

**ELMHURST HOSPITAL CENTER  
ANTI-COAGULATION PROTOCOLS  
FOR ADULT INPATIENT THERAPEUTIC ANTI-COAGULATION**

**I. UNFRACTIONATED HEPARIN (UFH) THERAPY**

a. INDICATIONS:

- i. FULL DOSE used for treatment of DVT/PE, ACS (Acute Coronary Syndrome). If initiating Warfarin for long-term management must have a minimum course of 5 days of dual treatment and INR in the therapeutic range.
- ii. REDUCED OR LOW DOSE used for Post-Thrombolytic Therapy for Acute MI/ACS and for Unstable Angina.

b. INITIAL DOSING: Dosing must be based on the patient’s current body weight or based on the adjusted body weight.

- *Adjusted Body Weight* =  
Ideal Body Weight + 0.4 x (Actual Body Weight – Ideal Body Weight)
- *Ideal Body Weight for males* = 50 kg + 2.3 kg for every inch over 5 ft
- *Ideal Body Weight for females* = 45.5 kg + 2.3 kg for every inch over 5 ft

	<b>Heparin IVP (Bolus Dose)</b>	<b>Heparin IVP (Maximum Bolus Dose)</b>	<b>Heparin Drip (IV Rate)</b>	<b>Heparin Drip (Maximum IV Rate)</b>
<b>Full Dose</b> <i>Goal:</i> PTT of 50-88 sec.	<i>HHC recommended dose: 70 Units/kg</i> <i>ACCP recommended dose: 80 units/kg</i>	7,000 units	<i>HHC recommended rate: 15 units/kg/hr</i> <i>ACCP recommended rate: 18 units/kg/hr</i>	1,500 units/hr
<b>Reduced or Low Dose</b> <i>Goal:</i> PTT of 50-88 sec.	60 units/kg	4,000 units	12 units/kg/hr	1,000 units/hr

c. BASELINE TESTING:

- i. CBC, PT / PTT / INR

d. REQUIRED MONITORING:

- i. PTT should be checked 6 hours after starting IV Heparin and every 6 hours until therapeutic and then once daily while on Heparin.
- ii. CBC with platelets should be checked every one to three days according to risk for HIT (Heparin Induced Thrombocytopenia).
- iii. Heparin dose should be adjusted according to the Table below:

	<b>Heparin IVP (Bolus Dose)</b>	<b>Heparin Drip (IV Rate)</b>
<b>PTT Range 1</b> < 30 secs	60 units/kg	+ 4 units/kg/hr
<b>PTT Range 2</b> 30-49 secs	30 units/kg	+3 units/kg/hr
<b>PTT Range 3</b> 50-88 secs	No IVP	No change in heparin dose
<b>PTT Range 4</b> 89 - 119 secs	No IVP	-3 units/kg/hr
<b>PTT Range 5</b> > 120 secs	No IVP	Stop infusion for 1 hour, then -4 units/kg/hr

**NOTE:** The Target Range for PTT is different for each hospital and is established by each hospital periodically.

e. Required Monitoring:

- i. Repeat PTT six (6) hours after any bolus or change in dose.

f. Nursing to notify MD for

- i. Any signs of bleeding or drop in blood pressure (BP)

g. Pharmacy to notify MD for:

- i. Incorrect dosing
- ii. No PTT done in past 24 hours
- iii. No CBC done in past 3 days
- iv. Platelet count < 100,000 or drop in platelet count by >50%.
- v. Potential drug interactions.

## LOW MOLECULAR WEIGHT HEPARIN (LMWH)

### II. ENOXAPARIN (LOVENOX) THERAPY

#### a. INDICATIONS:

- i. Initial treatment of acute thrombosis. If starting Warfarin for long-term management must have a minimum course of five (5) days of dual treatment and INR in the therapeutic range.
- ii. Initial anticoagulation in some patients with atrial fibrillation (of recent or unknown onset) in whom cardioversion is planned.

#### b. DOSING:

	<b>Q 12hr Order Set</b>
<b>Max. Dose</b>	150 mg q 12 hrs
<b>Dose</b>	1 mg/kg SC q 12hrs

#### c. DOSAGE ADJUSTMENT IN OBESITY:

- i. Use Total Body Weight up to 150 kg.
- ii. If over 150 kg, use Anti Xa level monitoring (see “e” below).

#### d. DOSAGE ADJUSTMENT IN RENAL IMPAIRMENT:

- i. UFH is recommended over LMWH in patients with renal impairment or renal failure.
- ii. If there is a need to use LMWH (Lovenox), the dose should be adjusted to 50% of the usual dose in patients with Creatinine Clearance of less than 30, i.e. 1 mg/kg every 24 hours, and monitoring with anti-Xa is indicated. In patients with Creatinine Clearance of 30-60, the dose should be adjusted to 85%, i.e. 0.85 mg/kg subcut q12hours, and monitoring with anti-Xa levels is indicated.
- iii. Check Anti-Xa assay 4 hours post- injection. Trough Anti Xa monitoring may be indicated to evaluate accumulation at end of dosing interval.

#### e. MONITORING OF PEAK ANTI-Xa ACTIVITY:

- i. Goal is
  - a. 0.6 – 1.2 Units/ml for q 12 hrs dosing
  - b. 1.0-2.0 Units/ml for q daily dosing.
- ii. Check under certain circumstances: changing weight, changing renal function, and/or changing health status.

