Pediatric Chest Pain
Code STEMI or...?

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**Pediatric Chest Pain**

*Code STEMI or....???

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**CASE**

- Chest pain of ½ hour duration
  - Subternal and left chest
  - Sudden onset
  - Some epigastric pain
  - Left shoulder pain
  - Sweaty
- What next?

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**What if the patient is....?**

- 60 year old male no previous history of heart disease

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**What if the patient is....?**

- 52 year old male marathon runner. No previous history of heart disease.
  - Seen yesterday in ED with diagnosis of GERD

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**What if the patient is....?**

- 62 year old male no previous history of heart disease who approaches you at a rest stop for a bike event. Pain started after eating

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**What if the patient is....?**

- 13 year old male
  - Pain is sharp radiates to back
What if the patient is....?

- 13 year old male
- Previous history of heart disease

Here in Pierce County
This child received an IV, morphine aspirin and nitroglycerin in the field with a normal EKG.
PAH Valvular Aortic Stenosis

What if the patient is....?

- 15 year old male
- No previous history of heart disease
- History of Sickle Cell Anemia

What if the patient is....?

- 7 year old male
- Recent surgery for valvular AS

Adult vs. Pediatrics

- Adult up to 45% of ED Visits
  - High rate of cardiac disease
  - Time is muscle mentality
- Pediatric
  - 1% of Pediatric ED visits
  - 6% of adolescent EMS
    - Abdominal pain more common
  - Rarely significant cause

Causes

- Median age 12.5
- 43% acute <48 hours
- Males equal to Females
- Trauma more common in males
- Costochondritis and psychogenic causes more common in females
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Causes
- ECG abnormal in 16% but <3% of those had new or significant findings
  - Pericarditis, WPW, Myocarditis,
- ECHO Abnormal in 12%
  - MVP in 8.8% Same as general population
- CXR abnormal in 27%
  - Most minor pulmonary findings

Follow-up
- 6-month follow-up of patients
- 43% had intermittent or persistent pain
- No significant disease identified
- 1 mitral valve prolapse
- 1 gastrointestinal disease
- 3 asthma

Causes
- Organic disease more likely if...
  - <12 years old
  - Pain awakening child from sleep
  - Acute onset
  - Abnormal physical
- No relation found to description or location of pain

Differential Diagnosis
- Chest wall
  - Trauma
  - Costochondritis
  - Precordial catch
  - Slipping rib
  - Infection
  - Mastalgia
  - Zoster
- Gastroesophageal
  - Reflux
  - Foreign body
- Pulmonary
  - Asthma
  - Pneumonia/effusion
  - Pneumothorax
  - Pleurisy
  - Pulmonary embolus
  - Malignancy
- Hematologic
  - Sickle cell disease
- Psychogenic

Causes
- Cardiac
  - Angina
    - Coronary abnormalities
    - Hypercoagulable state
  - Cocains
  - Obstructive heart disease
    - BHS, aortic stenosis
  - Pericardial effusion/pericarditis
  - Arrhythmias
  - Myocarditis
  - Aortic aneurysm

67% OF PARENTS WHO BROUGHT CHILD IN FOR CHEST PAIN THOUGHT THEY WERE HAVING A HEART ATTACK

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When to worry?

Case
- A 12-year-old girl with chest pain for 2 days
  - Started gradually
  - Worse with deep breath
  - Had URI last week
  - Afebrile
  - Tender on both sides of sternum
  - Remainder of physical exam normal

Costochondritis
- Inflammation of costochondral cartilage
- Cause
  - Overuse
  - Preceding URI with cough
  - Idiopathic
- Sharp pain, worse with movement respiration
- All ages
- Tenderness over costochondral joints

Case
- A 10-year-old boy presents with recurrent episodes of left chest pain.
  - Feels like a sudden stab
  - Can't take a deep breath
  - Lasts 2-3 minutes
  - Occurs at rest
  - Not reproducible
  - Normal physical exam

Precordial Catch Syndrome
"Texidor's twinge"
- Sudden, brief
- Occurs at rest
- Localized
- Sharp
- Exacerbated by deep breath
- No associated symptoms
- No physical findings
**Case**

