Common Cardiac Complaints in College Students

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Disclosures

• No disclosures
“He’s complaining of chest pain, shortness of breath, cramps and dizziness. Do you sell earplugs?”
Chest Pain
Definition, etc.

• A pain or uncomfortable sensation in the chest
• One of the three cardinal signs of heart disease. The other two being; dyspnea and palpitations.
• One of the most common challenges for the practitioner.
Chest Pain: The Challenge

• Patients presenting with chest pain who have life threatening underlying disease often look well on initial presentation

• It is estimated that 8-10% of patients presenting with ACS are discharged mistakenly from the ED

• These patients have 30 day mortality of 2%
Pain

Visceral Pain

- Visceral fibers enter the spinal cord at several levels leading to poorly localized, poorly characterized pain. (discomfort, heaviness, dull, aching)
- Heart, blood vessels, esophagus and visceral pleura are innervated by visceral fibers
- Because of dorsal fibers can overlap three levels above or below, disease of thoracic origin can produce pain anywhere from the jaw to the epigastrum
Pain

Parietal Pain

• Parietal pain, in contrast to visceral pain, is described as sharp and can be localized to the dermatome superficial to the site of the painful stimulus.

• The dermis and parietal pleura are innervated by parietal fibers.
## Table 1. Causes of Chest Pain in the Primary Care Setting

<table>
<thead>
<tr>
<th>Final diagnosis</th>
<th>United States*¹</th>
<th>Germany†²,³</th>
<th>Switzerland‡⁴</th>
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<tbody>
<tr>
<td>Musculoskeletal conditions and chest wall pain</td>
<td>36.2</td>
<td>46.6</td>
<td>48.7§</td>
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<td>Gastrointestinal conditions</td>
<td>18.9</td>
<td>—</td>
<td>8.2</td>
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<tr>
<td>Nonspecific chest pain</td>
<td>16.1</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Other or no diagnosis</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Stable angina</td>
<td>10.5</td>
<td>11.3</td>
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<tr>
<td>Psychogenic pain</td>
<td>7.5</td>
<td>—</td>
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<tr>
<td>Respiratory condition</td>
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<td>—</td>
<td>10.3</td>
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<tr>
<td>Nonischemic cardiac condition</td>
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<td>—</td>
<td>3.1</td>
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<tr>
<td>Acute cardiac ischemia</td>
<td>1.5</td>
<td>3.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>—</td>
<td>—</td>
<td>0.3</td>
</tr>
</tbody>
</table>

*—Study included 399 patients in 12 family practices in Michigan.
†—Study included approximately 1,200 patients in 74 primary care practices in Germany. Data for other diagnoses have not been published.
‡—Study included 672 patients from 59 primary care practices in Switzerland.
§—Includes patients with traumatic chest pain (3.9 percent).

Information from references 1 through 4.
Case

• A 20 year old comes into student health complaining of chronic chest pain with exercise. It is non-focal, not pleuritic, not sharp, goes away in 3 to 5 minutes after he stops exercising.
Coronary Anomalies

RCA from left cusp

LM from right cusp
Case

- A 26 year-old man had acute anterior myocardial infarction at midnight after drinking alcohol.
- He had had bilateral coronary aneurysms caused by KD at the age of 8 months. Selective coronary angiograms (CAGs) at the age of 7 years revealed regression of both coronary aneurysms. He had no symptoms until the onset of acute myocardial infarction.
Case

• It should be recognized that young adults with apparently normal coronary arteries angiographically after regression of large coronary aneurysms caused by KD may occasionally have acute coronary syndromes.

• Risk factors for atherosclerosis must be avoided in this population.
ACS

Acute Coronary Syndromes - History

• “Typical” Chest Pain Story (Pressure-like, squeezing, crushing pain, worse with exertion, SOB, diaphoresis, radiates to arm or jaw) The majority of patients with ACS DO NOT present with these symptoms!

• Cardiac Risk Factors (Age, DM, HTN, FH, smoking, hypercholesterolemia, cocaine abuse)
ACS

Acute Coronary Syndromes – EKG Findings

• STEMI - ST segment elevation (>1 mm) in contiguous leads; new LBBB
• T wave inversion or ST segment depression in contiguous leads suggests subendocardial ischemia
• 5% of patients with AMI have completely normal EKGs
Chest Pain Case

- A 26 year old man presents with intermittent, sharp, mid-sternal chest pain. The pain is somewhat worse with inspiration and is associated with mild dyspnea. Several weeks ago, he had “cold” symptoms.
Chest Pain

Two Goals

• Determine the diagnosis
• Implement the immediate management plan-
  Is this life threatening?
Chest Pain

- Is the chest pain due to an acute, potentially life-threatening condition that mandates immediate hospitalization and aggressive evaluation?
  - Acute Coronary Syndromes
  - Pulmonary Embolus
  - Tension Pneumothorax
  - Aortic Dissection
  - Esophageal Rupture
  - Pericarditis with Tamponade
Chest Pain

Is the chest pain due to a chronic condition that may lead to a serious complication?

- Stable Angina
- Aortic Stenosis
- Pulmonary Hypertension
Chest Pain

Is the chest pain due to an acute condition that mandates specific treatment?

