Content Description

This session reviews cardiogenic and hypovolemic shock, hypertensive crisis, aortic aneurysm, and cardiac tamponade, including clinical presentation, diagnostic testing, and collaborative management. Cardiac trauma will also be discussed. Emphasis will be on possible questions that may be asked on these subjects in the CCRN, PCCN and CMC examinations. There will be time allotted for sample questions at the end of the session.

Learning Objectives
At the end of this session, the participant will be able to:

1. Describe clinical manifestations of cardiogenic and hypovolemic shock, hypertensive crisis, aortic aneurysm, and cardiac tamponade

2. Describe collaborative management for the conditions listed.

REFERENCES

NOTE: Please refer to outline for references pertaining to this session.
Certification Review: Cardiovascular III

Approximately 20% of the CCRN exam, 36% of the PCCN exam and 43% of the CMC exam will focus on cardiovascular disease

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Note for PCCN candidates: This presentation includes discussions of pulmonary artery catheter measurements, administration of vasoactive medications, and advanced mechanical devices such as intra-aortic balloon pump and ventricular assist devices. These topics will not be tested in the PCCN exam.

I. Shock

A. Stages of shock

1. Clinical signs & symptoms related to stage of shock

   Initial stage - Decreased CO and tissue perfusion, no clinical symptoms
   Compensatory stage – Mediated by SNS; consists of Neural, hormonal and chemical responses. Decreased CO, early clinical S/S: tachycardia, increased cardiac contractility, decreased urine output
   Progressive stage – Compensatory mechanisms begin to fail: acidosis, third spacing, peripheral, gastrointestinal and renal vasoconstriction, capillary vasodilation, organ dysfunction
   Refractory stage – Shock unresponsive to therapy; irreversible

B. Hemodynamic monitoring of the patient in shock

1. CVP

   CVP = RAP = RVEDP = Right heart preload
   Normal 2-5 mmHg
   Measures filling pressures in right heart
   Normally correlates with volume
   May obtain CVP with a single, double, or triple lumen catheter or proximal port of PA catheter
   Subclavian or internal jugular veins most often used
Femoral veins not part of central circulation. Catheter placed in femoral site must be advanced into the IVC near the right atrium.

Low CVP indication of hypovolemia – relative or actual
- **D/T:** Bleeding, vasodilation, diuretics, rewarming post OHS, fluid shifts
- **S/S:** Tachycardia causing an increase in myocardial oxygen demand
  - Will see fall in CVP before hypotension

High CVP indication of volume overload
- **D/T:** Aggressive fluid resuscitation, heart failure, renal failure
- **S/S:** Dyspnea, crackles, distended neck veins
  - Requires increased cardiac workload to move volume, increasing myocardial oxygen demand

Not a reliable indicator of left ventricular dysfunction.

2. **PAOP**

**PAOP=PAWP=LVEDP=left heart preload**
- Normal 5-12 mmHg
  - PAD can also be used. Equal to or 1-3 mmHg higher than PAOP
  - Measures filling pressures in left heart
  - Normally correlates with volume
  - Obtained from distal port of PA catheter with balloon inflated
  - Subclavian or internal jugular veins most often used

**Considerations**
- Pulmonary hypertension can alter PAD/PAOP relationship
- Mitral stenosis and mitral regurgitation elevate PAOP

**Low PAOP** indicates hypovolemia
**High PAOP** indicates hypervolemia
**Indicator of myocardial dysfunction**
- Higher the PAOP, greater dysfunction

3. **Cardiac output/cardiac index**

**Normals:** CO: 4-8 L/min; CI: 2.5-4.0 L/min/m²
- Obtained from PA catheter either by thermodilution or continuous
- Tricuspid valve regurgitation and ventricular septal defect will cause inaccurate CO

**Low CO/CI:**
- **HR:** Fast or slow
- **Preload:** Decreased from diuresis, dehydration, fluid shifts, hypovolemia, vasodilation
- **Afterload:** Increased from vasoconstriction caused by hypertension, hypothermia, low-flow states, compensatory vasoconstriction
- **Contractility:** Decreased from MI, HF, cardiomyopathy, cardiogenic shock, cardiac tamponade, valvular disease

