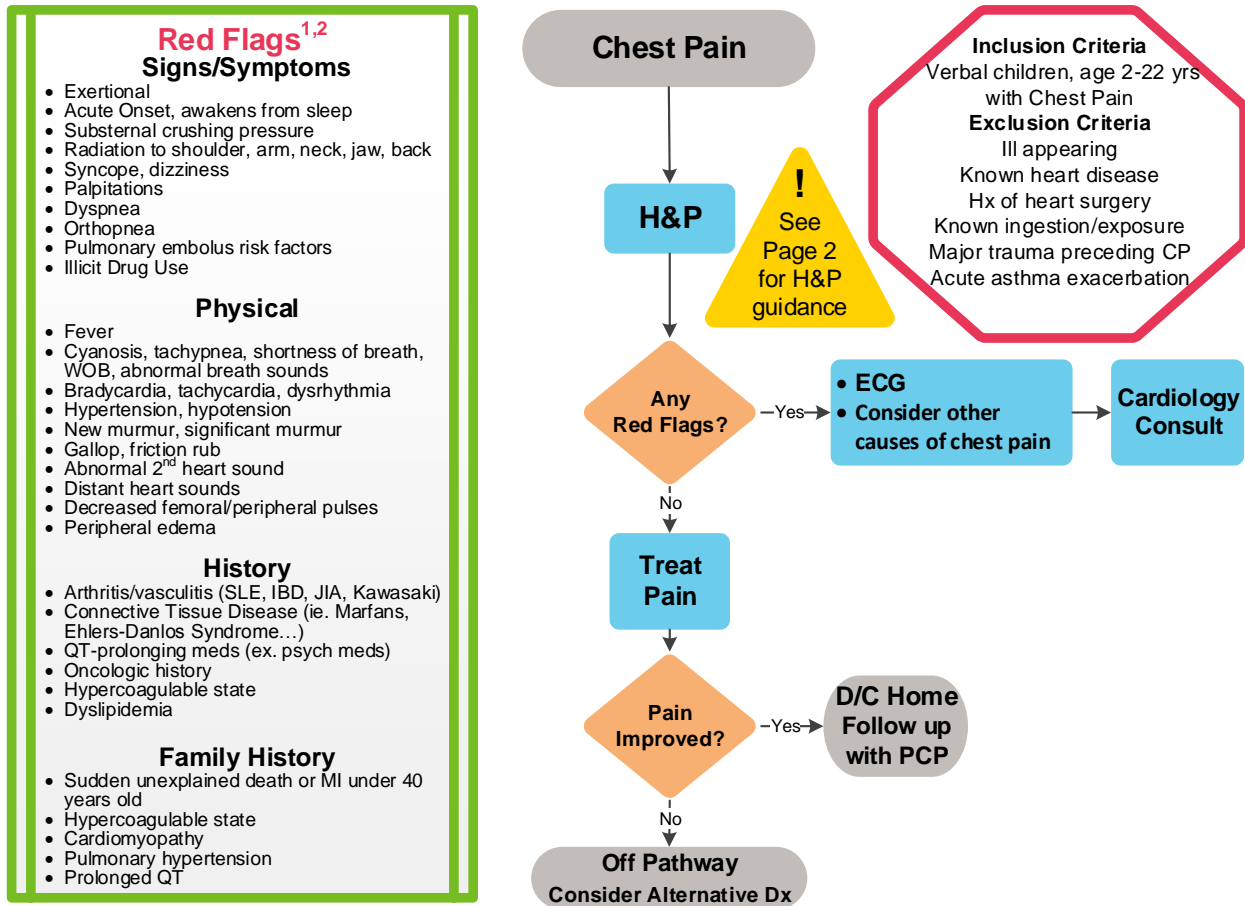


# ED/UC CARDIAC CAUSES OF CHEST PAIN

## ALGORITHM



**Concerning ECG Findings in a  $\geq 2$ yo patient with complaint of chest pain<sup>1,2</sup>**  
 Anschutz: In-person Cardiology Consult  
 NOC: Phone Cardiology Consult to determine if transfer is needed

**Concern of Ischemia, Myocarditis or Pericarditis:**

- Pathologic ST Segment changes in 2 or more contiguous leads: More than 2mm above or below baseline
- Abnormal T wave inversion: >1mm in depth in two or more contiguous leads – Excludes leads aVR, III, and V1
- Pathologic Q waves (more than 5mm deep and >40ms wide) in 2 or more contiguous leads – Excludes leads III, aVR
- Low Voltage QRS amplitude (5mm or less in all six limb leads)

**Right Ventricular Hypertrophy:**

- Upright T wave between 4 days and Puberty in V1 and a qR pattern in V1
- Tall R V1 (>15 mm) and Deep S in V6 (>5mm)
- Right axis deviation for age

**Left Ventricular Hypertrophy:**

- Tall R V6 (>25 mm) and deep S V1 (>25mm)
- Q in V6 > 4mm
- Left axis deviation for age

**Findings that are NOT part of the chest pain pathway but should be reviewed on all EKGs (if any of the below are found – please call the cardiology fellow on call for a phone consultation)**

