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### Development and Implementation of a Heparin-Induced Thrombocytopenia Pathway in a Trauma ICU

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## **Development and Implementation of a Heparin-Induced Thrombocytopenia Pathway in a Trauma ICU**

### **Disciplines**

Pharmacy and Pharmaceutical Sciences

### **Comments**

Presented at the American College of Clinical Pharmacy Annual Meeting in Anaheim, California, October 2009.

## Development and Implementation of a Heparin-Induced Thrombocytopenia Pathway in a Trauma ICU

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ACCP Fall Meeting; October 2009; Anaheim, CA

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## Anticoagulation in the Presley Trauma Center

- Prophylactic UFH preferred for DVT prophylaxis
  - Head trauma, acetabulum fracture, other cases of high bleeding risk
  - May be preferred in renal dysfunction, pregnancy
- Prophylactic enoxaparin otherwise agent of choice for DVT prophylaxis
- Trauma patients at high risk of VTE, many require bridging to warfarin, long-term anticoagulation

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## Heparin-Induced Thrombocytopenia (HIT)

- Clinicopathologic syndrome
  - Clinical signs + laboratory confirmation
- Thrombocytopenia common in critically ill
  - Incidence: up to 40%
  - Causes confounding
- Systematic evaluation of thrombocytopenia essential to:
  - Diagnosis
  - Management

*Crit Care Med* 2006 Vol. 34, No. 12.

## Thrombocytopenia: Differential Diagnosis in Trauma Patients

- Sepsis and HAIs
- Hemodilution
- Drugs
- Liver disease
- Hypersplenism
- DIC
- Antiphospholipid antibody syndrome / lupus anticoagulant
- ITP, TTP, PTP
- Intravascular devices

## Prior to Study

- No standardized approach to managing HIT in Presley Trauma Center
- Inappropriate evaluation of thrombocytopenia and laboratory analysis performed
- Increased costs in diagnosis and treatment of suspected HIT

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## Preliminary Data

- 56 Patients in Trauma ICU (TICU): 1/6-1/31 2009
- 12 patients experienced thrombocytopenia (decrease in platelets >50% of baseline value)
- 1 patient qualified for HIT pathway
  - HIT antibody negative

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## Trauma ICU HIT Clinical Pathway

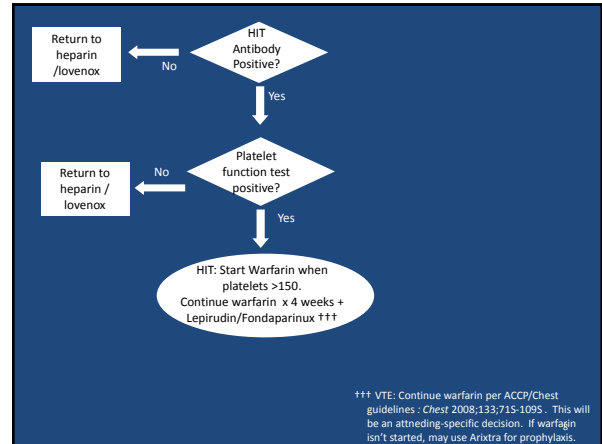
56 Patients in TICU:  
1/6-1/31 2009

DVT/ ↓ Platelets > 50%†

12 patients had thrombocytopenia, 1 patient qualified for HIT pathway

D/C all UFH and LMWH, including heparin flushes and heparin in dialysis ports.  
Start Lepirudin††  
Send HIT Antibody and Platelet function tests

† Platelet decrease seen within 5-14 days of starting heparin. Baseline platelet value: lowest number within first 4 days of initial heparin exposure, unless patient has known prior heparin exposure. Refer to 4Ts if unexplained thrombosis  
†† Option of fondaparinux for pts who have completed sx/procedures, adj for renal dysfx



††† VTE: Continue warfarin per ACCP/Chest guidelines : Chest 2008;133:715-1095. This will be an attending-specific decision. If warfarin isn't started, may use Arixtra for prophylaxis.

## Pre-Test Probability of HIT (4Ts)

Points (0, 1, or 2 for Each of Four Categories)  
Maximum Possible Score = 8

	2	1	0
Thrombocytopenia	> 50% fall to nadir $\geq 20 \times 10^9/L$	30-50% fall; nadir $10-19 \times 10^9/L$	< 30% fall; nadir $< 10 \times 10^9/L$
Timing of platelet fall	Days 5-10; < day 1 + heparin (past 30 days)	> day 10 / timing unclear; < day 1 + heparin (past 31-100 days)	< day 4 no heparin (past 100 days)
Thrombosis	New thrombosis; skin necrosis; acute reaction	Skin lesions; suspected thrombosis (unproven)	None
Other cause(s) of platelet fall	None evident	Possible	Definite

Crit Care Med 2006 Vol. 34, No. 12.

