ED/UC CARDIAC CAUSES OF CHEST PAIN

ALGORITHM

Red Flags¹,² 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 2¹ heart sound
- Distant heart sounds
- Decreased femoral/peripheral pulses
- Peripheral edema

History
- Arthritis/vasculitis (SLE, IBD, JIA, Kawasaki)
- Connective Tissue Disease (e.g. Marfans, Ehlers-Danlos Syndrome…)
- QT-prolonging meds (ex. psych meds)
- Oncologic history
- Hypercoagulable state
- Dyslipidemia
- Sudden unexplained death or MI under 40 years old
- Hypertension, hypotension
- New murmur, significant murmur
- Gallop, friction rub
- Abnormal 2¹ heart sound
- Distant heart sounds
- Decreased femoral/peripheral pulses
- Peripheral edema

Family History
- Sudden unexplained death or MI under 40 years old
- Hypertension, hypotension
- New murmur, significant murmur
- Gallop, friction rub
- Abnormal 2¹ heart sound
- Distant heart sounds
- Decreased femoral/peripheral pulses
- Peripheral edema

Concerning ECG Findings in a ≥2yo patient with complaint of chest pain¹,²

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 = QTc/√RR) greater than or equal to 450 msec²:⁴ 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
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\(^3,4\)
- This pathway focuses on identification of children at high risk for serious underlying pathology

INITIAL EVALUATION

*Concerning findings are in bold red below

History\(^1\)

- 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
• 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


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


Clinical pathways are intended for informational purposes only. They are current at the date of publication and are reviewed on a regular basis to align with the best available evidence. Some information and links may not be available to external viewers. External viewers are encouraged to consult other available sources if needed to confirm and supplement the content presented in the clinical pathways. Clinical pathways are not intended to take the place of a physician’s or other health care provider’s advice, and is not intended to diagnose, treat, cure or prevent any disease or other medical condition. The information should not be used in place of a visit, call, consultation or advice of a physician or other health care provider. Furthermore, the information is provided for use solely at your own risk. CHCO accepts no liability for the content, or for the consequences of any actions taken on the basis of the information provided. The information provided to you and the actions taken thereof are provided on an "as is" basis without any warranty of any kind, express or implied, from CHCO. CHCO declares no affiliation, sponsorship, nor any partnerships with any listed organization, or its respective directors, officers, employees, agents, contractors, affiliates, and representatives.
Discrimination is Against the Law. Children's Hospital Colorado complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex. Children's Hospital Colorado does not exclude people or treat them differently because of race, color, national origin, age, disability, or sex.

Children's Hospital Colorado provides free aids and services to people with disabilities to communicate effectively with us, such as: Qualified sign language interpreters, written information in other formats (large print, audio, accessible electronic formats, other formats). Children's Hospital Colorado provides free language services to people whose primary language is not English, such as: Qualified interpreters, information written in other languages.

If you need these services, contact the Medical Interpreters Department at 720.777.9800.

If you believe that Children's Hospital Colorado has failed to provide these services or discriminated in another way on the basis of race, color, national origin, age, disability, or sex, you can file a grievance with: Corporate Compliance Officer, 13123 E 16th Avenue, B450, Aurora, Colorado 80045, Phone: 720.777.1234, Fax: 720.777.7257, corporate.compliance@childrenscolorado.org. You can file a grievance in person or by mail, fax, or email. If you need help filing a grievance, the Corporate Compliance Officer is available to help you.

You can also file a civil rights complaint with the U.S. Department of Health and Human Services, Office for Civil Rights, electronically through the Office for Civil Rights Complaint Portal, available at ocr.hhs.gov/ocr/portal/lobby.jsf, or by mail or phone at: U.S. Department of Health and Human Services 20 Independence Avenue, SW Room 509F, HHH Building Washington, D.C. 20201 1-800-368-1019, 800-537-7509 (TDD) Compliant forms are available at www.hhs.gov/ocr/office/filerequest.html.

Children's Hospital Colorado complies with applicable Federal civil rights laws and does not discriminate on the basis of race, color, national origin, age, disability, or sex.

ATENCIÓN: si habla español, bene a su disposición servicios gratuitos de asistencia lingüística. Llame al 1-720-777-9800.


注意：如果您使用繁體中文，您可以免費獲得語言援助服務。請致電1-720-777-9800。

ВНИМАНИЕ: Если вы говорите на русском языке, то вам доступны бесплатные услуги переводчика. Звоните 1-720-777-9800.

ЩО ЗАПИЩАЄ МИ: Якщо ви мовчесь українською, вам можна звиноватити безкоштовні служби перекладу. Звертайтеся 1-720-777-9800.


PAUNAWA: Kung nagsasalita ka ng Tagalog, maaari kang gumamit ng mga serbisyo ng tulong sa wikang pilipino sa 1-720-777-9800.

注意力：如果您使用日本語，免費的語言支援可利用。1-720-777-9800 まで、お電話にてご連絡ください。

Niño que habla en español, bene a su disposición servicios gratuitos de asistencia lingüística. Llame al 1-720-777-9800.