

UWMC Montlake	
DEPARTMENT: UW Medicine Heart Institute: Cardiac Transplant	DOCUMENT TYPE: Protocol
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Anticoagulation and Antiplatelet Recommendations for MCS Patients on Durable Devices

STATEMENT OF PURPOSE:

Combined anti-coagulation with anti-platelet therapy is provided to prevent thromboembolism, which is a risk associated with durable mechanical circulatory support devices. Simultaneously, the adverse risk of bleeding should be minimized.

PROTOCOL:

Following discharge, anticoagulation will be managed by the UWMC Anticoagulation Clinic. Exceptions include patients in Skilled Nursing Facilities and patients who request transfer to local and/or remote anticoagulation clinics. We encourage patients to obtain anticoagulation management through the UWMC ACC.

There are reports describing increased platelet aggregation and endothelial activation in the setting of infection, particularly bacteremia, resulting in increased risk of stroke. In this setting, antiplatelet therapy may need to be intensified.

- Please note that we recommend venous draws for INR
- Point-of-care testing machines can be used, provided the patient is approved and has been set up for point-of-care testing.
- Further, we **strongly advise against** holding warfarin in the setting of over-anticoagulation, in the absence of major bleeding
- We **strongly recommend** that a single tablet strength of warfarin (2mg), be dispensed in order to maximize dosing flexibility

PROCEDURE:

I. HEARTMATE 3 Ventricular Assist Devices (VADs)

A. Post-Operative Heparin

- i. Intra-operative anticoagulation will be reversed prior to leaving the operating room after implantation of VAD.
- ii. Start heparin infusion by 0600 POD 1 at 500 units/hr using Provider Managed - Fixed Rate no titration, provided CT output <100 ml/hour.
- iii. Titrate Heparin Infusion on POD 2 to anti-Xa goal of 0.1-0.3 (ultra-low intensity) based on [Mechanical Circulatory Support \(MCS\) HEPARIN PROTOCOL ANTI-Xa MONITORING with NURSE-MANAGED INFUSION](#)

B. Post-Operative Warfarin

Start Warfarin the day following extubation

- i. Standard risk

- For standard risk patients, target INR 2.5 (goal range 2-3) in the absence of a separate indication for anticoagulation.
- ii. High risk
- High risk patients include those with separate indications for anticoagulation and include the following, with INR targets as follows:
 - A-Fib or history of recurrent DVT/PE: Target INR 2.5 (Goal range 2-3)
 - Mechanical mitral valve: Target INR 3 (Goal range 2.5-3.5)
 - History of LV noncompaction: Discussion with MCS and surgical team regarding goal range. Will likely require target INR 3 (Goal range 2.5-3.5)
 - Recurrent venous/arterial thrombosis despite adequate anticoagulation:
 - Higher INR goal (discuss with MCS team)
 - History of major bleeding: These patients may have customized goals. In some cases, anticoagulation may be stopped or modified per MCS attending discretion only.
- iii. Major bleeding
- For patients with major bleeding history during therapeutic anticoagulation, a modified INR goal, specific for each case, will be determined by the MCS team.
 - Administration of FFP, vitamin K and other factors will be addressed on a case-by-case basis. Routine reversal of high INR values, in the absence of significant clinical hemorrhage, is not indicated unless INR is 7 or greater. An attending provider should be contacted prior to reversal.
- C. Long Term Antithrombotic Therapy:
- i. Warfarin - with goal INR as outlined above.
- During the implant stay, at the time of discharge, a 20% increase in warfarin dose is recommended, but not intended to supersede clinical judgment.
 - Management by UWMC ACC is required if available.
 - A minimum of twice-weekly INR testing/ACC visits
 - 2mg tablets are recommended for greater dosing flexibility
- ii. Aspirin
- Chewable Aspirin 324mg (81 mg x 4) administered orally once daily for existing MCS patients already on ASA therapy.
 - HeartMate3 implants after November 2023 will no longer be initiated on Aspirin therapy
 - Existing HeartMate3, HeartMate2 and HeartWare HVAD patients on Aspirin who are admitted for bleeding issues will have their Aspirin therapy adjusted as follows:
 - Major bleeding: stop Aspirin
 - Minor bleeding: de-escalate ASA dosing (or discontinue if already on reduced 81mg dose)
- iii. Confirmed aspirin allergy or suspected pump thrombosis:
- Change from aspirin to clopidogrel (Plavix) 75mg PO daily for *destination therapy* patients or for *status 7 bridge-to-transplant* patients

