

Chest pain

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WARD CENTER HEART CENTER

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Chest pain-Providers first responses



Call cardiology.

Really?

Hot Cheetos and Takis strikes again!

Not again...

I can take care of this.... I think?

I can take care of this... No problem!



Complexity of chest pain

Multiple causes

Worries of seriousness of chest pain

Patient fears

Parental/guardian/school nurse/health care provider concerns

Media/News: Consequences of cardiac disease especially in athletes



Facts

Accounts for 0.5 % of pediatric ER visits

SCAMPs (standardized clinical assessment and management plans) Established to detect serious chest pain

Goals:

- Reduce unnecessary resource utilization
- Decrease in health costs
- Aid in detection of rare cardiac disease
- Decrease in referrals
- Decrease parental anxiety
- Guidelines aid primary care providers to complete chest pain evaluation, educate family and increase reassurances to families.

Chest pain causes and incidences

Musculoskeletal	50-60 %
Psychogenic	10-30 %
Respiratory	3-12 %
Gastrointestinal	2-8 %
Cardiac	0.1-1%
Other	10 %

FYI:

Life threatening conditions account for 1-6 % of non traumatic chest pain

Common conditions account for 94-99% of chest pain episodes

Chest pain with primary cardiac diagnosis

Congenital heart disease

Ischemic ventricular dysfunction

- Structural: Valve stenosis
- Hypertrophic cardiomyopathy
- Mitral valve prolapse
- Coronary artery abnormality
- Aortic dissection/aortic aneurysm
- Cocaine/drug induced

Inflammatory conditions

- Pericarditis
- Post pericardiotomy syndrome
- Myocarditis
- Kawasaki disease

Arrhythmias

- Supraventricular tachycardia
- Frequent PVC
- Ventricular tachycardia

Non cardiac differential diagnosis

Chest wall

- Trauma
- Muscle strain
- Over use (coughing)
- Costochondritis
- Precordial catch
- Slipping rib
- Infection
- Fibromyalgia

Gastrointestinal

- GERD
- Irritable bowel disease
- Peptic ulcer
- Esophagitis
- **Esophageal rupture**
- Cholecystitis
- Pancreatitis

Respiratory

- Asthma
- Pneumonia
- Pleural irritation (effusion)
- **Pneumothorax**
- **Pulmonary emboli**
- Foreign body

Psychogenic

- Life stressors
- Anxiety
- Depression
- Bullying
- Hyperventilation

Miscellaneous

- Sickle cell disease- **acute chest syndrome**
- Herpes Zoster
- Tumor

Anxiety/Depression

Children/adolescent stressors

- Inability to balance extracurricular activities, school related problems, trouble with bullies, relationship/family problems, poor economics, commuting problems, depression and anxiety

Turkey study 13-18 yr olds with CP N= 100 Controls N = 76

- Chest pain individuals had significant findings of bullying, lower grades, recent breakups

Findings	Chest pain	Control
Suicidal ideas	22 %	5 %
Depression	54 %	6.5 %

Iran study 11-18 yr olds with CP N= 194 Controls N=194

Findings	Chest pain	Control
Anxiety	67 %	15 %
Depression	46 %	17 %
Family hx of heart dx	27 %	5 %

Chest pain evaluation- Historical information

Patient history

- ROS
- Recent illness
- Chronic medical conditions
- Congenital heart disease
- Cardiac surgery
- Medications/illegal drugs

Family history

- Sudden deaths especially in adolescents or early adult years
- Cardiomyopathies- Dilated, hypertrophic, restrictive, arrhythmogenic
- Connective tissue disorder
- Inherited hypercoagulable diseases (Factor 5 Leyden, Protein C or S deficiency)
- Early coronary artery disease

Chest pain assessment

Chest pain information

Description of the chest pain

Location of the pain/radiation

When does CP occur? Rest/exercise

First time pain noted/last time pain noted

What increases/decreased pain

Precipitating events

Frequency

Associated symptoms

Fever

Dyspnea

Vomiting/nausea

Recurrent somatic complaints (head aches, abdominal pain, muscle aches, sleep disturbance)

