



# Stony Brook Medicine

Pharmacist Continuing Education  
IV Anticoagulation Infusions  
2012



# Part 1

# Adult Intravenous Heparin Protocol



# Objectives

- Identify the 2 University Hospital Adult Weight-Based IV Heparin protocols in CPOE
- Discuss practitioner responsibilities in using the University Hospital Adult Weight-Based IV Heparin protocols
- Name the 3 heparin drug orders involved with each protocol
- Describe the heparin rate adjustment nomograms
- Identify patients that may be exhibiting signs of HIT







## Our Institution Specific Nomogram for DVT/PE

aPTT (seconds)	Special Instructions	Infusion	Next aPTT
< 38	* Rebolus with full bolus as calculated above (max 10,000 units)	Increase rate by 100 units/hr	6 hrs
38-55	Rebolus with half the bolus calculated above (max 5,000 units)	Increase rate by 100 units/hr	6 hrs
56-64	No bolus	Increase rate by 50 units/hr	6 hrs
65-90	No bolus	No change	Next AM
91-100	No bolus	Decrease rate by 50 units/hr	6 hrs
101-120	No bolus	Decrease rate by 100 units/hr	6 hrs
121-180	Hold infusion 1 hour and inform MD	Decrease rate by 150 units/hr	4 hrs
181-240	Hold infusion 1 hour and inform MD	Decrease rate by 200 units/hr	4 hrs
>240	Hold infusion 1 1/2 hour and inform MD	Decrease rate by 200 units/hr	4 hrs



## Prescriber Responsibilities

- Choose proper protocol (arterial vs. venous)
- Screen for exclusions
- Assess patient for appropriateness of protocol use
- Assess patient as to normal or high risk status
- Identify the accurate patient weight in kilograms (actual body weight)



## Prescriber Responsibilities

- Choose proper protocol (arterial vs. venous)
- Screen for exclusions
- Assess patient for appropriateness of protocol use
- Assess patient as to normal or high risk status
- Identify the accurate patient weight in kilograms (actual body weight)



## Nurse Responsibilities

- Verify that proper protocol was chosen (arterial vs. venous)
- Obtain a baseline aPTT and CBC as ordered
- Verify calculations of bolus and maintenance rate
- Maintain flow sheet



Task Edit View Patient Chart Links Options Help

Patient List New Sticky Note View Sticky Notes Tear Off Attach Charges Charge Entry Exit Calculator AdHoc PM Conversation

IP Intensive Care FIN: 010047475313 [Admit Dt: 08/13/2009 1:20 Disch Dt: <No - Discharge date>]

Print 3 minutes ago

MAR

12 August 2009 11:57 - 14 August 2009 11:57 (Clinical Range)

Time View

- Scheduled
- Unscheduled
- PRN
- Continuous Infusions
- Future
- Discontinued Scheduled
- Discontinued Unscheduled
- Discontinued PRN
- Discontinued Continuous Infusions

Therapeutic Class View

Medications

**glucaqon**  
PRN Response

**glucose (glucose oral gel)**  
15 g, Gel, Oral, Q15MIN, PRN, Blood Sugar Less than 70 mg/dL, First dose is Routine, 08/13/09 5:20:00, glucose less than 70

**glucose**  
PRN Response

**heparin (heparin 1,000 units/mL 10 mL vial)**  
5000 Units, INJ, IV Push, Q6H, PRN, Other (Please Specify in Comments), First dose is Routine, 08/13/09 6:23:00, Heparin Protocol aPTT less than 43 seconds, MAX Dose: 5,000 Units Round to the nearest 100 units aPTT (seconds):Instructions < 43: Draw a STAT aPTT < 43 confirmed: Re-bolus using ...

**heparin**  
Appropriate Labs Reviewed

**heparin (heparin 1,000 units/mL 10 mL vial)**  
30 Units/kg, INJ, IV Push, Q6H, PRN, Other (Please Specify in Comments), First dose is Routine, 08/13/09 6:23:00, heparin protocol: aPTT 43-59 seconds., MAX Dose: 2,500 Units Round to the nearest 100 units aPTT (seconds):Instructions < 43: Draw a STAT aPTT < 43 confirmed: Re-bolus using ...

**heparin**  
Appropriate Labs Reviewed

**Continuous Infusions**

**DOPamine (additive) 800 mg + 0.9% NaCl intravenous solution 500 mL**  
500 mL, Continuous IV, First dose is Routine, 08/13/09 7:10:00, Go To Order Comments, MAX Dose: 50 mcg/kg/min Initiate infusion at \_\_\_ micrograms / kilogram / minute. Titrate by \_\_\_ microgram per kilogram per minute every 15 - 30 ...

**Administration Information**  
0.9% NaCl intravenous solution

heparin 25,000 Units / D5W 250 mL. 25000 Units Started on 08/13/2009 6:23:250 mL. Continuous I...

PROD MVAREL 13 August 2009 12:00

start 12:00 PM

- Menu
- Patient Information
- Allergies + Add
- PowerOrders + Add
- Clinical Notes
- Results / Flowsheets
- MAR
- MAR Summary
- Form Browser
- Diagnosis/Procedures
- Reference Text Browser

MAR Print 2 minutes ago

12 August 2009 11:57 - 14 August 2009 11:57 (Clinical Range)

- Time View
- Scheduled
  - Unscheduled
  - PRN
  - Continuous Infusions
  - Future
  - Discontinued Scheduled
  - Discontinued Unscheduled
  - Discontinued PRN
  - Discontinued Continuous Infusion
- Therapeutic Class View

**Medications**

**Continuous Infusions**

**DOPamine (additive) 800 mg + 0.9% NaCl intravenous solution 500 mL**  
 500 mL, Continuous IV, First dose is Routine, 08/13/09 7:10:00, Go To Order Comments, MAX Dose: 50 mcg/kg/min  
 Initiate infusion at \_\_\_ micrograms / kilogram / minute. Titrate by \_\_\_ microgram per kilogram per minute every 15 - 30 i...

**Administration Information**  
**0.9% NaCl intravenous solution**  
**DOPamine**

**heparin 25,000 Units / D5W 250 mL. 25000 Units**  
 250 mL, Continuous IV, First dose is Routine, 08/13/09 6:23:00, Go To Order Comments  
 Start infusion rate at 12 units/kg/hr, round to the nearest 50 units, do not exceed 1,000 units/hr as initial rate. Physician ...

**Administration Information**  
**heparin**

**midazolam (Versed) additive 125 mg + 0.9% NaCl (narcotic) 125 mL**  
 125 mL, Continuous IV, First dose is Routine, 08/13/09 3:09:00, 7 days, Stop date 08/20/09 3:08:00, 8 mL/hr  
 Initiate infusion at \_\_\_mg/hour titrate by 1mg/hour every 30 minutes. To maintain an OASS score of \_\_\_ Usua ...

