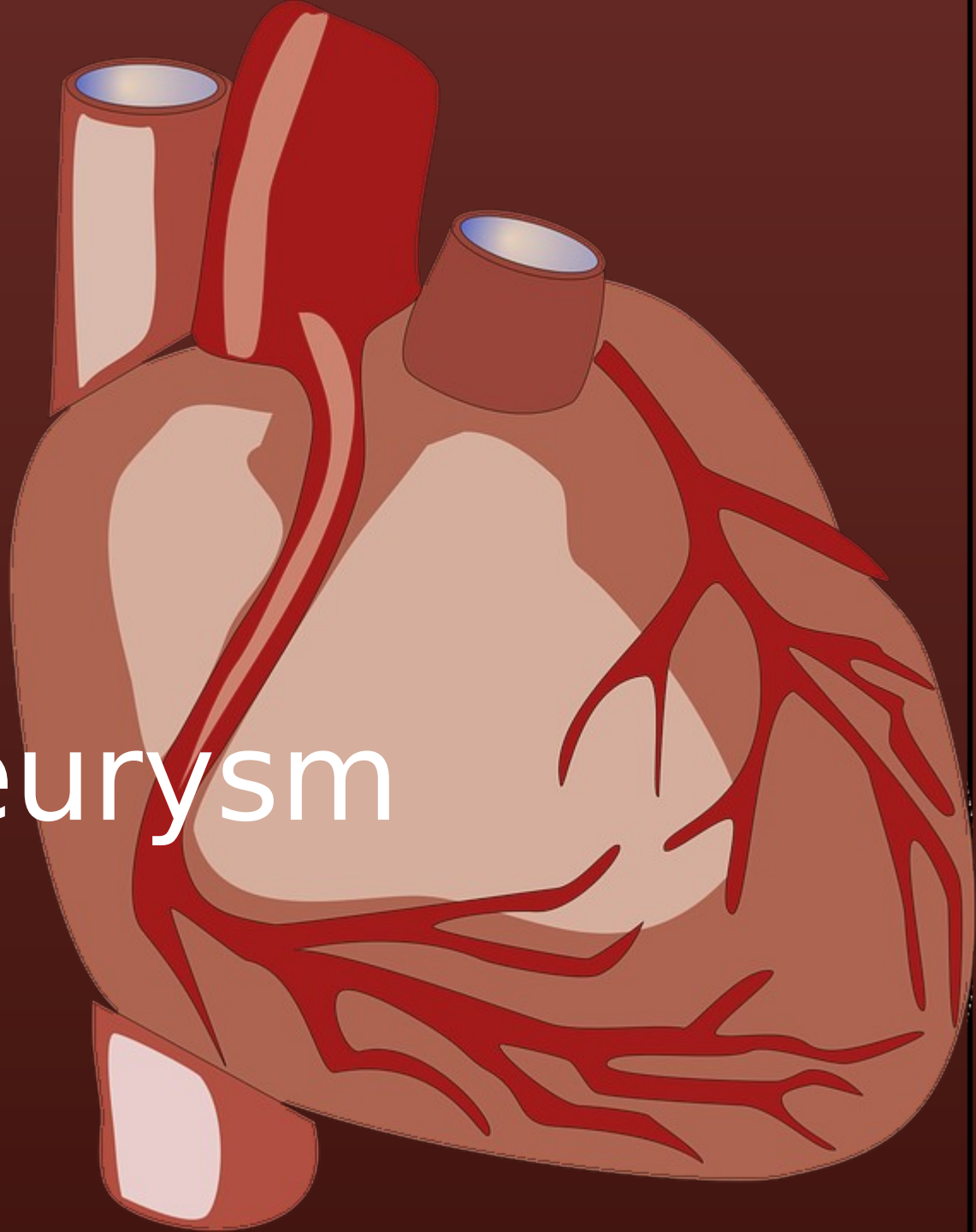
MI & Aneurysm

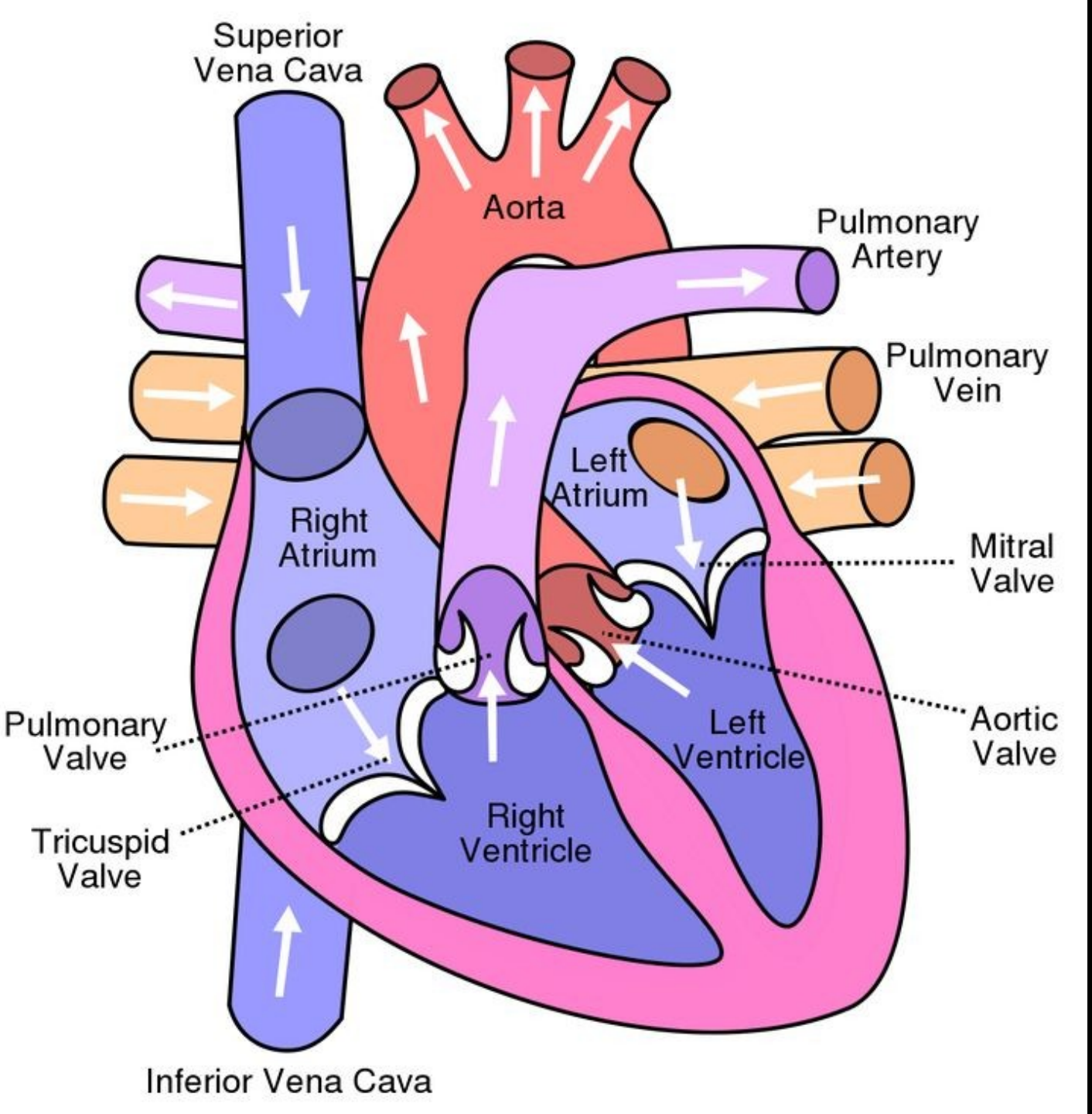
Jami Jones RN, MSN

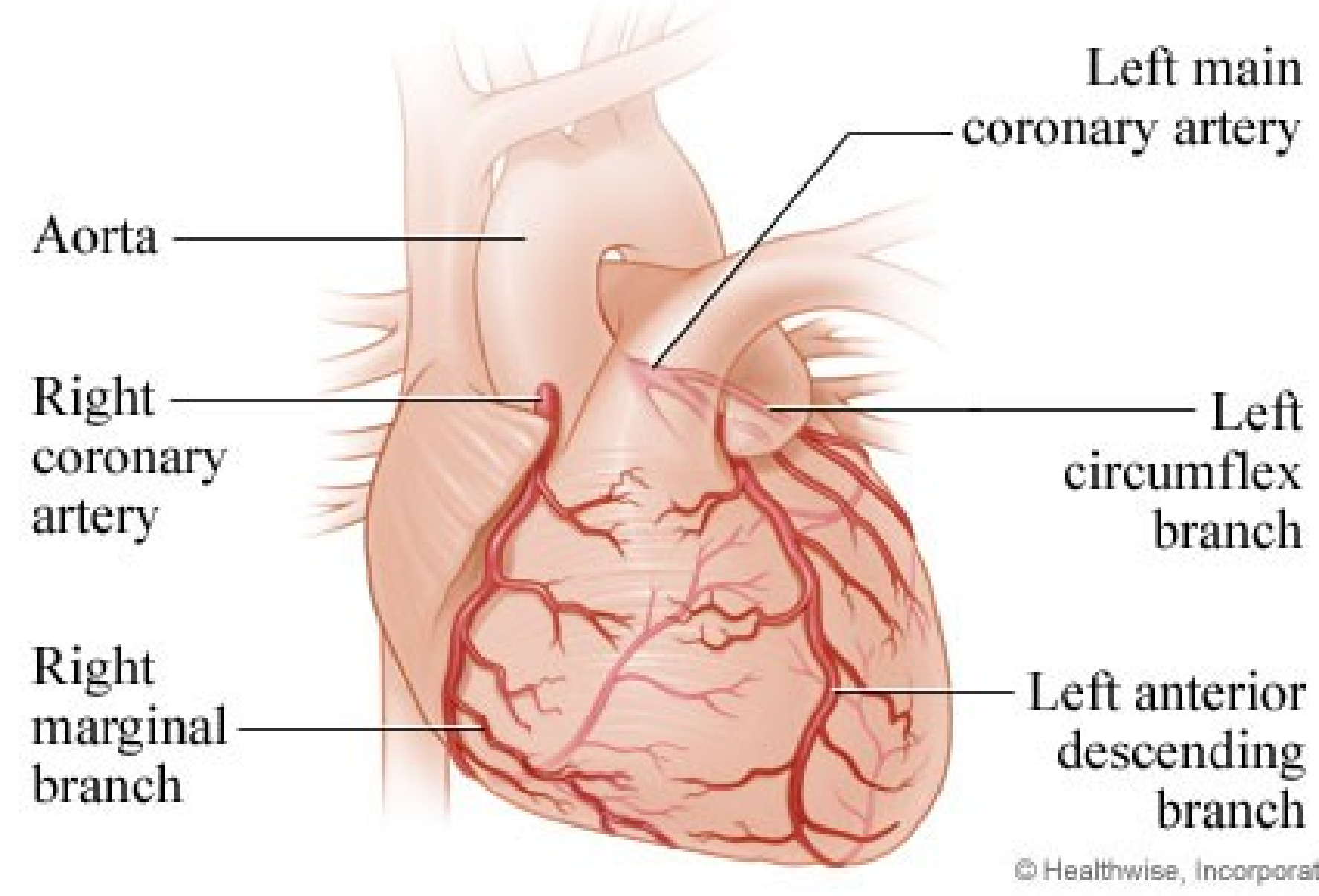
Instructional Module 7



Learning Outcomes

- Integrate knowledge of the cardiac anatomy and how it relates to normal and abnormal conduction of the heart and how it relates to perfusion.
- Recognize early signs and symptoms of MI and AAA along with timely nursing interventions.
- Formulate a discharge and rehabilitation therapy to prevent re-hospitalization.