Lightheadedness or paresthesia (hyperventilation)

Exertional syncope or palpitations

Other considerations

Ask about recent stressors, changes in daily life style, weight changes, daily diet intake to include water intake, sleeping habits, extent of extracurricular activities

Physical exam

Vital signs: HR, RR, BP, temperature, O₂ saturations

General: comfortable, anxious, dysmorphic features, sternum incision

Cardiac: Tachycardia, rhythm regularity, heart sounds (murmurs, gallop, rub, muffled), systemic perfusion

Respiratory: tachypnea, WOB, wheezes/stridor, BS, cyanosis

GI: Epigastric discomfort, abdominal distension, hepatomegaly

Skin: Rashes, ulcers

Musculoskeletal: Erythema, pectus, reproducible pain

Joint: Arthritis, inflammation

Non threatening chest pain characteristics

Musculoskeletal pain

- Achiness, tender, sharp pain, reproducible, localized/regional pain, exact start date, pain increases/decreases with movement, new exercise routine, more intense level of activity, relieved with analgesics

Gastrointestinal

- Burning, sharp, pressure pain, located over lower/mid sternum region, c/o nausea, triggered before/after eating, may worsen when supine

Pulmonary

- Recent illness and/or coughing, Shortness of breath resolves with resting, tightness in throat

Cardiac

- Exertional chest pain: heart pounding/tachycardia may be benign if patient has BMI > 25 or patient involved in < 3 hours/week of aerobic exercise

Stress

- Non specific characteristics, pressure, situational, Somatic complaints, sleeping difficulties, fatigue, headaches

Threatening chest pain characteristics

Angina pain: MI, Coronary artery anomalies, LVOTO, illicit drugs

- Substernal, crushing, radiation to left arm/jaw, emesis, diaphoresis, altered mental status, dyspnea

Aortic dissection: Severe, tearing pain with radiation to back

Pleuritic pain: pneumonia, pneumothorax, pleural effusion, pulmonary emboli, sickle cell, acute chest syndrome)

- Difficult breathing, diminished breath sounds, unequal breaths sounds

Exertional pain/exercise intolerance: MI, coronary artery anomalies, LVOTO, cardiomyopathy

Sharp retrosternal pain: effusions

- Exacerbated by supine position, fevers, pain radiation to left shoulder

Diagnostic tests

Labs: General labs and troponin/cardiac enzymes rarely needed

Chest x-ray: Consider if cardiac or respiratory process or esophageal foreign body suspected

ECG: Obtain if cardiac disease or arrhythmia suspected

Echocardiogram: Based on patient/family hx, assess for PTHN, LVOTO, cardiomyopathy, ventricular systolic function, pericardial effusion, coronary artery anomalies

Cardiac monitoring devices: assess for arrhythmia, Ectopy, inappropriate heart rates, AV blocks

Exercise stress tests: Assess for CP/SOB with exertion, arrhythmia

Management considerations

If normal exam or findings consistent with non-cardiac diagnosis- cardiac referral not necessary. Treat underlying cause and monitor

Assess for red flags

Consider referral to specialists/ER if serious cause suspected



- Cardiology:
 - Abnormal exam, unexpected vital signs, exertional chest pain, Abnormal ECG
 - Concerning family history of cardiac disease or early/sudden deaths
- GI: GERD (moderate/severe), recurrent abdominal pain, motility disorder
- Pulmonology: PHTN, pulmonary embolism, poorly controlled asthma
- Hematology: sickle cell disease, hypercoagulable states
- Rheumatology: systemic lupus

Provider's Take home information

Thorough history and physical exam important

Evaluate for medical and psychogenic causes

Accurate chest pain information important for families

Cardiac cause for chest pain in pediatric population very rare (<1%)

Offer reassurances to patient and family

Trust yourself to assess, monitor, and treat noncardiac process before requesting referrals



Family take home information



Cardiac chest pain is real to the patient, acknowledge their concerns

Families may over estimate prevalence of serious chest pain while underestimating benign causes

Consider “mixed messages” to parents when diagnostic tests are completed based on family anxiety and request for tests/referrals