**High CO/CI:**
- Anxiety, compensatory response in pulmonary edema, increased metabolic states (hyperthyroid, fever, tachycardia), sepsis, mild
hypertension

4. Afterload
Pressure the ventricles must generate to overcome the resistance to ejection
Calculated measurement derived from information obtained from PA catheter
Right heart afterload = pulmonary vascular resistance
   Normal 50-250 dynes/sec/cm^5
   Increased in acute lung injury
Left heart afterload = systemic vascular resistance
   Normal 800-1200 dynes/sec/cm^5
   Formula: MAP – CVP ÷ CO x 80 = SVR
   Increased in heart failure, cardiogenic shock, hypovolemic shock
   Decreased in septic shock

5. Putting it all together

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<tr>
<th>Diagnostic Indications</th>
<th>Hemodynamic Profile</th>
<th>Possible Causes</th>
<th>Clinical Findings</th>
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<td>Hypovolemic shock</td>
<td>CO/CI, CVP, PAOP, SVR</td>
<td>Trauma, Surgery, Bleeding, Burns</td>
<td>Tachycardia, hypotension, Clear lungs, Variable MS</td>
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<tr>
<td>Cardiogenic shock</td>
<td>CO/CI, CVP, PAOP, SVR</td>
<td>MI, Aortic or mitral valvular disease</td>
<td>Tachycardia, dysrhythmias, Hypotension, weak pulses, Crackles, UO, Skin cool, pale, moist, Possible MS Δs</td>
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<tr>
<td>Septic shock</td>
<td>CO/CI, CVP, PAOP, SVR</td>
<td>Sepsis</td>
<td>Tachycardia, hypotension, Bounding pulses, Lungs clear or with crackles, UO, Skin warm and flushed, Variable MS</td>
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<tr>
<td>MODS</td>
<td>CO/CI, or CVP, or PAOP, or SVR</td>
<td>Sepsis, SIRS</td>
<td>Normal or tachycardia, Hypotension, weak pulses, Lungs clear or with crackles, UO, BUN, creatinine, Skin cool and mottled, Variable MS</td>
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C. Cardiogenic shock

1. Description
   Impaired ability of the heart to pump blood effectively, resulting in decreased systemic blood flow and inadequate tissue perfusion

2. Etiology
   MI, ischemia, end-stage cardiomyopathy, severe valvular dysfunction, myocardial contusion

3. Clinical manifestations
   SBP < 90mm Hg; MAP < 60 mmHg
   Tachycardia, dysrhythmias, rapid, thready pulse, JVD, peripheral edema
   Hemodynamic parameters: CVP, PAP increased; PAOP > 18 mmHg, SVR > 2000 dynes/sec/cm⁻⁵; CI < 1.8 L/min/m²
   Ejection fraction < 30%
   Oliguria, decreased/absent bowel sounds
   Tachypnea, crackles, orthopnea
   Restlessness, agitation, confusion, obtunded
   Cool, pale, diaphoretic/mottled/cyanotic skin

4. Medical Management
   Oxygen therapy – mechanical ventilation
   Hemodynamic monitoring: pulmonary artery catheter, arterial line
   Angioplasty, thrombolytics if acute
   Intra-aortic balloon pump
     Improves coronary artery perfusion, reduces afterload, and improves perfusion to vital organs
     Balloon inserted into descending thoracic aorta via femoral artery
     Tip of balloon distal to aortic arch
     Distal end of balloon just above renal artery
     Inflates during diastole
       Blood displaced forward into coronary arteries and backward into kidneys.
       Deflates just before systole
       Decreases afterload, reduces myocardial oxygen demand.
   Ventricular Assist Device (VAD)
     Provides mechanical circulation when standard therapies fail.
     Decreases preload, myocardial workload, neurohormonal responses
     Increases systemic circulation, tissue perfusion
     Left ventricle is cannulated. Blood is sent through pump and returned to aorta for systemic circulation.
     Pump may be internal or external. Smaller devices allow for mobility.
     Bridge to transplant, destination therapy, or bridge to recovery
     Improved mortality, function and quality of life.
     Complications: sepsis, device failure, perioperative bleeding, stroke
   Heart transplant
   Pharmacologic management:
     Morphine - pain/anxiety reduction; preload/afterload reduction
     Vasopressors - Dopamine, Levophed - maintain blood pressure
Vasopressin and phenylephrine (Neosynephrine) not typically used in cardiogenic shock

