County of Los Angeles **Department of Health Services**

Los Angeles County Department of Health Services
POLICY & PROCEDURE

SUBJECT/TITLE: Unfractionated Heparin Infusion in Adults

PURPOSE: To establish standard guidelines for the management of anticoagulation therapy as related to unfractionated heparin (UFH) infusion. The goal is to promote safe and effective use of weight based heparin infusion in Los Angeles County medical center facilities.

PATIENT POPULATION: This policy applies to all adult patients (age 18 or older) in emergency department or inpatient units within the Department of Health Services.

DEPARTMENTS:
PHARMACY
NURSING
LABORATORY
MEDICINE
SURGERY
EMERGENCY MEDICINE
OB-GYN

ABBREVIATIONS:
Intravenous (IV)
Unfractionated heparin (UFH)
Unless otherwise specified, the term “heparin” will refer to unfractionated heparin
Low molecular weight heparin (LMWH)
Direct oral anticoagulant (DOAC)
Heparin-induced thrombocytopenia and thrombosis (HITT)
Deep venous thrombosis (DVT)
Pulmonary embolism (PE)
Acute coronary syndrome (ACS)
Registered Nurse (RN)
Electronic Medical Record (EMR)
Emergency Department (ED)
Non-ST-Elevation Myocardial Infarction (NSTEMI)

BACKGROUND:

Heparin is a parenteral anticoagulant that is effective in the prevention and treatment of venous thrombosis and pulmonary embolism, in the prevention of mural thrombosis after myocardial infarction, in the treatment of patients with unstable angina and acute myocardial infarction, and in the prevention of coronary-artery thrombosis after thrombolysis.[i]

The anticoagulant effect of unfractionated heparin (UFH) can vary widely between different patients or even in the same patient in different clinical situations. By contrast, low molecular weight heparins (LMWH) can be dosed based on weight and rarely require monitoring or dose adjustments. Therefore, use of LMWH or a direct oral anticoagulant (DOAC) is recommended in most clinical scenarios.[ii]

UFH is the preferred agent when:

- Patient's renal function precludes use of LMWH and DOACs
- It is desirable to be able to rapidly discontinue anticoagulation (such as patients with unusually high bleeding risk or upcoming procedures)
- The indication for anticoagulation is ACS

When UFH is the preferred agent, safety and efficacy is enhanced when an institutional dosing nomogram is utilized by trained nurses.[iii] The activated partial-thromboplastin time (aPTT) has been widely used to measure the anticoagulant effect of UFH, but the accuracy and reproducibility of this test is highly variable. Therefore, many institutions have transitioned to monitoring UFH using a nomogram based on antifactor Xa levels, which are less likely to be affected by patient or preanalytic variables. Severe hyperbilirubinemia, lipemia, and hemolysis can interfere with the test results, so antifactor Xa levels should not be used in those situations.[iv]

Several studies have evaluated the use of antifactor Xa vs. aPTT monitoring for UFH and have found more rapid achievement of target levels, fewer dosing adjustments and fewer monitoring tests when antifactor Xa is used.[v]

Patients receiving anticoagulation with heparin are at elevated risk for bleeding, which can occur even when the drug is in the therapeutic range. A baseline CBC and coagulation assays can help determine a patient's risk for bleeding on heparin.

Heparin is also associated with a life-threatening reaction called heparin-induced thrombocytopenia (HIT), which is usually characterized by a ≥50% drop in the platelet count during the first 2 weeks of administration. Patients may develop new arterial and/or venous blood clots. Immediate cessation of heparin therapy is required in addition to use of an alternative anticoagulant, argatroban.

