CHEST PAIN, ADULT, EMERGENCY DEPARTMENT & INPATIENT, PATHWAY

Updated: June 22, 2022

Clinical Pathway Summary

CLINICAL PATHWAY NAME: Chest Pain in the Adult

PATIENT POPULATION AND DIAGNOSIS: Adult patients experiencing chest pain with suspicion of Acute Coronary Syndromes (ACS).

APPLICABLE TO: All Spectrum Health Sites

BRIEF DESCRIPTION: This clinical guideline outlines the management of chest pain with suspected ACS and potential STEMI. Multiple algorithms and tables are provided for a comprehensive guide to addressing treatment and management. Beginning guidelines direct initial evaluation of suspected ACS in addition to ACS rule out strategies. High Sensitivity Troponin results are reviewed. A stress test decision tree is provided in addition to a table directing an algorithm to order noninvasive cardiac stress testing. The hypothermia treatment algorithm for treatment of cardiac arrest to Cath Lab is provided. Associated Guideline: STEMI Cath lab activation

OPTIMIZED EPIC ENHANCEMENTS: Order sets: ED Chest Pain and STEMI, ED Obs Chest Pain

IMPLEMENTATION DATE: September 2022

LAST REVISED: June 2022

Pathway Information

OWNER(S): Dr. Trevor Cummings, Dr. Jeffrey Decker

Contributor(s): Dr. Ryan Madder

EXPERT IMPROVEMENT TEAM (EIT): Clinical Cardiology and ED Cardiac Care

CLINICAL PRACTICE COUNCIL (CPC): Cardiovascular Health, Acute Health

CPC APPROVAL DATE: September 23, 2022, November 1, 2022

OTHER TEAM(S) IMPACTED: Emergency Department, Hospitalists, Cardiologists, Cath lab
Clinical Pathways Clinical Approach

Initial Evaluation of ACS

- Patient with chest pain suspicious for ACS
  - ECG Indicative of STEMI?
    - STEMI/NSTEMI guideline
    - Treat & Activate local STEMI process
  - cTn & Initial Orders
  - Review 1st cTn & Heart Score

Low Risk Heart Score 0-3 & Initial Troponin Negative

- Symptom onset > 3 hours of ED arrival?
  - Yes
    - Shared decision making* Offer additional cTn & ECG monitoring
  - No
    - No, patient declines

Intermediate-Moderate Risk Heart Score of 4-6 & Initial Troponin Negative

- 2 or 3 hour cTn* (In ED or may continue as inpatient or obs if appropriate)
  - Negative cTn
    - Recommend patient admission & further cTn & ECG monitoring
  - Yes
    - 6 hour cTn* (In ED or may continue as inpatient or obs as appropriate)
      - Negative cTn
        - Shared decision making on disposition Observation vs inpatient vs discharge
  - + cTn

High Risk Heart Score ≥7 and/or Initial Troponin Positive/Evolving ECG changes

- Positive cTn?
  - Treat NSTEMI
  - Cardiology Consult & Inpatient Admission anticipating an early invasive strategy
  - Extended ED Stay/Admission to Observation/Inpatient for continued monitoring, stress testing or advanced imaging
  - Discharge home with outpatient stress testing within 72 hours
  - Discharge home with outpatient follow up within 1 week
  - Emergency Department discharge from PCP within 3 days

*At anytime either ECG or troponin findings indicate STEMI or NSTEMI, immediately implement appropriate treatment in accordance with the AHA & local hospital recommendations.

*The use of shared decision making and the discussion of individualized patient risk level should be documented in medical decision making.

**Consider onset of symptoms when determining the necessary time intervals for serial troponin studies. Local assays and corresponding cutoffs must be evaluated to differentiate between normal or elevated troponin findings.
Rule out Strategies for Evaluation of Suspected Acute Coronary Syndromes (ACS): Highly Sensitive Troponin Assays (Hs-Tn)\textsuperscript{11,15,17,18}

- Clinicians are required to know the 99\textsuperscript{th} percentile Upper Reference Limit (URL), the Lowest Levels of Detection (LoD) and significant Deltas (Δ) established by each hospital site.
- Concentrations and values of such measurements are specific and unique to each assay and lab and cannot be generalized across different settings.
- Established Hs-Tn references should be modified based on sex.