Diuretics - Keep PAOP < 20 mmHg

Positive inotropes - Dobutamine, primacor (Milrinone) - increase cardiac contractility/CO

Also increases myocardial oxygen demand. Use only until crisis is controlled.

Nitrates - nitroglycerin for preload reduction, nitroprusside for afterload reduction

5. Nursing Management
Cardiac, hemodynamic monitoring, including SVO₂

Keep PAOP at point in which CI is maximized

Frequent head-to-toe assessments: VS, LOC, skin color/temperature, peripheral pulses, respiratory status, bowel sounds, UO

Administer smallest effective doses of ordered medications; concentrate dilution wherever possible; assess effectiveness

Monitor oxygen therapy: ABGs, pulse oximetry

Monitor lab values: electrolytes, BUN, creatinine, cardiac enzymes

Neurovascular checks on limb in which IABP is placed

Patient/family emotional support

Patient/family education

D. Hypovolemic shock

1. Description
30 - 40% blood volume loss; results in inadequate intravascular volume

Shock irreversible if volume not replaced in 90 minutes

2. Pathophysiology of stages of shock
Initial stage - Approximately 10% loss of blood volume – 750-1250cc (6-10% of body weight); compensatory mechanisms keep CO normal; mild vasoconstriction, cool skin, elevated heart rate < 110 BPM

Compensatory stage - Approximately 15-20% loss of blood volume – 1250-1750cc (10-15% of body weight); SBP <90-100 with decreased pulse pressure, tachycardia 110-120 BPM, increased respiratory rate, increased vasoconstriction, oliguria.

Progressive stage - Greater than 25% loss of blood volume - > 2500cc (> 15% of body weight); SBP < 90, tachycardia > 120 BPM, anuria, stuporous; compensatory mechanisms begin to fail

Refractory stage - irreversible; death imminent

3. Etiology
Trauma, post-op, GI bleed, third spacing

4. Clinical manifestations on presentation
Cool, clammy, mottled skin
SBP < 90mmHg, MAP < 60 mmHg

Agitation, confusion, obtunded
UO < 0.5 ml/kg/hr

Tachycardia, weak pulse
PAOP < 10 mmHg; CO decreased, ↓CVP, ↓PAP, ↓SVO₂, ↑SVR
5. Medical management
Rapid fluid resuscitation:
   Crystalloids: NSS, Ringer’s – need 2-3 times lost volume; will develop peripheral edema before fluid resuscitation complete
   Colloids: albumin, hetastarch, dextran – moves fluid from tissues to intravascular space; hetastarch stays in intravascular space longest – 36 hrs; dextran contraindicated in coagulopathies
   Blood products: PRBCs, FFP - > 20% blood loss, need to restore oxygen transport; after 5 units PRBCs, need to give FFP; after 10 units, need to give platelets, to prevent coagulopathy. Monitor for hyperkalemia from cell breakdown, hypocalcemia from binding to preservative.
   Oxygen, ABGs
   Hemodynamic monitoring
   Treat underlying cause

6. Nursing management
   Cardiac, hemodynamic monitoring
   Monitor labs: H&H, platelets, electrolytes, BUN, creatinine
       May take 12-72 hours for hct to reflect true extent of blood loss.
   Titrate dopamine, norepinephrine to blood pressure; need to replace volume first
   Monitor acid-base
   Complete bedrest
   Monitor VS, Oxygen, ABGs, Neuro, peripheral pulses, I&O, UO
   Administer fluids, assess effectiveness on VS, hemodynamics, etc
   Nutritional support
   Patient/ family support, education