Superior
Vena Cava
Aorta
Pulmonary
Artery
Pulmonary
Vein
Left
Atrium
Right
Atrium
Mitral
Valve
Pulmonary
Valve
Aortic
Valve
Left
Ventricle
Tricuspid
Valve
Right
Ventricle
Inferior Vena Cava


Left main coronary artery
Aorta
Right coronary artery
Left circumflex branch
Right marginal branch
Left anterior descending branch
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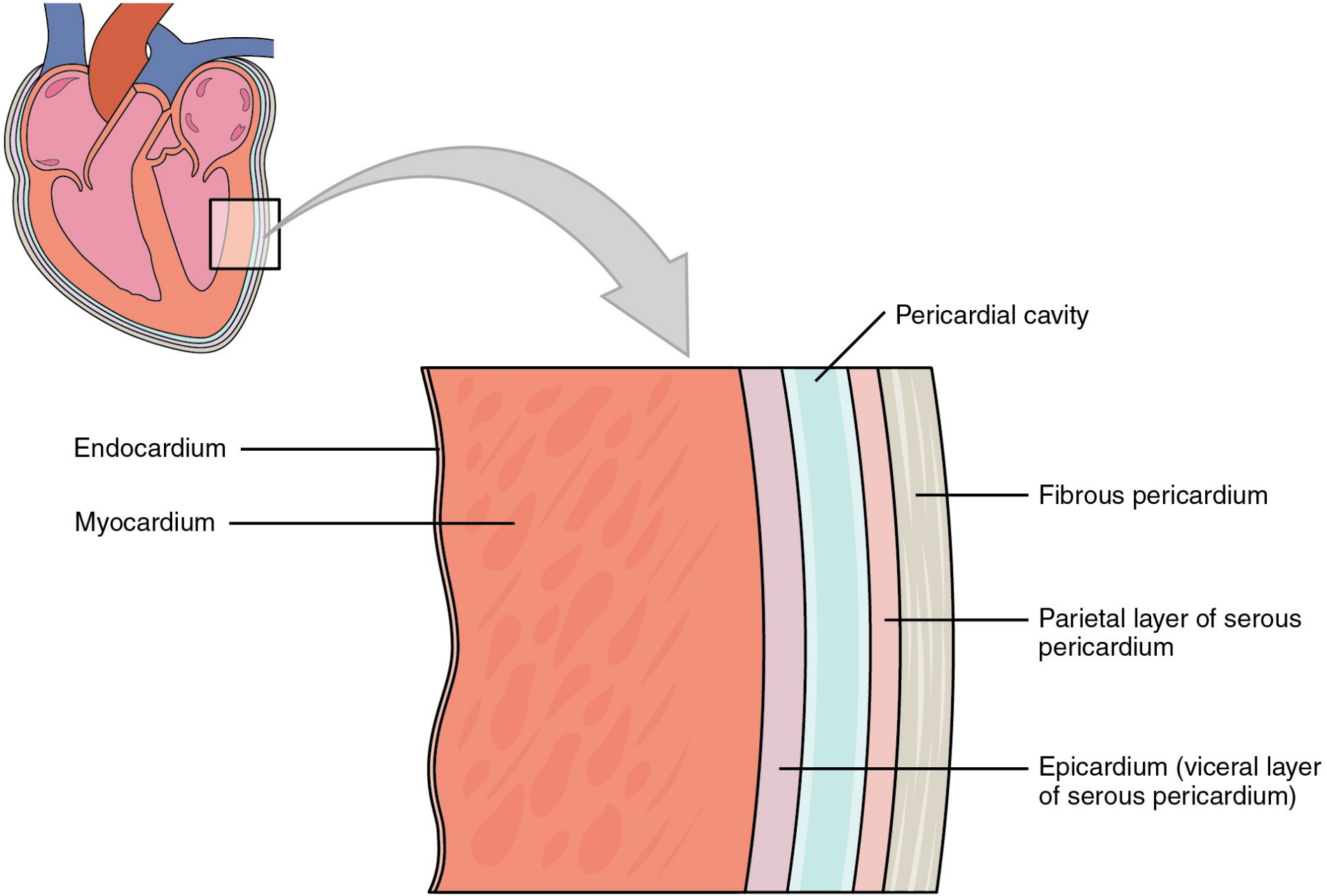
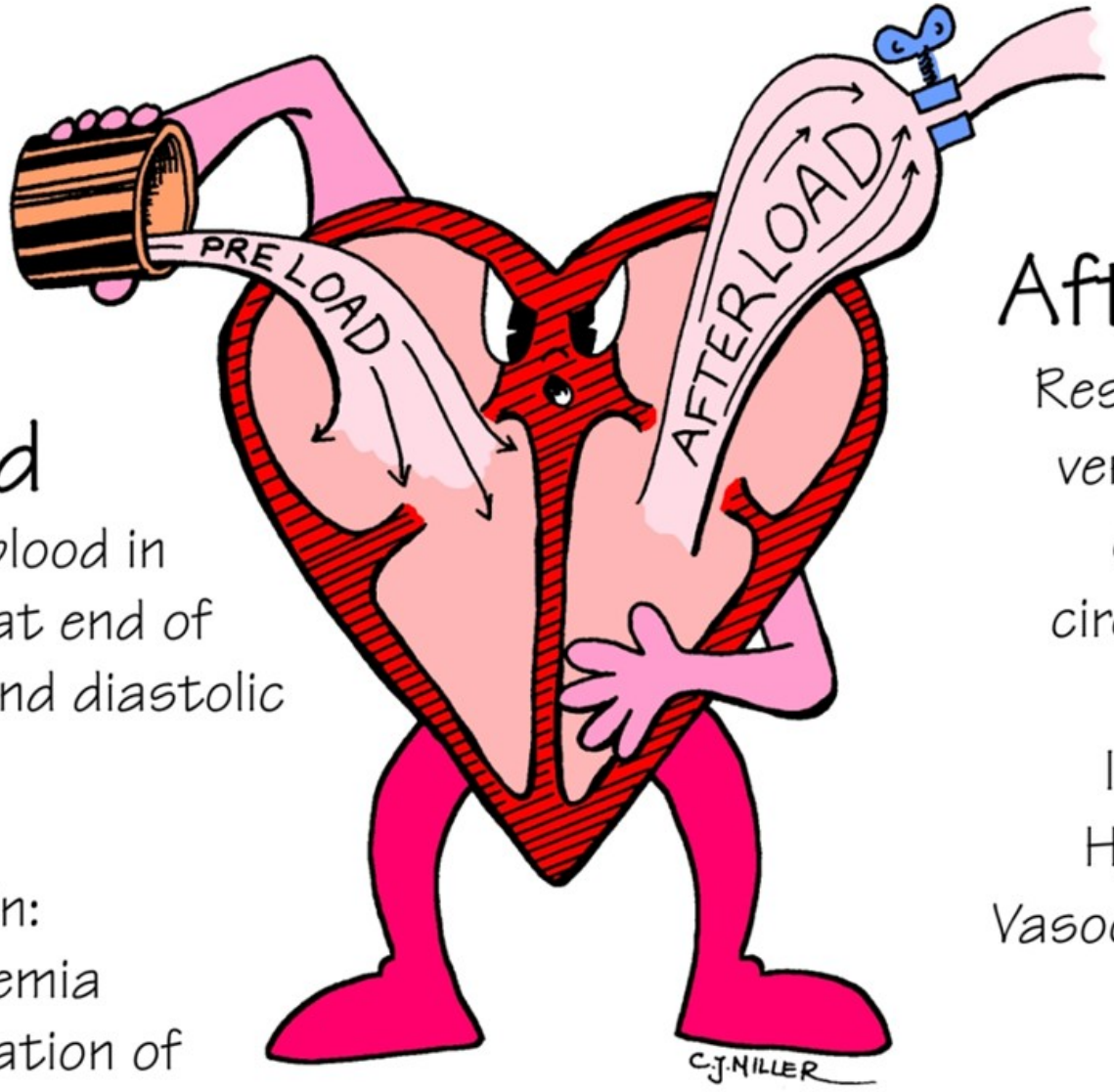

Pericardial cavity
Endocardium
Myocardium
Fibrous pericardium
Parietal layer of serous pericardium
Epicardium (viceral layer of serous pericardium)

PRELOAD AND AFTERLOAD



Preload

Volume of blood in ventricles at end of diastole (end diastolic pressure)

Increased in:

- Hypervolemia
- Regurgitation of cardiac valves

Afterload

Resistance left ventricle must overcome to circulate blood

Increased in:

Hypertension
Vasoconstriction

↑ Afterload
↑ Cardiac workload

What does the heart do?

- Receives blood from the body and pumps it to the lungs
- Receives blood from the lungs and pumps it to the body

- Oxygenates the body
- Carries nutrients to the body
- Gets rid of waste

- What if the heart fails?

Let’s Talk About Angina

What is Angina? (Chest Pain)

- Stable: Chronic chest pain that occurs intermittently over time when myocardial O2 demand exceeds supply
  - Worsened with activity, stress or emotional upset.
  - Pain usually lasts a few minutes and dissipates when exacerbating factor is relieved (treat with short-acting nitrates).
  - Treat with nitrates, ACE or ARB, Beta Blockers, Calcium Channel Blockers, Lipid-Lowering Agents and possibly a sodium current inhibitor (prolongs QT interval). PCI and CABG are therapies as angina progresses and becomes more severe.
- Unstable: (Acute Coronary Syndrome)
  - Chest pain that is new, occurs at rest or with increasing frequency, duration or with less effort than the patient's chronic stable angina pattern.
  - Lasts 10 minutes or more.
  - Prompt intervention is necessary with these patients.