- A 6-year-old girl has chest pain at home.
  - Stopped playing, became clingy, said chest hurt
  - Mom thought she looked pale
  - Now looks and feels better
  - HR=110, normal physical exam
  - Has had similar episodes in the past

**SVT**

- In children >1 year
  - 82% present with palpitations
  - 14% with pain
  - 14% perspiration
  - 14% dizzy
  - 4% pallor
  - 1-3% of chest pain complaints in ED
  - 6% of chest pain referred to cardiologist

**Case**

- A 13-year-old boy presents with sudden severe chest pain
  - Sharp pain in anterior chest
  - Appears anxious
  - BP 80/40 in right arm
  - Diastolic murmur

**Marfans**

- Caused by fibrillin gene mutation
- Manifestations
  - Musculoskeletal: Tall, long limbs and fingers, pectus
  - Ocular: Lens dislocation
  - Cardiovascular: Aortic root dilation, MVP
  - Pulmonary: Spontaneous pneumothorax
  - 50% have aortic root dilation by age 10 years
  - 90% have aortic root dilation by age 20 years

**Aortic dissection**

- Children at risk
- Marfan syndrome
- Ehlers-Danlos
- Coarctation
- Aortic stenosis
- Turner syndrome
- Endocarditis
- Cocaine use

**Case**

- A 15-year-old girl calls with chest pain
  - Present for several days
  - Now much worse 10/10
  - Reports feeling dizzy and short of breath numbness of fingers
  - I think I am having a heart attack
  - Physical exam Tachycardic
  - Grandmother died last week of heart attack
**Psychogenic**
- 5-20% of chest pain in children
  - More common in adolescents
  - Recent or current stressful situation
  - Family illness, especially cardiovascular
  - Family history of chest pain
  - Other somatic and sleep complaints
  - Depression
  - Often with acute anxiety attack

**Case**
- A 17-year-old female presents at soccer practice with chest pain that has lasted for 1 hour
  - Pain began during soccer practice
  - Has happened previously with exercise
  - Midsternal, squeezing, radiates to left arm
  - PMH: Admitted to hospital for FUO at age 2 years
  - What was the FUO?

**EKG**
- What does this look like to you?

**Kawasaki Disease**
- Acute febrile vasculitis of childhood
  - Features
    - Fever (>39 degrees for 5 days)
    - Non-exudative conjunctivitis
    - Erythema of oral mucosa and tongue
    - Erythema and swelling of hands and feet
    - Cervical adenitis >1.5 cm
    - Rash
  - Leading cause of acquired heart disease in kids

**Cardiac sequelae of KD**
- Myocarditis (50% of patients)
- Pericarditis
- Mitral, aortic insufficiency
- Anhythmias
- Coronary aneurysms
  - 20-30% if untreated
  - 5% if treated with IVIG
- Appears 7 days to 4 weeks after onset of fever
- Long-term follow-up (>10 years) of 554 untreated patients
- IVIG treatment standard since late 1980’s
  - 24% had coronary aneurysms
  - 49% had regression
  - 15% developed stenosis (4% of total)
  - 8% developed myocardial infarction (2% of total)

**Myocardial ischemia in children**
- Anomalous coronary arteries
  - Prevalence 2:1000
  - Anomalous origin of L coronary from pulm. artery
  - Presents in first months of life
  - Irregularity, heart failure, cardiac enlargement
  - Anomalous origin from incorrect sinus of Valsalva
  - Presents later in childhood
  - Compression between aorta and pulm. artery
  - Hypoplastic coronary arteries
**Myocardial ischemia in children**
- Sickle cell disease
  - Myocardial infarction uncommon but described
  - Perfusion defects in 5% children studied in a Paris sickle cell clinic (Arch Dis Child 2004;89:359-62)
- Microvascular occlusion of small vessels
- Naphotic syndrome
- Thrombotic occlusion of coronary arteries
- Long-standing diabetes mellitus
- Familial hypercholesterolemia
- SLE, Antiphospholipid antibody syndromes
- Cardiac transplant
- Cocaine abuse

**Hypertrophic cardiomyopathy**
- Autosomal dominant
- Symptoms in 2nd decade
- May present with angina-like pain or syncope
  - Impaired diastolic relaxation, increased O2 demand
- Risk of sudden death 0% in children
- Diagnosis
  - Systolic ejection murmur
  - Increase with decreased LV volume (Valsalva, squatting, standing)
  - Normal or increased heart size on CXR
  - ECG with LVH, LAO, conduction abnormalities
  - Echocardiography diagnostic