Certification Questions

1. Which of the following is the earliest clinical sign of impending hypovolemic shock?
   A. Systolic BP less than 90 mmHg
   B. Capillary refill time greater than 4 seconds
   C. Decreased urine output
   D. Tachycardia greater than 120 bpm

2. A patient in cardiogenic shock is in the ICU on vasopressor and intra-aortic balloon pump support. Which of the following assessment findings most reliably indicates that the current therapy is appropriate?
   A. HR 100 bpm, MAP 66 mmHg, SVR 1200 dynes/sec/cm⁻⁵
   B. HR 107 bpm, MAP 53 mmHg, SVR 1900 dynes/sec/cm⁻⁵
   C. HR 110 bpm, MAP 70 mmHg, SVR 2800 dynes/sec/cm⁻⁵
   D. HR 117 bpm, MAP 53 mmHg, SVR 2400 dynes/sec/cm⁻⁵
3. A patient admitted with acute GI bleeding and syncopal episodes exhibits the following:

VS: BP: 86/52; HR:140; RR: 22; Temp: 99.8°F  ECG: Sinus tachycardia; PVCs
Skin mottled; cool and clammy to touch  Breath sounds clear

The nurse would initially anticipate administration of which of the following?
A. IV fluids  C. Metoprolol (Lopressor)
B. Dopamine  D. Phenylephrine (Neo-synephrine)

4. After transfusion of 10 units of packed red blood cells for acute hemorrhagic shock, which of
the following therapies is anticipated?
A. Fresh frozen plasma and platelets
B. Acetaminophen and diphenhydramine (Benadryl)
C. Furosemide (Lasix) and calcium chloride
D. Normal saline at 200 ml/hr and 50 ml of salt poor albumin

5. A patient who develops cardiogenic shock after myocardial infarction with papillary muscle
rupture would benefit most from which of the following immediate therapies?
A. Coronary artery bypass with mitral valve replacement
B. PTCA of occluded arteries and mitral valve replacement after the patient has stabilized
C. Thrombolytic therapy to reperfuse occluded coronary arteries and mitral valve repair
after the patient has stabilized
D. Vasopressor support and intra-aortic balloon pump counterpulsation

II. Hypertensive Crisis
A. Definition
Rise in diastolic blood pressure to greater that 120 mmHg
Hypertensive emergency
Rise in blood pressure with evidence of end-organ damage to the brain, kidneys, or retina that can be related to acute hypertension
Organ damage:
Brain – stroke, encephalopathy
Heart – MI, heart failure, angina, aneurysm
Kidney – hematuria, proteinuria, decreasing renal function
Retina – hemorrhage, exudates, papilledema

Hypertensive urgency
Elevated blood pressure without evidence of acute and-organ damage

B. Causes
Noncompliance
Inadequate treatment
Acute renal failure
Subarachnoid hemorrhage, intracerebral bleed
Drug induced – cocaine, amphetamines
Ingestion of tyramine-containing foods when taking MAO inhibitors
Pregnancy-induced eclampsia
Pheochromacytoma

C. Presentation
Related to affected organ
Neuro – neuro deficit, seizure, coma, headache, papilledema
Cardiac – chest pain, heart failure, pulmonary edema
Renal – acute renal failure, oliguria, hematuria, proteinuria

D. Interventions
Take BP in both arms
Insert arterial line for close monitoring
12-lead ECG
Administer IV vasodilator
  Nitroprusside
    Reduces preload and afterload. Administer with caution: reduction of preload may require fluid administration. Decreased diastolic pressure may cause coronary steal and angina.
  Nicardipine
    Dihydropyridine calcium channel blocker. Main action is as an arterial vasodilator. No effect on venous capacitance. Slower onset and offset than nitroprusside, but as effective. Fewer incidences of hypotension. Reduces cardiac and cerebral ischemia.
  Esmolol
    Short acting cardio selective beta-blocker. Useful for rapid titration of beta blockade. May be given in combination with nitroprusside to offset coronary steal, avoid rebound hypertension when nitroprusside is discontinued.
  Labetalol
    Combination noncardio selective beta blocker and alpha blocker. Longer-acting than esmolol; cannot be titrated quickly. Beneficial for patients with myocardial ischemia.
  Enalaprilat (Vasotec IV)
    ACE inhibitor, primarily an arterial dilator. May have important role in treatment of hypertensive emergency due to its inhibition of angiotensin II
  Fenoldopam
    Shown to be as effective as nitroprusside without its side effects. Improves creatinine clearance and urine flow rates; may be preferred in patients with impaired renal function.

