ₂ score 0-2 (and no prior stroke or TIA) | Single VTE occurred >12 months ago and no other risk factors | Discontinue warfarin 5 days prior to procedure May consider low-dose LMWH* as above Check INR 1-2 days prior to procedure, and if INR ≥1.5 consider giving low-dose oral Vit K (1-2 mg) Resume warfarin 12-24 hours post-procedure |

*For patients with renal insufficiency use UFH or consult University Thrombosis Service.

3. Obtain baseline labs necessary for LMWH therapy (see *Injectable Anticoagulant Dosing Guideline*) if not drawn in the last 6 months. Check results prior to proceeding with therapy.
4. Educate patient/caregiver about the risks versus the benefits of the designated method of bridging or lack of bridging.
5. Educate patient/caregiver on the proper technique for self-injection, dose of LMWH, potential complications, and the interventions they should take if a complication occurs. Assess his/her level of understanding of complications and ability to perform injections. Have patient/caregiver demonstrate technique if necessary.

6. Order LMWH from the appropriate pharmacy and ensure medication is in-stock and available within the necessary time frame. Check on insurance coverage and get prior authorization if needed. Arrange for patient financial assistance programs if available and necessary.
7. Provide written instructions to the patient/caregiver for bridging and set follow-up appointment(s).
8. Document therapeutic plan and patient consent for bridging therapy (as well as any refusal of therapy) in the patient's medical record.

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