**Administration Information**  
**0.9% NaCl intravenous solution narcotic**  
**midazolam**

**Discontinued Scheduled**

**aspirin**  
 325 mg, SUPP, PR, X1, First dose is Routine, 08/13/09 6:22:00, Stop date 08/13/09 6:22:00

**aspirin**

**aspirin**

Allergies: No Known Allergies IP Intensive Care FIN: 010047475313 [Admit Dt: 08/13/2009 1:20 Disch Dt: <No - Discharge date>]

- Menu
- Patient Information
- Allergies + Add
- Order Orders + Add
- Clinical Notes
- Results / Flowsheets
- Medication
- Medication Summary
- Medication Browser
- Diagnosis/Procedures
- Reference Text Browser

MAR Print 3 minutes ago

12 August 2009 11:57 - 14 August 2009 11:57 (Clinical Range)

Time View

- Scheduled
- Unscheduled
- PRN
- Continuous Infusions
- Future
- Discontinued Scheduled
- Discontinued Unscheduled
- Discontinued PRN
- Discontinued Continuous Infusion

Therapeutic Class View

Medications

**Continuous Infusions**

**DOPamine (additive) 800 mg + 0.9% NaCl intravenous solution 500 mL**  
 500 mL, Continuous IV, First dose is Routine, 08/13/09 7:10:00, Go To Order Comments, MAX Dose: 50 mcg/kg/min  
 Initiate infusion at \_\_\_ micrograms / kilogram / minute. Titrate by \_\_\_ microgram per kilogram per minute every 15 - 30 m...

**Administration Information**  
**0.9% NaCl intravenous solution**  
**DOPamine**

**heparin 25,000 Units / D5W 250 mL. 25000 Units**  
 250 mL, Continuous IV, First dose is Routine, 08/13/09 6:23:00, Go To Order Comments  
 Start infusion rate at 12 units/kg/hr, round to the nearest 50 units, do not exceed 1,000 units/hr as initial rate. Physician ...

**Administration Information**  
**heparin**  
 Start infusion rate at 12 units/kg/hr, round to the nearest 50 units, do not exceed 1,000 units/hr as initial rate.  
 Physician MUST calculate and fill in units/hr

**midazolam (Versed) additive 125 mg + 0.9% NaCl intravenous solution narcotic 125 mL**  
 125 mL, Continuous IV, First dose is Routine, 08/13/09 6:23:00, Go To Order Comments  
 Initiate infusion at \_\_\_mg/hour titrate by 1m

**Administration Information**  
**0.9% NaCl intravenous solution narcotic**  
**midazolam**

**Discontinued Scheduled**

**aspirin**  
 325 mg, SUPP, PR, X1, First dose is Routine, 08/13/09 6:23:00, Go To Order Comments

**aspirin**  
**aspirin**

aPTT (seconds):Instructions  
 < 43: Draw a STAT aPTT  
 < 43 confirmed: Re-bolus using full dose, Increase rate by 100 units/hr and draw aPTT in 6 hrs  
 43-59: Give ½ of the initial bolus (max. 2500 units), Increase rate by 50 units/hr, aPTT in 6 hrs  
 60-85: No bolus, No change in rate, draw aPTT Next Day AM  
 86-100: No bolus, Decrease rate by 50 units/hr, and draw aPTT in 6 hrs  
 101-130: No bolus, Decrease rate by 100 units/hr, and draw aPTT in 6 hrs  
 131-160: Hold infusion for 1 hr & call MD, Decrease rate by 150 units/hr, and draw aPTT in 6 hrs  
 161-190: Hold infusion 1 hr & call MD, Decrease rate by 200 units/hr, and draw aPTT in 6 hrs  
 > 190: Hold infusion 1 ½ hour & call MD, Decrease rate by 200 units/hr, and draw aPTT in 6 hrs



## FAQ: Regarding Maximum Dosages

- Can the minimum rate of the infusion be exceeded once the protocol is in progress?

Yes. The maximum rates only apply to initialization. The infusion rate can be increased as necessary as per the aPTT result.

The bolus maximums, however, should not be exceeded however.



## HIT

- Results from an allergy to heparin
- Antibodies are formed and attack heparin which has a receptor site on platelets
- First sign is decrease in platelets to 50% of baseline
- Usually occurs after 1 or 2 weeks of heparin therapy
- Can result in thrombosis
- Potential loss of limbs
- Potentially fatal



Task Edit View Options Help

Gender: Female      Location: 16N - Medicine / P046 W  
Admitted: 3/23/2009 17:03      Physician: GAVI, SHAI

Enter a patient name:

Profile   Results   Unverified Orders   Monitor

Flowsheet: ALL RESULT SECTIONS   Level: ALL RESULT SECTIONS   Table   Group   List

15 March 2009 15:19 - 15 April 2009 15:19 (Clinical Range)

**Demographics**

Height 154.94 cm  
Result Dt/Tm 3/31/09 00:00

Weight 71 kg  
Result Dt/Tm 3/31/09 00:00

Creatinine 0.5 mg/dL  
Result Dt/Tm 4/7/09 06:00

BSA 1.7 m<sup>2</sup>

BSA Method Dubois

IBW 47.8 kg

IBW Method Devine

CrCl (est.) OUT OF R...

CrCl Method Cockcroft...

Patient Note (1)

Click here to view/edit the patient note...

Reason For Visit (1)

UPPER GASTROINTESTINAL ...

Allergies (2)

Click here to add a new allergy...  
hydrochlorothiazide  
Dilantin

Problems

Click here to add a new problem...

Medications

**Navigator**

- Emergency Department
- Nursing Documents
- Patient Education
- Blood Bank Tests
- Blood Bank Products
- General Chemistry
- Urine Chemistry
- Toxicology
- Endocrinology
- General Hematology
- Coagulation
- Special Hematology
- General Immunology
- Immunology/Infectious D
- Flow Cytometry
- Microbiology
- Reference Lab
- Cytogenetics
- Surgical Pathology

ALL RESULT SECTIONS	PLT	MPV	Lymp	Monc	Neut	Eos	Baso	Lymp
3/28/09 6:00	4.2	4.24	12.7	36.6	86.2	29.9	34.6	13.6
3/27/09 6:00	3.5	4.21	12.6	36.8	87.3	29.8	34.1	13.3
3/26/09 6:00	3.7	3.96	11.8	34.4	86.9	29.7	34.2	13.9
3/25/09 6:00	4.9	3.95	11.7	34.7	87.8	29.7	33.8	13.6
3/24/09 18:00	5.8	3.96	11.6	34.7	87.6	29.3	33.4	13.7
3/24/09 6:00	5.9	4.02	11.9	35.1	87.3	29.7	34.0	13.4
3/23/09 17:19	7.2	4.24	12.6	37.7	88.8	29.7	33.4	13.3
<b>General Hematology</b>								
4/7/09 6:00	298	6.7	34.9	6.9	57.1	0.6	0.5	2.7
4/6/09 3:21	234	6.5	32.3	9.4	57.8	0.1	0.4	2.0
4/5/09 11:18	219	6.7	19.1	4.7	75.4	0.3	0.5	1.0
4/4/09 6:00	155	6.9	36.9	9.1	53.7	0.2	0.2	1.9
4/3/09 6:00	97	7.0	34.6	9.6	55.3	0.2	0.4	1.4
4/2/09 6:00	75	7.0	40.2	9.3	49.9	0.3	0.3	1.4
4/1/09 6:00	45	7.5						
3/31/09 23:11	* 44	7.3	19.7	7.5	72.5	0.1	0.3	0.7
3/31/09 6:00	* (c) 10	8.3						
3/31/09 3:15	* 9	8.5	25.3	8.4	64.3	1.7	0.3	0.8
3/31/09 0:09	PLTS CL	PLTS CL	18.3	6.7	73.3	1.7	0.1	0.7
3/30/09 6:00	17	7.8						
3/29/09 6:00	* 101	7.0	16.8	6.5	74.6	1.9	0.2	0.7
3/28/09 6:00	* (c) 298	6.4	24.3	6.8	64.6	3.9	0.4	1.0
3/27/09 6:00	366	6.4	30.0	10.6	54.2	4.7	0.5	1.1
3/26/09 6:00	427	6.4	23.4	12.9	59.1	3.5	1.0	0.9
3/25/09 6:00	433	6.1	19.4	9.1	66.6	4.3	0.6	1.0
3/24/09 18:00	471	6.2						
3/24/09 6:00	477	6.0						
3/23/09 17:19	553	6.5	24.8	5.5	67.5	1.8	0.4	1.8