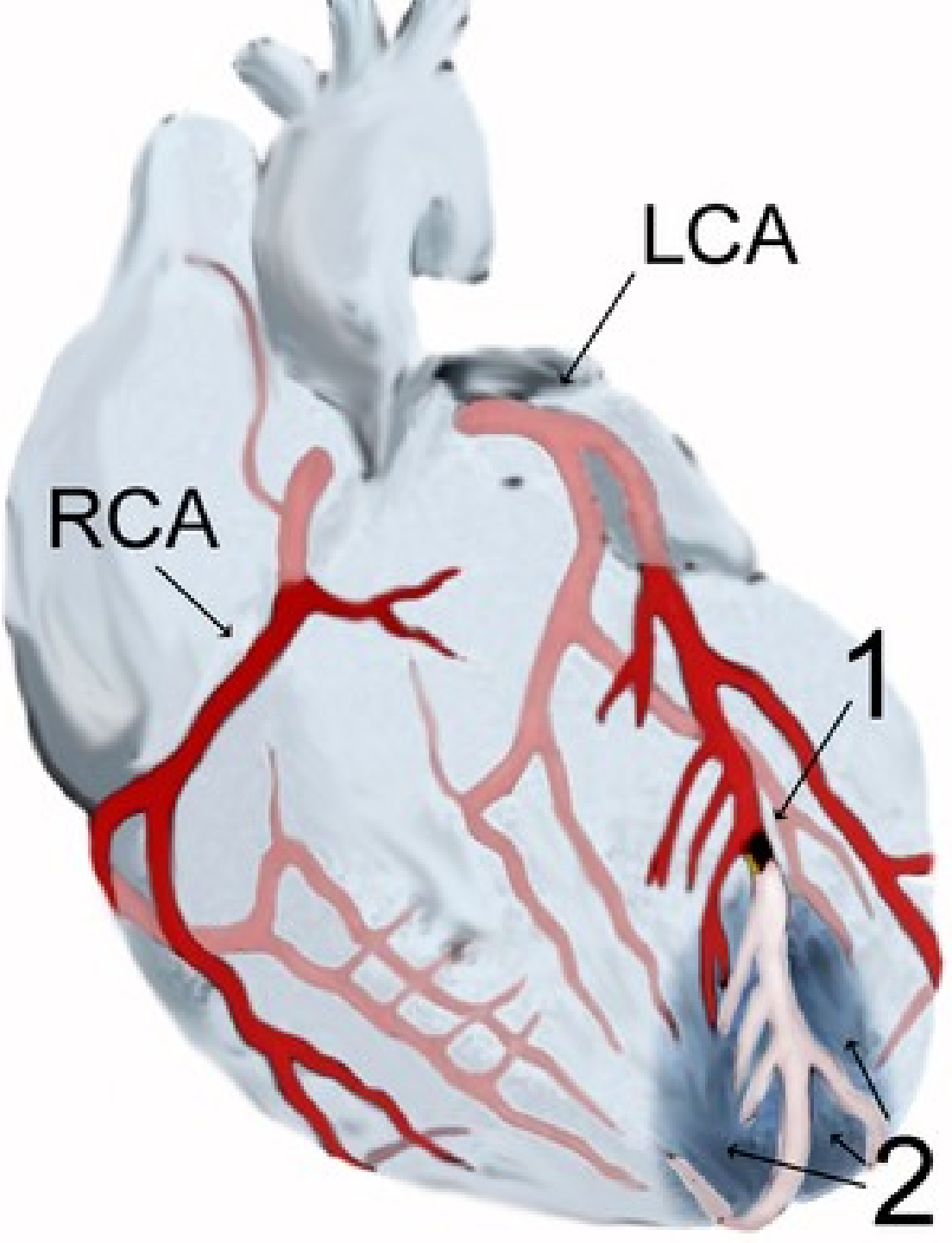
Objective: Decrease O2 Demand and Increase O2 Supply

- Pharmacology therapy:
  - Decrease preload: Nitrates
  - Dilate Coronary arteries: Nitrates, Calcium channel blocking agents
  - Prevent thrombosis of plaques: Antiplatelet aggregation agents
  - Decrease HR: Calcium channel antagonist agents, Beta blocker
  - Decrease afterload: Nitrates, Beta blocker
  - Decreased myocardial contractility: Calcium channel antagonist agents, Beta blocker

Let’s Talk About Myocardial Infarction…MI

What is an MI?

- Form of Acute Coronary Syndrome
- Death of myocardial cells distal to a coronary artery blockage caused by platelet aggregation
- A STEMI is a complete occlusion.
- An NSTEMI is non-occlusive.



Risk Factors

- Age
- Hyperlipidemia* (Low HDL and High LDL)
- Hypertension*
- Smoking*
- Family History
- Diabetes*
- Male Gender**
- Obesity
- Inactive lifestyle

Time = Muscle

- Once cells have died, they are gone
- The body will replace necrotic cells with scar tissue
- The body can only lose so many myocardial cells
- The longer a blockage goes untreated – the more myocardial death occurs
- A STEMI is an emergent situation! Intervention w/in 90 minutes!
- A NSTEMI is non-emergent but needs to be addressed in 12 to 72 hours if no contraindications

Signs and Symptoms of MI

- Typical symptoms:
  - Chest pain/discomfort/pressure
  - Left shoulder pain
  - Shortness of breath
  - Belching
  - N/V
  - Diaphoresis
  - Indigestion
  - Dizziness
  - Lightheadedness
  - Fatigue
  - Clamminess
  - Neck, back, jaw or head pain
  - S4 heart sound!
- Atypical symptoms
  - Absence of chest pain with the presence of any other symptom listed on the left.

Descriptions frequently used by patients include:		It is generally not described as:
• Squeezing	• Fullness in the Chest	• Sharp
• Tightness	• Band-like sensation	• Knife-like
• Pressure	• Knot in the center of the chest	• Fleeting
• Constriction	• Lump in throat	• Stabbing
• Crushing	• Ache	• Like “pins and needles”
• Strangling	• Heavy weight on chest (elephant sitting on chest)	• Better or worse with a deep breath
• Burning	• Like a bra too tight	
• Heartburn	• Toothache (when there is radiation to the lower jaw)	

Evaluation of MI

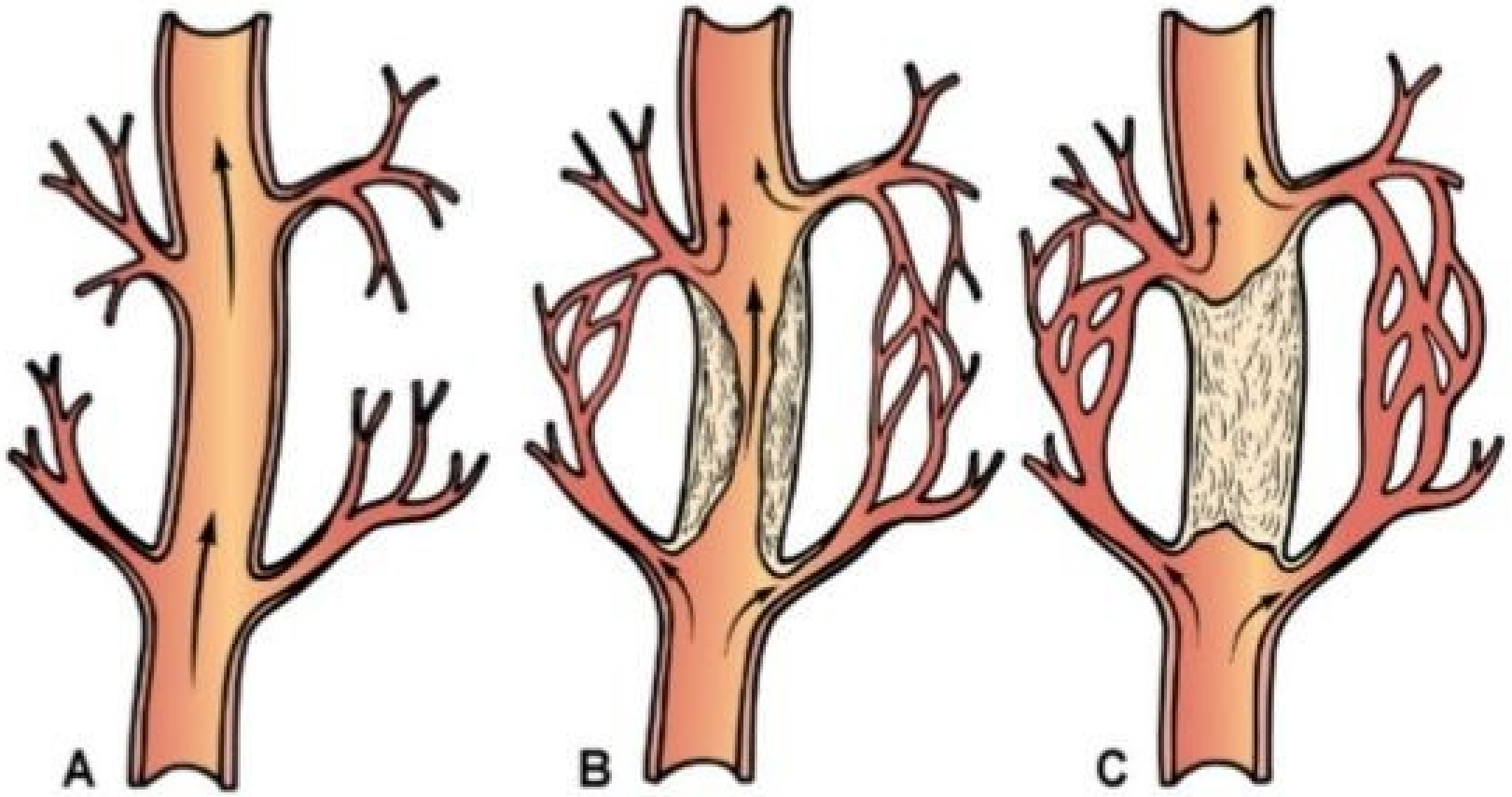
- Diagnosis is made with an elevated cardiac enzyme AND
  - Pt. has typical complains
  - Pt. has ST elevation or depression
  - History of cardiac intervention
- Serial EKG's – abnormalities are ***early*** signs of ischemia
  - First one read within 10 minutes of arrival to ED
  - Should be repeated every 20 to 30 minutes
- Serial Cardiac Enzymes – abnormalities are ***delayed***
  - Should be repeated every 4 to 6 hours
- Stress Test
- Echocardiogram
- Coronary Angiogram

Some Extra Info...

- “Collateral Circulation” is a big deal. This is alternate circulation around a blocked artery or vein via another route.
- Develops in response to increasing severity of ischemic coronary disease.

- If a 35 year-old and 85 year-old have an identical MI – who is more likely to survive?

