

MOUNT SINAI ST. LUKE'S & MOUNT SINAI WEST STANDARD: POLICY AND PROCEDURE	SUBJECT NO. A2-148
DEPARTMENT: Administration	
SUBJECT: Anticoagulation – Intravenous Heparin	

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Reviewed:									
Revised:	11/2010	2/2015	8/2015	6/2018					

PURPOSE: To outline the responsibilities of providers, pharmacists, and nursing in the administration of weight-adjusted continuous intravenous unfractionated heparin.

POLICY:

- Weight-adjusted doses will be used when prescribing IV heparin and adjustments in the IV dose will be made by the Physician/Licensed Independent Practitioner (LIP) based on the patient's aPTT. Boluses, if needed, will be ordered by the LIP.
- The Physician/LIP will order the appropriate heparin infusion orders based on the indication.
- Pharmacy will review orders and dispense the standard pre-mixed heparin infusion when available.
- Nursing will administer the IV bolus and continuous infusion as described in the body of this policy.
- If reversal is required, consult policy #A2-152 *Heparin Reversal* for use of Protamine Sulfate.

Responsibility of the Provider:

1. **The Physician/LIP will inform the RN of the decision to administer IV heparin as part of the patient's plan of care.**
2. The Physician/LIP will order the appropriate heparin infusion based on the desired indication and therapeutic aPTT range.
 - a. Standard aPTT range for deep vein thrombosis/pulmonary embolism is 60 to 90 seconds
 - b. Standard aPTT range for acute coronary syndrome/atrial fibrillation is 50 to 70 seconds
3. The Physician/LIP will order:
 - a. The initial heparin bolus (if indicated) and the initial continuous infusion dosage using the patient's weight and diagnosis using the dosing guides.
 - b. A repeat bolus dose with parameters for administration, if necessary, based on the aPTT.
4. The Physician/LIP will confirm that the patient has a CBC, platelet count and aPTT prior to the start of the infusion.
5. The MD/LIP will oversee the administration of the heparin adjustments per the guideline. The Physician/LIP is responsible for ordering required lab tests, placing an order for each dosing rate change per the guidelines, and notifying the RN when the dose is changed.

Responsibility of Pharmacy:

The pharmacist is responsible for reviewing and verifying the appropriateness of heparin orders before dispensing the standard solution of 25,000 units of heparin in 250 mL; premixed if available. The pharmacist will review adjustments and boluses ordered by the Physician/LIP and, based on attached guidelines, will assess clinical appropriateness.

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Responsibility of Nursing:

1. The RN will review the heparin order.
2. Bolus doses of heparin will be administered IV push by the RN using heparin 1000 units per mL, 10 mL vials. Continuous infusions of heparin 25,000 units/250 mL premixed bag (when available) will be provided by Pharmacy based on patient specific orders.
3. Prior to the administration of heparin and with each new order or dose adjustment the RN is required to confirm the drug, concentration, dose calculation, rate of infusion, pump settings, line attachment, and patient identity.
4. Intravenous heparin infusions must be administered via a programmable infusion pump in order to provide consistent and accurate dosing.
5. RN must have a second practitioner (RN or LIP) verify dose and pump settings and must document this verification prior to administration.
 - Also at initiation, change of shift, or when a patient is transferred, two RNs, or an RN and an LIP must note that
 - a. Pump settings are correct.
 - b. Document as such with dual signature within Epic (or log if downtime).
6. The RN must verify orders for lab specimens (aPTT, CBC, and platelets) and ensure that specimens are drawn and sent to the lab.
 - CBC, platelet count and aPTT must be drawn **prior to heparin administration**.
 - aPTT must be drawn 6 hours after the initial bolus and 6 hours after each heparin infusion dosage change.
 - CBC and platelet count must be drawn at least every 2 days.
7. The RN will adjust and monitor heparin dose based on the Physician/LIP’s updated orders.
8. The RN will monitor the patient for bleeding including ecchymosis, gum bleeding, hematuria, or oozing from venipuncture (or wound) sites and report any of these findings to the Physician/LIP and document in the progress notes.