Ready.      Inactive      View: CPOE-VIEW 1 (System Default View)      MVAREL      PROD      15:23

start      3:23 PM



## Management of HIT

- Discontinue all heparin therapy (including flushes)
- For patients at risk of thrombosis, prescriber must begin therapy with a direct thrombin inhibitor
  - Argatroban
  - Lepirudin (REFLUDAN)
- Prescriber to order heparin antibody test
- Assessment of heparin allergy (physician/LIP)
- Dopplers
- Documentation of heparin allergy in records
- Discuss with patient



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## Part 2

# Intravenous Argatroban Protocol



# Objectives

- Discuss the use of argatroban as an anticoagulant in the treatment of patients with HIT
- Identify the Argatroban PowerPlan in CPOE
- Discuss the responsibilities of different healthcare practitioners in the treatment of a patient on the argatroban protocol
- Identify the 3 paper (back-up) order forms and 3 corresponding flow sheets



## The 4 T's: A Clinical Probability Scoring Model

4 T's	2 Points	1 Point	0 Points
<b>T</b> hrombocytopenia	Platelet count fall ➤ 50% and platelet ➤ Nadir <u>&gt; 20 x 10<sup>9</sup> /L</u>	Platelet count fall 30-50% or platelet nadir 10-19 x 10 <sup>9</sup> /L	Platelet count fall < 30% or platelet nadir <10 x 10 <sup>9</sup> L /L
<b>T</b> iming of platelet Count fall	Clear onset between days 5- 14 or platelet falls <u>≤ 1</u> day prior heparin exposure within 30 days	Consistent with days 5-14 fall, but not clear (e.g. missing platelet counts) or onset after day 14 or fall <u>≤ 1</u> day (prior heparin exposure 30-100 days ago)	Platelet count falls <u>≤ 4</u> days without recent exposure
<b>T</b> hrombosis or other sequelae	New thrombosis (confirmed): skin necrosis at heparin injection site, anaphylactoid reaction after bolus	Progressive or recurrent thrombosis; Non-necrotizing (erythematous) skin lesions; Suspected thrombosis (not confirmed)	None
<b>o</b> ther causes of Thrombocytopenia	None apparent	Possible	Definite

High probability: 6-8 points; intermediate probability: 4-5 points; low probability: ≤ 3 points



# Argatroban

- **Class**
  - Direct thrombin inhibitor
  - Anticoagulant
- **Indications**
  - Anticoagulation therapy with history of HIT
  - Treatment of HIT
- **Standard Concentration**
  - 250 mg in 250 mL D5W (1:1)
- **Protect from Light**



# Argatroban

- **Dosing (initial rate)**
  - Standard: 2 mcg/kg/min
  - Greater than 140 kg 1 mcg/kg/min
  - Critically ill /hepatic 0.5 mcg/kg/min
- **ADRs**
  - Bleeding
  - Hypotention
  - Dyspnea
  - N/V
- **Monitoring**
  - aPTT
  - Target 45-90 seconds
  - Stroke patient target: 45-65 seconds



## The Argatroban PowerPlan

- Choice of 3 different dosing strategies
- Similar to heparin protocol
- No bolusing necessary with Argatroban PowerPlan
- This PowerPlan is NOT for PCI dosing of argatroban



View

- Orders for Signature
- Plans
  - Document In Plan
  - Medical
    - Argatroban Infusion MultiPhase PowerPlan
    - Argatroban Baseline Labs (Planned Pending)**
    - Argatroban Infusion Orders (Planned Pending)
    - Argatroban Conversion to Coumadin (Planned)
    - Argatroban Infusion MultiPhase PowerPlan
      - Argatroban Initial Orders (All Patients) (Planned)
      - Argatroban Infusion Orders (Planned)
      - Argatroban Conversion to Coumadin (Planned)
    - CICU Precedex Protocol PowerPlan (Planned)
    - Standard Infusion of Argatroban (Planned)
    - CACU Admission/Transfer PowerPlan (Planned)
    - Argatroban Infusion MultiPhase PowerPlan
      - Argatroban Initial Orders (All Patients) (Planned)
      - Argatroban Infusion Orders (Planned)
        - Standard Infusion of Argatroban (Planned)
        - Argatroban Conversion to Coumadin (Planned)
      - Hemodialysis PowerPlan (Planned)
      - Heparin for DVT-PE PowerPlan (Adult) (Init)
      - Labor & Delivery Zidovudine PowerPlan (Ir)
      - Hypothermia Protocol Multiphase PowerPL
        - Immediate Post Cardiac Arrest Phase (1)
        - Hypothermia Cooling Phase (Planned)
        - Hypothermia Sedation/Paralytics (Vents) (Plan)
        - Hypothermia Postcardiac Arrest Phase (Planned)

Start: Now ... Duration: None ...

Component	Status	Details
<b>Argatroban Infusion MultiPhase PowerPlan, Argatroban Baseline Labs (Planned Pending)</b>		
Condition		
Physician Reminder: This powerplan is NOT FOR USE with PCI patients		
PowerPlan Instructions		
Physician Reminder: Patients should be evaluated (ie 4T score) for appropriate therapy		
Physician Reminder: For patients with positive HIT, discontinue all heparin IV, SC, flushes, products (heparin coated catheters)/LMWH (enoxaparin) and warfarin orders and document heparin allergy in patient chart. Any medications that are likely to increase bleeding should be discontinued		
Physician Reminder: Platelet transfusions should not be ordered for patients starting Argatroban		
Physician Reminder: May consider use of Vitamin K for HIT patients recently started on Coumadin		
Physician Reminder: Consider ordering lower extremity venous duplex to evaluate for deep vein thrombosis		
Physician Reminder: Dosing of Argatroban is dependent on liver function. Please order from appropriate plan based on patient's liver function		
Laboratory		
Baseline Labs		
Physician Reminder: Baseline labs should ONLY be ordered if NOT already obtained within the last 24 hours		
<input type="checkbox"/> Prothrombin Time		Routine, Nurse Collect, X1, Blood, Baseline lab
<input type="checkbox"/> aPTT		Routine, Nurse Collect, X1, Blood, Baseline lab
<input type="checkbox"/> Complete Blood Count		Routine, Nurse Collect, X1, Blood, Baseline lab
<input type="checkbox"/> Chem 8		Routine, Nurse Collect, X1, BLOOD-CHEM, Baseline lab
<input type="checkbox"/> Hepatic Panel		Routine, Nurse Collect, X1, BLOOD-CHEM, Baseline lab
Physician Reminder: Order HIT Assay only if the platelet count has fallen to 50% of baseline or below AND this drop occurred after 5-10 days of heparin exposure or on day 1 of heparin re-exposure.		
<input type="checkbox"/> Anti-Plt Ab (Heparin) (HIT Assay)		
Diagnostic Tests		
<input type="checkbox"/> Venous Duplex - Bilateral Lower Ext		