Consider consequences of unnecessary referrals: missed days of school, work absences, restrictions from exercise/activities, anxiety, medical costs

Syncope

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Syncope- Word Association

Fainted

Blacked out

PASSED OUT

Spaced out

Collapsed

FELL OUT

What do these terms mean? Mostly likely the same thing....SYNCOPE

Syncope definition

Sudden, brief loss of consciousness associated with loss of postural tone from which recovery is spontaneous

Transient global cerebral hypoperfusion due to low peripheral resistance and/or low cardiac output



Complete loss of consciousness

4 characteristics of LOC

Short duration

Abnormal motor control

Loss of responsiveness

Amnesia

About a Nurse



"This needle made him faint. Maybe he would've been more comfortable if I had put some ink in it."

Mechanism of syncope

Decreased cardiac output

1. Reflex bradycardia
2. Cardiovascular causes: arrhythmia, structural, pulmonary emboli, PHTN
3. Inadequate venous return due to volume depletion or venous pooling
4. Chronotropic and inotropic incompetence through automatic failure

Lower peripheral resistance

1. Decreased reflex activity causing vasodilation through withdrawal of sympathetic vasoconstrictions
2. Functional impairment
3. Structural impairment

Facts

Most common between ages 15-19 years

More common in females

30 % of population will experience syncopal event within their life

15 % of population will have syncopal event before age 21 years

Noted often with positive family history, during growth spurts, menstrual cycles and rapid weight loss

Syncope evaluations accounts for 1-3 % of all ER visits

Syncope Incidence

Cause	Incidents
Neurocardiogenic	75-80 %
Cardiac syncope	1-6 %
Psychogenic syncope	8-15 %
Neuro/seizures	
Traumatic syncope	

Neurocardiogenic/Vasovagal syncope

Most common form of reflex syncope

Mediated by the vasovagal reflex

Triggers:

- Upright posture, position change, warm showers
- Exposure to emotional stress, pain or medical setting

Prodromal symptoms:

- Diaphoresis, warmth, nausea, pallor, vision changes, decreased acuity

Associated with vasodepressor hypotension, inappropriate bradycardia

Post syncopal event: fatigue

Neurocardiogenic/Vasovagal: subtypes

Carotid sinus syndrome

- Oversensitive to manual stimulation (rotation of head or pressure on carotid)
- Shaving, convulsive seizures

Pallid infant syncope

- Occur after a sudden unexpected fright or injury
- First episode by 18 months of age, Resolved by 5 yrs

Situational syncope

- Coughing
- Micturition or defecation
- Laughing
- Hair grooming

Postural/Orthostatic hypotension

>20 mmHg drop in systolic BP and /or a >10 mmHg drop in diastolic BP after 3 minutes of standing

Triggers

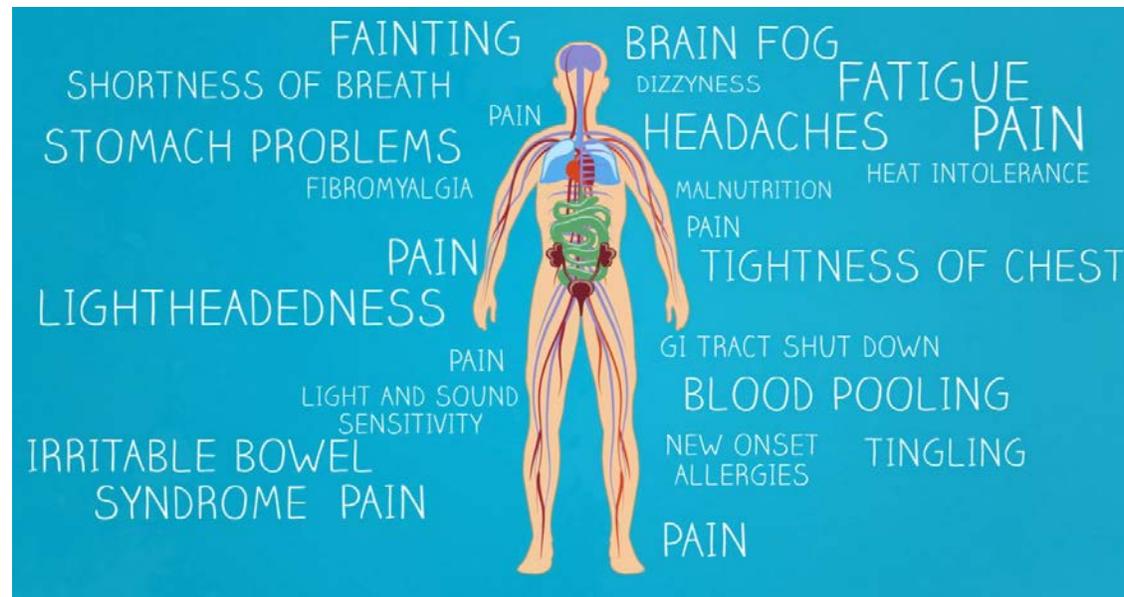
- Volume depletion
- Prolonged standing
- Standing after exertion
- Changes secondary to new medications
- Autonomic neuropathy
- Anemia
- Anorexia Nervosa
- Pregnancy