POLICY:

1. Three heparin protocols are approved and available for use in DHS (Appendix A). These are monitored and adjusted with Anti-Xa. The protocols vary by the magnitude of heparin bolus, the initial rate of infusion, and the target Anti-Xa.
    a. DVT/PE Heparin Infusion Protocol
    b. ACS Heparin Infusion Protocol
    c. Low Dose Heparin Infusion Protocol
2. Provider will select appropriate heparin infusion protocol and specify the clinical indication
    a. DVT/PE Heparin Infusion Protocol may be used for:
        1. Acute DVT or PE
        2. Arterial thrombosis
    b. ACS Heparin Infusion Protocol may be used for:
        1. Unstable angina/NSTEMI
        2. Bridging for AFib/flutter
        3. Cardiac valve replacement
        4. STEMI with TPA
        5. Intraaortic balloon pump
        6. Perioperative bridging
    c. Low Dose Heparin Infusion Protocol targets a prophylactic (subtherapeutic) level of anticoagulation and is intended for high bleeding-risk surgical patients in whom there is concern for vascular thrombosis
3. Exclusion criteria from heparin infusion
    a. Active major bleeding
    b. Presence of an epidural catheter
    c. Platelets less than 50,000 mm^3
    d. Hypersensitivity to heparin or pork/beef products
    e. Suspected or proven HITT
4. Relative contraindications to heparin infusion
    a. Baseline coagulopathy (prolonged aPTT or PT/INR)
    b. Recent administration (within the past 8 hours) of another rapid-onset therapeutic anticoagulant. In this case, attending approval is required prior to administering heparin bolus or infusion
5. In certain clinical situations, Anti-Xa-based monitoring is precluded. In these situations, aPTT-based protocols are available for use (Appendix B)
    a. Exclusions from Anti-Xa-based monitoring include:
        1. Patients with indirect bilirubin > 13mg/dL
        2. Baseline abnormal Anti-Xa (0.30 IU or greater)
6. Pharmacist will calculate and order, according to protocol:
    a. Initial heparin bolus
    b. Initial heparin infusion

   c. Subsequent adjustments to heparin infusion based on antifactor Xa lab results
7. Patient monitoring:
   a. It is the responsibility of all team members caring for the patient to monitor for signs of bleeding, thrombosis, HITT, or other complications and to notify the provider immediately if they should occur.
   b. The provider is responsible for monitoring the clinical response to therapy and for considering transition to oral anticoagulation or LMWH as soon as appropriate.
   c. Pharmacist will notify the provider if there is a significant decrease in the patient's platelet count or hemoglobin
8. If a custom titration scale is used instead of the approved heparin protocols (specified in Appendix A and B), the ordering provider is responsible for laboratory monitoring and subsequent titration orders.
9. It is the provider's responsibility to determine when a continuous heparin infusion is no longer indicated and to discontinue the order in ORCHID

PROCEDURES:

Provider Procedures

1. Provider orders one of the three approved heparin protocols (See Appendix A) and documents the indication for therapy in the appropriate field.
   a. Provider enters contact information in the appropriate field, to be available for nursing or pharmacy clarification
2. Provider orders heparin bolus in units/kg (dose will be pre-populated in order set in units/kg based on clinical indication).
3. Provider orders heparin infusion. Initial rate to be determined by pharmacist
4. Provider orders "heparin dosing per pharmacy"
5. Provider orders baseline tests, including:
   a. "Dosing weight change"
   b. Complete blood count (CBC) – to be ordered before starting heparin infusion and once daily while the heparin infusion is continued
   c. Prothrombin time (PT), international normalized ratio (INR), and activated partial thromboplastin time (aPTT)
   d. Anti-Xa, UFH

e. Baseline tests do not need to be repeated if performed within 24 hours prior to initiating heparin infusion
f. Heparin infusion may be initiated before baseline tests are resulted

6. Provider and pharmacist responsible to review the results of the baseline labs (CBC, PT/INR, PTT, Anti-Xa) when available
7. Provider discontinues all other prophylactic or therapeutic anticoagulants except oral antiplatelet agents and warfarin overlap therapy