**The first phase is for Baseline lab orders only. If labs already done, they can go to next phase....**



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Choose the appropriate Infusion for the patient

View

Orders for Signature

Plans

Document In Plan

Medical

- Argatroban Infusion MultiPhase PowerPlan
- Argatroban Baseline Labs (Planned Pending)
- Argatroban Infusion Orders (Planned Pending)**
  - Standard Infusion of Argatroban
- Argatroban Conversion to Coumadin (Planned Pending)

Component

Status

Details

Argatroban Infusion MultiPhase PowerPlan, Argatroban Infusion Orders (Planned Pending)

Medications

Component	Status	Details
<input checked="" type="checkbox"/> Standard Infusion of Argatroban	Planned P...	
<input type="checkbox"/> Hepatic Impairment/Critically Ill Patient Argatroban Infusion		
<input type="checkbox"/> Stroke/Neurology Argatroban Infusion Orders		

Once the correct infusion plan is chosen, the MD needs to sign and initiate the plan

Orders Medication List Document In Plan

View

Orders for Signature

Plans

Document In Plan

Medical

- Argatroban Infusion MultiPhase PowerPlan
- Argatroban Baseline Labs (Planned Pending)
- Argatroban Infusion Orders (Planned Pending)
  - Standard Infusion of Argatroban (Planned Pending)
  - Argatroban Conversion to Coumadin (Planned Pending)
- Argatroban Infusion MultiPhase PowerPlan
- Argatroban Initial Orders (All Patients) (Planned Pending)
- Argatroban Infusion Orders (Planned Pending)
- Argatroban Conversion to Coumadin (Planned Pending)
- Hemodialysis PowerPlan (Planned Pending)
- CICU Precedex Protocol PowerPlan (Planned Pending)
- Standard Infusion of Argatroban (Planned Pending)
- CACU Admission/Transfer PowerPlan (Planned Pending)
- Argatroban Infusion MultiPhase PowerPlan
- Argatroban Initial Orders (All Patients) (Planned Pending)
- Argatroban Infusion Orders (Planned Pending)
  - Standard Infusion of Argatroban (Planned Pending)
  - Argatroban Conversion to Coumadin (Planned Pending)
- Hemodialysis PowerPlan (Planned Pending)
- Heparin for DVT-PE PowerPlan (Adult) (Init)
- Labor & Delivery Zidovudine PowerPlan (Init)
- Hypothermia Protocol Multiphase PowerPlan
- Immediate Post Cardiac Arrest Phase (Init)
- Hypothermia Cooling Phase (Planned Pending)
- Hypothermia Sedation/Paralytics (Vents) (Planned Pending)

Return to Argatroban Infusion Orders

Component

Status

Details

Argatroban Infusion MultiPhase PowerPlan, Argatroban Infusion Orders, Standard Infusion of Argatroban (Planned Pending)

Condition

Physician Reminder: This powerplan is NOT FOR USE with PCI patients

PowerPlan Instructions

- Physician Reminder: Patients should be evaluated (ie 4T score) for appropriate therapy
- Physician Reminder: For patients with positive HIT, discontinue all heparin IV, SC, flushes, products (heparin coated catheters)/LMWH (enoxaparin) and warfarin orders and document heparin allergy in patient chart. Any medications that are likely to increase bleeding should be discontinued
- Physician Reminder: Platelet transfusions should not be ordered for patients starting Argatroban
- Physician Reminder: May consider use of Vitamin K for HIT patients recently started on Coumadin
- Physician Reminder: Consider ordering lower extremity venous duplex to evaluate for deep vein thrombosis
- Physician Reminder: Dosing of Argatroban is dependent on liver function. Please order from appropriate plan based on patient's liver function

Notifications

- Notify Provider IMMEDIATELY for any bleeding
- Do Not Perform No Intramuscular injections while patient is on Argatroban

Continuous Infusions

- Argatroban Standard Infusion Adjustment Nomogram
- argatroban 250 mg / D5W 250 ml (Adult) 250 mL, Continuous IV, First dose is Now, Hold for any signs or symptoms of bleeding or results ... Adjust based on the patient's aPTT result aPTT(sec): Instructions ...
- argatroban 250 mg / 0.9% NaCl 250 ml (Adult)

Laboratory

Therapeutic Monitoring

- Post Therapy Lab Draw Repeat aPTT 3 Hour(s) Starting Argatroban, Special Instructions: then per nomogram. RN to draw blood and enter lab order into Powerchart
- Complete Blood Count Next Day AM, Lab Collect, Q24H, Blood

Return to Argatroban Infusion Orders



Orders Medication List Document In Plan

View

Orders for Signature

- Plans
  - Document In Plan
  - Medical
    - Argatroban Infusion MultiPhase Pow
      - Argatroban Baseline Labs (Plann
      - Argatroban Infusion Orders (Plar
        - Standard Infusion of Argatrot
        - Hepatic Impairment/Critically :
          - Argatroban Conversion to Coum**
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        - Argatroban Conversion to Coum.
      - CICU Precedex Protocol PowerPlan
      - Standard Infusion of Argatroban (Pl
      - CACU Admission/Transfer PowerPlai
    - Argatroban Infusion MultiPhase Pow
      - Argatroban Initial Orders (All Pat
      - Argatroban Infusion Orders (Plar
        - Standard Infusion of Argatrot
        - Argatroban Conversion to Coum.

Start:  Duration:

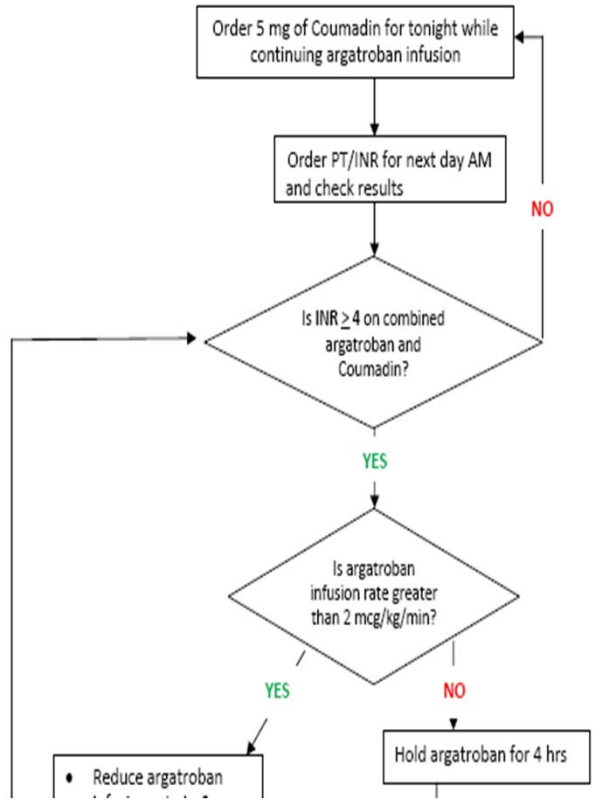
Component	Status	Details
<b>Argatroban Infusion MultiPhase PowerPlan, Argatroban Conversion to Coumadin (Planned Pending)</b>		
Condition		
PowerPlan Instructions		
Physician Reminder: To see the Argatroban to Coumadin Bridge Therapy Flowchart, click on the icon next to the Plan/Phase name and then click on the reference text		
Physician Reminder: Do Not begin coumadin therapy until the patient's platelet count is greater than 150,000 or platelets have returned to pre-HIT baseline values, and the patient has been stabilized on argatroban		
Medications		
Physician Reminder: Argatroban infusion will likely overlap with coumadin therapy for approximately 4-5 days.		
Anticoagulants: Warfarin		
<input checked="" type="checkbox"/> warfarin (Coumadin)		5 mg, Current INR: Less than 4, Indication: Other, TAB, Oral, Bedtime, First dose is Routine, 1 days, See Orde... Argatroban to coumadin conversion
Laboratory		
Physician Reminder: A baseline INR is required prior to the first dose of Coumadin and should be monitored daily.		
<input checked="" type="checkbox"/> Prothrombin Time		Next Day AM, Lab Collect, X1, Blood, Patient Taking: Warfarin (Coumadin)
<input checked="" type="checkbox"/> Post Therapy Lab Draw		Repeat Prothrombin Time 4 Hour(s) Argatroban is held, Special Instructions: RN to draw PT and enter the order into Cerner
Consults		
<input checked="" type="checkbox"/> Physician to Physician Consult (Consult - Physician to Physician)		



Argatroban Infusion MultiPhase PowerPlan - Argatroban Conversion to Coumadin

CarePlan information Chart guide Nurse preparation Patient education Policy and procedure

Argatroban to Coumadin Bridge Therapy: Begin ONLY when Infusion rate of argatroban is stable and platelets have recovered (>150K or at patient's baseline)



Argatroban Infusion MultiPhase PowerPlan - Standard Infusion of Argatroban

Reference

Argatroban Infusion MultiPhase PowerPlan - Standard Infusion of Argatroban

CarePlan information Chart guide Nurse preparation Patient education Policy and procedure

**Argatroban Infusion: Standard Nomogram Max: 10 mcg/kg/min**

*Initial infusion rate: See above. Check aPTT 3 hrs after start of infusion. Adjust rate of infusion as follows*

aPTT (sec)	Infusion rate change	Next aPTT
Less than or equal to 44	Increase by 0.5 mcg/kg/min	3 hrs after rate change
45-90 (target)	NONE	3 hours from last aPTT; once there are two consecutive aPTTs within target range, check aPTT every 12 hours.
91-120	Decrease by 0.5 mcg/kg/min	3 hours after rate change
121-149	Hold infusion for 1 hour, then resume at half the previous rate	3 hours after rate change
Greater than or equal to 150	Hold infusion and check aPTT in 1 hour and every hour thereafter until the aPTT is less than 90 sec, then resume at half the previous rate	Repeat every hour until the aPTT is less than 90 sec. (Once infusion restarted, check aPTT in 3 hours)

Each infusion plan has the nomogram available and the warfarin (COUMADIN) phase has a conversion flow chart available to the ordering prescriber. It can be printed and placed in the chart



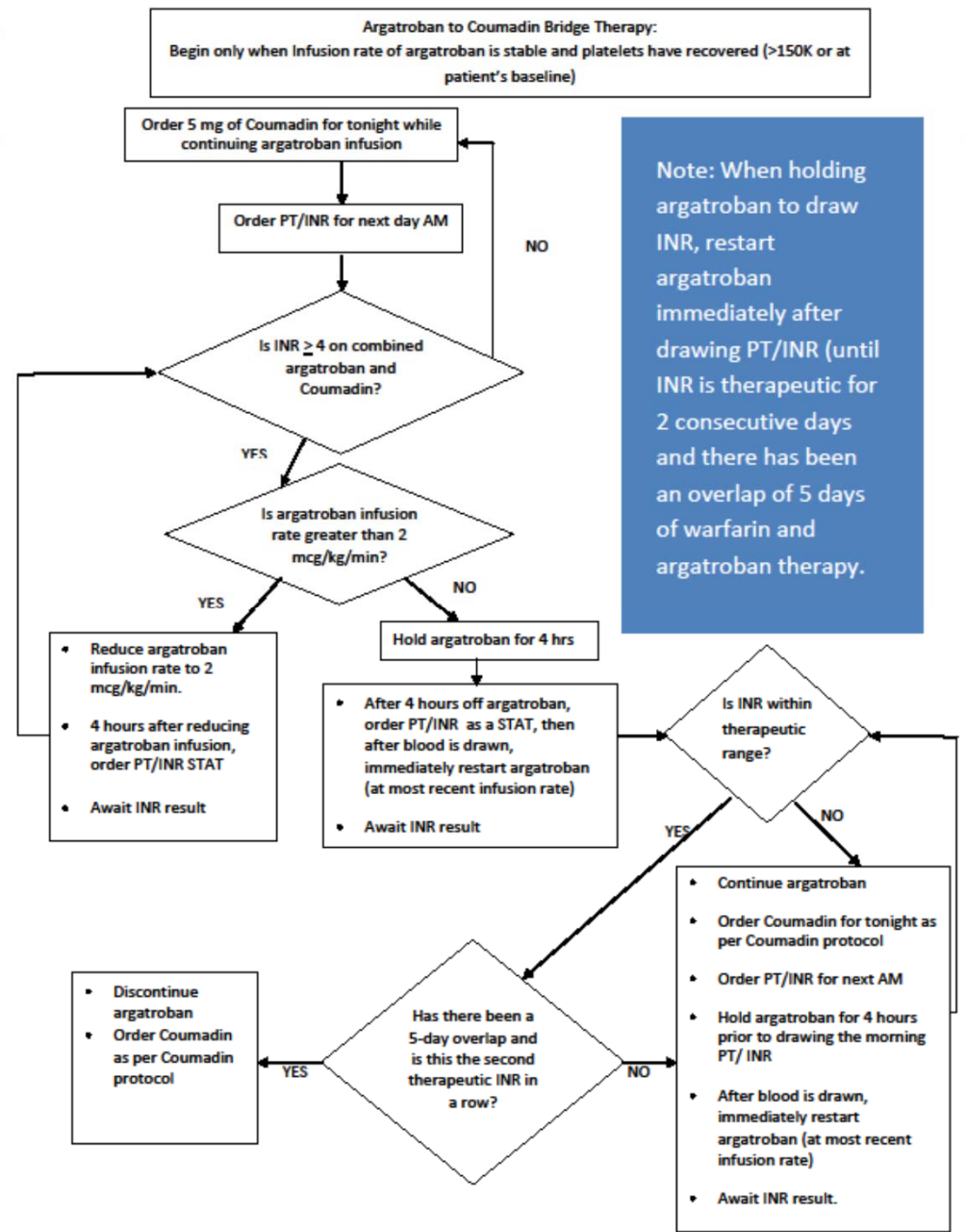
## Conversion to Warfarin (Bridge Therapy)