Blood pressure should be reduced by 15-25% over the first 1-2 hours. Diastolic pressure should be reduced to 110 mmHg within 60 minutes. In the presence of aortic dissection, reduce DBP by 10-15% within 5-10 minutes. May need to maintain hypertension in patients with stroke.

III. Aortic Aneurysm
A. Definition
   Localized dilation of the wall of the artery; risk of rupture increases dramatically at 6 cm. Usually recommend surgery at 5 cm
B. Types
Saccular: Outpouching of wall; due to weakened area in aorta, involves only a portion of the circumference
Fusiform: Diffuse area of weakness, spindle-shaped dilation, affects entire circumference
Dissecting: Cavity formed by dissection by blood between layers of arterial wall
Rupture: Artery wall ruptures, leaking arterial blood into mediastinum or abdominal cavity

C. Etiology
90% have a history of hypertension
Atherosclerosis, blunt trauma, Marfan’s syndrome, pregnancy are other causes

D. Clinical manifestations
Usually asymptomatic until aneurysm begins to leak or presses on adjacent organs
Ascending aortic aneurysm: Dyspnea, chest pain, widened pulse pressure, bounding pulse, aortic murmur
Aortic arch aneurysm: dyspnea, stridor, cough, chest pain, JVD, crackles, S₃
Descending thoracic aortic aneurysm: dull pain between shoulders, lower back
Abdominal aneurysm: dull and constant back pain, abdominal pain
Dissection: Sudden intense, severe, tearing pain in the chest or abdomen, depending on location of aneurysm;
severe hypertension, acute neurologic deficits
Thoracic - BP or pulse difference between arms, new murmur of aortic regurgitation.
Abdominal - back or leg pain, tender abdominal mass

E. Medical Management
Control risk factors
Check size of aneurysm every six months
Dissection: Requires IV antihypertensive medication to lessen the aortic stress, slow the rate of dissection and prevent rupture. Medications commonly used are nitroprusside with esmolol. Nitroprusside alone can increase the velocity of ventricular contraction and worsen dissection. Nicardipine or fenoldopam can be used in place of nitroprusside. Labetalol is an alternative to nitroprusside and esmolol, as it is both an alpha and beta blocker. Goal is to maintain MAP at 80-90 mmHg
Monitor urine output, mental status, and neurologic signs. Administer oxygen as needed.
Hypotension can indicate rupture.
Prepare for surgery.

F. Surgical management
Traditional: crossclamping of aorta above and below dissection. Dacron graft is placed inside aneurysm; sutured to proximal and distal aorta. Aneurysm wall closed over graft.
Interventional: Endovascular stent grafting. Used for descending thoracic and abdominal aneurysms. Stent consisting of graft fabric over metal mesh is inserted
through femoral artery and placed at area of dissection.

G. Post-op Nursing Management
VS q1 hour
Keep systolic blood pressure < 120 mmHg
Monitor output from chest tubes, drains and urine output
Wean from ventilator; aggressive pulmonary toilet
Antiembolism stockings, SCDs
HOB < 45° first 72°
Pain medication
Monitor for complications
  MI - hemodynamic parameters: CVP, PAOP, CO; ECG: ST elevation, dysrhythmias
  Bleeding - hemorrhage or coagulopathy; assess for S/S hypovolemia: hypotension, tachycardia, ↑CVP, PAOP
  Renal failure - due to crossclamping time, emboli; monitor I&O, BUN, creatinine
  Limb ischemia - due to atheroembolism; assess distal peripheral pulses, skin temperature and color, sensation, pain
  Colon ischemia - associated with high mortality; assess bowel sounds, abdominal pain, melena
Endovascular stent graft complications
  Renal failure, bowel infarction, lower extremity embolism, paraplegia or paraparesis.