Pharmacy Procedures – Initiation of Heparin

8. Pharmacist reviews order for appropriateness
   a. Pharmacist reviews the clinical indication for heparin (entered by ordering provider) to verify that the correct heparin protocol was selected
   b. If pharmacist has questions or concerns, contact ordering provider for clarification
   c. Pharmacist may order any baseline blood tests that are missing, including:
      1) Complete blood count (CBC) – prior to starting heparin infusion and once daily while the heparin infusion is continued
      2) Prothrombin time (PT), international normalized ratio (INR), and activated partial thromboplastin time (aPTT)
      3) Anti-Xa, UFH
9. Review of laboratory results:
   a. Prior to dispensing initial heparin bolus and infusion, pharmacist will review any *available* results for CBC, INR, aPTT, and Anti-Xa. Pharmacist will notify provider if:
      1) INR > 2.0
      2) Platelets < 100,000
      3) PT > 1.5 or aPTT > 60
      4) Anti-Xa > 0.30
   b. While heparin infusion is ongoing, pharmacist will review available values for CBC and INR on a daily basis. Notify provider if:
      1) INR > 2.0
      2) Platelets < 100,000
10. Pharmacist reviews the dosing weight according to Appendix C
11. Pharmacist uses “dosing weight” to calculate the initial heparin bolus (in units), round to the nearest 500 units, ensure it does not exceed the maximum, and enter the order in Pharmnet

12. Pharmacist uses "dosing weight" to calculate the initial heparin infusion rate (in units/hr), round to the nearest 50 units, ensure it does not exceed the maximum, and enter the order in Pharmnet
13. Pharmacist will discontinue other parenteral and oral anticoagulants if not discontinued by the provider, with the exception of antiplatelet agents and warfarin for bridge therapy. Notify provider of change.
14. Pharmacist orders "Anti-Xa, UFH" level to be drawn 6 hours after starting the heparin infusion
15. If, at any time during the heparin infusion, the pharmacist feels it is clinically indicated to check an aPTT level at the same time as an "Anti Xa, UFH" level, the pharmacist may do so.
16. If needed, at any time during the heparin infusion, the pharmacist may consult internal medicine or hematology for assistance
17. Pharmacist calls nurse to sign out initial bolus and infusion instructions.
18. Heparin will be dispensed from pharmacy or released from floor
19. Details of initial bolus and infusion rate are automatically captured in the order information. Additional documentation is not required.

Pharmacy Procedures – Adjustment and monitoring of Heparin

20. Pharmacist will titrate the heparin infusion, order additional boluses, and order Anti-Xa according to protocol (Appendix A)
21. Order entry details are outlined in Appendix D
22. Documentation is required when the heparin infusion is titrated (Appendix F)
23. Details of Anti-Xa timing can be found in Appendix G
24. Pharmacist may order a daily PT/INR according to their clinical judgement

Nursing Procedures

25. Obtain patient weight:
    a. Weigh patient as soon as possible after receiving order
    b. Enter weight in "measured weight" field in ORCHID and also in the "dosing weight" field.
    c. If patient can't be weighed, nurse will enter reported or estimated patient weight instead.
    d. Patient weight details can be found in Appendix C
26. Review of laboratory results:

a. Prior to administering initial heparin bolus and infusion, nurse will review any *available* results for CBC, INR, aPTT, and Anti-Xa. Nurse will notify provider if:
   1) INR > 2.0
   2) Platelets < 100,000
   3) PT > 1.5 or aPTT > 60
   4) Anti-Xa > 0.30
b. While heparin infusion is ongoing, nurse will review available values for CBC and INR on a daily basis. Nurse will notify provider if:
   1) INR > 2.0
   2) Platelets < 100,000