• Pericarditis
• Pneumonia/Pleuritis
• Herpes Zoster
Chest Pain

Is the chest pain due to a treatable chronic condition?

- Esophageal Reflux or Spasm
- Peptic Ulcer Disease
- Gallbladder Disease
- Other Gastrointestinal Conditions
- Musculoskeletal Disease
- Anxiety
Chest Pain History

- **O**: Onset
- **L**: Length, Location
- **D**: Duration
- **C**: Compounding factors—alleviating or aggravating
- **A**: Associated Symptoms
- **R**: Radiation
- **S**: Severity, quality
Chest Pain
History

• Exertional or non-exertional
• Cardiac Risk Factors
• Previous Cardiac History
• Previous GI History
• Previous Pulmonary History
• Recent Prolonged Immobility
• Drugs; cocaine, methamphetamines
Chest Pain
Physical Exam

• Blood pressure in Both Arms
• Pulses in both legs
• Chest auscultation – decreased breath sounds, pleural rub, evidence of pneumothorax, pulmonary embolus, pneumonia, pleurisy.
• Cardiac exam should include second heat sound, rub, third or fourth heart sound, murmurs
Chest Pain Case

• General no acute distress
• Weight 160 pounds, height 72 inches
• Heart rate 110 bpm (beats per minute)
• Respiratory rate 20
• Blood Pressure 124/70 in both arms
Chest Pain
Case

• No JVD, carotids equal/brisk upstrokes, no bruits
• Normal lung exam
• Pericardial friction rub present
Chest Pain Case

- Abdomen soft/non-tender, no organomegaly, no abnormal pulsations or bruits
- No cyanosis, clubbing, or edema
- Peripheral pulses equal (U/L extremities)
Chest Pain

Labs

What labs do you want to order?

• Chest X-ray
• ECG (Electrocardiogram)
• Cardiac Enzymes: Troponin or CPK
• Computed Tomography (CT)
• MRI
• Echocardiogram
ECG
Case 7

• 19 year old healthy male had a mild URI 2 weeks ago which was getting better. He has a mild cough that is getting better each day. Last night he could not lie supine as he had sub-sternal chest pressure and a sensation of not getting enough air. He is sitting on the exam table leaning forward with his elbows on his knees.

• On exam: no JVD, lungs clear. heart: normal S1 & S2 no murmurs, +rub, no wheeze or adventitious sounds.

• Diagnosis?

• Possible etiology?
Case 6

• A 16 year old female with no past medical history complains of on and off pleuritic sternal chest pain worsening over the last few weeks. No injury, no radiation, no associated symptoms. It can last all day.
• She points to the left sternal border.
• Her exam is normal but she winces when you gently press on the sternal rib border
• Diagnosis?
Case 2

• 18 year old volleyball player with sudden onset of searing, severe, the worst back pain she has ever had.
Physical Exam

This person with the Marfan syndrome is tall and thin and has an arm span that exceeds her height.
Famous People with Marfan Syndrome

? Michael Phelps

Flo Hyman
Dissection

- Blood dissects aortic intimal and adventitial layers
- False lumen is created
- Dissection may extend proximally, distally, or in both directions
Aortic Dissection Should be Suspected in the Following:

• Bimodal distribution
  – Young: Connective tissue (Marfan) or pregnancy
  – Older: Most commonly > 50 (mean age 63)

• Risk factors
  – Male: 66% of patients
  – Hypertension: 72% of patients
  – Connective tissue disease
    • 30% of Marfan patients get dissections
  – Cocaine Use
  – Syphilis
Aortic Dissection

- Presentation (Difficult clinical diagnosis)
  - 85% have chest or back pain
  - “Ripping” or “tearing” in 50%
  - Neurologic symptoms in 20%
  - Hematuria
  - Asymmetric pulses, blood pressure
Aortic Dissection: diagnosis

• **CXR**- Widened mediastinum, abnormal aortic knob, pleural effusions
  – Not sensitive (25% have wide mediastinums)

• **Chest CT**- Very sensitive and specific
  – Quickly obtained
  – Must think about kidney + contrast

• **Angiography**- Gold standard
  – Most reliable anatomy of dissection

• **Bedside US** – evaluate aorta and look at heart to r/o tampanode.
19 year old is evaluated in the ED for acute onset of substernal CP radiating to the L arm. Smoker and PMH of HTN. PE 210/95 L arm, 164/56 R arm, HR 90, RR 20, dullness half way up the R posterior thorax, 2/6 diastolic murmur at RUSB.

What is the most appropriate med to administer?

ASA
IV heparin
Thrombolytic
Beta blocker
ACEI
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What is the most appropriate med to administer?

ASA
IV heparin
Thrombolytic
Beta blocker
ACEI
Ascending Dissection with Acute AR

- Aortic Regurg: Diastolic murmur

- Risk Factors:
  - age
  - HTN
  - bicuspid aortic valve
  - Coarctation
  - 3rd trimester pregnancy and Marfan Syndrome
  - Marfan syndrome

- Possible imaging include:
  - CT chest with contrast
  - MRI with contrast
  - TEE

- Complications:
  - MI from anterograde propagation,
  - Tamponade
  - limb ischemia (if great vessels involved)
  - aortic rupture
Case

• 18 year old healthy male was lifting weights when he had sudden onset of sharp CP & shortness of breath.
• HR 122, RR 34, BP 70/P, Sat 88%
• Decreased breath sounds on left.