Occlusion/Collateral Circulation

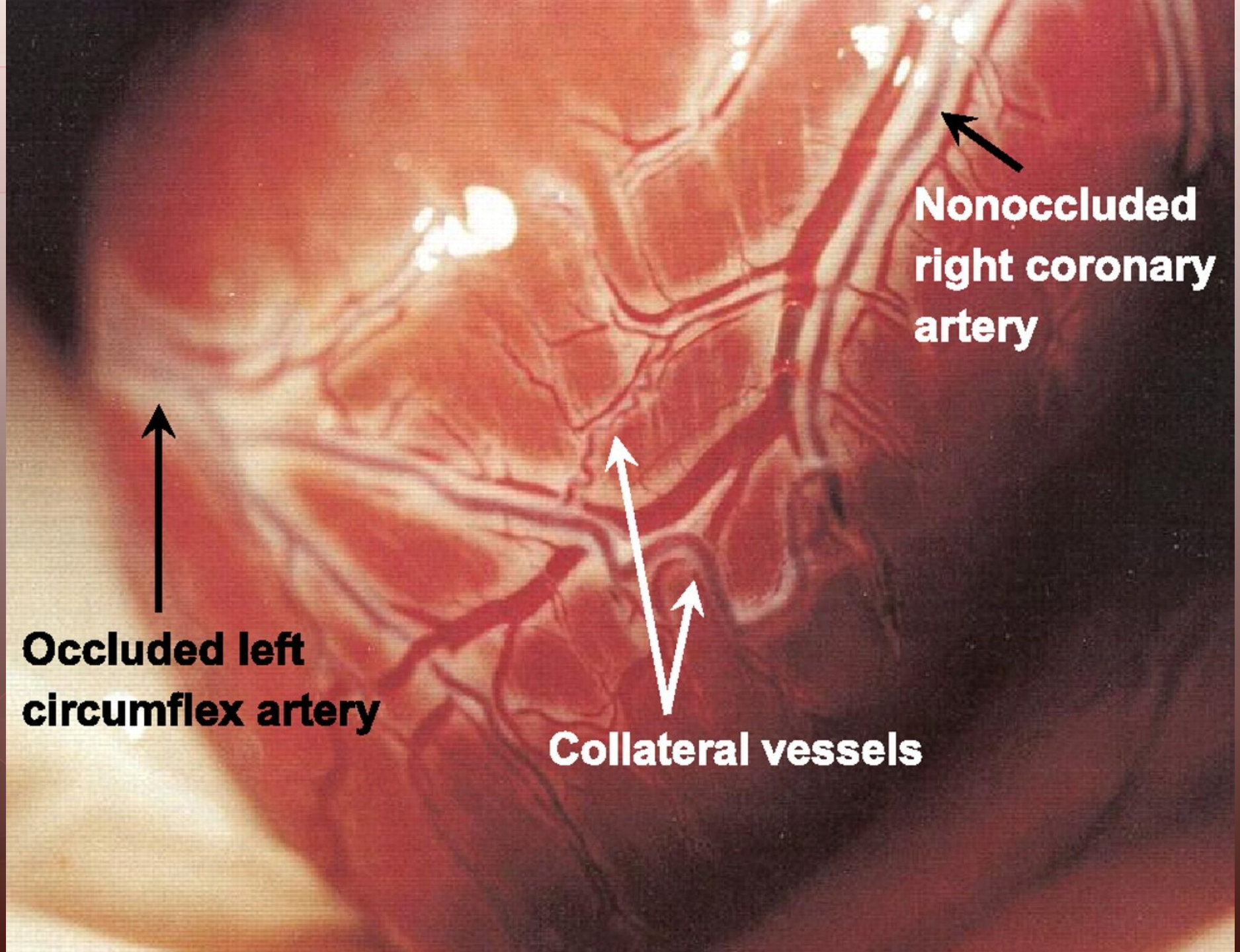


Vessel Occlusion with Collateral Circulation

A. Open, functioning coronary artery

B. Partial coronary artery closure with collateral circulation being established

C. Total coronary artery occlusion with collateral circulation bypassing the occlusion to supply the myocardium


Nonoccluded right coronary artery
Occluded left circumflex artery
Collateral vessels

Let’s Talk Lab Work…

- Troponin
  - Only increases with cardiac injury or infarction!
  - Elevate as early as **2-3 hours** after injury
  - Level = <0.01
  - Remains elevated for days after an MI
- CK (Creatinine Kinase)
  - Found in cardiac muscle, skeletal muscle and the brain
  - Can elevate within **6 hours** of injury
  - Returns to normal 2-3 days following injury
- CK-MB (Creatinine Kinase Myoglobin)
  - Elevates **3-6 hours** after injury
  - Returns to normal 12-24 hours after injury

Treatment of MI

- Fibrinolytic Therapy
  - Tissue Plasminogen Activators (tPA)
    - alteplase, reteplase, tenectaplase
    - Should be administered within 30 minutes of arrival to hospital
- Percutaneous Coronary Intervention (PCI)
  - Stent
  - Balloon deployment
- Cardiac Bypass if PCI is unsuccessful

- The artery must be opened within 90 minutes of presentation to minimize cardiac death!

Your Patient Complains of Chest Pain……

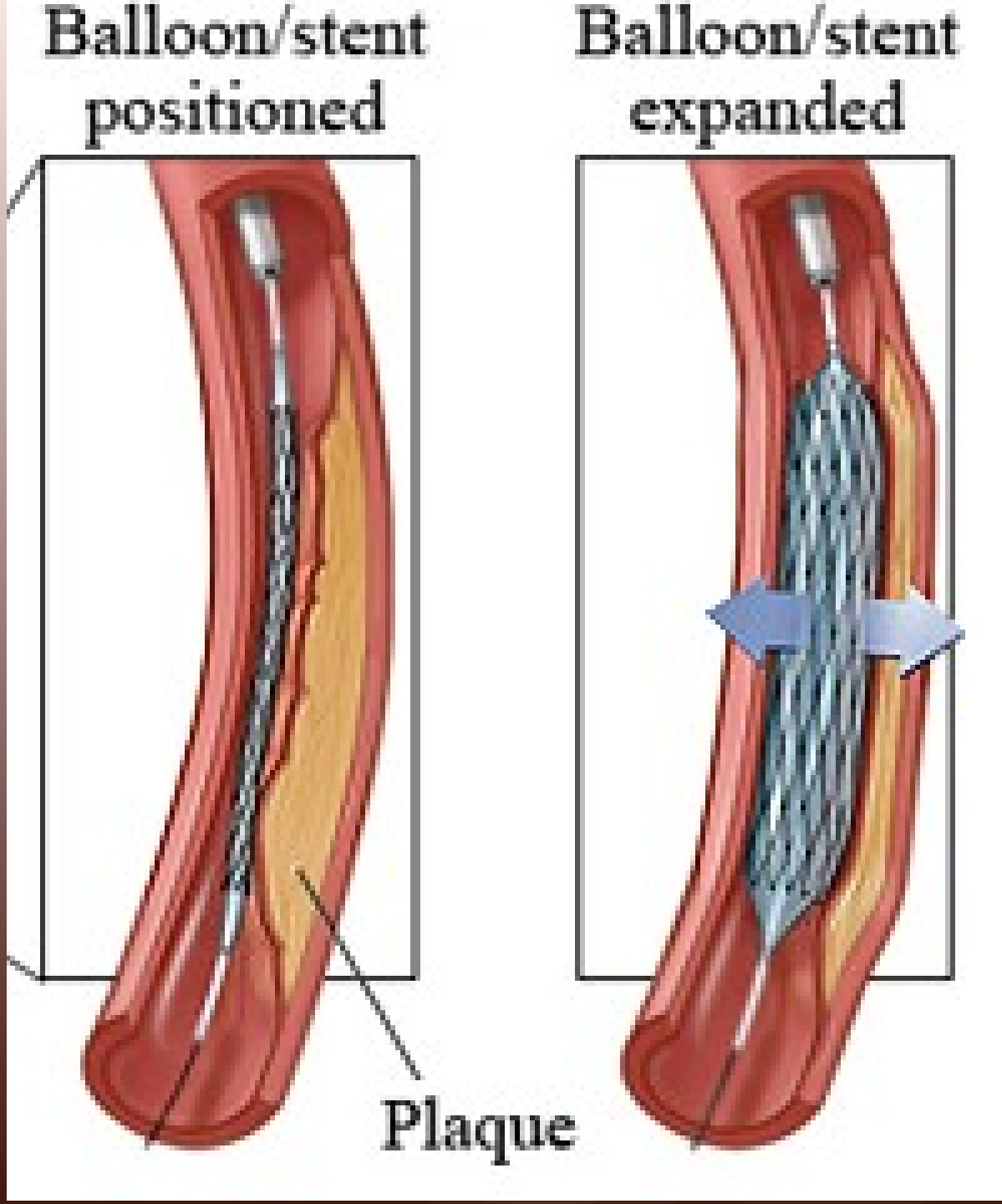
- What do you do???

- Vital Signs
- Assess Pain
- **M**orphine **O**xygen **N**itro **A**spirin
- Stat EKG
  - If it indicates an active MI – **STAT get ready for cath lab!**
- Stat Cardiac Enzymes
- STAT CALL THE DOCTOR!

Percutaneous Coronary Intervention (PCI)

- The use of a stent or balloon inflation to open up an area of blockage.

https://www.youtube.com/watch?v=gVMi4j6v1E4



Nursing Care

- Pre-op
  - Educate
  - Check allergies
  - Check lab work
  - Obtain consents
  - NPO status
  - CHG shower
  - Baseline vital signs
  - Give ASA, Plavix, beta blocker and IV fluids as ordered.
- Post-op
  - Vital signs
  - Monitor for bleeding
  - Monitor for chest pain

Complications of MI

- Recurrent MI’s
- Cardiac arrhythmias
- Heart failure
- Aneurysm
- Heart valve dysfunction
- Cardiogenic shock
- Cardiac tamponade
- Pericarditis

Cardiogenic Shock

- Pump failure
  - Effects the left ventricle

- Most common cause: AMI
- ↓ CO → inadequate tissue perfusion and initiation of *shock syndrome*
- Can also occur with end-stage HF, cardiac tamponade, PE, cardiomyopathy, and dysrhythmia

- Life-threatening/high mortality rate ~50-75%

Cardiogenic Shock

- Signs and symptoms:
  - Cerebral hypoxia
  - Hypotension
  - Rapid/weak pulse
  - Cold clammy skin
  - Tachypnea/SOB
  - Crackles in lungs – why?

Cardiogenic Shock

- Must find the cause and treat it!
- Oral Antiplatelet Therapy
  - ASA
  - clopidogrel*
- Heparin
- GP IIb/IIIa inhibitors
  - eptifibatide
- Amiodarone
- Sympathomimetic inotropic and vasopressor agents
  - norepinephrine
  - dopamine
- What about fluid boluses to keep blood pressure up?