27. Critical Anti-Xa and aPTT results:
    a. Critically high Anti-Xa and aPTT values will be reported according to each facility's policy for notification of critical results
    b. Person accepting critical result must notify pharmacy within 15 minutes
28. Administration of heparin
    a. Heparin is a high alert medication. Nurses will follow their institution's procedure for administering high alert medications.
    b. The nurse will administer initial and subsequent bolus doses of heparin using a single dose injection vial dispensed from pharmacy. Bolus doses are never to be administered from the infusion bag.
29. Heparin infusion will be delivered via continuous infusion pump according to each institution's policy
30. The nurse will draw any "stat" or "timed-stat" orders related to the heparin infusion
31. Required documentation
    a. Nurse will document heparin bolus in the MAR
    b. Nurse will document initiation of continuous infusion and any subsequent rate changes in the MAR

Laboratory Procedures

32. Anti-Xa samples must be processed within 1 hour of collection
33. Therapeutic range for aPTT will be reviewed annually according to existing laboratory protocols, and the aPTT-based nomograms will be updated as needed
34. The laboratory will check validity of Anti-Xa results and report to the ordering provider any abnormalities per laboratory protocols.

a. Specimens will be reviewed and rejected for severe hyperbilirubinemia, lipemia (with milky appearance), or hemolysis. According to laboratory SOP.
b. In the event that an acceptable specimen cannot be obtained, provider will be contacted to consider a hematology consultation and use of a aPTT-based heparin protocol

Special Situations

35. If reliable Anti-Xa values cannot be obtained, the laboratory staff must contact the provider to consider switching to an aPTT-based protocol (Appendix B). Specific situations include:
    a. Unreliable lab specimens due to severe hyperbilirubinemia, lipemia, or hemolysis
    b. Baseline abnormal Anti-Xa (0.30 IU or greater) due to recent DOAC use. In this situation, aPTT-based protocol should be used for the first 48 hours of the heparin infusion[vi]. After 48 hours, provider should determine whether to continue aPTT-based protocol or switch to Anti Xa-based protocol.

36. When short-term discontinuation of heparin is required (e.g. for procedures)
    a. Temporary interruption of heparin may NOT be ordered via "communication" orders
    b. To discontinue infusion:
        1) Provider selects "cancel/discontinue" for the heparin infusion, and indicates the desired end-time
        2) When provider modifies the heparin infusion order, this will result in electronic communication to pharmacist
        3) Provider will not discontinue or change the "heparin dosing per pharmacy" orderable
        4) Provider will contact nurse to verbally communicate plan to discontinue heparin infusion
    c. To resume infusion:
        1) Provider will order a new heparin order set, including:
            i. A new heparin bolus, if desired
            ii. A new heparin infusion
        2) Pharmacist selects new infusion rate based on patient's previous Anti-Xa levels and previous infusion rate
        3) Pharmacist orders Anti-Xa level according to protocol

37. Deviation from protocol:
    a. If the pharmacist determines, according to clinical judgment, that it would be beneficial to deviate from the approved protocols, they must contact the provider for approval.
    b. If verbally approved by provider, the pharmacist will document the type of deviation, reason for deviation, and name of approving provider in the "Pharmacy Anticoagulation Inpatient Note" powerform.
    c. Documentation will be forwarded to approving provider for signature

38. Discontinuation of heparin
    a. When the provider determines that heparin infusion is no longer clinically indicated, provider will discontinue the infusion order
    b. Provider will discontinue "heparin dosing per pharmacy" orderable
    c. Pharmacist must verbally communicate with nurse to ensure heparin drip is discontinued

List of Appendices

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Appendix B – Approved heparin protocols using aPTT
Appendix C – Dosing Weight
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Appendix E – Required communication between pharmacist and nurse
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Appendix A: Approved Heparin Protocols using Anti-Xa

1. DVT/PE Heparin Infusion

Approved clinical indications:

1. Acute DVT or PE
2. Arterial thrombosis

DVT/PE Heparin Infusion (Target Anti-Xa 0.30 – 0.70 IU)	
Initial UFH infusion and bolus	
• Initial bolus 80 units/kg (not to exceed 10,000 units). Round to the nearest 500 units. • Initial rate of infusion 18 units/kg/hr (not to exceed 2,000 units/hr).	
Laboratory monitoring	
• Check anti- Xa 6 hours after initiating heparin infusion and 6 hours after any rate change. • If the infusion is interrupted and restarted according to protocol, the 6 hour period begins when the infusion is restarted.	
UFH infusion adjustment	
Anti-Xa (IU)	**Action**
Less than 0.2	Bolus 30 units/kg. Max 10,000 units. Increase rate of infusion by 3 units/kg/hr
0.20 – 0.29	Increase rate of infusion by 2 units/kg/hr
0.30 – 0.70	Continue current infusion rate. Recheck Anti-Xa in 6 hours. If Anti-Xa is therapeutic on two consecutive measurements, recheck daily.
0.71 – 0.80	Decrease infusion by 1 unit/kg/hr
0.81 – 1.10	Hold infusion x 60 min, then restart at 2 units/kg/hr less than previous rate.
1.11 – 1.70	Hold infusion x 60 min, then restart at 3 units/kg/hr less than previous rate.
Greater than 1.70	Hold infusion x 60 min, then recheck Anti-Xa. - If Anti-Xa is 1.1 or lower, restart infusion at 3 units/kg/hr less than previous rate. - If Anti-Xa > 1.1, contact MD for instructions

2. ACS Heparin Infusion

Approved clinical indications:

1. Unstable angina/NSTEMI
2. Bridging for AFib/flutter
3. Cardiac valve replacement
4. STEMI with TPA
5. Intraaortic balloon pump
6. Perioperative bridging

ACS Heparin Infusion (Target Anti-Xa 0.30 – 0.70 IU)	
Initial UFH infusion and bolus	
• Initial bolus 60 units/kg (not to exceed 4,000 units). Round to the nearest 500 units. • Initial rate of infusion 12 units/kg/hr (not to exceed 1,000 units/hr).	
Laboratory monitoring	
• Check anti- Xa 6 hours after initiating heparin infusion and 6 hours after any rate change. • If the infusion is interrupted and restarted according to protocol, the 6 hour period begins when the infusion is restarted.	
UFH infusion adjustment	
Anti-Xa (IU)	**Action**
Less than 0.2	Bolus 30 units/kg. Max 4,000 units. Increase rate of infusion by 3 units/kg/hr
0.20 – 0.29	Increase rate of infusion by 2 units/kg/hr
0.30 – 0.70	Continue current infusion rate. Recheck Anti-Xa in 6 hours. If Anti-Xa is therapeutic on two consecutive measurements, recheck daily.
0.71 – 0.80	Decrease infusion by 1 unit/kg/hr
0.81 – 1.10	Hold infusion x 60 min, then restart at 2 units/kg/hr less than previous rate.
1.11 – 1.70	Hold infusion x 60 min, then restart at 3 units/kg/hr less than previous rate.
Greater than 1.70	Hold infusion x 60 min, then recheck Anti-Xa. - If Anti-Xa is 1.1 or lower, restart infusion at 3 units/kg/hr less than previous rate. - If Anti-Xa > 1.1, contact MD for instructions

3. Low Dose Heparin Infusion

Approved Clinical Indication:

Low Dose Heparin Infusion Protocol targets a prophylactic (subtherapeutic) level of anticoagulation and is intended for high bleeding-risk surgical patients in whom there is concern for vascular thrombosis

Low Dose Heparin Infusion (Target Anti-Xa 0.10 – 0.30 IU)	
Initial UFH infusion and bolus	
• No initial bolus • Initial rate of infusion 7 units/kg/hr (not to exceed 1,000 units/hr).	
Laboratory monitoring	
• Check anti- Xa 6 hours after initiating heparin infusion and 6 hours after any rate change. • If the infusion is interrupted and restarted according to protocol, the 6 hour period begins when the infusion is restarted.	
UFH infusion adjustment	
Anti-Xa (IU)	**Action**
Less than 0.10	Increase rate of infusion by 2 units/kg/hr
0.10 – 0.30	Continue current infusion rate. Recheck Anti-Xa in 6 hours. If Anti-Xa is therapeutic on two consecutive measurements, recheck daily.
0.31 – 0.70	Decrease infusion by 1 unit/kg/hr
0.71 – 1.10	Hold infusion x 60 min, then restart at 2 units/kg/hr less than previous rate.
Greater than 1.10	Hold infusion x 60 min, then recheck Anti-Xa. - If Anti-Xa is 0.70 or lower, restart infusion at 3 units/kg/hr less than previous rate. - If Anti-Xa > 0.70, contact MD for instructions

