Heparin Induced Thrombocytopenia QUality Improvement directed at reduced Testing (HIT-QUIT)

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Team Members

- Team Leader: David Blumenthal, MD
- Team Members:
  - Jessica Lee, DO: Co-investigator
  - Jose Larios, MD: Literature Review
  - Murtaza Hussain, MS IV: Chart Review
- Project Sponsors: Ascension Providence Hospital- Graduate Medical Education
- Team Coach: Valorie Harvey
Institutional Overview

- Ascension Providence Hospital
- Founded in 1952
- 772-bed, Level One Trauma Center (Southfield, MI campus)
- 264-bed, Level Two Trauma Center (Novi, MI campus)
- More than 50 medical and surgical specialties
- 1400 physicians, 4600 nurses and associates, 900 volunteers, 180 medical residents and fellows

ASCO® Quality Training Program
Pathophysiology

- PF4
- Platelet
- Heparin
- IgG
- Immune complex
- Fc receptor
The Ascension Providence health system recognized unnecessary testing for heparin-induced thrombocytopenia (HIT) to be a hospital-wide issue. The underlying components to this problem include: miseducation in testing for HIT, use of heparin instead of other anticoagulants for the prevention of DVTs, assay ordering within the hospital operating system, and laboratory processing of the assays.
The aim of this study is to evaluate the current practice patterns of testing for heparin induced thrombocytopenia at our institution in order to decrease the overutilization and misutilization of both the HIT-Ab and serotonin release assays by 50%
## Background

### The 4Ts scoring system

<table>
<thead>
<tr>
<th>4Ts category</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrombocytopenia</td>
<td>Platelet count fall &gt; 50% and platelet nadir ≥ 20</td>
<td>Platelet count 30%-50% or platelet nadir 10-19</td>
<td>Platelet count fall &lt; 30% or platelet nadir &lt; 10</td>
</tr>
<tr>
<td>Timing of platelet count fall</td>
<td>Clear onset days 5-10 or platelet fall ≤ 1 day (prior heparin exposure within 30 days)</td>
<td>Consistent with days 5-10 fall, but not clear (eg, missing platelet counts); onset after day 10; or fall ≤ 1 day (prior heparin exposure 30-100 days ago)</td>
<td>Platelet count ≤ 4 days without recent exposure</td>
</tr>
<tr>
<td>Thrombosis or other sequelae</td>
<td>New thrombosis (confirmed); skin necrosis; acute systemic reaction postintravenous unfractionated heparin bolus</td>
<td>Progressive or recurrent thrombosis; non-necrotizing (erythematous) skin lesions; suspected thrombosis (not proven)</td>
<td>None</td>
</tr>
<tr>
<td>Other causes of thrombocytopenia</td>
<td>None apparent</td>
<td>Possible</td>
<td>Definite</td>
</tr>
</tbody>
</table>

The 4Ts score is the sum of the values for each of the 4 categories. Scores of 1-3, 4-5, and 6-8 are considered to correspond to a low, intermediate, and high probability of HIT, respectively.

Background

• HIT antibody testing
  – Immunoassays
    • ELISA $\rightarrow$ optical density (OD) units
      – 0.4 OD
    • Frequent false-positive results
  – Functional assays
    • Washed platelet serotonin release assay (SRA) $\rightarrow$ positive or negative
    • Higher specificity
    • Send out test, higher cost, increased turnaround time
Process Map

Thrombocytopenia?

Heparin Exposure?

Clinical Suspicion?

Order HIT-Ab +/- SRA

Look for other causes +/- Hem/Onc Consult

Calculate 4Ts Score?

Low

Intermed

High
**Cause & Effect Diagram**

- **Provider**
  - Not aware of 4Ts score
  - Inconsistent scoring
  - Physicians do not know which immunoassay to use

- **Education**
  - Ineffective delivery
  - Lack of education provided to all inpatient teams: hospitalist groups and housestaff?