What do you do first?
Case 5

• Well thin 24 year old male with no PMH presents with a 2 hour history of sudden onset left sided chest pain and mild shortness of breath. No drugs, tobacco, injury or recent illness.

• Vitals T 97.7 BP 152/80 HR 102 RR 24 sat=93%.

• Exam is unremarkable. EKG, otherwise normal

• What is the most likely diagnosis with this age group and presentation?
Case

• A 18-year-old male patient came to Student Health with complaints of shortness of breath and chest pain which started one day ago.

• The shortness of breath was mild in severity, made worse by exertion and relieved with rest, associated with pleuritic chest pain, left sided, 5-6/10, sharp in nature.

• He denied any similar symptoms in the past.
Case

• He also denied any use of illicit drug like cocaine or and any history of trauma.
• He did not have any past medical history or past surgical history.
• He had no family history of premature CAD or asthma. He does not smoke or drink alcohol.
• He was on no prescription medications and he participated in sports without any difficulty.
Case

• Blood pressure 112/70 mm/Hg, HR 90 bpm, temp. 98.7 F and RR was 23/min, SpO2 90 % on room air. His height was 5’10” with BMI of 19.9. He was in mild respiratory distress. HEENT exam was unremarkable. No crepitus was felt. Trachea was in the midline
Case

• On auscultation, there were no breath sounds on the left side with hyperresonance on percussion. S1 and S2 were normal with no murmurs/rubs or gallops. The abdomen was unremarkable. No pedal edema was appreciated. No clinical stigmata of Marfan’s syndrome like high arched palate or increased arm span were observed.
Case

• Primary pneumothorax occurs in the absence of any lung disorder.
• It occurs mostly in tall thin young men.
• A subset of the patients may be predisposed by a genetic disorder, Marfan’s syndrome.
Pneumothorax

Tension Pneumothorax - Pathophysiology

• Collection of air in the pleural space causes collapse of the ipsilateral lung and then cardiovascular collapse as intrathoracic pressures increase.
Pneumothorax

Tension Pneumothorax - Diagnosis

• Risk factors: COPD; connective tissue disease, trauma, recent instrumentation, positive pressure ventilation

• Absent breath sounds unilaterally, hypotension, distended neck veins, tracheal deviation
Pneumothorax

Tension Pneumothorax - Treatment

• Needle decompression
• Tube thoracostomy
Case

• A 26-year-old man was seen because of acute thoracic pain, dyspnea and vomiting following alcohol consumption and vomiting.
• He had a 2-year history of alcohol abuse and hard smoking.
• On exam, he had tachycardia and fever (39.2°C) with 90/60 mmHg of blood pressure.
Case

- Physical examination detected no ventilation on the left hemithorax.
- Chest roentgenogram uncovered left pneumothorax with complete collapse of the lung parenchyma, left pleural effusion, pneumomediastinum and bilateral subcutaneous emphysema in the neck and right axillary region
Esophagus

Esophageal Rupture - Pathophysiology

- Tear in the esophagus leads to leaking of gastrointestinal contents into the mediastinum
- Inflammation followed by infection cause rapid deterioration, sepsis and death
Esophageal Rupture - Diagnosis

• Rare but devastating
• Risk Factors: iatrogenic, heavy retching, trauma, foreign bodies, toxic ingestion
• Radiology: Mediastinal air on plain films or CT scan
Esophagus

Esophageal Rupture - Treatment

• Antibiotics
• Supportive Care
• Small tears with minimal extraesophageal involvement can be managed conservatively
• Surgical consult for all regardless of size
Esophagus

• The majority of spontaneous longitudinal tears in the esophagus are encountered most commonly in persons who have history of alcoholism, attributed to episodes of vomiting or gastroesophageal reflux in the onset of an alcoholic stupor.
Esophagus

- Patients often present with non-specific complaints and subtle physical findings, making diagnosis difficult so that the problem frequently goes unrecognized until late in the clinical course.
Case

• 45 year old non-traditional student presents with neck pain. She was on study abroad in Europe when it first started 3 weeks ago. She was seen, had a CT scan, physical exam which were normal. She was told it was a sprain. It comes and goes with no pattern. Now it is getting worse. She is also very tired.

• Thoughts?
Evaluation of patients presenting with symptoms suggestive of ACS. ACC indicates American College of Cardiology; AHA, American Heart Association.