Postural orthostatic tachycardia syndrome (POTS)

Orthostatic intolerance associated with increase in heart rate from supine to upright position of >40 bpm or a heart rate of >120 bpm within 10 minutes of standing

Most frequently seen in female (80%) versus males (20%)



Cardiac syncope

Causes

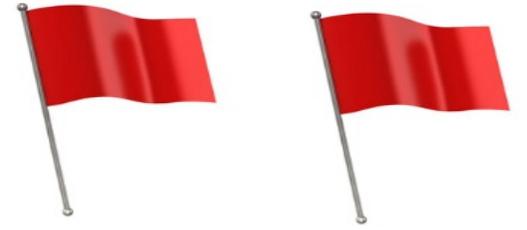
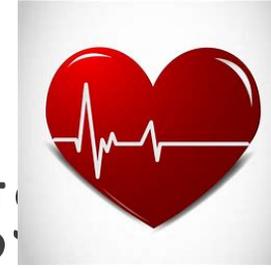
- Tachyarrhythmias
- Bradyarrhythmias
- Structural heart disease
- Hypertrophic cardiomyopathy
- Coronary artery anomaly/disease



Characteristics

- Acute collapse (often with exertion, short in duration)
- Few prodromes
- Preceding palpitations within seconds of LOC
- Lack of prolonged upright position
- Syncope during exercise

Cardiac syncope- Red flags



Family history of sudden deaths at young age

Abnormal physical examination

Abnormal ECG

- Persistent bradycardia or sinus pause > 3 seconds when awake
- Mobitz II or Complete heart block
- Alternating left and right bundle branch block
- Ventricular tachycardia
- Non- sustained episodes of polymorphic ventricular tachycardia
- Short or long QT intervals
- Supraventricular tachycardia

Conditions that mimic syncope

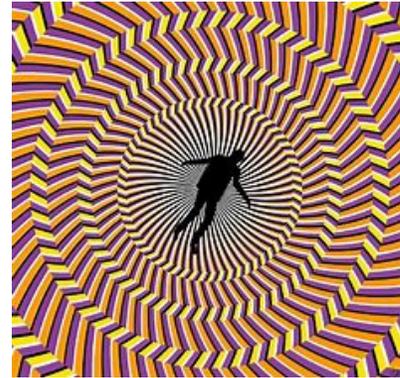
Migraines

Hyperventilation

Narcolepsy

Psychogenic/ cardioversion disorder

Seizures



Psychogenic syncope

Psychological process of conversion

No gross somatic brain dysfunction

Characteristics

- Duration of LOC much longer in duration (15-30 minutes)
- Eyes usually closed
- Subtle signs: eyelid flicker/movement, swallowing, intact muscle tone, resistance to eye opening
- Lack of response to touch or speech
- Attack frequency is high with severe attacks occurring over a week or day
- No recognizable trigger; no sweating, pallor, nausea
- Injury does not exclude psychogenic syncope

Syncope with convulsions

SYNCOPE

Lightheadedness

Sweating

Prolonged standing

Chest pain

Palpitations

Bradycardia

Hypotension

Situational event

SEIZURES

déjà vu

Aphasia

Olfactory aura

Epigastric sensation

Tongue biting

Post event delirium

Focal neurologic findings

Incontinence

Diagnostic evaluation- History

History- obtain from patient and eye witness

Clear etiology

Complete LOC? Duration of LOC?