Appendix B: Approved Heparin Protocols using aPTT

1. DVT/PE Heparin Infusion

Approved clinical indications:

1. Acute DVT or PE
2. Arterial thrombosis

DVT/PE Heparin Infusion (Target aPTT 75-100 sec)	
Initial UFH infusion and bolus	
• Initial bolus 80 units/kg (not to exceed 10,000 units). Round to the nearest 500 units. • Initial rate of infusion 18 units/kg/hr (not to exceed 2,000 units/hr).	
Laboratory monitoring	
• Check aPTT 6 hours after initiating heparin infusion and 6 hours after any rate change. • If the infusion is interrupted and restarted according to protocol, the 6 hour period begins when the infusion is restarted.	
UFH infusion adjustment	
aPTT (sec)	**Action**
Less than 57	Bolus 30 units/kg. Max 10,000 units. Increase rate of infusion by 3 units/kg/hr
58 – 74	Increase rate of infusion by 2 units/kg/hr
75 – 100	Continue current infusion rate. Recheck aPTT in 6 hours. If aPTT is therapeutic on two consecutive measurements, recheck Q12 hours.
101 – 115	Decrease infusion by 1 unit/kg/hr
116 – 131	Hold infusion x 60 min, then restart at 2 units/kg/hr less than previous rate.
132 – 179	Hold infusion x 60 min, then restart at 3 units/kg/hr less than previous rate.
Greater than 179	Hold infusion x 60 min, then recheck aPTT. - If aPTT is 131 or lower, restart infusion at 3 units/kg/hr less than previous rate. - If aPTT > 131, contact MD for instructions

2. ACS Heparin Infusion

Approved clinical indications:

1. Unstable angina/NSTEMI
2. Bridging for AFib/flutter
3. Cardiac valve replacement
4. STEMI with TPA
5. Intraaortic balloon pump
6. Perioperative bridging

ACS Heparin Infusion (Target aPTT 75-100 sec)	
Initial UFH infusion and bolus	
• Initial bolus 60 units/kg (not to exceed 4,000 units). Round to the nearest 500 units. • Initial rate of infusion 12 units/kg/hr (not to exceed 1,000 units/hr).	
Laboratory monitoring	
• Check aPTT 6 hours after initiating heparin infusion and 6 hours after any rate change. • If the infusion is interrupted and restarted according to protocol, the 6 hour period begins when the infusion is restarted.	
UFH infusion adjustment	
aPTT (sec)	**Action**
Less than 57	Bolus 30 units/kg. Max 4,000 units. Increase rate of infusion by 3 units/kg/hr
58 – 74	Increase rate of infusion by 2 units/kg/hr
75 – 100	Continue current infusion rate. Recheck aPTT in 6 hours. If aPTT is therapeutic on two consecutive measurements, recheck Q12 hours.
101 – 115	Decrease infusion by 1 unit/kg/hr
116 – 131	Hold infusion x 60 min, then restart at 2 units/kg/hr less than previous rate.
132 – 179	Hold infusion x 60 min, then restart at 3 units/kg/hr less than previous rate.
Greater than 179	Hold infusion x 60 min, then recheck aPTT. - If aPTT is 131 or lower, restart infusion at 3 units/kg/hr less than previous rate. - If aPTT > 131, contact MD for instructions

3. Low Dose Heparin Infusion

Approved Clinical Indication:

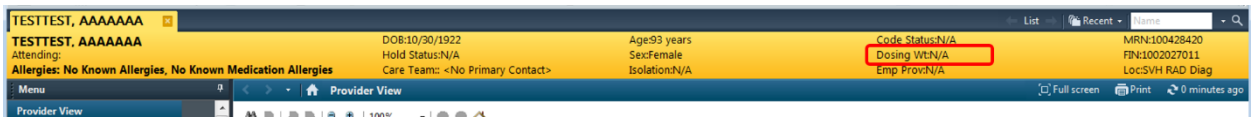
Low Dose Heparin Infusion Protocol targets a prophylactic (subtherapeutic) level of anticoagulation and is intended for high bleeding-risk surgical patients in whom there is concern for vascular thrombosis

Low Dose Heparin Infusion (Target aPTT 50 – 74 sec)	
Initial UFH infusion and bolus	
• No initial bolus • Initial rate of infusion 7 units/kg/hr (not to exceed 1,000 units/hr).	
Laboratory monitoring	
• Check **aPTT** 6 hours after initiating heparin infusion and 6 hours after any rate change. • If the infusion is interrupted and restarted according to protocol, the 6 hour period begins when the infusion is restarted.	
UFH infusion adjustment	
aPTT (sec)	**Action**
Less than 49	Increase rate of infusion by 2 units/kg/hr
50 – 74	Continue current infusion rate. Recheck aPTT in 6 hours. If aPTT is therapeutic on two consecutive measurements, recheck Q12 hours.
75 – 100	Decrease infusion by 1 unit/kg/hr
101 – 107	Hold infusion x 60 min, then restart at 2 units/kg/hr less than previous rate.
Greater than 107	Hold infusion x 60 min, then recheck aPTT. - If aPTT is 100 or lower, restart infusion at 3 units/kg/hr less than previous rate. - If aPTT > 100, contact MD for instructions

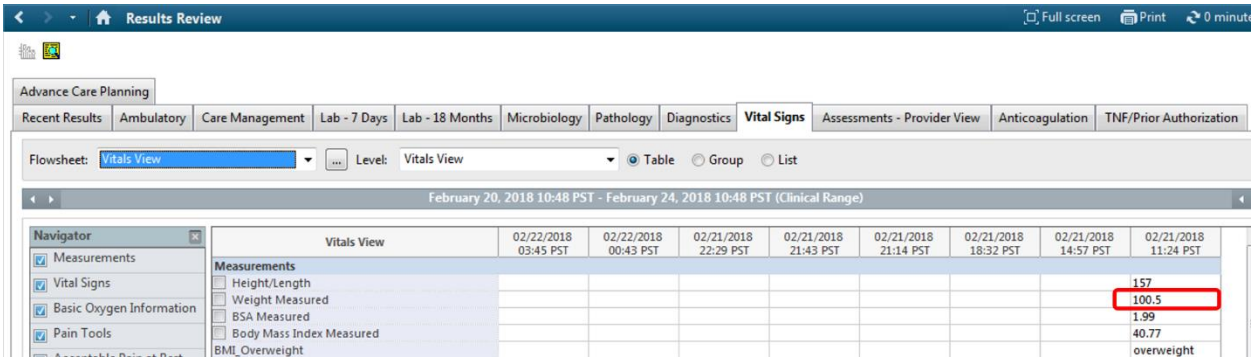
Appendix C: Dosing Weight

Definitions:

"Dosing weight" — The value contained within the "Dosing Wt" field in the ORCHID electronic medical record (EMR), located in the banner bar of the patient's chart.



"Measured weight" — The value contained within the "Weight Measured" field in the ORCHID EMR, located in the results section of the patient's chart



How to identify correct weight for heparin infusion protocol:

1. Heparin order set includes an order for nurse to weigh patient and update dosing weight
2. Nurse weighs patient and updates the "measured weight" and the "dosing weight"
3. If measured weight is unavailable:
    a. Pharmacist will contact nurse to measure patient's current weight and enter the value as the "measured weight" and "dosing weight"
    b. If weight cannot be measured, nurse will obtain patient's stated or estimated weight, which will be entered as the "dosing weight"
    c. In any situation in which measuring the patient's weight will significantly delay the administration of the heparin infusion, it is acceptable to use the patient's stated or estimated weight.