Amsterdam E A et al. Circulation 2010;122:1756-1776
What is Angina

- “not a pain”
- tightness, pressure, heaviness
- usually in center of chest
- may radiate to either arm, neck, jaw
- usually provoked by exercise (walking)
- usually relieved by rest
- lasts no more than 2 minutes
Case

• An 20-year-old man with no significant past medical history presents to Student Health complaining of a sudden onset of chest pain that awakened him from sleep at 4 AM.
• The pain is located in the midsubsternal region and radiates to the neck.
Case

• The patient describes it as a sharp pain; when asked to rate the pain on a scale of increasing severity from 1 to 10, he states that it is an 8.
• The pain worsens with inspiration and is associated with shortness of breath.
• The patient denies having any fevers, chills, cough, hemoptysis, nausea, or vomiting.
• He has not had any recent trauma or surgeries.
Case

• He admits to occasional marijuana use and remote experimentation with inhaled methamphetamines.
• He denies any alcohol use.
• He states that he is not currently taking any medications and does not have any known allergies to medications.
Case

• On physical examination, he is noted to be a well-developed, well-nourished male in no acute distress.

• He does not appear to be tachypneic or cyanotic. The vital signs show a temperature of 98.1°F (36.7°C), a blood pressure of 94/58 mm Hg, a heart rate of 67 bpm, a respiratory rate of 20 breaths/min, and an oxygen saturation of 95% while breathing room air.

• The rest of the exam is normal.
Case

• The chest radiograph shows linear and curvilinear radioluencies in the anterior mediastinum and possibly pericardium suggestive of pneumomediastinum and minimal pneumopericardium.
Case

• Spontaneous pneumomediastinum is a rare, usually self-limited disease primarily affecting young men. More than 75% of reported cases occur in males, with a mean age of 20 years.

• The most commonly proposed cause of pneumomediastinum is alveolar rupture, which occurs in the presence of elevated intra-alveolar pressure or damage to the alveolar walls.
Case

- Pneumomediastinum has also been found to be associated with inhalational drug use.
- Theoretically, this has been thought to be caused by barotrauma from prolonged forceful breath holding.
- Cocaine and marijuana users perform a Valsalva-type maneuver during deep inhalation of the respective substance (often through a water pipe), leading to an increase in intra-alveolar pressure and subsequent alveolar rupture.
- There is no evidence of a direct pharmacological effect of illicit drugs on spontaneous pneumomediastinum.
Case

• 17 year old student with chest pain. It has been occurring off and on for 2 months. It is on the left chest. It is not related to exercise. He can point to the very spot it hurts. It is sharp. He cannot take a deep breath because it hurts more. It last a few seconds to a few hours.

• Thoughts?
Case

• A 20 year old student with pleuritic chest pain, not related to exercise, that is sharp, squeezing, pressure type feeling in the left chest. It wakes her up at night. It feels better when she sits up.

• Thoughts?
Case

• A 23 year old graduate student has chest pain for the past 3 weeks. There is no trigger. It is not related to exercise. It hurts across the entire chest. It never goes away. It gets better and worse on its own. She has not been able to go to school because it is so painful. She cannot work. She cannot sleep.

• Thoughts?
Case

• Normal Physical Exam
• Normal ECG
• Normal CXR
• Normal PFTs
• Normal Exercise treadmill
• Normal echocardiogram
• Normal endoscopy
• Negative cardiac, pulmonary, GI evaluation
Chest Pain
Differential Diagnosis

• Angina
• Myocardial Infarction
• Aortic Stenosis
• Aortic Dissection
• Pericarditis
• Pulmonary Hypertension
• Pulmonary Embolism
• Pneumonia
Chest Pain
Differential Diagnosis

• Spontaneous Pneumothorax
• Esophageal Rupture
• Gastroesophageal Reflux
• Esophageal Spasm
• Musculoskeletal Pain
• Herpes Zoster
• Anxiety
DYSPEPSIA

A 3-IN-1 MEDICAL REFERENCE

Medical Dictionary
Bibliography &
Annotated Research Guide
TO INTERNET REFERENCES
Dyspnea

• The sensation of breathlessness or inadequate breathing, is the most common complaint of patients with cardiopulmonary diseases.

• “shortness of breath” or “breathlessness”

• Defined as abnormal/uncomfortable breathing

• Multiple etiologies -
  – 2/3 of cases - cardiac or pulmonary etiology
Dyspnea-Differential Diagnosis

• Composed of four general categories
  – Cardiac
  – Pulmonary
  – Mixed cardiac or pulmonary
  – Non-cardiac or non-pulmonary
Dyspnea-Cardiac

- CHF
- CAD
- MI (recent or past history)
- Cardiomyopathy
- Valvular dysfunction
- Left ventricular hypertrophy
- Pericarditis/Cardiac Tamponade
- Arrhythmias
Dyspnea-Pulmonary

- COPD
- Asthma/Bronchospasm
- Restrictive Lung Disorders
- Hereditary Lung Disorders
- Pneumonia/Lung infection
- Pneumothorax
- Upper airway obstruction-Aspiration,
Dyspnea-Mixed

- COPD with pulmonary HTN and/or cor pulmonale
- Deconditioning
- Chronic pulmonary emboli
- Pleural effusion
- PULMONARY EMBOLUS
Dyspnea

• Metabolic conditions (e.g. acidosis)
• Pain
• Trauma
• Neuromuscular disorders
• Functional (anxiety, panic disorders, hyperventilation)
• Chemical exposure
Clinical History

- Rapid onset: pulmonary embolism, pneumothorax, elevated left ventricular end diastolic pressure
Clinical History

• Patients with COPD complain of an increased "effort to breathe" as well as a sensation of "unsatisfying breaths" or a sense that they "cannot get a deep breath".