- **System**
  - Duplicate PF4 and HIT-Ab
  - HIT-Ab and SRA are both send out tests

- **EMR**
  - Poor documentation of 4Ts score
  - Poor implementation

- **Clinical Scenario**
  - Multiple comorbidities
  - Multiple hospitalizations

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ASCO® Quality Training Program
Measures

• **Measure:** HIT-Ab/SRA testing, heparin use
• **Patient population:** Adult patients with same admission
  HIT-Ab/SRA testing
  - **Exclusions (if any):** None
• **Data source:** Retrospective chart review
• **Data collection frequency:** September 2017-September 2018
• **Data quality (any limitations):** Single institution
Baseline Data

- September 1, 2017-September 30, 2018
  - Documented 4Ts: 0
  - Number of HIT-AB tests ordered: 142
    - <0.4: 121/142 (85.2%)
      - Low Probability HIT-AB without further testing: 86/121 (71.1%)
      - Low Probability HIT-AB followed by SRA: 35/121 (28.9%)
        - Negative SRA: 33/35 (94.2%)
        - Indeterminant SRA: 1/35 (2.9%)
        - Positive SRA: 1/35 (2.9%)
    - >/= 0.4: 21/142 (14.8%)
      - High Probability HIT without follow up by SRA: 9/21 (42.9%)
      - Positive SRA: 1/21 (4.8%)
Baseline Data

• September 1, 2017-September 30, 2018
  • Number of SRA ordered: 55
    • SRAs ordered without HIT-AB: 8/55 (14.5%)
      • Positive: 1/8 (12.5%)
<table>
<thead>
<tr>
<th>Test</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIT-AB</td>
<td>125</td>
</tr>
<tr>
<td>HIT-AB in house</td>
<td>36.73</td>
</tr>
<tr>
<td>SRA</td>
<td>330</td>
</tr>
</tbody>
</table>
## Baseline Data

### Examples of Change in Anticoagulation

<table>
<thead>
<tr>
<th>Patient</th>
<th>HIT-Ab</th>
<th>SRA</th>
<th>Anticoagulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>Negative</td>
<td>Heparin drip-&gt; fondaparinux x1 day-&gt; argatroban drip x4 days-&gt; heparin drip-&gt; eliquis</td>
</tr>
<tr>
<td>2</td>
<td>1.16</td>
<td>Negative</td>
<td>Heparin 5k q8-&gt; fondaparinux x8 days-&gt; heparin 5k q8</td>
</tr>
<tr>
<td>3</td>
<td>0.17</td>
<td>Negative</td>
<td>Heparin 5k q8</td>
</tr>
<tr>
<td>4</td>
<td>0.17</td>
<td>N/A</td>
<td>Heparin 5k q8-&gt; argatroban drip x2 days-&gt; lovenox</td>
</tr>
<tr>
<td>5</td>
<td>0.5</td>
<td>N/A</td>
<td>No AC -&gt; Heparin 5k q8</td>
</tr>
<tr>
<td>6</td>
<td>0.32</td>
<td>Negative</td>
<td>Heparin drip-&gt; argatroban drip x3 days-&gt; heparin 5k q8</td>
</tr>
<tr>
<td>7</td>
<td>0.18</td>
<td>Negative</td>
<td>Heparin 5k q8-&gt; No AC x3 days -&gt; heparin 5k q8</td>
</tr>
<tr>
<td>8</td>
<td>0.2</td>
<td>Negative</td>
<td>Heparin gtt-&gt; No AC x4 days-&gt; argatroban gtt x4 days-&gt; fondaparinux 2.5 mg SQ x6 days-&gt; xarelto</td>
</tr>
<tr>
<td>9</td>
<td>0.42</td>
<td>N/A</td>
<td>No AC</td>
</tr>
<tr>
<td>10</td>
<td>1.9</td>
<td>Positive</td>
<td>Hep 5k q8-&gt; fondaparinux 2.5 mg SQ x1 day-&gt; argatroban gtt x5 days-&gt; eliquis</td>
</tr>
</tbody>
</table>
## Baseline Data

<table>
<thead>
<tr>
<th>Medication</th>
<th>Purchase Cost ($)</th>
<th>Cost to the Patient ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heparin subcutaneous</td>
<td>0.73</td>
<td>19</td>
</tr>
<tr>
<td>Heparin drip</td>
<td>8</td>
<td>30*</td>
</tr>
<tr>
<td>Fondaparinux</td>
<td>36</td>
<td>19</td>
</tr>
<tr>
<td>Argatroban drip</td>
<td>119</td>
<td>306**</td>
</tr>
</tbody>
</table>

*Usually 1-2 bags/day.

**Price per vial. Dosing is dependent on weight and most patients requires 2-3 vials/day.
# Prioritized List of Changes (Priority/Pay –Off Matrix)

<table>
<thead>
<tr>
<th>Ease of Implementation</th>
<th>High Impact</th>
<th>Low Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>Education of 4Ts calculator</td>
<td>Education to use LMWH instead of heparin for DVT prophylaxis</td>
</tr>
<tr>
<td></td>
<td>Implementation of 4Ts calculator in EMR</td>
<td>4Ts score populates in documentation</td>
</tr>
<tr>
<td></td>
<td>Documentation of 4Ts score</td>
<td>Change of send out HIT-AB to in-house testing</td>
</tr>
</tbody>
</table>
# PDSA Plan (Test of Change)

<table>
<thead>
<tr>
<th>Date of PDSA Cycle</th>
<th>Description of Intervention</th>
<th>Results</th>
<th>Action Steps</th>
</tr>
</thead>
</table>
| **July 1, 2018- August 30, 2018** | - Obtain IRB and complete modules  
- Identify problem and aim statements  
- Identify team members  
- Research/Literature review | - IRB approval obtained and modules completed  
- Team members identified, fluid roles based on availability  
- Literature reviewed | - QTP training 7/11-7/12  
- Compilation and review of SRA/HIT-AB lists  
- Design/Methods |
| **September 1, 2018- October 31, 2018** | - Chart review to determine baseline data  
- Meet with IT  
- Meet with lab director/personnel  
- Meet with pharmacy  
- Meet with research coordinator  
- Identify administration | - SRA/HIT-Ab lists compiled and charts reviewed  
- Baseline data obtained  
- Testing methods (in-house vs sendout) | - QTP training 9/20-9/21  
- Identify administration |
# PDSA Plan (Test of Change)

<table>
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<th>Results</th>
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</tr>
</thead>
</table>
| November 1, 2018- November 20, 2018 | -Met with lab director/personnel to discuss change of HIT-AB testing to in-house
- Met with research coordinator | -Changes to laboratory processing in-house vs send out to take about 1 year
- 4T calculator implementation challenging | -Rethink approach to problem
- Focus on what has biggest impact to patients |
| November 20, 2018- Present | -Educational efforts to reduce the amount of heparin use for prophylaxis | -Reduced use of heparin for prophylaxis
- Will require about 3 months of data to confirm reduction in HIT testing | -Determine best possible DVT prophylaxis medication algorithm based on cost, outcomes, patient experience
- Expand educational efforts
- Modify DVT prophylaxis algorithm in EHR |
### Change Data

<table>
<thead>
<tr>
<th>Number of SRAs ordered hospital wide over a 13 month period pre-intervention</th>
<th>Number of HIT antibody tests ordered hospital wide over a 13 month period pre-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>142</td>
</tr>
</tbody>
</table>

Will require about 3 months of follow-up data for adequate power to determine whether or not HIT testing was reduced.
Conclusions

• Aim: to evaluate the current practice patterns of HIT-Ab assay testing at our institution in order to decrease overutilization and misutilization.
  – No documentation of 4Ts score
  – Difficult to determine if the HIT-Ab was correctly ordered based off the 4Ts score
    • 85% of the 142 HIT-Ab tests ordered in the last year resulted in low probability (<0.4)
    • Of these, 30% were followed up by SRA
  – 14.5% of SRAs were ordered without preceding HIT-Ab

• Identifying the problem
  – Electronic (national)
  – Laboratory: send out vs in-house testing

• Reducing the use of heparin use will reduce HIT testing, improve patient experiences, and save money
Next Steps/Plan for Sustainability

• Provide education to admitting PAs, hospitalists and housestaff
• Shift the default order set in the EMR from a heparin weighted preference to a better agent
• Finalize data collection proving improvement metrics were met