- Evaluate the QTc (Seattle criteria that applies to athletes *Prolonged QTc*(calculated per Bazett's Formula= $QT/\sqrt{RR}$ ) greater than or equal to 450 msec<sup>1,4</sup>. Note: Prolonged QTc in of itself rarely is an etiology for chest pain, these patients more often present with syncope
- Abnormal: >470 msec in males, > 480 msec in females. And, Bazett's Formula was not designed for HR >100 bpm. In the absence of syncope or seizure, would argue more for a repeat EKG rather than consult.
- Abnormal P wave axis (outside of 0-90 degrees) in setting of tachycardia
- Wide QRS for age
- Delta waves, Wolff-Parkinson-White (WPW)
- First degree AV block
- Second degree AV block (Mobitz I, Wenckebach)
- Frequent PVCs on a 12 lead ECG or multiform PVCs

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## TARGET POPULATION

### Inclusion Criteria

- Verbal children, age 2-22 years old, complaining of chest pain

### Exclusion Criteria

- Ill appearing
- History of congenital heart disease
- History of heart surgery
- Known ingestion/exposure
- Major trauma preceding chest pain
- Acute asthma exacerbation

## BACKGROUND | DEFINITIONS

- Cardiac causes of chest pain are rare among children<sup>3,4</sup>
- This pathway focuses on identification of children at high risk for serious underlying pathology

## INITIAL EVALUATION

**\*Concerning findings are in bold red below**

### History<sup>1</sup>

- Pain: location, onset (**acute**), frequency, duration, quality (**substernal, crushing**), severity, radiation (**shoulder, arm, neck, jaw, back**)
- Triggers: **exertional**, post prandial, pleuritic
- Alleviating factors: rest, position, medications

- Associated symptoms: **dizziness, near syncope/syncope, dyspnea, orthopnea, palpitations, fever**, cough, sore throat, history of foreign body or caustic ingestions, rash, arthralgia, arthritis
- Social: anxiety, depression, **substance abuse**
- Medications: recent medications, including over the counter medications, supplements and caffeine intake

### Physical Exam<sup>1</sup>

- Complete set of vital signs including blood pressure (**hypertension, hypotension**) and pulse oximetry
- General: Perfusion, pulses (**decreased femoral/peripheral**), appearance (**cyanosis**), distress, anxiety, **edema**
- Chest: Heart rate and rhythm (**bradycardia, tachycardia, dysrhythmia, murmur, S2, gallop, distant heart sounds, friction rub**, etc.), Lung (**wheezing, rales, crackles, air entry, respiratory distress, tachypnea**, etc.), focal chest tenderness, crepitus, asymmetry of chest
- Abdomen: Hepatosplenomegaly (HSM), epigastric tenderness
- Other: **fever**, rash, arthritis, trauma, thrombophlebitis

## CLINICAL MANAGEMENT

- Aims at identification of patients at high risk for serious underlying pathology
- [See algorithm](#)

## LABORATORY STUDIES | IMAGING

- Most patients do not require any studies or imaging
- ECG is indicated for patients with Red Flags (see page 1)
  - ECG tutorial with examples: <https://lifeinthefastlane.com/ecg-library/paediatric-ecg-interpretation/>
- CXR and Laboratory evaluation maybe indicated in patients with Red Flags (see page 1)

## THERAPEUTICS

Treat pain as indicated.

## PARENT | CAREGIVER EDUCATION

Chest pain discharge Smart Set is available for use in appropriate patients.

## REFERENCES


1. M'Farrej, M., Mohan, S., Nandi, D., Stephens, P., Amaya, D., Lavelle, J. ED Pathway for the Evaluation/Treatment of Chest Pain in Children without Known Cardiac Disease. Children's Hospital of Philadelphia, <http://www.chop.edu/clinical-pathway/chest-pain-clinical-pathway> . March 2016. Retrieved April 10, 2017.
2. Division of Emergency Medicine Evidence Based Guideline for Chest Pain, Boston Children's Hospital, updated 7/26/2016.
3. Drossner DM, Hirsh D a, Sturm JJ, et al. Cardiac disease in pediatric patients presenting to a pediatric ED with chest pain. *Am J Emerg Med* 2011;29:632–8.
4. Saleeb SF, Li WY V, Warren SZ, et al. Effectiveness of screening for life-threatening chest pain in children. *Pediatrics* 2011;128: e1062–8.

**CLINICAL IMPROVEMENT TEAM MEMBERS**

- Irina Topoz, MD** | Emergency Medicine
- Timothy Givens, MD** | Emergency Medicine
- Roxanna Lefort, MD** | Emergency Medicine
- Emily Greenwald, MD** | Emergency Medicine
- Patrick Burchett, PNP** | Emergency Medicine
- Kevin Carney, MD** | Emergency Medicine
- Leah Kaye, MD** | Emergency Medicine
- Cindy Barrett, MD** | Cardiology
- Michael Schaffer, MD** | Cardiology
- Kaylee Wickstrom, RN** | Clinical Effectiveness
- Elise Rolison, RT** | Clinical Effectiveness

**APPROVED BY**

- Clinical Pathways and Measures Committee – May 15, 2017
- ED/UC Pathways and Policies Committee- August 1, 2017
- Pharmacy & Therapeutics Committee – N/A

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Scheduled for full review on May 15, 2021.

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