• Heart failure is associated with a sensation of "air hunger" and "suffocation".

• Cardiovascular deconditioning is characterized by "heavy breathing".
Clinical History

- Substernal chest pain with cardiac ischemia
- Fever, cough, and sputum with respiratory infections
- Urticaria with anaphylaxis
- Wheezing with acute bronchospasm
- Dyspnea may be the sole complaint and the physical examination may reveal few abnormalities (e.g., pulmonary embolism, pneumothorax).
Diagnosis

• The history and physical examination lead to accurate diagnoses in patients with dyspnea in approximately two-thirds of cases.

• Chest radiography and pulmonary function testing should be the first tests obtained in the majority of cases in which additional information is required.

• CT scanning is generally reserved for patients in whom there is a suspicion of interstitial lung disease, occult emphysema, or chronic thromboembolic disease or pulmonary emboli.
Physical Exam

Focus on

• Head
• Neck
• Chest
• Heart
• Lower extremities
Diagnostic Studies

• Chest X-ray in all
• Arterial Blood Gases (ABG)
  – Hypoxemia
  – Hypercapnea
  – Acidosis
  – Hard to get
  – Use pulse oximetry!
Pulmonary Embolism

• Prolonged immobility
• Estrogen therapy
• Risk factors for deep vein thrombosis
• Cause of dyspnea is not apparent

Sudden Dyspnea + No Readily Identifiable Cause = Pulmonary Embolism
Pneumothorax

• Acute onset of unilateral chest pain and dyspnea
• May not have underlying lung disease
• Minimal physical findings
• Pleural air on chest x-ray (CXR)
• Primary pneumothorax affects thin, tall males between 10 and 30 years of age
Dyspnea Case

• A 22 year old obese man presents to student health with dyspnea. He reports that the dyspnea began suddenly when he was sitting in class. He notes associated left lateral chest pain that is worse when he breathes deep. He denies fever, chills, or cough.
Dyspnea Case

• He appears to be in moderate respiratory distress.
• BP 110/70 mm Hg
• Heart Rate (HR) 104 bpm regular
• Respiratory Rate (RR) 28/minute
• Oxygen saturation 93 % on room air (at altitude)
• Height 72 inches
• Weight 264 pounds
Case

• 21 year old healthy female smokes ½ ppd for 5 years
• Awoke last night with mild shortness of breath. Today still feels like she is “working harder to breathe” and had to stop several times while walking to her class.
• Your history reveals no CP, URI symptoms, trauma, prolonged immobility, or travel. She recently started OCs and her menses are more regular and less painful now.
• Her physical exam, vitals, and O2 sats are completely normal but she looks like she is working hard to breathe.
Pulmonary Embolus

• Symptoms
  – SOB or dyspnea- Present in 90%
  – Chest pain (pleuritic)- 66% of patients with PE
  – Cough
  – Sudden onset

• Signs
  – Tachycardia > 100 beats per minute
  – Tachypneea > 20 breaths per minute
  – Hypoxia < 95% on RA (no other cause)
  – Lower extremity swelling
PE-Risk Factors

• Hypercoaguability
  – Malignancy, pregnancy, estrogen use, factor V Leiden, protein C/S deficiency

• Venous stasis
  – Bed rest > 48 hours, recent hospitalization, long distance travel

• Venous injury
  – Recent trauma or surgery
PE

Pulmonary Embolism - Pathophysiology

• Thrombosis of a pulmonary artery
• >90% arise from DVT
• Clot from a DVT travels through the venous system and lodges in the pulmonary vasculature creating a ventilation/perfusion mismatch
Dyspnea
History

• Onset; sudden or gradual
• Chest Pain (CAD, PE, Pneumothorax)
• Cough (Pneumonia, Asthma, Bronchitis)
• Fever (Pneumonia, Bronchitis)
• Hemoptysis (PE, Bronchitis)
• History of smoking (COPD)
• Cardiac risk factors (Angina, MI)
• Chest wall trauma (Pneumothorax)
Dyspnea

History

• Frequently precipitated by exertion, regardless of cause

• Occurs at rest; indicates cardiac or pulmonary disease

• Occurs 2 to 4 hours after falling asleep – paroxysmal nocturnal dyspnea
Dyspnea
Diagnostic Evaluation

• Chest X-Ray
• Complete Blood Count; anemia
• Pulmonary Function Tests
• ECG
• Echocardiogram
• Serum brain natriuretic peptide (BNP)
He used to be my heart-throb, now he just gives me palpitations.
Palpitations
Definition, etc.