What if my patient codes?

- Code Management
  - Check for responsiveness, breathing, pulse
  - Person who found patient is the “leader”
  - Call for help – “CODE BLUE”
  - Perform CPR (push hard, push fast)
  - Assign roles as people walk in:
    - Compressions
    - Airway
    - Meds (Get rainbow labs, start IV)
    - Recorder
    - “Go-For” (Call physician, family and chaplain)
    - You remain the leader and guide the code
  - Follow ACLS guidelines

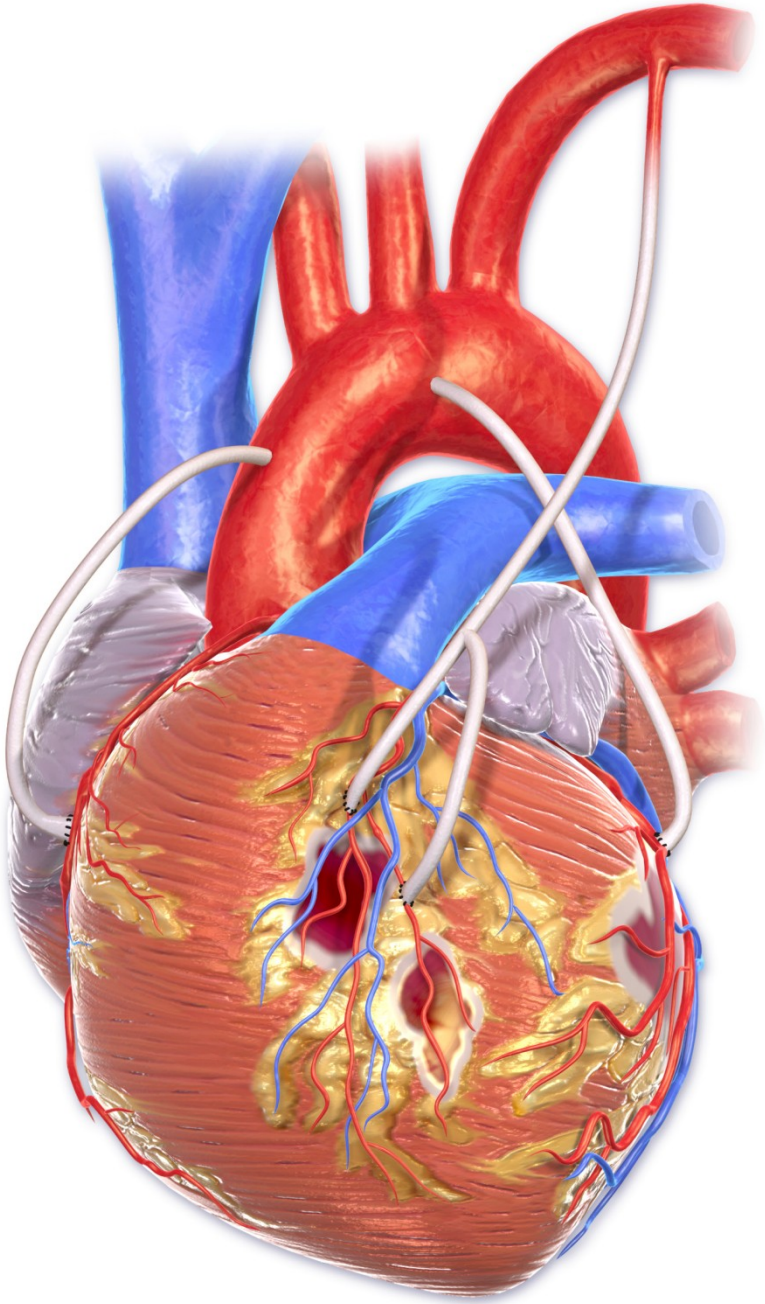
Recovery After an MI

- Several weeks
  - Scar tissue replaces damaged heart muscle
- Life style changes are necessary
  - New medications
  - Diet modification
  - Activity modification
  - Tobacco cessation
- Cardiac rehab is a good resource for these patients.

What if a blockage cannot be fixed with PCI?

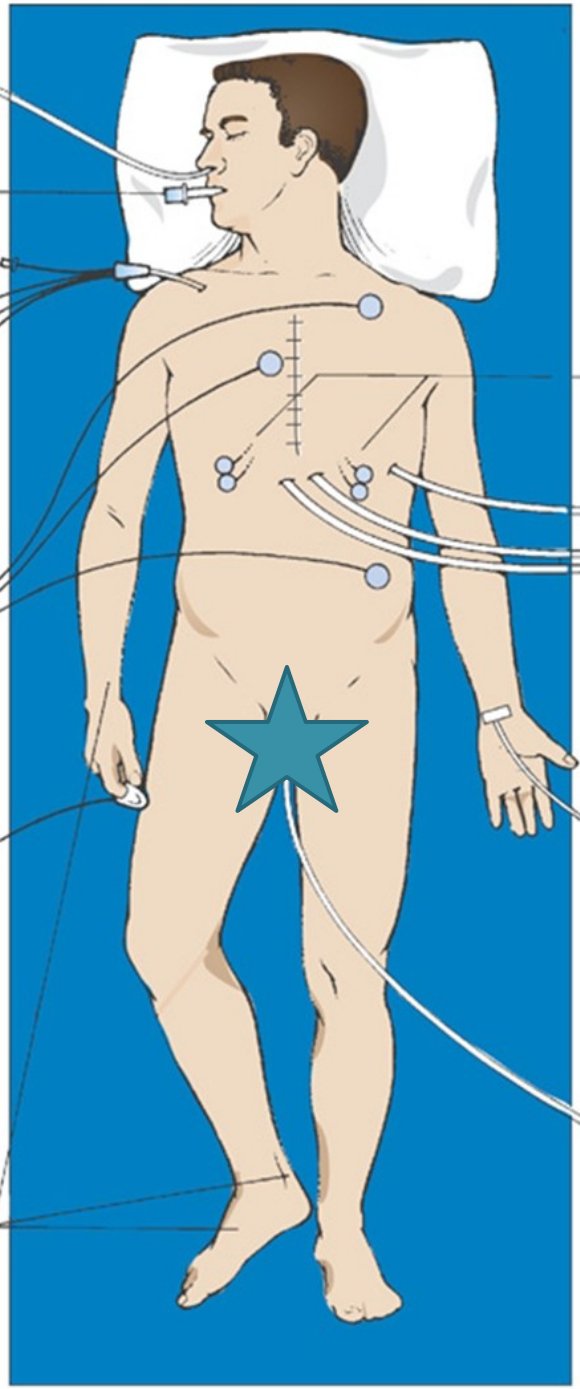
Cardiac Bypass

- The surgeon “bypasses” a blockage that cannot be opened with PCI.
- A vein or artery is used from the patient’s leg, chest or arm.
  - Veins are used more often.
- Present following bypass:
  - Chest tubes w/ or w/out a JP drain
  - Pacer wires



Coronary Artery Bypass Graft (CABG)

Quadruple Bypass



Nasogastric tube to decompress stomach.

Endotracheal tube for providing ventilatory assistance, suctioning, and use of end-tidal CO_2 monitor.

Swan-Ganz catheter for monitoring central venous pressure, pulmonary artery and pulmonary artery wedge pressures, temperature, SVO_2. Can be used for determining cardiac output, for venous and pulmonary artery blood sampling, and for medication administration. Venous lines can be used for fluid administration.

ECG electrodes for monitoring heart rate and rhythm.

SpO_2 monitor for measuring arterial oxygen saturation.

Assess peripheral pulses: radial, posterior tibial, dorsalis pedis.

Neurological assessment:
- Level of responsiveness
- Hand grasp
- Pupils
- Pain
- Movement

Assess skin color and temperature, color of lips, and color and capillary refill of nail beds.

Epicardial pacing electrodes to temporarily pace the heart.

Mediastinal and pleural chest tubes attached to suction; drainage and wound healing are monitored.

Radial arterial line; used for monitoring arterial blood pressure and for blood sampling.

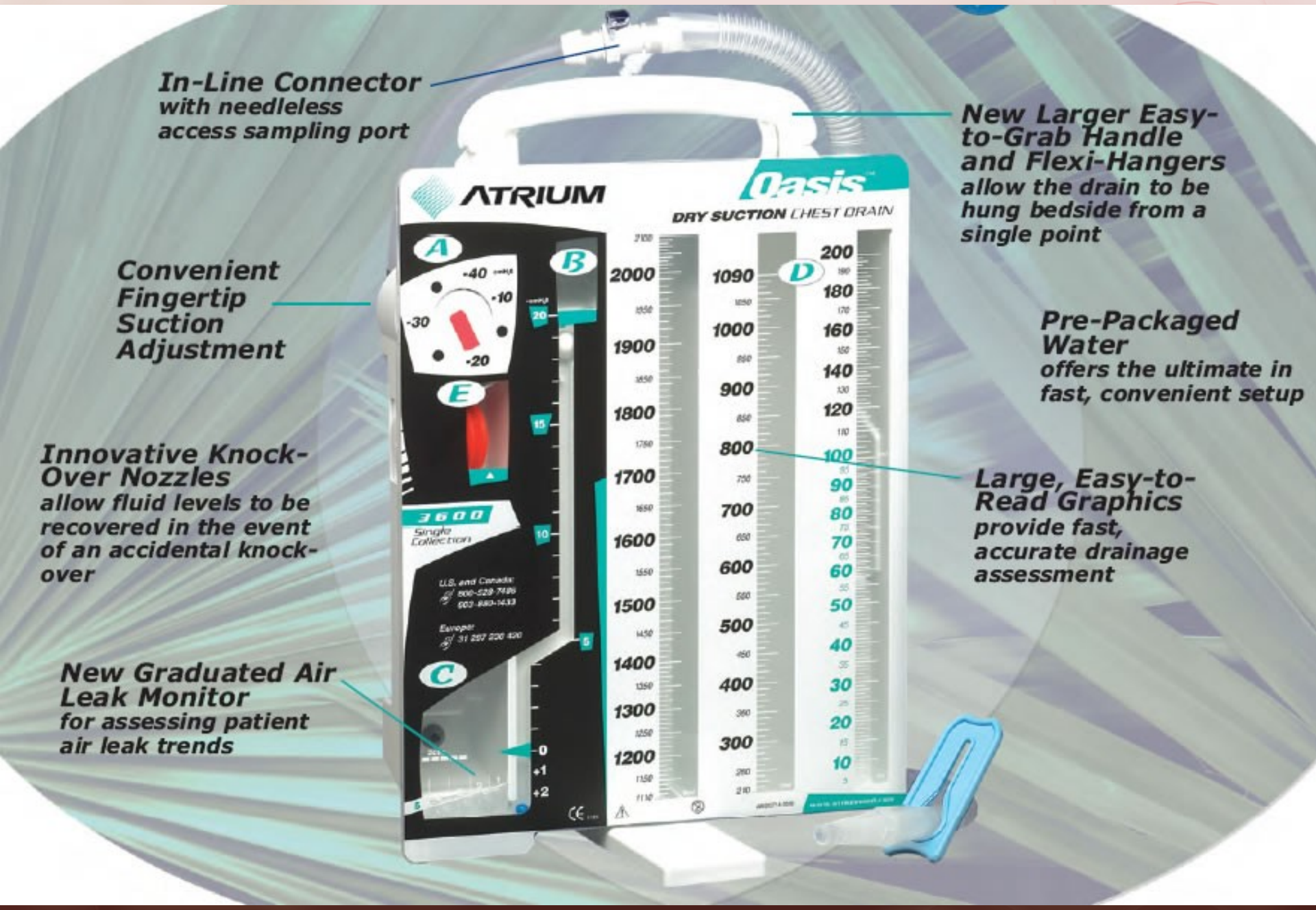
Indwelling catheter to closed drainage system for accurate measurement of urine output; a temperature probe may be part of the indwelling catheter.