**STEMI/NSTEMI guideline**

1. **Patient with chest pain suspicious for ACS**
   - ECG indicative of STEMI?
     - Treat & Activate local STEMI process\textsuperscript{^}\n   - Hs-Tn & Initial Orders

2. **Eval 1st Hs-Tn, time of symptoms onset and risk stratify**
   - Low Risk HEART Score 0-3 & Initial Hs-Tn < LoD - <URL
     - Symptom onset > 6 hours of ED arrult?\textsuperscript{\textbullet}
       - Yes: Symptom onset > 3 hours of ED arrival?\textsuperscript{\textbullet}
         - Yes: Hs-Tn below the URL at greater than 6 hours symptom onset excludes MACE\textsuperscript{\textbullet}\n         - No: patient declines
       - No: Symptom onset > 3 hours of ED arrival?\textsuperscript{\textbullet}
         - Yes: Shared Decision Making\textsuperscript{\textbullet}: Offer additional troponin & ECG monitoring
         - No: Discharge home-follow up with PCP within XXXX\textsuperscript{\textbullet}

   - Moderate/Intermediate & High-Risk\textsuperscript{\textbullet}\textsuperscript{\textbullet}
     - Hs-Tn ≤ 99\textsuperscript{th} Percentile
       - Obtain 2 or 3 hour Hs-Tn\textsuperscript{\textbullet}
         - Yes: Significant Δ?\textsuperscript{\textbullet}
           - Yes: Obtain cardiology guidances appropriate & recommend patient admission for further Hs-Tn & ECG monitoring
           - No: Discharge home with outpatient stress testing within 72 hours
         - No: Discharge home with outpatient stress testing within 72 hours
     - Hs-Tn >99\textsuperscript{th} percentile\textsuperscript{\textbullet}
       - Treat NSTEMI if diagnostic critical Hs-Tn and other applicable
evalution criteria met

\textsuperscript{^}\textit{At anytime either ECG or troponin findings indicate STEMI or NSTEMI, immediately implement appropriate treatment in accordance with the AHA& local hospital recommendations.}
\textsuperscript{\textbullet}\textit{The use of shared decision making and the discussion of individualized patient risk level should be documented in medical decision making.}
\textsuperscript{\textbullet\textbullet}\textit{Consider onset of symptoms when determining the necessary time intervals for serial troponin studies.}
\textsuperscript{\textbullet\textbullet\textbullet}\textit{High-risk patients should be admitted unless serial Hs-Tn studies demonstrate no significant increase and after cardiology consult.}
High Sensitivity Troponin T: Stress Testing

Chest Pain Center/Emergency Department/Observation/Inpatient Unit Patients: Key Points

- Elevated HsTn levels in the critical range (>100ng/L) or abnormal deltas (>=8ng/L) must be confirmed and approved by a physician.
- If baseline HsTn levels are indeterminate (women: 14-99ng/L; men: 22-99ng/L), a 2-hour HsTn level must be evaluated prior to stress testing.
- If patient’s symptom onset is less than 3 hours, a two hour follow up HsTn level must be evaluated prior to stress testing.
- If patient’s symptom onset is greater than 3 hours, and baseline HsTn level is normal, no additional serial troponin is required prior to proceeding to stress testing.
Stress Test Decision Tree

Can the patient walk at least 6 minutes on an inclined treadmill?

Yes

- Does patient have:
  - Left Bundle Branch Block
  - Permanent Pacemaker
  
  Yes
  - Lexiscan
    - Myocardial Perfusion Imaging Stress Test
  
  No
  - Treadmill
    - Myocardial Perfusion Imaging Stress Test
  
No

- Does patient have:
  - Left Bundle Branch Block
  
  Yes
  - Lexiscan
    - Myocardial Perfusion Imaging Stress Test
  
  No
  - Dobutamine Stress Echo Stress Test

---

**Stress Echo**: Testing to evaluate patients for coronary artery disease by utilizing stress testing along with echocardiography to visualize the structure, function and wall motion of the myocardium.
- **Treadmill Echo**: Patients that can walk a treadmill >6min., are <350 pounds, and do not have a LBBB or pacemaker.
- **Dobutamine Echo**: Patient's that cannot walk a treadmill >6min., and do not have a LBBB or pacemaker, or for patients >350 pounds (treadmill wt. limit is 350#)
  - (Medicated test in which patients are given Dobutamine to increase heart rate to a minimum of 85% of age predicted max heart rate)