## Pre-Test Probability of HIT (Modified 4Ts)

Points (0, 1, or 2 for Each of Four Categories)  
Maximum Possible Score = 8

	2	1	0
Thrombocytopenia	> 50%	30-50% fall	< 30% fall
Timing of platelet fall	Days 5-14		< day 5
Thrombosis	New thrombosis; skin necrosis; acute reaction	Skin lesions; suspected thrombosis (unproven)	None
Other cause(s) of platelet fall	None evident	Possible	Definite

Crit Care Med 2006 Vol. 34, No. 12.

## HIT Treatment

Agent	Cost/day	Adverse Effects	Comments
Argatroban	~\$2,000-6,300	↑ INR (drug/lab interaction)	Requires close aPTT monitoring, adj in hepatic dysfx, discontinue $\geq 4$ hrs before procedure
Bivalirudin (Angiomax®)	\$688		Investigational, adj in renal dysfx, monitor aPTT

## HIT Treatment Continued

Agent	Cost/day	Adverse Effects	Comments
Lepirudin (Refludan®)	\$1200	Antilepirudin antibodies, may increase INR	Requires close aPTT monitoring, adj in renal dysfx
Fondaparinux (Arixtra®)	\$48		Long half-life (~ 20 hrs), adj in renal dysfx

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## HIT Laboratory Tests

Test	Location Performed	Turnaround Time	Cost
HIT Antibody	Baptist East	1-4 days	\$146/test
Platelet Function Test	Lab Core Memphis	5-7 days	\$220/test

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## Limitations

- Lepirudin agent of choice for TICU HIT Clinical Pathway based largely on cost
- Pathway not designed to recognize all types of HIT
- Pathway focuses on diagnosis and management of HIT, not prevention

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## Recommendations

- Criteria for pathway entry: Platelet values (>50% drop) and medication (timing of heparin)
- Send HIT antibody and platelet function tests
- Lepirudin as initial drug
- Coumadin x 4weeks for HIT

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## Post Study

- Preliminary data and HIT clinical pathway presented at Trauma Conference
- Extensive trauma staff education
- Increased knowledge of HIT pathophysiology and rational approach to diagnosis and treatment
- Appropriate concern, laboratory analysis, decreased costs in diagnosis and treatment

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## Conclusions

- HIT is a clinicopathologic diagnosis, and presents a problem in trauma patients
- Proposed HIT clinical pathway helps simplify and standardize diagnosis and treatment of HIT to avoid morbidity and mortality related to this life-threatening disorder and its complications.

## Patient Example: Trauma Pt X

### *Plts on admit: 300*

- Plts Day 1: 250
- Plts Day 2: 200
- Plts Day 3: 225
- Plts Day 4: 215
- Plts Day 5: 210
  - Heparin Started
- Plts Day 6: 145
  - Decrease >50% from admit value

- Plts Day 7: 75
  - **Plts Day 8: 70**
    - Day 4 heparin, "baseline"
  - Plts Day 9: 73
  - Plts day 10: 80
  - Plts Day 11: 100
  - Plts Day 12: 105
- Plts need to fall to <35 to meet criteria**

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## Additional References

- Karnik M. Anticoagulation in the trauma patient. *Trauma*. 7(2)(pp 63-68), 2005.
- Brathwaite CE, et al. Complications of anticoagulation for pulmonary embolism in low risk trauma patients. *Chest* 1993;104;718-720.
- Counts RB, et al. Hemostasis in Massively Transfused Trauma Patients. *Ann. Surg.* July 1979; 91-99.
- Hanes SD, Quarles DA, Boucher BA. Incidence and risk factors of thrombocytopenia in critically ill trauma patients. *Ann Pharmacother.* 1997 Mar;31(3):285-9.
- Arepally GM, Ortel TL. Heparin-Induced Thrombocytopenia. *N Engl J Med* 2006;355:809-17.

## Additional References

- Di Nisio M, Middeldorp S, Büller HR. Direct Thrombin Inhibitors. *N Engl J Med* 2005;353:1028-40.
- Thompson CB. Selective consumption of large platelets during masive bleeding. *BMJ* 1985;291:95-96.
- Carrick MM. Subsequent Development of Thrombocytopenia and Coagulopathy in Moderate and Severe Head Injury: Support for Serial Laboratory Examination. *J Trauma*. 2005;58:725-730.
- Golob JF. Theraputic anticoagulation in the trauma patient: Is it safe? *Surgery* 2008;144:591-7.
- Hirsch J, et al. Chest Guidelines. Antithrombotic and Thrombolytic Therapy: 8th Edition. *Chest* 2008;133;71S-109S .

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## Additional References

- Warkentin TE. Platelet Count Monitoring and Laboratory Testing for Heparin-Induced Thrombocytopenia. *Arch Pathol Lab Med*. 2002;126:1415-1423.
- Heparin-Induced Thrombocytopenia: Pathogenesis and Management. *British Journal of Haematology*, 2003, 121, 535-555.
- Napolitano LM. Heparin-induced thrombocytopenia in the critical care setting: Diagnosis and management. *Crit Care Med* 2006 Vol. 34, No. 12.