Appendix D: Pharmacist order entry details

1. General instructions:
    a. Supplemental heparin boluses, when indicated, will be ordered via Pharmnet
    b. Adjustments to the rate of heparin infusion will be ordered via Pharmnet
    c. Anti-Xa levels will be ordered in ORCHID
        i. "Anti-Xa, UFH" is the correct laboratory test for heparin activity
        ii. Stat labs should be designated:
            1. Collection priority: "Stat" or "Timed Stat" and
            2. Collection type: "nurse draw"
        iii. Routine labs should be designated:
            1. Collection priority: "AM draw" or "Routine"
            2. Collection type: "lab draw"
        iv. Pharmacist may modify the collection priority and collection type as needed
2. Specific procedure, based on Anti-Xa value:
    a. Anti-Xa value below target level
        i. Order supplemental bolus, if indicated
        ii. Modify order for heparin infusion and enter new rate
        iii. Order Anti-Xa to be drawn in 6 hours
        iv. Call nurse to communicate bolus/infusion instructions
    b. Anti-Xa value within target range
        i. Order Anti-Xa to be drawn in 6 hours
        ii. If Anti-Xa within target range on two consecutive measurements, order next Anti-Xa to be drawn daily thereafter (see Appendix G for details)
    c. Anti-Xa above target level
        i. If protocol calls for infusion to be temporarily held, pharmacist will discontinue order for heparin infusion
        ii. Call nurse to stop infusion
        iii. Enter a new order for the heparin infusion (with a lower rate, according to protocol) with an appropriate future start date and time
        iv. Order next Anti-Xa to be drawn according to protocol
    d. Anti-Xa critically high
        i. If Anti-Xa is critically high (value depends on nomogram) on two consecutive measurements, protocol requires provider notification
        ii. Place order to discontinue heparin infusion
        iii. Call nurse to stop infusion
        iv. Contact provider for new instructions

Appendix E: Required communication between pharmacist and nurse

In the following situations, the nurse must give verbal report to the pharmacist:

1. Patient's weight cannot be measured
2. Patient shows signs of bleeding, thrombosis, or other clinical complications (nurse must also notify provider)
3. Patient has an upcoming procedure that might require discontinuation of heparin infusion
4. Nurse will notify the pharmacist of critically high Anti-Xa values within 15 minutes of receiving notification from lab

In the following situations, the pharmacist must give verbal report to the nurse. If the primary nurse is not available, the instructions may be given to the charge nurse or another RN on the patient's unit. Initial infusion, infusion rate changes, and boluses should occur within 10 minutes of notification.

1. Initial bolus and heparin infusion have been made available by pharmacy
2. Heparin infusion needs to be discontinued, temporarily held, or interrupted
3. Rate of heparin infusion needs to be changed
4. Supplemental heparin bolus is required

Appendix F: Pharmacy documentation

When documentation is required, pharmacist will use “Pharmacy Anticoagulation Inpatient” ad hoc form.

Pharmacist documentation is required in the following situations:

1. Any time the heparin infusion is titrated
2. Any time protocol requires provider notification
    a. Required information includes:
        i. Name of provider
        ii. Reason for notification

Appendix G: Anti-Xa Timing

Pharmacist will order Anti-Xa 6 hours after any change to rate of heparin infusion.

If the heparin infusion is interrupted and restarted according to protocol, the 6 hour period begins when the heparin infusion is restarted.

If the Anti-Xa is at goal on two consecutive measurements, recheck Anti-Xa daily as long as the value remains therapeutic. The next Anti-Xa (after two consecutive therapeutic values) should be checked no sooner than 6 hours and no later than 24 hours after the second consecutive therapeutic value.

References

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