Nursing Care

- Pre-op
  - Education
  - Obtain consents
  - Maintain NPO status
  - Two CHG showers
  - Clip neck to ankle
  - Pre-op Lab work (T/C)
  - Glucose control*
  - Pre-op medications and IV fluids
  - Offer to have chaplain/preacher/priest come pray with patient and family before surgery
- Post-op
  - Monitor I&O's and vital signs
  - Monitor for bleeding, infection and changes in cardiac rhythm
  - Monitor lab work
  - Ventilatory management
  - Incision care
  - Monitor pulses
  - Glucose control*
  - Get patient out of bed!
  - Encourage patient to cough and deep breathe!
  - Titrate drips – blood pressure/sedation/pain

Chest Tubes

- Always present after bypass to drain excess blood
- One in the pleural space and one in the mediastinal space
- Sutured in with a dressing covering
- Will be to gravity or suction
  - Bubbling will be continuous on suction
- Output is recorded in 8 hour increments and recorded as current output/level in chamber, then marked on chamber
  - 120/600 means the patient has had 120 mls out and the current level in the collection chamber is at 600


In-Line Connector
with needleless
access sampling port
New Larger Easy-
to-Grab Handle
and Flexi-Hangers
allow the drain to be
hung bedside from a
single point
Convenient
Fingertip
Suction
Adjustment
Pre-Packaged
Water
offers the ultimate in
fast, convenient setup
Innovative Knock-
Over Nozzles
allow fluid levels to be
recovered in the event
of an accidental knock-
over
Large, Easy-to-
Read Graphics
provide fast,
accurate drainage
assessment
New Graduated Air
Leak Monitor
for assessing patient
air leak trends
ATRIUM
Oasis
DRY SUCTION CHEST DRAIN
A
B
C
D
E
3600
Single Collection
U.S. and Canada:
Europe:
2000
1900
1800
1700
1600
1500
1400
1300
1200
1090
1000
900
800
700
600
500
400
300
200
180
160
140
120
100
90
80
70
60
50
40
30
20
10
-40
-10
-30
-20
0
+1
+2

Nursing Care

- Keep accurate I&O's and monitor for bleeding and infection
  - Drainage should be serosanguinous or have a pus-like appearance, it should not be frank blood
  - Drainage should not exceed 100mls/hr
- Monitor respiratory status and vital signs
- Monitor for air leak
  - There should be NO BUBBLING when disconnected from suction
  - With pneumothorax, you can have intermittent bubbling but not continuous bubbling.
- Change dressing per orders and as needed
- Check insertion site and entire setup at shift change, every 4 hours and PRN
  - Monitor for **subcutaneous emphysema**

Troubleshooting

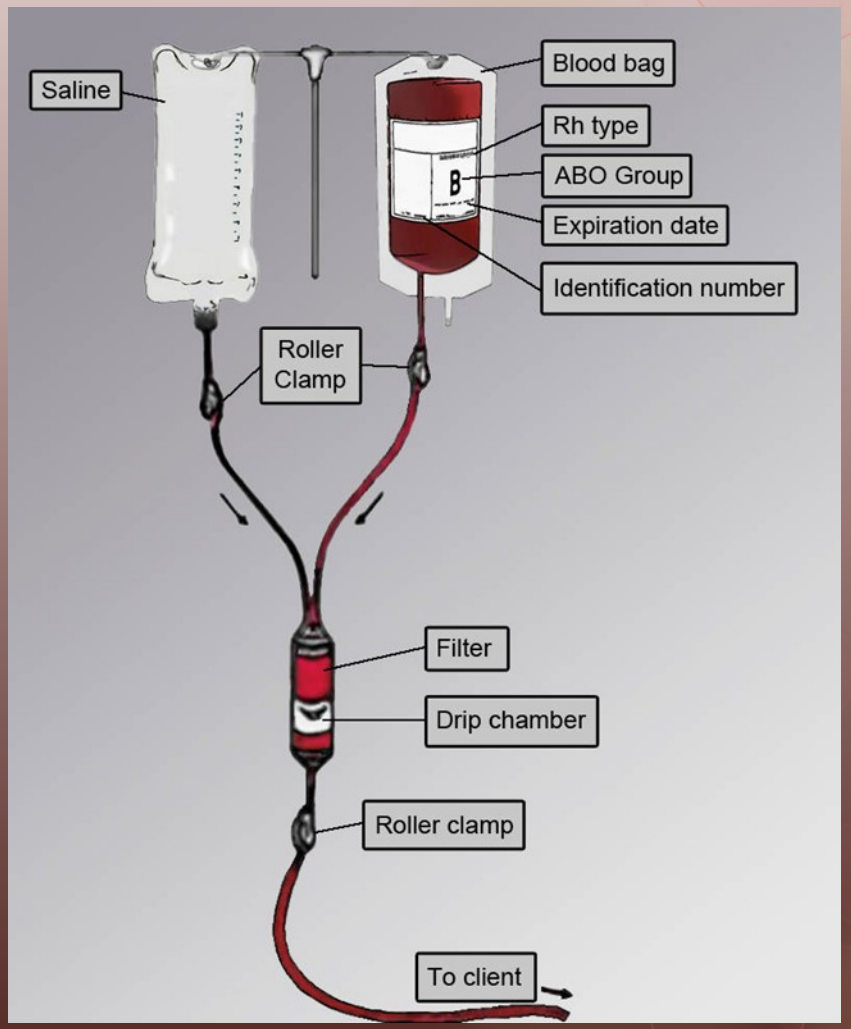
- If chest tube disconnects from setup or setup breaks:
  - Reconnect to system, or get a new system
  - Notify the physician immediately
  - You can put the end of the chest tube in sterile water to buy time and decrease risk of air or bacteria entering the chest tube.
- If chest tube is pulled out:
  - Place a sterile NON-OCCLUSIVE dressing over the insertion site
    - Tape down 3 sides, leaving one side open for air to escape.
  - Notify the physician immediately

Blood Transfusions

- Blood often needed after major surgery
- Considered a “transplant” and should be monitored closely
- Types of transfusions:
  - Red Blood Cells (RBC’s)
  - White Blood Cells (WBC’s)
  - Cryoprecipitate
  - Fresh Frozen Plasma (FFP)
  - Platelets
  - Albumin

RBC Transfusion

- Maintain hemoglobin at or above 7
- One unit = 300 mL.
- Infused within 2-4 hours
- Two nurses must verify blood prior to hanging on the patient.
- Consent must be obtained
- Must use blood tubing
- Hung with normal saline
- Monitor for transfusion reactions



Transfusion Reaction

- Vital signs within 30 minutes **before** starting
- Remain with the patient for the first **15 minutes** of transfusion and retake vital signs.
- Monitor vital signs **every hour** until transfusion complete.
- **Post-transfusion** vital signs.
- If reaction suspected, **STOP** the transfusion and notify the physician.
- Infuse NS at a slow drip while waiting on physician and continue to monitor.
- The physician will order to discontinue transfusion or to treat symptoms and resume transfusion.
- Draw lab work and collect a urine for testing.
- Send blood, tubing and any lab work to the blood bank.