- Warfarin initiation requires
  - Platelet recovery
  - Stabilization of aPTT in the target range on argatroban
  - Continuation of argatroban until warfarin is therapeutic
- Argatroban affects INR
- Monitoring requires checking INR while argatroban is infusing until total INR is above 4 when on warfarin
- Subsequent monitoring (when INR is above 4) requires holding of argatroban before and until blood is drawn for INR while warfarin
- See bridge therapy flow chart (next slide)
- Hematology consult during bridge therapy is recommended



# Bridge Therapy Flow Chart

for initiating warfarin while on argatroban





## Prescriber Responsibilities

- Assess patient for appropriateness of protocol use
- Discontinue the following:
  - Heparin products IV, SC
  - Heparin flushes
  - heparin coated catheters
  - LMWH (enoxaparin)
  - Warfarin (COUMADIN)
- Assess heparin allergy
- Document positive heparin allergy in medical record
- Discuss heparin allergy with patient



## Prescriber Responsibilities (continued)

- Choose proper protocol (standard, critical care, or neuro)
- Order correct PowerPlan based on patient co-morbidities
- Identify the accurate patient weight in kilograms (actual body weight)
- Accurately calculate the Argatroban dose



## Prescriber Responsibilities (continued)

- Avoid IM injections while on Argatroban
- Platelet transfusions should not be ordered for patients starting Argatroban
- Assess patient daily
- Bridge to warfarin therapy if and when appropriate (hematology consult recommended)



## Nurse Responsibilities

- Verify that proper protocol was chosen
- Verify that the dosage calculations are correct
- Obtain blood draws for laboratory test as ordered

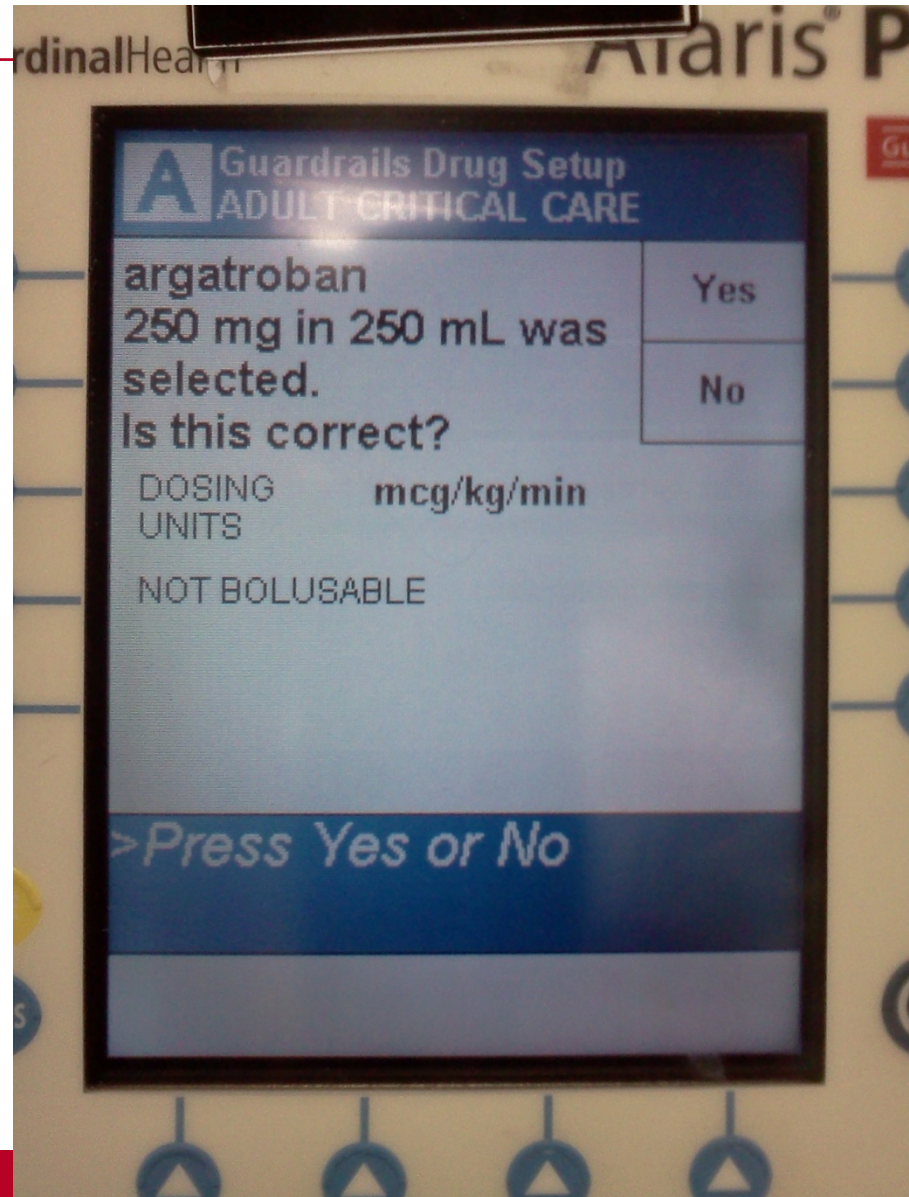


## Nurse Responsibilities (continued)

- Argatroban settings and guardrails are programmed into the pump
- Properly set pump (see screen shots)
- Double check pump settings with another nurse
- Maintain documentation of infusion administration