IV. Peripheral Vascular Disease
A. Peripheral arterial disease (PAD)
  1. Can occur in any peripheral artery, but is more painful in lower extremity arteries.
     a. Superficial femoral artery, popliteal artery and distal aorta and iliac arteries most commonly affected
  2. Causes
     a. Atherosclerosis common
     b. Risk factors same as for CAD
     c. Diabetes
     d. Smoking
     e. Hypertension
     f. Hyperlipidemia
     g. Male gender
  3. Diagnosis
     a. Ankle-brachial index (ABI)
        Noninvasive
        Compares SBP of arm and leg, just above ankle. Posterior tibial and dorsalis pedis pulses measured. Arm SBP divided into ankle SBP
        
        0.9-1.0 = normal
        0.71-0.9 = mild PAD
0.41-0.7 = moderate PAD  
<0.4 = severe PAD  
Lower the value, greater symptoms of peripheral ischemia  
Typically asymptomatic until well advanced

4. Clinical manifestations  
a. Thickened nails  
b. Hair loss on lower leg, feet, and toes  
c. Coolness  
d. Intermittent claudication  
   Cramping, aching pain when walking  
   Relieved by rest  
e. Rest pain  
   Requires catheter or surgical intervention  
f. Acute occlusion  
   Due to thrombosis  
   Sudden onset of severe pain, loss of pulses, coldness  
   Requires immediate intervention

5. Prevention  
a. Eliminate or control risk factors  
b. Foot care  
c. Rest  
d. Pain relief

6. Pharmacologic management  
a. Anticoagulants  
b. Vasodilators  
c. Antiplatelet agents

7. Interventional and surgical interventions  
a. Angioplasty with stent placement  
b. Bypass surgery if diffuse disease  
c. Amputation

8. Nursing management  
a. Assess peripheral pulses, limb color and temperature  
   Doppler if indicated to obtain pulse  
b. Protect limb from injury and development of ressure ulcers  
c. Pain control  
d. Monitor for rest pain, sudden occlusion  
e. Patient/family education  
   Risk factor modification  
   Foot care  
   Medications

B. Carotid artery disease  
A. Bifurcation of carotid arteries a common site of atherosclerotic plaque formation  
B. Etiology  
   1. Atherosclerosis most common  
   2. Irradiation, arteritis
3. Risk factors as with CAD and PAD
4. Modifiable risk factors
5. Uncontrolled hypertension (SBP over 160 mmHg
6. Atrial fibrillation
7. Smoking
8. Uncontrolled diabetes
9. Hyperlipidemia
10. Atherosclerotic plaque may cause emboli
11. Stenotic areas may develop thrombosis

C. Medical management
1. Doppler studies
2. Emergency CT scan with stroke
3. Treatment of stroke as discussed in neuro discussion
4. Control risk factors
5. Carotid endarterectomy recommended for carotid stenosis greater than 70% and patient symptomatic
6. Carotid stenting if surgery contraindicated

D. Nursing management
1. Neuro assessment
2. Education on risk factors and prevention
   a. Stop smoking
   b. Control BP
   c. Weight management
   d. Statin medication
   e. Control blood glucose
   f. Healthy diet low in saturated fat and high in fruits and vegetables
   g. Exercise
   h. ASA

V. Cardiac Tamponade
1. Definition: Fluid builds in pericardial space and compromises cardiac output
2. Etiology: Post MI, post open heart surgery, cardiac infection, dissecting aortic aneurysm, renal failure, neoplasms, penetrating and nonpenetrating cardiac trauma.
3. Clinical manifestations not specific
   Dyspnea and tachypnea progressing to air hunger at rest are key symptoms.
   Tachycardia, PEA, pericardial friction rub
   Beck’s triad – JVD, hypotension, muffled heart sounds
   Narrowed pulse pressure, pulses paradoxus
   Hemodynamic parameters:
      CVP, PAD, PAOP all elevated and equalized
      CO and SVO2 decreased
   CXR – water bottle shape of cardiac silhouette
Echocardiogram – collapse of right atrium  
ECG - ST elevations in all leads except avR, avL, V1, , low voltage, electrical alternans

![ECG Waveforms]

Electrical Alternans

4. Diagnostics
Doppler echocardiography visualizes pericardial fluid and compressed chambers, usually right atrium and ventricle. Left atrial collapse highly specific for tamponade.