***Any change seen in your patient can be an indication of a reaction!!**

Blood Transfusion Reaction

A Allergic

MILD
Facial Flushing
Hives/ Rash
SEVERE
Increased Anxiety
Wheezing
Decreased BP

F Febrile

Headache
Tachycardia
Tachypnea
Fever/Chills
Anxiety

H Hemolytic

Decreased BP
Increased RR
Hemoglobulinuria
Chest Pain

Apprehension
Low Back Pain
Fever
Tachycardia
Chills

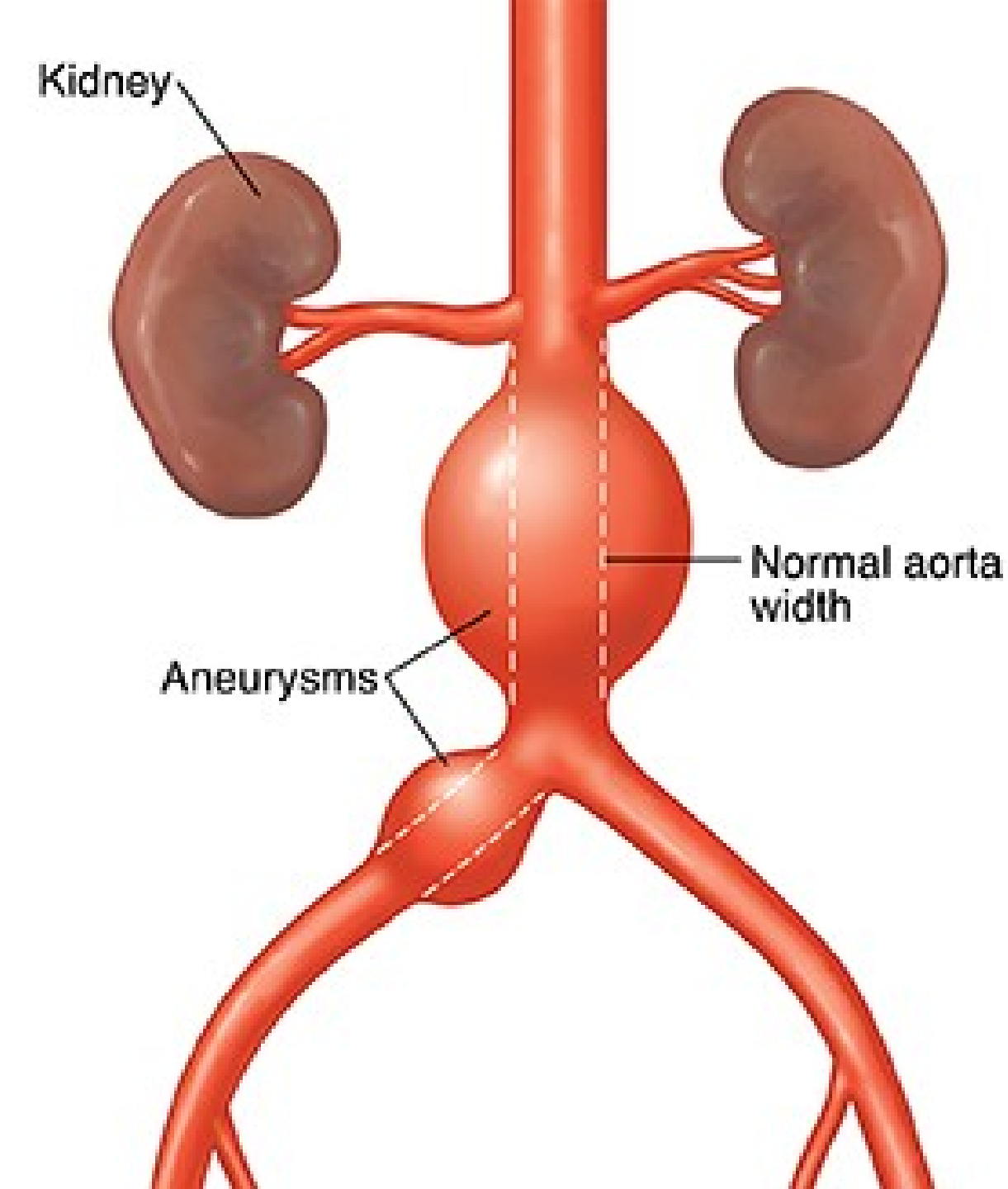
Cardiac Rehabilitation

- Physiologic = lifestyle modification (wt. reduction, smoking cessation, physical exercise), rest & comfort
- Psychologic = anxiety & fear, denial & anger, dependency & depression
- Spiritual = hopeless, guilt, social isolation
- Economic = loss of income, work restrictions
- Vocational = new skills

Let’s Talk About Aneurysms

What is an aneurysm?

- When an artery wall weakens causing it to widen abnormally or “balloon out”



Risk Factors

- Smoking (current or past)
- Male gender
- Advancing age
- Caucasian race
- Atherosclerosis
- Hypertension
- Family history of AAA
- Other large artery aneurysms

- Decreased Risk:
  - Female gender
  - Non-Caucasian race
  - Diabetes

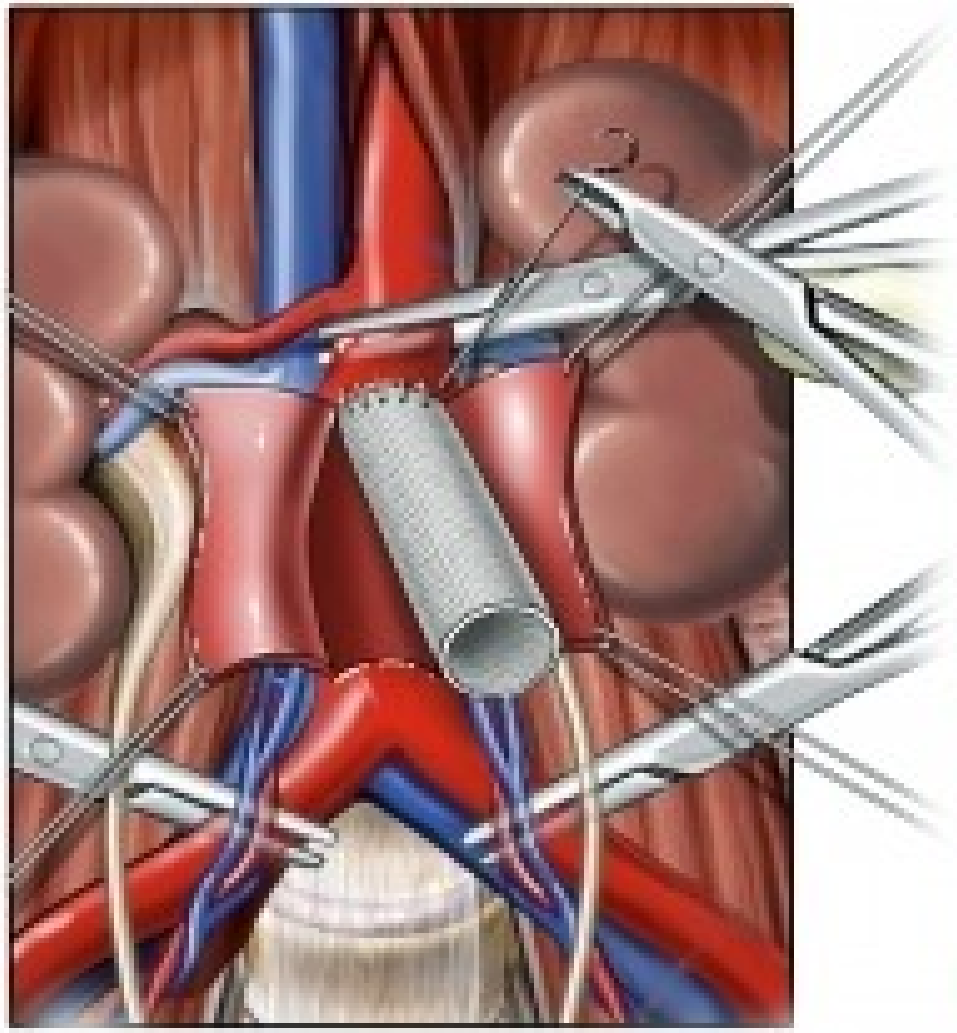
Signs & Symptoms of a AAA

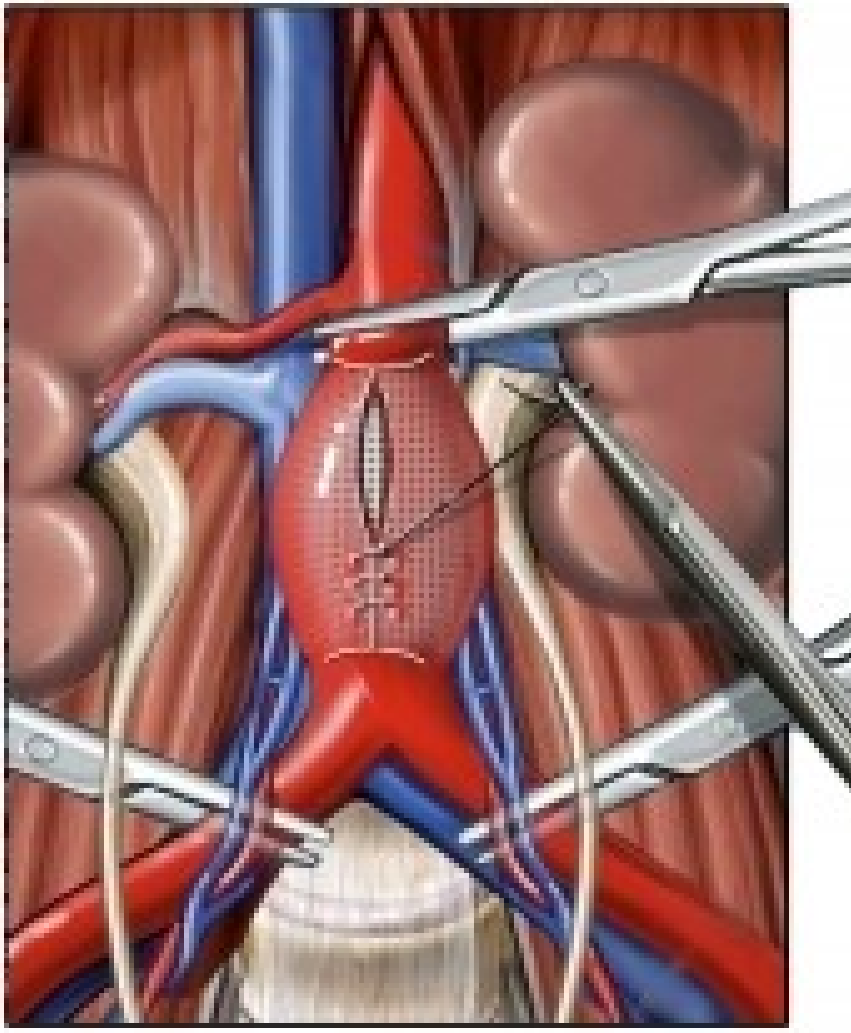
- Nonruptured:
  - Abdominal, back or flank pain
  - Pulsating abdomen
  - Pain or discoloration in the feet
- Ruptured:
  - Severe pain
  - Hypotension**
  - Pulsatile abdominal mass
  - MEDICAL EMERGENCY!!!

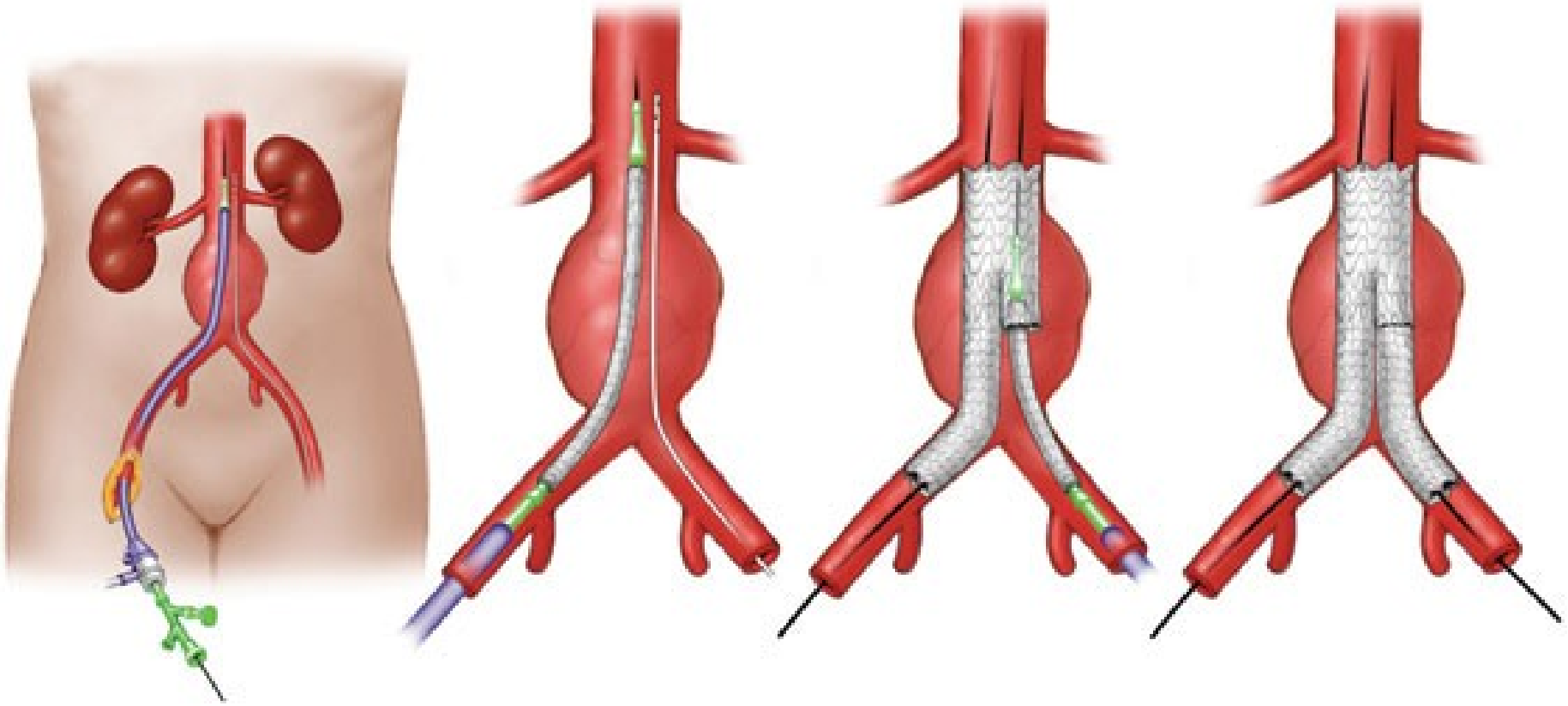
Treatment of a AAA

- Open Repair
- Endovascular Aneurysm Repair (EVAR)
- Replace diseased part of aorta with a tube or bifurcated prosthetic graft.

- Complications post-op:
  - MI
  - Bleeding
  - Renal Failure
  - Bowel or ureteral injury
  - GI complications (ischemic colon)
  - Leg ischemia
  - Graft infection (mortality of 90% with this)





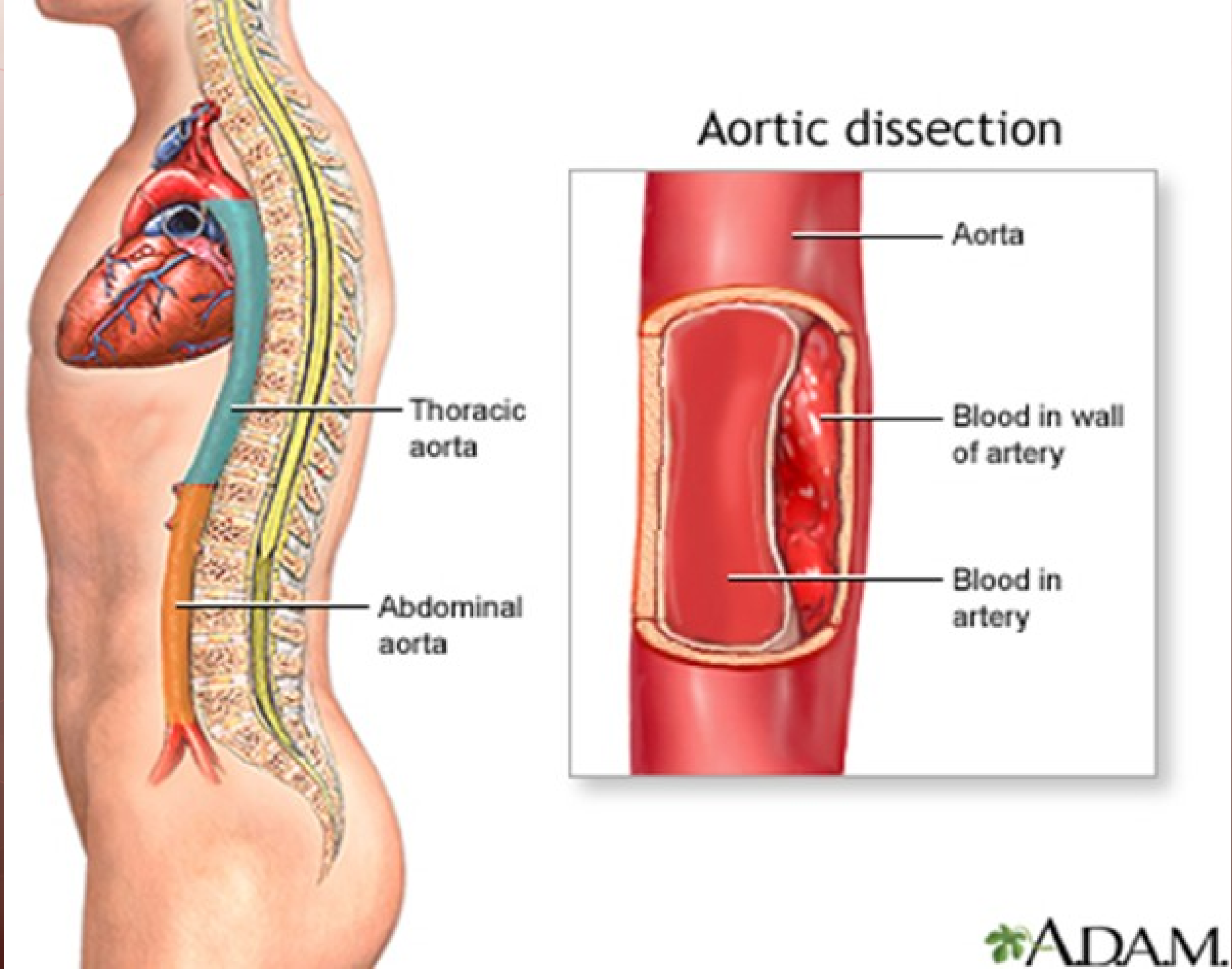


Nursing Care

- Notify physician STAT if you suspect a ruptured AAA!
- Pre-Op:
  - STAT CT of abdomen
  - Educate and obtain consents
  - CHG shower/bed bath
  - Lab work with T/C
  - Offer prayer or chaplain visit
- Post-Op:
  - Same as with CABG

Aortic Dissection

- When the aorta “tears”, allowing blood to flow between the artery layers.
- Two types:
  - Type A – affects the ascending aorta and arch
  - Type B – begins in the descending aorta
- If tear progresses through outer layer, most often fatal


Thoracic aorta
Abdominal aorta
Aortic dissection
Aorta
Blood in wall of artery
Blood in artery
ADAM.

Aortic Dissection

Risk Factors

- Male gender
- Age
- Aortic diseases
- Atherosclerosis
- Trauma
- Tobacco use
- Cocaine or Meth use
- Congenital heart disease
- Connective tissue disorders
- Family history
- History of heart surgery
- Pregnancy
- Uncontrolled hypertension

Symptoms

- Type A:
  - Abrupt onset of excruciating chest pain
  - Neuro deficits
  - Weakened or absent carotid pulses
  - Dizziness
  - Syncope
- Type B:
  - Pain in back, abdomen or legs
- Pain often described as sharp, tearing, ripping or stabbing…
- May have no symptoms…

***Symptoms follow the dissection as it moves….

Aortic Dissection Complications

- Cardiac Tamponade
- If rupture occurs:
  - Exsanguination and death
- Occlusion of blood supply to vital organs

- Diagnosis:
  - EKG – rule out cardiac cause
  - Chest x-ray – widening of mediastinum and pleural effusion
  - CT scan
  - MRI
  - TEE

Aortic Dissection Treatment

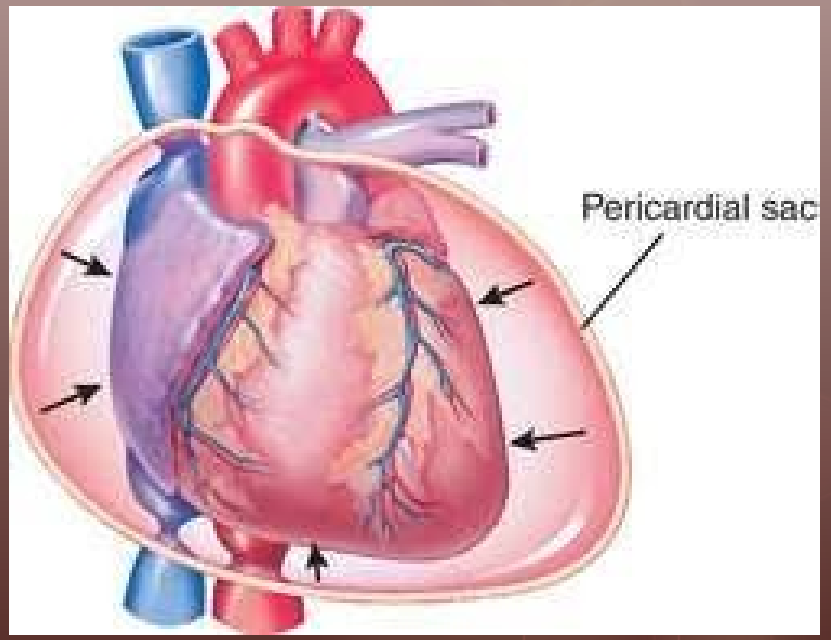
- Pain relief
- Heart rate and BP control (Uncomplicated Type B)
- Endovascular repair (Type B)
- Surgical therapy (Type A)

Nursing Care

- Pre-op:
  - Education
  - Keep HOB up
  - Maintain relaxing environment
  - Manage pain and anxiety
  - Blood pressure and heart rate control
  - Continuous assessments (circulation and neuro)
  - Offer prayer or chaplain/priest/preacher visit
- Post-op:
  - Same as pre-op!
  - General post-op care

Cardiac Tamponade

- Blood accumulates in pericardial sac (pericardial effusion)
- Sac can only extend so far
- Once limit is reached, the heart has to compete with fluid
- Tamponade occurs when limit is reached and heart cannot function properly anymore
- Manifestations include:
  - Sinus tachycardia or hypotension*
  - Dyspnea or tachypnea
  - Narrowed pulse pressure
  - Jugular venous distention*
  - Peripheral edema
  - Muffled heart sounds*
  - Pulsus paradoxus
  - Pericardial rub (w/ pericarditis)



https://www.youtube.com/watch?v=EUCp_3_vwtw

Cardiac Tamponade

Treatment

- If having hemodynamic changes:
  - Percutaneous drainage
  - Surgical drainage
  - “Pericardiocentesis”
- If no hemodynamic changes:
  - Conservative management with continuous hemodynamic assessment

Nursing Care

- Close monitoring and assessment!
  - Hemodynamic status
  - Cardiac rhythm
  - Urine output
- Post-op care