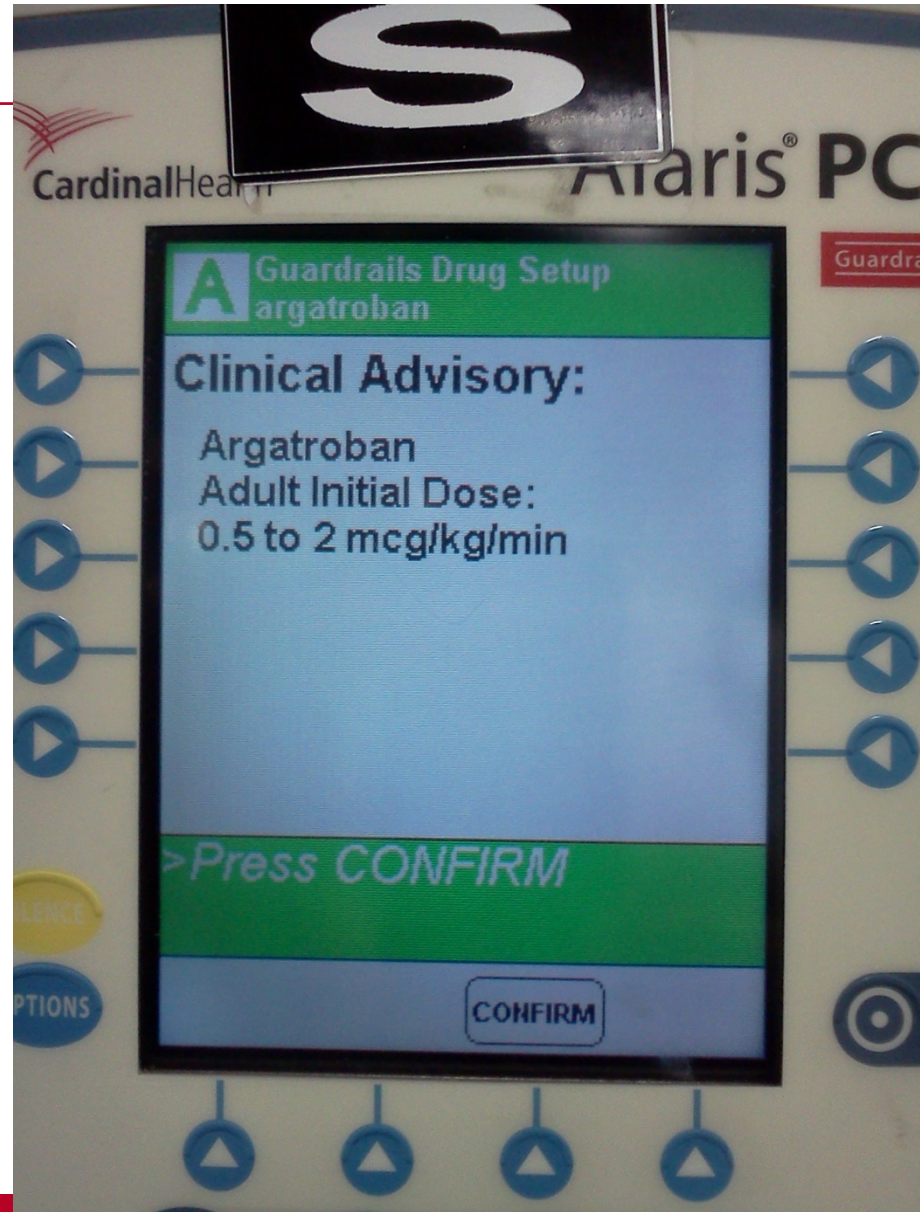
Screen 1





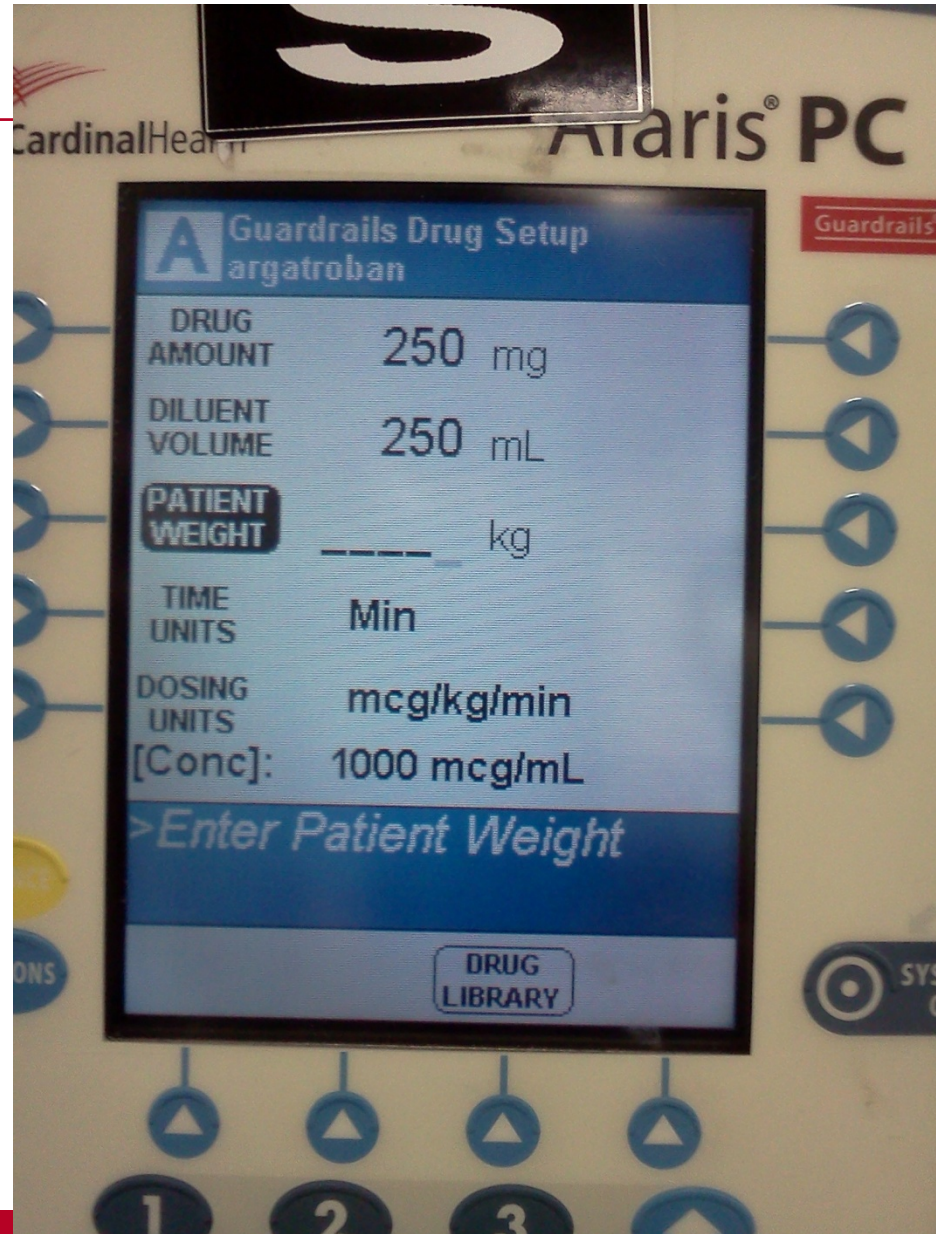
Stony Brook University

Screen 2



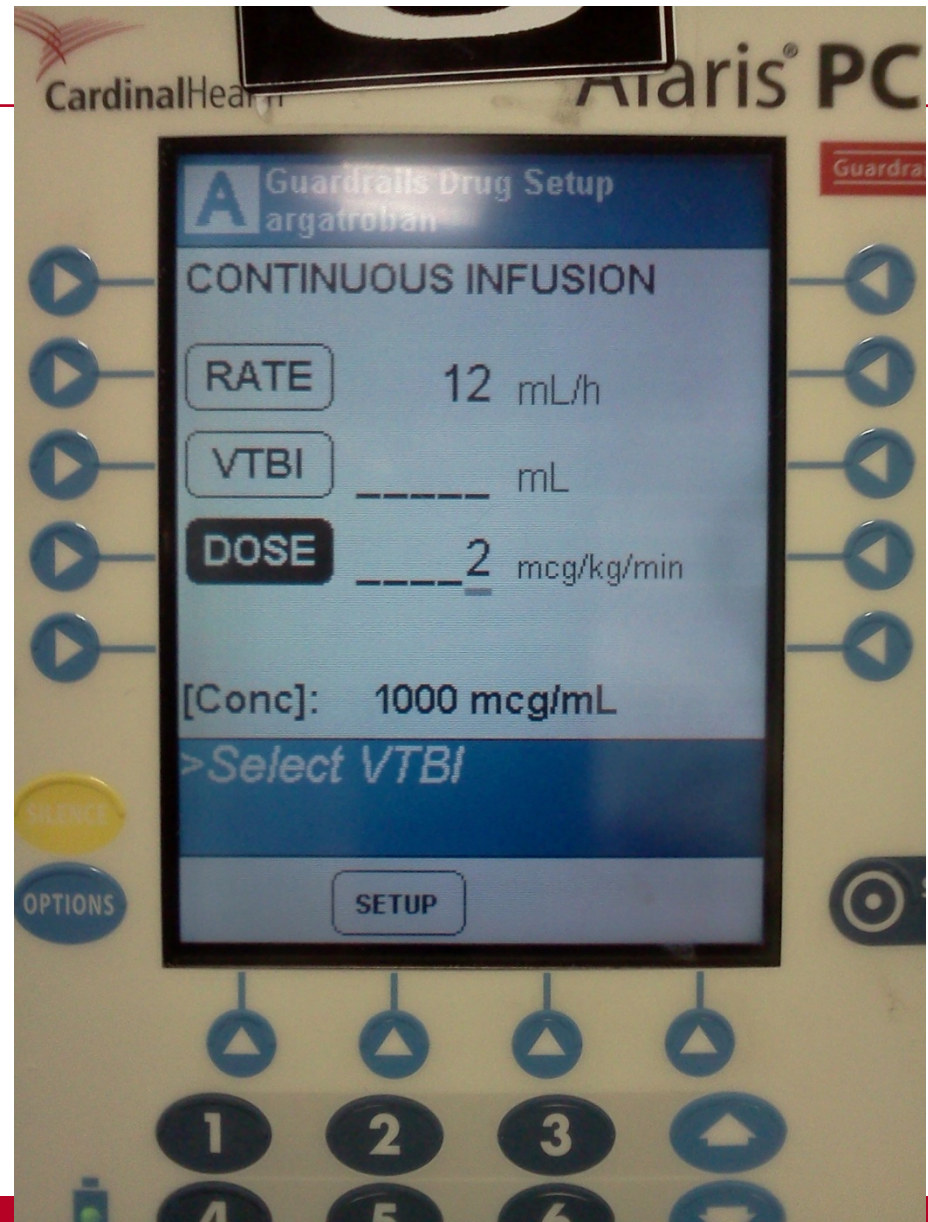


Screen 3





Screen 4





## Nurse Responsibilities (continued)

- Notify prescriber if any bleeding occurs
- Notify prescriber if aPTT therapeutic range is not reached within 48 hours of argatroban initiation
- Avoid IM injections while patient is on argatroban
- Provide and document patient education regarding medication and bleeding precautions



## Pharmacist Responsibilities

- Assess that proper dosing strategy was chosen
- Screen patient EPR for any active heparin or enoxaparin orders that need to be discontinued
- Contact prescriber to discontinue any active heparin or enoxaparin orders
- Verify the PowerPlan order (if appropriate)
- Dispense in light protected covering



**S** STANDARD ARGATROBAN  
INFUSION ORDERS (NOT FOR PCI)

Paper Version  
of Argatroban  
Standard  
Order Form

<b>Physician Reminders:</b> <ul style="list-style-type: none"> <li>For patients with positive HIT, discontinue all heparin IV, SC, flushes, products (heparin coated catheters)/LMWH (enoxaparin) and warfarin orders and document heparin allergy in patient chart. Any medications that are likely to increase bleeding should be discontinued</li> <li><b>Platelet transfusions should not be ordered for patients starting Argatroban</b></li> </ul>			RN Init/ID
<input checked="" type="checkbox"/> Notify Provider immediately for any bleeding <input checked="" type="checkbox"/> Notify Provider if therapeutic range is not reached within the first 48 hrs <input checked="" type="checkbox"/> Avoid intramuscular injections while patient is on argatroban			
<b>Baseline Labs:</b> <input type="checkbox"/> Prothrombin time <input type="checkbox"/> aPTT	<input type="checkbox"/> CBC <input type="checkbox"/> Chem 8		
<input checked="" type="checkbox"/> Draw aPTT 3 hours after start of infusion and then as indicated by adjustment nomogram below  <i>Order HIT Assay only if platelet count has fallen to 50% of baseline or below AND this drop occurred after 5-10 days of heparin exposure or on day 1 of heparin re-exposure.</i> <input type="checkbox"/> HIT Assay			