**Sudden Cardiac Death**
- Up to 50% of childhood cases of sudden death have symptoms suggestive of pathology prior to cardiac arrest
- 2/3 of sudden death cases are due to
  - Myocarditis
  - HCM
  - Coronary artery disease
  - Congenital coronary artery anomalies
  - Aortic lesions
  - Abnormalities of the conduction

**Myocarditis**
- Usually viral etiology
  - Enterovirus (coxsackie), adenovirus
  - Neonates lethargy poor feeding pallor fever
  - Older Weakness fatigue chest pain SOB
  - Tachycardia poor perfusion diminished pulses signs of heart failure
  - Chest pain, muffled heart tones gallop crackles
  - Shock
- EKG
  - Decreased voltages (<5 mm) limb leads
  - LVH
  - Prolonged PR interval, prolonged QT interval

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**Case**
- A 6-year-old girl presents with cough for 3 weeks and chest pain for 1 week
  - Feels very tired weak
  - Illness began with URI 3 weeks ago
  - Afibrile
  - Heart rate = 160
  - Liver palpable 3 cm below RCM

**Case**
- A 16-year-old boy has a syncopal episode at a track meet. You are called on the side lines
  - He is now awake sitting up
  - Remembers having chest pain during his race
  - Father died suddenly in his 30's
  - Systolic murmur on exam

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Case

- 15-year-old girl with chest pain who seems unwell.
  - Seen at PCP for pneumonia and treated
  - Worsening dyspnea and chest pain for 3 days
  - Leaning forward holding her chest

Pericarditis

- Infectious etiology common in children
- Pain
- More common in older children and adolescents
- Worse when supine, relieved by leaning forward
- Physical findings
  - Friction rub if effusion small
  - Muffled heart sounds, pulsus paradoxus if large

EKG

- Low voltages
- ST elevation
- Usually leads I, II, V5, V6
- Electric alternans
  - Produced by swinging motion of heart within effusion

Post-Pericardiotomy syndrome

- Pericarditis
- Pericardial effusion
- Cardiac surgery
- Transplant

Tamponade

- Becks Traid
  - Hypotension
  - Muffled heart tones
  - Distended neck veins
- Pericardiocentesis

Case

- A 3-year-old boy with chest pain for several hours
  - Points to sternal notch
  - Drooling
  - Refusing juice
  - Afebrile, well-appearing
  - Mild stridor
Case

A 14-year-old boy at basketball practice during which he said his chest hurt
• Pain increasing more on left
• Now with difficulty breathing
• Decreased breath sounds on left

Pneumothorax

• Children at risk
  - Asthma, bronchiolitis
  - Barotrauma
  - Cough, choking, vomiting
  - Crack, cannabis
  - Cystic fibrosis
  - Marfan syndrome
  - Tall male teenagers

Approach to Pediatric Chest Pain

Even though rarely serious don't

Worrisome Physical Findings

• Abnormal cardiac exam
  - Ejection murmur at URSB
  - HOCM, AS
  - Other loud murmurs
    • AS, PS
  - Clicks, Rubs
    • AS, PS, MVP
    • Pericarditis, hemopericardium

Approach

• ABCDE
  - Reassuring physical findings:
    • Lack of significant murmurs
    • Tenderness at costochondral margins
  • Worrisome
    • SOB or increased WOB
    • Poor perfusion
    • Sick

Reassuring History

• Occurrence at rest or with activity
• Nonspecific or variable description
• New exercise routines using chest muscles
• Pain on the right side of chest
• Brief sharp pain lasting seconds
• Dull pain lasting hours
• Association with psychological stress
• Relatives or acquaintances with recent heart problems or death
History Red Flags

- Pain with exertion, palpations or syncope
- Sudden onset persistent
  - Pain during night or awakens from sleep
- Substance abuse
- Prior cardiac history
  - Surgery, Kawasaki
- Family history of sudden cardiac death, Marfans

Approach

- Treat the ABC's
- Transport as appropriate
- But
  - No aspirin, morphine or nitroglycerin without base contact

Contact Information

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