Associated Policies:

1. A2-128 Food-Drug Interactions
2. A2-150 Warfarin for Pharmacists & Providers
3. A2-149 Enoxaparin
4. A2-151 Warfarin for Patient Care Services (Nursing)
6. A2-152 Heparin Reversal (Protamine)

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Dosing Guidelines

HEPARIN – ATRIAL FIBRILLATION/ACUTE CORONARY SYNDROME

<u>Heparin Protocol for Patients with Atrial Fibrillation or Acute Coronary Syndrome</u> Instructions: THIS IS NOT A MEDICAL ORDER, BUT AN EDUCATIONAL TOOL TO GUIDE HEPARIN DOSING				
Note: Patient Weight and Baseline aPTT must be obtained prior to the initiation of heparin.				
Patient Weight (kg): _____ Baseline aPTT: _____				
<u>Initial Heparin Bolus: *Maximum Bolus for any patient is 4,000 units* - Bolus optional for Atrial Fibrillation</u>				
ALL PATIENTS: Bolus dose is 60 units/kg. Multiply the patient's weight in kg x 60 units to calculate bolus dose.				
Bolus Dose = _____ units (Maximum 4,000 units)				
<u>Initial Heparin Infusion:</u>				
Heparin 25,000 units in 250 mL of D5W premixed bag				
ALL PATIENTS: 12 UNITS/KG/HOUR. Multiply patient's weight in kg X 12 units/kg/hour to calculate units per hour.				
Then divide the units per hour by 100 to obtain mL/hr. MAXIMUM INITIAL INFUSION WILL BE 1,000 UNITS/HOUR				
Administer the Initial Infusion = _____ units/hour (Maximum initial infusion 1,000 units/hour)				
Infusion pumps have maximum titratable doses: Soft Max: 3,500 units/hour; Hard Max: 5,678 units/hour				
<u>LABORATORY</u>				
1. Obtain aPTT six (6) hours after initial bolus				
2. Send sample for aPTT six (6) hours after each change, send next sample STAT for aPTT greater than 70 seconds				
3. Do not draw aPTT from the same arm as heparin infusion				
4. Obtain CBC and Platelet count every two (2) days while on heparin				
5. After each aPTT result, adjustment to the heparin dose and/or rate is made as per the chart below:				
6. NOTIFY THE MD IMMEDIATELY IF aPTT IS LESS THAN 41 seconds OR GREATER THAN 110 seconds OR INR IS GREATER THAN 3				
7. Target therapeutic aPTT is 50-70 seconds				
Patient's aPTT	Repeat Bolus Dose	Stop Infusion?	Change in Heparin Infusion	Timing of Next aPTT
<41 seconds	2,000 units	NO	Increase rate by 2 units/kg/hr	6 hours
41-49 seconds	None	NO	Increase rate by 1 unit/kg/hr	6 hours
50 – 70 seconds	No change* THERAPEUTIC RANGE			6 hours*
71-90 seconds	None	NO	Reduce rate by 1 unit/kg/hr	6 hours
91-110 seconds	None	Hold heparin drip for 30 minutes	Reduce rate by 2 units/kg/hr	6 hours
>110 seconds	None	Hold heparin drip for 60 minutes	Reduce rate by 3 units/kg/hr	6 hours send STAT
HEPARIN DOSE ADJUSTMENTS MUST BE MADE WITHIN ONE HOUR OF RECEIVING aPTT RESULTS *WHEN TWO CONSECUTIVE aPTT RESULTS ARE THERAPEUTIC, SEND aPTT EVERY 24 HOURS				

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WEIGHT ADJUSTED HEPARIN DOSING CHART – ACS/Atrial Fibrillation

WEIGHT ADJUSTED HEPARIN DOSING CHART FOR PATIENTS WITH ACUTE CORONARY SYNDROME OR ATRIAL FIBRILLATION

HEPARIN BOLUS DOSES ARE ROUNDED TO NEAREST 500 UNITS; HEPARIN INFUSION RATES ROUNDED TO NEAREST 50 UNITS

PATIENT'S WEIGHT	BOLUS*	INITIAL RATE*		INFUSION RATE CHANGE*					
	60 units/kg	12 units/kg/hour		3 units/kg/hour		2 units/kg/hour		1 unit/kg/hour	
KG	UNITS	UNITS/H R	ML/H R	UNITS/H R	ML/H R	UNITS/H R	ML/H R	UNITS/H R	ML/HR
41-43	2,500	500	5	150	1.5	100	1	50	0.5
44-45	2,500	550	5.5	150	1.5	100	1	50	0.5
46-47	3,000	550	5.5	150	1.5	100	1	50	0.5
48-52	3,000	600	6	150	1.5	100	1	50	0.5
53-54	3000	650	6.5	150	1.5	100	1	50	0.5
55-56	3500	650	6.5	150	1.5	100	1	50	0.5
57-58	3,500	700	7	150	1.5	100	1	50	0.5
59-60	3,500	700	7	200	2	100	1	50	0.5
61-62	3,500	750	7.5	200	2	100	1	50	0.5
63-64	4,000	750	7.5	200	2	150	1.5	50	0.5
65-68	4,000	800	8	200	2	150	1.5	50	0.5
69-70	4,000	850	8.5	200	2	150	1.5	50	0.5
71-72	4,000	850	8.5	200	2	150	1.5	50	0.5
73-74	4,000	900	9	200	2	150	1.5	50	0.5
75-77	4,000	900	9	250	2.5	150	1.5	100	1
78-79	4,000	950	9.5	250	2.5	150	1.5	100	1
80-81	4,000	950	9.5	250	2.5	150	1.5	100	1
>82	4,000	1000	10	250	2.5	150	1.5	100	1

NOTE:

Infusion: 25,000 units/250 mL premixed (if available)

Notify the physician immediately if aPTT is < 41 or > 110 or INR is > 3

If aPTT is < 41, rebolus with 2,000 units of heparin

Please adjust heparin infusion rate by following these steps:

- 1) Based on the patient's weight, find the appropriate Bolus dose and Initial Infusion Rate (units/hr) across the row.
- 2) Based on aPTT result and patient's weight, select the appropriate infusion rate change.
- 3) Add/subtract selected infusion rate change from the previous infusion rate.

ROUND HEPARIN BOLUS DOSES TO THE NEAREST 500 UNITS; ROUND INFUSION RATES TO NEAREST 50 UNITS

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HEPARIN – DEEP VEIN THROMBOSIS/PULMONARY EMBOLISM

<u>Heparin Protocol for Patients with Deep Vein Thrombosis of Pulmonary Embolism</u> Instructions: THIS IS NOT A MEDICAL ORDER, BUT AN EDUCATIONAL TOOL TO GUIDE HEPARIN DOSING				
Note: Patient Weight and Baseline aPTT must be obtained prior to the initiation of heparin.				
Patient Weight (kg): _____ Baseline aPTT: _____				
Initial Heparin Bolus: *Maximum Bolus for any patient is 10,000 units*				
ALL PATIENTS: Bolus dose is 80 units/kg. Multiply the patient's weight in kg x 80 units to calculate bolus dose.				
Bolus Dose = _____ units (Maximum 10,000 units)				
<u>Initial Heparin Infusion:</u>				
Heparin 25,000 units in 250 mL premixed bag (if available)				
Initial Rate: 18 UNITS/KG/HOUR. Multiply patient's weight in kg * 18 units/kg/hour to calculate units per hour. Then divide the units per hour by 100 to obtain mL/hr. MAXIMUM UNITS/HOUR WILL BE 2,100 UNITS/HOUR				
Administer the Initial Infusion = _____ units/hour (Maximum initial infusion 2,100 units/hour)				
Infusion pumps have maximum titratable doses: Soft Max: 3,500 units/hour; Hard Max: 5,678 units/hour				
<u>LABORATORY</u>				
1. Obtain aPTT six (6) hours after initial bolus				
2. Send sample for aPTT six (6) hours after each change, send next sample STAT for aPTT greater than 90 seconds				
3. Do not draw aPTT from the same arm as heparin infusion				
4. Obtain CBC and Platelet count every two (2) days while on heparin				
5. After each aPTT result, adjustment to the heparin dose and/or rate is made as per the chart below:				
6. NOTIFY THE MD IMMEDIATELY IF aPTT IS LESS THAN 45 seconds OR GREATER THAN 109 seconds OR INR IS GREATER THAN 3 (remove trailing zero)				
7. Target therapeutic aPTT is 60-90 seconds				
Patient's aPTT	Repeat Bolus Dose	Stop Infusion?	Change in Heparin Infusion	Timing of Next aPTT
<45 seconds	3,000 units	NO	Increase rate by 3 units/kg/hr	6 hours
45-59 seconds	2,000 units	NO	Increase rate by 2 units/kg/hr	6 hours
60-90 seconds	No change* THERAPEUTIC RANGE			6 hours*
91-109 seconds	None	NO	Reduce rate by 2 units/kg/hr	6 hours
>109 seconds	None	Hold heparin drip for 60 minutes	Reduce rate by 3 units/kg/hr	6 hours
HEPARIN DOSE ADJUSTMENTS MUST BE MADE WITHIN ONE HOUR OF RECEIVING aPTT RESULTS				
*WHEN TWO CONSECUTIVE aPTT RESULTS ARE THERAPEUTIC, SEND aPTT EVERY 24 HOURS				