• The subjective awareness of the heart beating
• The most common causes are psychiatric disorders, medications, and arrhythmias
Palpitations

• Among the commonest symptoms in primary care
• Second only to chest pain as a reason for cardiology referral
• Only a minority of patients have a treatable arrhythmia
Causes of Palpitations

• Cardiac Rhythm disturbances
  – Atrial fibrillation
  – Atrial flutter
  – SVT
• Ectopic beats: ventricular/ atrial
• Sinus Tachycardia
  – Anemia
  – Thyrotoxicosis
Normal sinus rhythm

Distinct P waves before each QRS
Atrial Fibrillation

Irregular ventricular rate

No distinct P waves
Atrial Flutter

Regular ventricular rate

Saw tooth pattern for P waves
SVT

Rapid regular ventricular rate

No distinct P wave activity
History

• Critical in diagnosis

• Character of Palpitations
  – Regularity
  – Onset
  – Temporal pattern

• Associated symptoms
  – Syncope, Chest Pain, Breathlessness
Red flag features

- Syncope
- Angina like chest pain
- Family history of sudden cardiac death
- History of MI or LV dysfunction
Normal Sinus Rhythm

Atrial fibrillation

Ectopic beats

SVT
Examination

• If patient is currently experiencing palpitations
  – Radial Pulse
    • Irregularly irregular: AF
    • Regularly irregular: ventricular ectopy
    • Normal: does NOT rule out arrhythmia (flutter)
      - JVD
      - Cannon waves (AV dissociation)
Examination

• If patient is currently NOT experiencing palpitations
  – Pulse: can still reveal AF/ ectopy
  – Sinus tachycardia
  – Fine tremor: thyrotoxicosis
Investigations

- Aim is to record ECG during symptoms
- Depends on
  - frequency of attacks
  - duration of attacks
- Event recording is standard on modern pacemaker and ICD pulse generators
  - It has to be switched on
Choice of recording device

- Every Day: Holter
- \( \geq 1/\text{week} \): Wearable loop recorder
- \(< 2/\text{mo or syncopal} \): Implantable loop recorder
Why is diagnosis important?

• Most arrhythmias can now be cured with catheter ablation
  – SVT: 95% success rates
  – Flutter: 90% success rates
  – Paroxysmal AF: 80-90% success
  – Ventricular ectopics: 70-80%

• Latest scientific guidelines advocate Catheter ablation as first line therapy
A 28 year old is evaluated for palpitations. He reports a 5 year history of palpitations. These episodes used to occur once or twice a year, but over the past 6 months, he has been experiencing them on a monthly basis. He reports that his heart starts racing suddenly for no reason, and the episode usually terminates abruptly after he takes a few deep breaths. Episodes typically last 10 to 15 minutes, although one episode last month lasted 30 minutes. He is otherwise healthy, denies other symptoms, and takes no medications. Results of his physical examination are within normal limits. A baseline EKG is obtained and shown.
A 25 year old is evaluated in Student Health for palpitations. She has no history of CV disease but does have a history of intermittent palpitations. This is her first prolonged episode, and cough and strain maneuvers that she has used in the past to terminate the episodes have been ineffective this time. PE is unremarkable with the exception of tachycardia. The BP is 110/70. EKG shown.
Case

- A 17 year old female presents to Student Health with three days of intermittent “fluttering” sensation in her chest
Etiology

- Cardiac - 43%
- Psychiatric - 31%
- Miscellaneous – 10%
- Unknown – 16%
Conclusions

• Palpitations are very common
• History should suggest the diagnosis in many cases
• An ECG recorded at time of symptoms is diagnostic
• Most arrhythmias can be cured with catheter ablation
Palpitations Case

• A 22 year old female presents with six month history of intermittent palpitations. This occurs almost daily at rest, lasting 5 minutes at a time. There is no associated dizziness, chest pain, shortness of breath. No previous history of heart disease. She drinks several cups of coffee a day.
Palpitations
Case Additional Questions

• Have patient demonstrate rate and rhythm by tapping hand
• She denies cocaine or methamphetamine use
• Functionally asymptomatic between episodes
• No family history of syncope or sudden death
• Feels better when she is jogging
Palpitations

Case

• Physical exam is normal

What test should she get?

• ECG(WPW, HOCM)

• 24 hours holter monitor

• Event monitor (best way to make the diagnosis)

• Echocardiogram

• Implantable loop recorder
Case

- 20-year-old asymptomatic female noted to have frequent extra beats on physical exam; patient asks if she should worry
- No prior history of heart disease; physically fit; snorted cocaine when she was a teenager
- Nonsmoker; no alcohol
- Physical exam normal except frequent extra systoles
Quadrigeminal PVC's: every fourth beat is a PVC
Case

What tests does she need?

• Holter monitor; quantity, repetitive form
• Echocardiogram; exclude structural heart disease
• Exercise test; exclude exercise induced ventricular tachycardia
• ECG; exclude long QT, etc.
Case

- No treatment if asymptomatic, normal exercise tolerance test, normal echo (if has unpleasant palpitations consider beta blockers)
Case

• A 21 year old comes in for a racing heart. It started while at a party last night. He is healthy and is on no medications. His heart rate is 110 and irregular. His exam is unremarkable except for his irregular heart rate.
Case

- Pneumonia
- Acute COPD
- Acute respiratory failure
- Pulmonary embolism
- Elderly

- Acute MI
- CHF
- Valvular disease, esp. mitral stenosis
- Hypertensive heart
- Idiopathic
- Alcohol
- Hyperthyroidism
Palpitations