- If a destination therapy patient is switched to transplant candidate status, or if a bridge-to-transplant patient is re-activated, antiplatelet therapy should be switched from clopidogrel to aspirin prior to transplant listing. If patients with confirmed aspirin allergy, desensitization may be considered. Discuss with MCS and Allergy teams.

D. Management of subtherapeutic anticoagulation

i. Bridge Therapy Options: Outpatient subtherapeutic INR

- Enoxaparin (Lovenox) – Outpatient bridging
 - Not an enoxaparin candidate if:
 - Within 30 days of MCS device implant
 - Within 30 days of high risk bleeding episode
 - Patient has estimated CrCl < 30 ml/min
 - Patient's total body weight is ≥ 140 kg
 - History of Heparin-induced thrombocytopenia
 - Dosing recommendations for enoxaparin:
 - CrCl > 30 ml/min: enoxaparin 0.5mg/kg SQ q12h
 - CrCl < 30 ml/min: admit for IV heparin
 - Consider monitoring Anti-Xa levels for enoxaparin
- IV heparin – inpatient admission: used in the following situations:
 - Suspected pump thrombosis or history of pump thrombosis.

NOTE: for patients with a history of pump thrombosis, a single dose of enoxaparin 0.5mg/kg SQ should be administered by the patient while en route to the hospital for admission, unless otherwise contraindicated.
 - When enoxaparin is contraindicated
 - Patients whose INR has remained subtherapeutic beyond 7 days of outpatient enoxaparin bridging will be admitted for evaluation

ii. Bridge Therapy Options: Subtherapeutic INR during inpatient admission

- IV heparin will remain the primary bridging strategy for subtherapeutic INR during an inpatient admission
- If patient medically suitable for discharge but INR remains subtherapeutic and delaying discharge
 - INR ≥ 1.5 may discharge with continued warfarin loading and enoxaparin bridging
 - If patient admitted for bleeding/thrombosis issue, will continue IV heparin and may discharge once INR stable in therapeutic range.

iii. Bridge Therapy Decision Tree: follow the table below

GOAL INR	INCIDENT INR (Venous sample)	MANAGEMENT
Goal: 2-3 Target: 2.5	1.8 - 1.9	ACC to load warfarin, recheck INR next day/per ACC - If repeat INR <1.8, bridge with enoxaparin or admit for IV heparin if enoxaparin contraindicated.

	<1.8	Bridge with enoxaparin if no contraindications <i>ACC to dose warfarin, recheck INR next day/per ACC</i> ACC to alert VAD coordinators if >7 days of subtherapeutic INR and/or insufficient upward trend of INR
Goal: 2.5-3.5 Target: 3	2.0-2.4	<i>ACC to load warfarin, recheck INR next day/per ACC</i> ACC to alert VAD coordinators if >7 days of subtherapeutic INR and/or insufficient upward trend of INR
	<2.0	Bridge with enoxaparin if no contraindications <i>ACC to dose warfarin, recheck INR next day/per ACC</i> ACC to alert VAD coordinators if >7 days of subtherapeutic INR and/or insufficient upward trend of INR
Goal: 1.8-2.5 Target: 2	1.5 to 1.7	Load warfarin, recheck INR next day
	<1.5	Bridge with enoxaparin if no contraindications <i>ACC to dose warfarin, recheck INR next day per ACC</i> ACC to alert VAD coordinators if >7 days of subtherapeutic INR and/or insufficient upward trend of INR

iv. Bridge Therapy Procedure: enoxaparin

- ACC pharmacist report subtherapeutic INR to VAD coordinator, enter EPIC note
- ACC pharmacist recommend loading dose of warfarin and dose enoxaparin
- Recheck INR per ACC pharmacist
- If still subtherapeutic after 7 days, ACC pharmacist notifies VAD coordinator
 - VAD coordinator contacts patient to arrange for direct admit, evaluation and heparin bridging. Electronic message to MCS Admit and contact admitting provider.