#### f. USE IN PREGNANCY:

Monitoring of anti-Xa levels are indicated for pregnant women on long-term anticoagulation with LMWH (Lovenox) at full therapeutic dose. Check patient weight and Anti Xa periodically.

### III. INPATIENT INITIATION AND MONITORING OF WARFARIN THERAPY:

- a. INDICATIONS: Long-term management of medical conditions (e.g. DVT, PE, a.fib.). When pre-existing thrombosis is present, start Warfarin concurrently with UFH or LMWH. Continue the UFH or LMWH for at least 5 days of Warfarin therapy and until the INR is in therapeutic range.
- b. DOSING AND MONITORING:

	INR Lab Result	Warfarin Dose
Day 1	-	5 mg
Day 2	-	5 mg
Day 3	< 1.5	10 mg
	1.5 - 1.9	5 mg
	2.0 - 3.0	2.5 mg
	> 3.0	0 mg
Day 4	< 1.5	10 mg
	1.5 - 1.9	7.5 mg
	2.0 - 3.0	5 mg
	> 3.0	0 mg
Day 5	< 2	10 mg
	2.0– 3.0	5 mg
	> 3	0 mg
Day 6	< 1.5	12.5 mg
	1.5 - 1.9	10 mg
	2.0 - 3.0	7.5 mg
	> 3.0	0 mg

**NOTE:** As soon as INR is in desired therapeutic range, break-away from the table above and continue the same daily dose.

#### IV. ANTICOAGULATION AROUND INVASIVE PROCEDURES:

Thromboembolic Risk	PRE-OP	POST-OP
<p><b>HIGH RISK</b></p> <ul style="list-style-type: none"> <li>• A-fib with moderate / high stroke risk</li> <li>• Hx stroke/TIA</li> <li>• Any hypercoaguable state</li> <li>• Mechanical valve</li> <li>• Hx DVT/PE &lt; 3 mo ago</li> </ul>	<p>Hold Warfain for 5 days pre-procedure (decision predicated on age, dosing requirement, and other comorbid conditions associated with prolonged time for reversal)</p> <p>OR hold Warfarin 2-3 days pre-procedure and administer Vitamin K 2.5 mg po two days pre-procedure (may repeat on day -1)</p> <p>Initiate UFH SQ/IV or LMWH when INR falls below lower limit of therapeutic range.</p> <p>LMWH is preferred over UFH acc to 2008 ACCP Guidelines.</p> <p>Stop IV UFH 6 hours pre-procedure or stop SQ UFH/LMWH 24 hours pre-procedure.</p>	<p>Resume UFH/LMWH 12-24 hours post-procedure (decision predicated on post-op assessment of bleeding risk) and continue until INR &gt; lower limit of therapeutic range.</p> <p>Resume Warfarin 12 - 24 hours post-procedure at usual maintenance dose (decision predicated on post-procedure assessment of bleeding risk)</p>
<p><b>LOW RISK</b></p> <ul style="list-style-type: none"> <li>• A-fib with low / moderate stroke risk</li> <li>• Dilated cardiomyopathy with no Hx thrombosis</li> <li>• Hx DVT/PE &gt; 3 mo ago</li> </ul>	<p>Hold warfain for 3-5 days pre-procedure OR hold Warfarin for 2-3 days pre-procedure and administer Vitamin K 2.5 mg po two days pre-procedure (may repeat on day -1)</p> <p>Use of low-dose sub cutaneous LMWH is optional.</p>	<p>Resume Warfarin 12-48 hours post-procedure at usual maintenance dose (decision predicated on post-op assessment of bleeding risk)</p>

#### V. OPTIMAL THERAPEUTIC RANGE / TARGET INR BY INDICATION:

For almost all Indications, the Target INR and Therapeutic Range is 2.5 and 2-3.

The most common exceptions to this target are:

- Certain Mechanical Valve Replacements (but not all) in which the Target is 3 and the range is 2.5 to 3.5. Always check the literature to determine the target INR for patients with valve replacements.
- Treatment / prevention of recurrent DVT/PE in patients with antiphospholipid antibody syndrome AND recurrent VTE or other risk factors; the target in this case is 3, and the range is 2.5 to 3.5.

The duration of anticoagulation varies depending on the indication. For many, but not all indications, the patient will be on Warfarin chronically. Always check the recommended duration of anticoagulation for the condition being treated.

**VI. GUIDELINES FOR CORRECTION OF WARFARIN OVER-ANTICOAGULATION:**

**NOTE:** ORAL VITAMIN K IS ONLY AVAILABLE AS 5 MG SCORED TABLET, WHICH CAN BE SPLIT BY PHARMACY TO YIELD A DOSE OF 2.5 MG.

IF DOSES OF 1 MG OR 2 MG ARE NEEDED, MUST ORDER THE IV FORMULATION OF VITAMIN K AND GIVE THAT LIQUID ORALLY.

INR	Clinical Setting	Therapeutic Options
< 5	NO bleeding	Omit one dose of Warfarin or lower Warfarin dose
5 – 9	NO bleeding	Omit 1 - 2 doses of Warfarin +/- Vitamin K, 1 - 2.5 mg PO
> 9	NO bleeding	Hold Warfarin until INR in therapeutic range and give Vitamin K 2.5 – 5 mg PO or 1 -2 mg IV. May repeat q 24 hrs as necessary
Any INR	<b>SERIOUS OR LIFE THREATENING BLEEDING</b>	Hold Warfarin and give Vitamin K 10 mg SLOW IV infusion and supplement with FFP or PCC (Bebulin). Repeat as necessary guided by INR. Hematology approval required to give these blood components.