History

• Regular rhythm suggests SVT or VT
• Abrupt onset and offset suggests SVT or VT
• Associated syncope suggests VT
• Missed beats are usually PAC or PVC
• Is it exercise induced? VT
• Make sure it is not a pro-arrhythmic effect of the patients medications
Palpitations
Physical Exam Clues

• Murmurs
• Gallop Rhythms
• Elevated jugular pressure
• Rales
• Enlarged thyroid gland
Palpitations
Differential Diagnosis

Cardiac

• Tachyarrhythmia's
• Bradyarrhythmias
• Implanted Pacemaker
• Cardiomyopathy (Dilated or Hypertrophic)
Palpitations
Differential Diagnosis

Metabolic Disorders
• Thyrotoxicosis
• Hypoglycemia
• Pheochromocytoma
• Electrolyte Abnormalities (hyper or hypokalemia, hypomagnesemia)
Palpitations
Differential Diagnosis

Medications/Drugs
• Sympathomimetic agents (e.g. theophylline, albuterol)
• Vasodilators
• Cocaine
• Amphetamines
• Caffeine
• Nicotine
Palpitations
Differential Diagnosis

Psychiatric

• Panic Attacks
• Anxiety Disorder
• Depression
• Emotional Stress
Palpitations
Differential Diagnosis

Other

• Pregnancy
• Anemia
• Fever
Syncope
Definition, etc.

• A transient loss of consciousness due to reduced cerebral blood flow
• It is a common clinical entity accounting for 3% of all emergency room visits and 6% of all hospital admissions in adult patients.
The Significance of Syncope

The only difference between syncope and sudden death is that in one you wake up.¹

SYNCOPE: Natural History

Mortality

Sudden Death

%  Year of follow-up

Cardiogenic
Undetermined
Noncardiac

Kapoor: Medicine, 1990
Syncope
Natural History

• Recurrent, unexplained syncope, particularly in someone with structural heart disease is associated with a high risk for death (40% mortality within 2 years).
Syncope Case

• A 25 year old woman presents to student health after “passing out” while standing in line at the book store. Immediately before passing out, she recalls she felt nauseated and warm all over. She then got light headed and passed out. She was out for less than a minute. When she woke up she was oriented. She was not incontinent nor postictal.
Syncope
Case

• This has not happened before. A witness said she tried to hold onto the counter before she collapsed.
Syncope

History

• The history is the most important aspect of evaluating a patient with syncope and frequently gives clues to its underlying cause.

• Obtain the history from the patient and any witnesses
Syncope
History

• What was the patient doing at the time of the syncopal episode?
• What symptoms occurred before the event?
• Is the patient on any medications?
• Was there any seizure activity?
• How long was the patient unconscious?
• What was the patient's appearance? white, red
Syncope
History

• When the patient came to were they confused or drowsy? (neurological)

• Cardiac syncope is always sudden in onset, may be preceded by palpitations or chest pain, may occur with exertion, may occur without a warning, and usually resolves spontaneously

• Is there a family history of syncope?
Syncope
Case

• Her heart rate and blood pressure are normal
• Her pulmonary, cardiac, and neurological examination are all normal
Syncope
Physical Exam

• Are there orthostatic changes in blood pressure, heart rate?
• The cardiac and neurological exams are the most important to concentrate on
• Carotid sinus massage should generally be avoided
Syncope
Case; Tests

What test should be done?

• Hematocrit
• Electrolytes, glucose
• ECG
• Echocardiogram
• 24 hour holter monitoring
• Event monitor
• Electrophysiological testing
Syncope
Case; Tests

• Head CT scan
• EEG
• Tilt table testing
Spontaneous VVS

Continuous Tracing

DG Benditt, UM Cardiac Arrhythmia Center
Syncope
Treatment

• Treatment should be aimed at the underlying cause

• Avoid situations where if they faint they may be injured; climbing, swimming, driving, operating heavy machinery, biking
Syncope
Treatment

Admit patients with syncope and any of the following:

– A history of CHF or ventricular arrhythmias

– Associated chest pain or other symptoms compatible with acute coronary syndrome

– Evidence of significant CHF or valvular heart disease on PE

– ECG findings of ischemia, arrhythmia, prolonged QT interval, or bundle branch block

– Congenital heart disease
Syncope

Treatment

Admit patients with syncope and any of the following:

• Family history of sudden death
• Exertional syncope in patients without an obvious benign etiology for the syncope
Syncope
Differential Diagnosis
Cardiac Causes

Reflex-Mediated (Neurocardiogenic)
Situational (vasovagal)

- Micturation
- Tussive
- Valsalva
- Post-prandial
- Combing Hair
Syncope
Differential Diagnosis
Cardiac Causes

Reflex-Mediated (Neurocardiogenic) cont.

Orthostasis
- Volume depletion
- Medications

Carotid sinus hypersensitivity
Syncope
Differential Diagnosis
Cardiac Causes

Structural
Cardiac
• Aortic Stenosis
• Mitral Stenosis
• Hypertrophic Cardiomyopathy
• Atrial Myxoma
• Myocardial infarction
• Pericardial tamponade
Syncope
Differential Diagnosis
Cardiac Causes

Structural cont.