v. Bridge therapy procedure: Heparin

- ACC pharmacist report subtherapeutic INR to VAD coordinator, enter epic note
- If >2hrs until arrival at UWMC, ACC to recommend warfarin loading dose
- VAD coordinator contact patient to arrange admission
- VAD coordinator to contact bed control to arrange direct admit
- If inpatient admission is delayed > 8 hrs, patient should be sent to the UWMC ED for initiation of IV heparin or bivalirudin

E. Periprocedural anticoagulation management

i. Inpatient procedure:

- May hold anticoagulation up to 4 hours prior to procedure if deemed necessary
- Resume heparin as soon as safely possible after procedure

- If procedure involved arterial access, may resume anticoagulation 6 hours after procedure if no bleeding concerns.
- ii. Outpatient procedure:
 - ACC to dose warfarin to allow INR to drift to subtherapeutic range
 - Once INR subtherapeutic, start enoxaparin bridging (if not contraindicated)
 - Hold enoxaparin dose the morning of procedure
 - Resume enoxaparin the evening of procedure, as long as no bleeding complications.

F. Management of Supra-therapeutic anticoagulation

INR	CLINICAL SYMPTOMS	MANAGEMENT
Less than 5.0	No sign of bleeding, hemodynamically stable	Manage on an outpatient basis. Avoid holding doses of warfarin
5.0 - 6.9	No sign of bleeding, hemodynamically stable	Admit to hospital for observation; do not reverse INR. Avoid holding doses of warfarin
7.0 or greater	Admit regardless of clinical symptoms	Admit to hospital; contact attending for guidance for reversal
For all INR levels	If patient is bleeding and hemodynamically unstable	Admit to hospital; contact attending for guidance for reversal

II. SynCardia TAH-T (TOTAL ARTIFICIAL HEART)

A. Peri-operative management

- i. Intra-operative anticoagulation will be reversed prior to leaving the operating room after implantation of a TAH.
- ii. Start heparin infusion at 0600 POD 1 at 500 units/hr (Provider Managed -Fixed Rate), no titration, if CT output <100 ml/hour.
- iii. Titrate Heparin Infusion on POD2 to anti-Xa goal of 0.1-0.3 (ultra-low intensity) based on [Mechanical Circulatory Support \(MCS\) HEPARIN PROTOCOL ANTI-Xa MONITORING with NURSE-MANAGED INFUSION](#)
- iv. Patients are maintained on heparin until their INR is therapeutic for long-term management (as below). (Can consider using heparin until serum pre-albumin level is > 20 and the serum albumin level is > 2.8 based on recommendations from SynCardia. The goal is to remain on heparin until end organ function has stabilized. This may require ~ 30 days in many cases.)

B. Long Term management - Once end organ function has stabilized, and the patient is preparing for long term maintenance therapy or home therapy:

- i. Warfarin is administered to achieve target INR 3.0 (goal range 2.5-3.5)
- ii. Once INR > 2.5, consider discontinuing heparin
- iii. A minimum of twice-weekly INR testing/ACC visits
- iv. Chewable ASA 324mg PO (81 mg x 4) once daily

PERFORMED BY:

Advanced Practice Providers

Physicians

Registered Nurses

CROSS REFERENCES:

[Mechanical Circulatory Support \(MCS\) HEPARIN PROTOCOL ANTI-Xa MONITORING with NURSE-MANAGED INFUSION](#)

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