Suspicion of CV event/diagnosis

Prodromal symptoms

When does syncope occur: rest, shower, standing, exertional

Precipitated by loud noise

Post-ictal phase

Family history

Life events: Hydration status, stressors, weight (+/-) height changes, illness, sleeping habits, new medications, drug use

Diagnostic evaluation: Physical exam

General impression

Cardiac exam

Central nervous system exam

Vital signs:

- Orthostatic vital signs

- POTS vital signs

Diagnostic tests and monitors

EKG –done on all patients

Echo- Previous cardiac disease, abnormal cardiac exam/EKG findings

Holter

Event monitoring: extended monitor (14-30 days)

Implantable loop recorder

Exercise stress test- exertional syncope

Tilt table

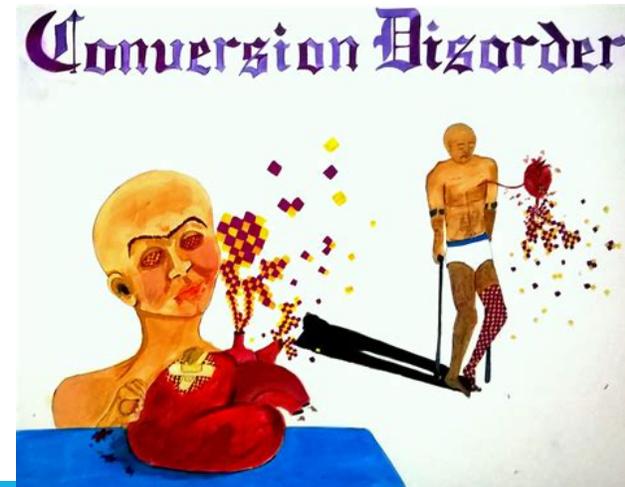
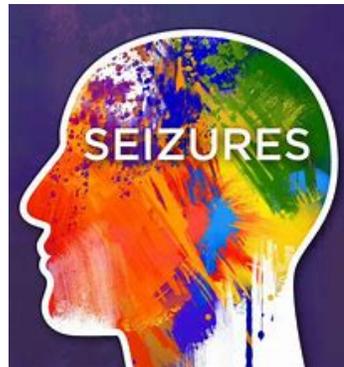
Electrophysiology testing

Management

Establish: serious versus non serious

Determine referral need: cardiology/neurology/psychology

Treat the underlying cause



Neurocardiogenic syncope management

Non pharmacological treatment

Oral hydration with water

Limit caffeine

Establish regular meals

Salt added to diet

Avoid triggers

Slow position changes

- Postural techniques to avoid venous pooling
 - Isometric exercise, contraction of lower extremities muscles
- Counter pressure maneuvers
 - Arm folding, leg crossing, squatting

Supportive stockings

Pharmacology management

Salt tablet

- 250 -1000 grams once a day

Fludrocortisone

- Synthetic form of aldosterone
- Mechanism: increases renal sodium reabsorption and expands plasma volume

Alpha agonists vasoconstrictions (Midodrine)

- Mechanism: Increases vasoconstriction of peripheral vessels
- Increases blood pressure in supine and upright position
- Increases venous return, cardiac preload, and stroke volume

Psychogenic syncope management

Assurance to patient syncope events are taken seriously

Acknowledge to patient syncopal events are involuntary

- Patient's acceptance of diagnosis of psychogenic syncope critical for therapy
 - Immediate reduction sometimes noted with increased education and communication

Cognitive behavioral therapy

Take home information



Most syncopal events are benign

Health care providers can diagnosis syncope with good accuracy from the history, physical exam and ECG results

Syncopal events causes anxiety and worries

Explanation and education important

Refer to cardiology, neurology, behavioral sciences with more serious or complex syncope