**Myocardial Perfusion Imaging**: Nuclear stress testing that evaluates a patient for coronary artery disease by visualizing perfusion and function of the myocardium.
- **Treadmill Nuclear**: Patients that can walk a treadmill >6min., are <350 pounds, and do not have a LBBB or pacemaker.
- **Lexiscan Nuclear**: Patient's that cannot walk a treadmill >6min., or for patients that have a LBBB or pacemaker.
  - (Medicated test in which patients are given Lexiscan to dilate the coronary arteries to assess blood flow to the heart- do not need to increase heart rate)

**Other testing offered at SH-CVI**: Nuclear MUGA imaging, GXT-treadmill stress testing (no imaging) and vascular testing (Vascular tests include: Carotid duplex tests, Renal Doppler studies, Upper and Lower Venous and Arterial studies, and ABI testing.)
# Algorithm for Ordering Noninvasive Cardiac Stress Testing

<table>
<thead>
<tr>
<th>Patient History</th>
<th>Exercise Echo</th>
<th>Chemical Echo</th>
<th>Exercise Nuclear SPECT MPI</th>
<th>Chemical Nuclear SPECT MPI</th>
<th>Non Imaging Treadmill</th>
<th>CTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient with known CAD/prior stent without prior MI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiomyopathy/resting wall motion abnormalities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient with conduction abnormalities, especially LBBB, A fib and ventricular paced rhythm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient has poor echo windows (e.g. Patient morbid obese BMI &gt;40, COPD, emphysema, or breast implants)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient has poor exercise tolerance/unable to achieve maximum exertion/unable to reach 7 mets (ex. duration of 5 mins)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients with renal insufficiency/failure or allergic to contrast dye</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients with known valvular stenosis or significant regurgitation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low risk &lt; 40 yrs of age male</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;60 yrs of age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hypothermia Initiation to Cath Lab

---

**Inclusion Criteria**
1. Age ≥18 years.
2. Cardiac arrest requiring CPR.
4. No following commands.
5. Core temp ≥33 degrees C.

**Exclusion Criteria**
1. Severe shock requiring high doses of multiple vasoressors.
2. Core temp <32 degrees C.
3. Uncontrolled bleeding or hemorrhagic shock.
4. Pregnancy (relative contraindication - see guideline).
5. Patient is DNR.

---

**Hypothermia For Cardiac Arrest ED to Cath Lab**

- **Patient to ED post arrest.**
  - **YES ROSC**
    - **Is patient a candidate for hypothermia protocol?**
      - **No**
        - Proceed with ED evaluation.
      - **Yes**
        - **Notify CTCC intensivist.**
        - **Initiate Post Cardiac Arrest Hypothermia Power Plan including 12 lead ECG.**
        - **Serial ECGs as indicated q 15.**
        - **STEMI or STEMI equivalent (e.g. VT/VF, suspicious history)**
        - **suggesting ischemic trigger?**
          - **No**
            - **CT Head**
            - Transfer to ICU.
          - **Yes**
            - **Give STEMI Meds**
              - 1. Aspirin rectal or per OG tube
              - 2. Brilliants per OG tube
              - 3. Heparin Solus
            - **If EMS-type airway present, replace with endotracheal tube prior to transfer to cath lab.**

---

**Per Power Plan**
1. Cold Saline IV (30mL/kg up to 2L)
2. Ice packs to axillae & groins
3. Tylenol per rectum
4. Propofol
5. Narcan

---

**Operator pages out STEMI**
- Cath Lab Team activated (includes “patient being cooled” in comments section of the page)

**ED Physician contacts CTCC intensivist through admission process**
- **CTCC team involved in ED care as needed**

**Cath Lab Team Arives**
- Prep's cath lab suite
- Calls ED for patient when ready

**ED delivers patient to the Cath Lab.**

**Cath Lab Team Activates Cath Lab Rap Team upon patient arrival to Cath Lab**
- Cath Lab rap team responds to assess and assist with cooling measures
References:


