Impella® Anticoagulation Management

Purpose: This document describes anticoagulation management for the Abiomed Impella devices. Impella is a percutaneous ventricular assist device (pVAD) used for short-term mechanical circulatory support. Because Impella requires use of anticoagulation, standardized approaches are essential for optimized efficacy and safety.

General Information:
- Indications for an Impella pVAD
  - High-risk percutaneous coronary intervention (PCI)
  - Cardiogenic shock
  - Acute decompensated heart failure
- Most patients with Impella devices will have unfractionated heparin (UFH) from two sources:
  - Heparinized purge solution that runs counter-current to blood flow via the Impella catheter
  - Systemic heparinization
- Purge solution:
  - The standard purge solution at UNMH is UFH 25 units/mL in D5W.
  - The purge solution should be continuously running to prevent blood from entering the Impella motor and protect against device thrombosis.
  - Flow rates on the purge solution are automatically determined by the device to maintain the appropriate purge pressure.
  - Flow rates are usually between 2-30 mL/hr and average around 7-20 mL/hr.
  - Non-standard purge solutions
    - Bicarbonate-based purge solution (BBPS) may be considered for patients with:
      - Bleeding or persistently supratherapeutic anti-Xa levels in the absence of systemic IV UFH.
      - Heparin-induced thrombocytopenia (HIT) along with systemic bivalirudin (see UNMH HIT protocol).
    - D5W only purge solution should only be used if BBPS is not available.
- Systemic heparinization
  - Should be initiated if heparin levels from purge solution alone are below target range.
  - UNMH has an Impella-specific heparin protocol that uses a lower initial heparin rate to account for heparin exposure via the purge solution.
    - The recommended starting IV UFH rate is 7 units/kg/hr.

Systemic Heparinization Protocol:
Impella Anti-Xa Monitoring (Standard)
- Standard monitoring for most patients.
- Draw anti-Xa as a baseline upon arrival to the ICU and again 4 hours after initiation of purge solution.
- Initiate systemic heparin infusion once anti-Xa < 0.3 units/mL.
  Starting rate = 7 units/kg/hr (Pharmacy will adjust to a maximum initial rate of 750 units/hour).

<table>
<thead>
<tr>
<th>Anti-Xa (units/mL)</th>
<th>Titration</th>
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</thead>
<tbody>
<tr>
<td>&lt;0.1</td>
<td>Bolus 25 units/kg; increase infusion by 3 units/kg/hr</td>
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<tr>
<td>0.1-0.19</td>
<td>Increase infusion by 2 units/kg/hour</td>
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<tr>
<td>0.2-0.29</td>
<td>Increase infusion by 1 units/kg/hour</td>
</tr>
<tr>
<td>0.3-0.5</td>
<td>NO CHANGE (goal)</td>
</tr>
<tr>
<td>0.51-0.6</td>
<td>Decrease by 1 units/kg/hr</td>
</tr>
<tr>
<td>0.61-0.75</td>
<td>STOP INFUSION for 1 hr, then decrease by 2 units/kg/hr</td>
</tr>
<tr>
<td>&gt;=0.76</td>
<td>STOP INFUSION for 1 hr, then decrease by 3 units/kg/hr and notify provider</td>
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</tbody>
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Last review: October 2021
Monitor anti-Xa every 6 hours x 24 hours initially and after each dose change; thereafter, once a therapeutic anti-Xa is achieved x 2 consecutive measurements, anti-Xa monitoring may be decreased to every 12 hours and/or after each dose change.

Impella ACT Monitoring
- In the rare cases where elevated bilirubin levels preclude the use of anti-Xa monitoring (e.g. bilirubin levels greater than 40 mg/dL), monitoring should be transitioned to ACT.
  - Careset for Impella ACT monitoring is located in Cerner MedManager.
- Initiate systemic heparin infusion once the ACT is less than 200.

Starting rate = 7 unit/kg/hr (Pharmacy will adjust to a maximum initial rate of 750 units/hour).

<table>
<thead>
<tr>
<th>ACT Value</th>
<th>Titration</th>
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<tbody>
<tr>
<td>&lt;140</td>
<td>Bolus with 10 unit/kg, then increase infusion by 2 unit/kg/hr</td>
</tr>
<tr>
<td>140-159</td>
<td>Increase infusion by 1 unit/kg/hr</td>
</tr>
<tr>
<td>160-180</td>
<td>GOAL = NO CHANGE</td>
</tr>
<tr>
<td>181-200</td>
<td>Decrease infusion by 1 unit/kg/hr</td>
</tr>
<tr>
<td>&gt;200</td>
<td>HOLD infusion for 1 hour, decrease infusion by 1 unit/kg/hr</td>
</tr>
</tbody>
</table>

Check ACT every hour until within goal x 4 hours, then every 4 hours thereafter.

Ongoing Monitoring
- CBC at least every other day and more frequently if deemed necessary.
- Monitor for signs and symptoms of HIT.
  - If suspected, refer to UNMH HIT guideline which includes information for HIT with Impella

References:

Please contact Pharmacy ED/ICU supervisor or Antithrombosis Stewardship via TigerConnect for any questions or concerns pertaining to this clinical guidance.

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