<b>Infusion Orders: Standard Argatroban Infusion</b> Patient's weight: _____ kg Physician Reminder: Consult Hematology service for dosing when bridging to warfarin or other recommended anticoagulant therapy  <b>For Patients 140 kg or less:</b> <input type="checkbox"/> Argatroban 250 mg / D5W 250 mL, Continuous IV, Begin infusion at 2 mcg/kg/min and adjust based on the patient's aPTT result. First dose NOW . MAX Dose: 10 mcg/kg/min  <b>For Patients weighing more than 140 kg:</b> <input type="checkbox"/> Argatroban 250 mg / D5W 250 mL, Continuous IV, Begin infusion at 1 mcg/kg/min and adjust based on the patient's aPTT result. First dose NOW . MAX Dose: 10 mcg/kg/min  <input checked="" type="checkbox"/> Hold for any signs or symptoms of bleeding or results of aPTT per nomogram			
<b>Argatroban Infusion: Standard Nomogram Max: 10 mcg/kg/min</b>			
<i>Initial infusion rate: See above: Check aPTT 3 hrs after start of infusion. Adjust rate of infusion as follows</i>			
aPTT (sec)	Infusion rate change	Next aPTT	
Less than or equal to 44	Increase by 0.5 mcg/kg/min	3 hrs after rate change	
<b>45-90 (target)</b>	<b>NONE</b>	3 hours from last aPTT; once there are two consecutive aPTTs within target range, check aPTT every 12 hours.	
91-120	Decrease by 0.5 mcg/kg/min	3 hours after rate change	
121-140	Hold infusion for 1 hour, then resume at half the previous rate	3 hours after rate change	
Greater than or equal to 150	Hold infusion and check aPTT in 1 hour and every hour thereafter until the aPTT is less than 90 sec, then resume at half the previous rate	Repeat every hour until the aPTT is less than 90 sec. (Once infusion restarted, check aPTT in 3 hours)	
MD/LIP/NP Signature: _____		ID#: _____	Date: _____ Time: _____
Nurse Signature: _____		ID#: _____	Date: _____ Time: _____

SCAN TO PHARMACY AND PLACE IN PATIENT CHART





## Argatroban Infusion Flowsheets/ Order Forms

### CATEGORY:NURSING

- PH2C425 ARGAT HEP IMPAR FLOWSHEET
- PH2C426 ARGAT NEURO/STK FLOWSHEET
- PH2C424 ARGAT STAND INF FLOWSHEET

### CATEGORY: PHYSICIAN ORDERS ADULTS

- PH2C433 ARGAT HEP IMPAR ORDER
- PH2C432 ARGAT NEURO/STK ORDER
- PH2C434 ARGAT STAND INF ORDER



# Summary

- PowerPlans for IV anticoagulation infusions are available to improve anticoagulation safety
- Paper forms are available (in DAS) as backup to CPOE
- The right protocol must be ordered based on the indication and patient comorbidities
- Therapy is guided with the aPTT
- Baseline (off anticoagulation) aPTT is necessary
- Monitor for ADRs (esp. a precipitous drop in platelets and signs of bleeding)



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