ED/UC CARDIAC CAUSES OF CHEST PAIN

ALGORITHM

**Red Flags**

**Signs/Symptoms**
- Exertional
- Acute Onset, awakens from sleep
- Subternal crushing pressure
- Radiation to shoulder, arm, neck, jaw, back
- Syncope, dizziness
- Palpitations
- Dyspnea
- Orthopnea
- Pulmonary embolus risk factors
- Illicit Drug Use

**Physical**
- Fever
- Cyanosis, tachypnea, shortness of breath, WOB, abnormal breath sounds
- Bradycardia, tachycardia, dysrhythmia
- Hypertension, hypotension
- New murmur, significant murmur
- Gallop, friction rub
- Abnormal 2nd heart sound
- Distant heart sounds
- Decreased femoral/peripheral pulses
- Peripheral edema

**History**
- Arthritis/vasculitis (SLE, IBD, JIA, Kawasaki)
- Connective Tissue Disease (ie. Marfans, Ehlers-Danlos Syndrome...)
- QT-prolonging meds (ex. psych meds)
- Oncologic history
- Hypercoagulable state
- Dyslipidemia

**Family History**
- Sudden unexplained death or MI under 40 years old
- Hypertensive state
- Cardiomyopathy
- Pulmonary hypertension
- Prolonged QT

**Concerning ECG Findings in a ≥2yo patient with complaint of chest pain**

**Inclusion Criteria**
- Verbal children, age 2-22 yrs with Chest Pain

**Exclusion Criteria**
- Ill appearing
- Known heart disease
- Hx of heart surgery
- Known ingestion/exposure
- Major trauma preceding CP
- Acute asthma exacerbation

**Concerning ECG Findings in a ≥2yo patient with complaint of chest pain**

- ECG
  - Consider other causes of chest pain
  - Cardiology Consult

**Off Pathway**
- Consider Alternative Dx

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**Concerns 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/√RR) greater than or equal to 450 msec). 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\textsuperscript{3,4}
- This pathway focuses on identification of children at high risk for serious underlying pathology

INITIAL EVALUATION

*Concerning findings are in bold red below

History\textsuperscript{1}

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

- 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**

- 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/](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


2. Division of Emergency Medicine Evidence Based Guideline for Chest Pain, Boston Children’s Hospital, updated 7/26/2016.


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