

### Physiological Changes with Age

**Cardiac Valves:** stiffen, calcify, degenerate  
= expect murmurs ("swish")

**Conduction System:** coronary arteries get poor blood = necrosis, arrhythmias; lose pacemaker cells, lose conduction, fat in SA node, coming from ectopic muscle

**Left Ventricle:** atrophies, stiffens, enlarges, becomes less distensible, dec. SV & CO, dec. EF, most noticeable w/ physical activity

**Aorta & Large Arteries:** thicken, stiffen, less distensible = pumps harder (inc. HR) & inc. systemic vascular resistance

**Baroreceptors:** located in carotid arteries; help regulate BP; less sensitive w/ age; most noticeable w/ position changes

**Framingham Heart Study (1948):** *Landmark study done in Framingham, MA looking at cardiac risk and what we can do--modifiable & non-modif. risk factors*  
- 5,209 subjects (mean age 47) & offsprings  
- Established the CV risk profile!

### Assessment: Psychosocial

Ask about...

Occupation?

Insurance?

Support system?

Pets at home?

Hobbies that may help?

\* Patients won't get better if they're stressed!

### Assessment: Modifiable & Non-Modif. Risk Factors

#### MODIFIABLE RISK FACTORS

**Age:** symptoms start by 40yo, unlikely to survive MI if <30yo b/c collateral circulation

**Ethnicity:** more prevalent in non-Hispanics, death rate higher in African Amer. (HTN)

**Heredity:** HTN, inc. lipids, DM, obesity

**Gender:** men > women until menopause, childbearing women have 25% chance, women >40yo & after menopause > men (r/t heart size & collateral circulation)

#### NON-MODIFIABLE RISK FACTORS

**BP:** biggest problem = insidious - take meds if needed

**HLD:** goals - **total cholesterol** < 200; **HDL** > 50, **LDL** < 70 - take meds if needed

**Smoking:** temp of vape = hyperplasia, asthma-like symptoms; causes 21% of CVD deaths; carcinogenic; inc. epic & norepi = heart works harder, vasoconstriction & dec. circulation, C monoxide = inc. vessel perm.

**DM:** r/t early atherosclerosis, inc. thickening of blood

**Physical Inactivity:** "new smoking", exercise inc. collateral circulation

**Obesity:** extra burden on heart

**Personal Factors:** stress, psych. response

**Collateral circulation:** *inc. angiogenesis; adding vessels to supply cardiac circulation*

**Obese:** BMI >30 / **Morbid Obese:** BMI >45  
**Super Morbid Obese:** BMI >65

### Assessment: Subjective & Objective Data

#### SUBJECTIVE DATA (History of Symptoms)

**Chest Pain:** (activity w/) onset? location? severity? type? precipitating factors? other Sx? may c/o nausea, indigestion  
- Causes: *cardiac* (myocardial), *pulm.*, *m/s*

**Dyspnea or SOB:** often assoc. w/ left side heart pain, dec. perfusion, orthopnic

**Palpitations:** usually PAC, c/o rapid HR = dec. EF & CO (caffeine)

**Fatigue:** mild to severe, may attribute to getting older (compare to daily activity)

**Extremity Pain:** arm (may be R), jaw

**Syncope:** if issue w/ CO

**Weight Gain:** fluid, daily wt, anasarca

#### OBJECTIVE DATA

**General Appearance:** AAOx3?, posture  
- Restlessness assoc. w/ change in O<sub>2</sub>

**Vital Signs:** BP? HTN < 130/80, check BP bilat., may see a paradoxical change in BP

**Heart Sounds:** S<sub>1</sub>, S<sub>2</sub>; may hear S<sub>3</sub> & S<sub>4</sub>, murmurs, clicks

**Cyanosis & JVD:** pallor; JVD = R-sided HF (cor pulmonale), seen w/ OSA; = give Lasix

**Subjective Data:** Ask for chief complaint (usually CP), PMH, current health  
- Dehydrated = lose H<sub>2</sub>O & electrolytes

#### Objective Data:

**Pulse Pressure:** *SBP - DBP; normally 30-40*  
- **Closer (~20):** r/t vasc. resistance = dec. CO & SV

- **Widened (~40):** r/t slow HR, atherosclerosis, inc. w/ age

### Diagnostic Studies

#### SERUM CARDIAC ENZYMES (SERUM MARKERS) OR CARDIAC BIOMARKERS

**Troponin:** *GOLD STANDARD OF CP*, appears 2-4 hr after damage to myocardial muscle, inc. further depending on damage

**CK-MB:** r/t cardiac muscle; detected 2-4 hr after damage, elevated 72 hr max

**CK-MM:** r/t skeletal muscle

**CK-BB:** r/t brain tissue

**Myoglobin:** byproduct of muscle breakdown, appears in 2-4 hr, then dec.; affects kidneys; rhabdomyolysis

**BNP:** r/t stretch of heart; correlates + w/ HF; secreted by ventricles r/t stress

**CRP:** non-specific inflammatory marker; correlates + w/ atherosclerosis; good for determining severity of disease process

**Myeloperoxidase:** leukocyte enzyme r/t plaque instability and enzyme production

**Ischemia Modified Albumin:** circulating albumin touches ischemic tissues

**Homocysteine:** get from eating meat (in amino acids), linked to disease development

**Serum Lipids:** correlates + w/ intravascular plaques

### COAGULATION STUDIES

**Unfractionated Heparin:** if elevated, give protamine sulfate

### APTT

**PT/INR:** if elevated, give vitamin K

**Why do coagulation studies?** *To know if pt is anti-coagulated in case of procedure*

### Antidotes

\* Coumadin = vitamin K

\* Many newer generation anti-coagulants don't have antidotes! = Give cryoprecipitate

### More Diagnostic Studies

#### OTHER

**EKG** shows issues r/t heart rhythm; 12-lead EKG w/ age 40yo+

**Telemetry** continuously monitoring EKG, ambulatory

**Holter Monitor** ambulatory type, pt takes it home & writes down what they do to compare it to the rhythm

**X-Ray** shows enlargement, fluid; pulmonary edema r/t CHF?

### STRESS, NUCLEAR, & ULTRASOUND TESTS

**Exercise Stress Test** look at BP and HR w/ inc. exercise and inc. myocardial O<sub>2</sub> demand

**Nuclear Perfusion Imaging** stress test & blood flow through the heart

**Echocardiogram** shows wall movement, overall ventilatory performance; can tell how badly heart was damaged

**TTE** 2-D

**TEE** 3-D (better)

### Serum Electrolytes & the Heart

#### K biggest electrolyte r/t heart

*Hypokalemia:* inc. electrical instability, a fib, digoxin toxicity

*Hyperkalemia:* P-wave issues, bradycardia, asystole, ventricle issues; give Kayexalate, insulin (IVP 10 units) + D50; give Lasix

#### Na r/t CHF

*Hyponatremia*

*Hypernatremia*

#### Ca Hypocalcemia

*Hypercalcemia*

#### Mg Hypomagnesemia

*Hypermagnesemia*

#### P Hypophosphatemia

*Hyperphosphatemia*

**Insulin:** *K follows glucose into cells*