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WEIGHT ADJUSTED HEPARIN DOSING CHART - DVT / PE

WEIGHT ADJUSTED HEPARIN DOSING CHART FOR PATIENTS WITH DEEP VEIN THROMBOSIS OR PULMONARY EMBOLISM
HEPARIN BOLUS DOSES ARE ROUNDED TO NEAREST 500 UNITS; HEPARIN INFUSION RATES ROUNDED TO NEAREST 50 UNITS

PATIENT WEIGHT	BOLUS*	INITIAL RATE*		INFUSION RATE CHANGE*			
	80 units/kg	18 units/kg/hour		3 units/kg/hour		2 units/kg/hour	
	UNITS	UNITS/H R	ML/HR	UNITS/HR	ML/HR	UNITS/HR	ML/HR
41	3,500	750	7.5	100	1	100	1
42-43	3,500	750	7.5	150	1.5	100	1
44-45	3,500	800	8	150	1.5	100	1
46	3,500	850	8.5	150	1.5	100	1
47-48	4,000	850	8.5	150	1.5	100	1
49-51	4,000	900	9	150	1.5	100	1
52-53	4,000	950	9.5	150	1.5	100	1
54	4,500	950	9.5	150	1.5	100	1
55-56	4,500	1,000	10	150	1.5	100	1
57-58	4,500	1,050	10.5	150	1.5	100	1
59	4,500	1,050	10.5	200	2	100	1
60-62	5,000	1,100	11	200	2	100	1
63-65	5,000	1,150	11.5	200	2	150	1.5
66-68	5,500	1,200	12	200	2	150	1.5
69-70	5,500	1,250	12.5	200	2	150	1.5
71	5,500	1,300	13	200	2	150	1.5
72-73	6,000	1,300	13	200	2	150	1.5
74	6,000	1,350	13.5	200	2	150	1.5
75-76	6,000	1,350	13.5	250	2.5	150	1.5
77-78	6,000	1,400	14	250	2.5	150	1.5
79	6,500	1,400	14	250	2.5	150	1.5
80-81	6,500	1,450	14.5	250	2.5	150	1.5
82-84	6,500	1,500	15	250	2.5	150	1.5
85-87	7,000	1,550	15.5	250	2.5	150	1.5
88-90	7,000	1,600	16	250	2.5	200	2
91	7,500	1,650	16.5	250	2.5	200	2
92-93	7,500	1,650	16.5	300	3	200	2
94-95	7,500	1,700	17	300	3	200	2
96	7,500	1,750	17.5	300	3	200	2
97-98	8,000	1,750	17.5	300	3	200	2
99-101	8,000	1,800	18	300	3	200	2
102-103	8,000	1,850	18.5	**300	**3	200	2
104	8,500	1,850	18.5	**300	**3	200	2
105-106	8,500	1,900	19	**300	**3	200	2
107-108	8,500	1,950	19.5	**300	**3	**200	**2
109	8,500	1,950	19.5	**350	**3.5	**200	**2
110-112	9,000	2,000	20	**350	**3.5	**200	**2
113-115	9,000	2,050	20.5	**350	**3.5	**250	**2.5
116-121	9,500	2,100	21	**350	**3.5	**250	**2.5
> 122	10,000	2,100	21	**350	**3.5	**250	**2.5

*** NOTE:**

Infusion: 25,000 units/250 mL premixed bag, if available

For all items with **, if increase in dose is indicated based on aPTT results, contact physician before increasing rate above 2100 units/hour

Please adjust heparin infusion rate by following these steps:

- 1) Based on the patient's weight, find the appropriate Bolus dose and Initial Infusion Rate (units/hr & mL/hr) across the row.
- 2) Based on aPTT result and patient's weight, select the appropriate infusion rate change.
- 3) Add/subtract selected infusion rate change from the previous infusion rate.