Heart and Vascular Center – Guideline HV.G.08.207

SUBJECT/TITLE: **Heparinization Guidelines for Extracorporeal Membrane Oxygenation (ECMO) Adult Intensive Care Unit Patients**

PURPOSE: To establish guidelines for the use of heparin as an anticoagulant during ECMO as ordered by the Licensed Independent Practitioner (LIP) for initiation, continuing ECMO therapy, and decannulation.

SCOPE: Applicable ECMO Staff

DEFINITIONS: None

GUIDELINE:

A. Heparin is an anticoagulant. Heparin inhibits clotting of blood and the formation of stable fibrin clots at various sites in the normal coagulation system.

B. When heparin sodium is combined with antithrombin III (heparin cofactor), thrombosis is blocked through inactivation of activated Factor X.

1. Thrombosis is also blocked by the inhibition of prothrombin's conversion to thrombin. In addition, fibrin formation from fibrinogen during active thrombosis is inhibited.

C. Heparin is required for the ECMO circuit to aid in clot prevention in any part of the circuit and cannulae. Heparin is a High Alert Medication. The LIP order, IV pump, label, tubing, rate and rate changes, medication administration record (MAR), calculations, and the medication must be double checked in accordance with the High Alert Medications policies (see *Related Documents*).

D. For the purposes of ECMO anticoagulation, the ECMO Specialist (ES) monitors bedside activated clotting times (ACT), for initiation of ECMO support with an iSTAT then uses Anti-Factor Xa values and adjusts heparin rates per LIP order.

E. LIP will determine the use of the Non-Bleeding or Bleeding Guidelines. Refer to Exhibit A or Exhibit B, respectively.

F. Maintenance Therapy after Initiation

1. Continuous heparin infusion initiated at 5-10 units/kg/hr

a) Refer to Unit specific Lab Protocols for test frequency.

b) Changes in rates are guided by the patient's previous response to heparin rate changes per specified ordered Table below in conjunction with LIP.

c) Typical heparin IV rate = 5-25 units/kg/hr, minimum heparin IV rate is 0.1mL/hr.

d) All rate changes and pump settings need to be double checked by another RN or RT. ECMO Specialist will document dose changes on the MAR.

G. Thrombate may be considered with poor heparin affect. Refer to Antithrombin Guidelines.

H. Monitoring:

1. Both Kaolin (ck) TEG and Heparinase TEG should be drawn together.

2. With all TEG checks also check aPTT.

3. Notify LIP immediately of any new bleeding from any source or any increase in bleeding from previous source.

4. Notify LIP of any new major fibrin/clot/thrombus formation within the ECMO circuit.

I. Dispensing and Administration:

1. Pharmacy will dispense only heparin 100 unit/mL concentration in 100 mL NS, 250 ml NS, or 500 mL NS bag sizes (depending upon patient size and flow rate of infusion).

2. ECMO heparin therapy will be administered by continuous intravenous infusion through the Alaris infusion pump into the ECMO circuit.

RELATED DOCUMENTS:

A. UI Heart and Vascular Center Departmental Policy Manual, (08) Mechanical Circulatory Support, (200) ECMO – *Lab Sampling from the Extracorporeal Membrane Oxygenation (ECMO) Circuit.* [HV.P.08.203]

B. UI Heart and Vascular Center Departmental Protocol Manual, (08) Mechanical Circulatory Support, (200) ECMO – *Protocol for Trailing off VA ECMO* [HV.CP.08.204]

C. UIHC Policies and Procedures, Medication Management, Anticoagulation Management, (1) Policies and Procedures, *Anticoagulation Management* [MM-AM-01.002]

REFERENCES:

UIHC Online Formulary

Mosby Nursing Skills

L1 Annich, G. M., & Miskulin, J. (2005). Coagulation, Anticoagulation, and the Interaction of Blood and Artificial Surfaces. In Van Meurs K., Lally K. P., Peek G., Zwischenberger, J. B. (Eds.), *ECMO. Extracorporeal Cardiopulmonary Support in Critical Care. 3rd Edition* (pp.29-58). Ann Arbor, Michigan: Extracorporeal Life Support Organization.

L2 Brogan, T. V., Lequier, L., Lorusso, R., MacLaren, G., & Peek, G. (Eds.). (2017). *Extracorporeal Life Support: The ELSO Red Book* (5th ed.). Ann Arbor, MI: Extracorporeal Life Support Organization.

L3 Brogan, T. V., Annich, G., Ellis, W. C., Haney, B., Heard, M. L., & Lorusso, R. (Eds.). (2018). *ECMO Specialist Training Manual* (4th ed.). Ann Arbor, MI: Extracorporeal Life Support Organization.

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SUBJECT/TITLE: Exhibit A: Anticoagulation guidelines for the **non-bleeding** adult patient

Exhibit A: Non-Bleeding Guidelines		
Adjust unfractionated heparin drip to maintain ckTEG R of 20-30		
ckTEG R min	Rate Change	Repeat ckTEG
<10	Increase by 20%	6 hours
10-19	Increase by 10%	6 hours
20-30	No Change	12 hours
31-40	Decrease by 10%	6 hours
>40	Decreased by 20%	6 hours

SUBJECT/TITLE: Exhibit B: Anticoagulation guidelines for the **bleeding** adult patient

Exhibit B: Bleeding Guidelines		
Adjust unfractionated heparin drip to maintain ckTEG R of 10-20		
ckTEG R min	Rate Change	Repeat ckTEG
<5	Increase by 20%	6 hours
5-9	Increase by 10%	6 hours
10-20	No Change	12 hours
21-30	Decrease by 10%	6 hours
>30	Decreased by 20%	6 hours