Vascular

• Pulmonary embolism
• Pulmonary hypertension
• Vertebrobasilar insufficiency
Syncope
Differential Diagnosis

Arrhythmic

• Supraventricular tachycardia
• Ventricular tachycardia
• Sinus node dysfunction
• AV nodal block
Syncope
Differential Diagnosis
Non-cardiovascular Causes

Central Nervous System
• Cerebral vascular accident
• Seizure

Metabolic abnormalities
• Hypoglycemia

Psychiatric
• Anxiety
• Pseudo-seizure
Case

• A 29 year old man comes to clinic for a recent episode of syncope. He and his friends were running to catch a campus shuttle. He had sudden loss of consciousness and awoke to find his friends looking over him. He does not recall what happened. He has never fainted before. He has exertional dyspnea.
Case

- On exam he has a blood pressure of 100/76 and a heart rate of 82. His chest exam is normal. He has a late peaking systolic ejection murmur at the right upper sternal border. His pulses are equal in all 4 extremities and are 1+ out of 4+.

- What is his most likely diagnosis?
Case V

• A 19 year old male athlete comes in for an evaluation of fainting while swimming. He has not other history or complaints. His exam is normal.
Case

• What is his likely diagnosis?
Sudden Death
History; Risk Factors

- Family history of seizures, syncope, sudden death
- Family history of an inherited heart condition; channelopathies (long QT syndrome, Brugada’s syndrome, etc.) hypertrophic cardiomyopathy, Marfan’s syndrome, etc.
Sudden Death
History; Risk Factors

• Previous history in the patient of seizures, syncope, unexplained heart murmur, palpitations, chest pain with exertion, dyspnea with exertion, single car accidents
Sudden Death
Physical Exam; Risk Factors

- Resting tachycardia, tachypnea, systemic hypertension
- Heart Murmur; that is not systolic ejection grade III or less, does not suppress with valsalva or standing
- A gallop rhythm, click, or rub
- Cardiomegally
- Non-equal pulses in all 4 extremities
Murmur

What is the most likely congenital heart lesion detected for the first time in adult patients?

• Mitral Valve Prolapse
• Bicuspid Aortic Valve with Aortic Stenosis
• Atrial Septal Defect
• Congenital Coronary Artery Artery Anomaly
22 year old with recent onset of exertional dyspnea and occasional palpitations. She has been told for years that she has a heart murmur.

PE: BP 129/78 in both upper extremities, HR 72, RR 14, Apical pulse unremarkable. Parasternal impulse present. 2/6 midsystolic murmur noted at 2nd Left intercostal. Fixed splitting of S2.

Which is the most likely cause of the symptoms?
Secundum atrial septal defect
Aortic stenosis
Ventricular septal defect
Mitral Regurgitation
ASD

• CXR; enlarged heart, prominent pulmonary artery, increased pulmonary vascular markings
• ECG; rsR' in V1, first degree AV block, right axis deviation
22 year old with recent onset of exertional dyspnea and occasional palpitations. She has been told for years that she has a heart murmur.

PE: BP 129/78 in both upper extremities, HR 72, RR14, Apical pulse unremarkable. Parasternal impulse present. 2/6 midsystolic murmur noted at 2nd Left intercostal. Fixed splitting of S2.

Which is the most likely cause of the symptoms?

- Secundum atrial septal defect
- Aortic stenosis
- Ventricular septal defect
- Mitral Regurgitation
ASD

• Fixed splitting of S2: hallmark of ASD

• Exam:
  – Parasternal impulse: R sided cardiac enlargement (also seen on CXR)
  – Midsystolic murmur: flow across the pulmonary valve.

• EKG shows first degree AV block, rsR’ in V1, right axis deviation, right atrial enlargement

• PE for PFO is normal

• Why does this matter: Secundum and PFO can be treated with percutaneous devices.
ASD Repair

• Closure in the catheterization lab is possible if it is a secundum ASD
• Surgical closure
Case

• A 19 year old came into Student Health complaining of fever, myalgias, fatigue, malaise.
• He was told it was a viral syndrome.
• He came in 4 more times over a 3 week period.
• He now had a 20 pound weight loss.
• He is a premed student and quit going to school. He felt too bad to go.
Case

- HR 104, RR20, T 37.9, BP 98/70, looks ill, nothing abnormal except a soft murmur.
- One night later he had a stroke.
Duke Criteria for the Diagnosis of Infectious Endocarditis

- 2 major
  or
- 1 major and 3 minor
  or
- 5 minor
Major Criteria

• Positive blood cultures (>2 positive cultures drawn > 12 hours apart or 3 cultures positive if drawn a hour apart or a majority positive if 4 or more cultures are drawn)

• Echocardiographic evidence of endocardial involvement

• New valvular regurgitation
Minor Criteria

- Predisposing cardiac condition or IV drug use
- Temperature > 38.0
- Vascular findings (arterial emboli, septic pulmonary infarcts, mycotic aneurysms, intracranial hemorrhage, and Janeway lesions)
Minor Criteria

• Immunologic Findings: Osler's nodes, Roth spots, glomerulonephritis, elevated rheumatoid factor, conjunctival hemorrhages
• Microbiologic evidence
• Echocardiographic evidence