5. Medical and surgical management
Fluid resuscitation
Treat cause
Pericardiocentesis
Dialysis for uremic tamponade
Pericardial window, thoracotomy

6. Nursing management
VS, cardiac and hemodynamic monitoring
Monitor output from chest tube if placed
Administer fluids as needed
Monitor labs: H&H, electrolytes, BUN, creatinine, CK-MB

VI. Cardiac Trauma
A. Blunt cardiac trauma
Etiology
MVA, blows to chest from kick, baseball, fight, falls
Heart thrown against sternum or thoracic vertebrae
Can cause contusion, concussion or rupture
Pericardial laceration, coronary artery thrombosis, and
great vessel rupture less common
Right atrium and ventricle most susceptible due to anterior position
Presentation
Few specific to blunt trauma
Signs of external chest trauma should increase awareness
Degree of external injury does not correlate with severity of cardiac trauma
Chest pain unrelieved by NTG
May be due to other injuries
ECG
Dysrhythmia, st changes, heart block, atrial fibrillation, PVCs, V-tach, V-fib
Changes indicative of mi or pericarditis
Pericardial rub, murmur
Muffled heart sounds
Symptoms of heart failure

Collaborative care
- Prevent and treat complications
- ECG monitoring
- Oxygen as indicated
- Pain medication
- Antidysrhythmic medications
- Treatment of heart failure
- Temporary pacemaker
- Fluid and electrolyte balance
- May require cardiac cath, pericardiocentesis or thoracotomy

B. Penetrating cardiac trauma

Etiology
- Guns, knives, impalements
- Injury to right ventricle most common due to anterior position
- Mortality high
  - Usually at site of trauma
  - Due to exsanguination, tamponade

Presentation
- Presentation
  - S/S hypovolemia
  - S/S cardiac tamponade

Collaborative care
- X-ray - object in or near heart
- Cardiac ultrasound – blood in pericardial sac (hemopericardium)
- Pericardiocentesis
- Thoracotomy/sternotomy
- Chest tube
- Oxygen
- Rapid fluid resuscitation
  - Large bore IV catheter
  - Crystalloids, blood products
  - Assess effectiveness
- ECG
- Post-op care of OHS/thoracotomy patient

Certification Questions
1. A nicardipine (Cardene) infusion is to be used for a patient in hypertensive crisis with a blood pressure of 240/140 mmHg. The nurse should titrate the nicardipine drip to achieve a systolic BP of:
   - A. 140 mmHg within 1 hour
   - B. 150 mmHg within 2 hours
   - C. 170 mmHg within 2 hours
   - D. 120 mmHg within 3 hours

2. A patient is 8 hours post repair of a dissecting abdominal aortic aneurysm. Assessment
reveals:
- BP: 140/90
- Creatinine: 2.8
- WBCs: 12,000/mm³
- HR: 105
- Serum electrolytes: Normal
- Urinalysis: Gross RBCs
- BUN: 46 mg/dl
- UO: <20cc/hr

The patient’s urinary status is most likely associated with
A. A urinary tract infection
B. An intraoperative MI
C. Renal ischemia
D. Hypovolemia

3. A patient receiving thrombolytics via continuous infusion for acute limb ischemia suddenly complains of pain in the affected limb. The most appropriate nursing intervention for this patient is to
A. Administer narcotic pain medication to relieve pain
B. Elevate the affected extremity above the level of the heart
C. Notify the MD that the patient may have compartment syndrome
D. Discontinue the thrombolytic infusion and notify the MD

4. The nurse in the ICU is admitting a patient with a stab wound of the chest. Cardiac tamponade is suspected. The physician orders an ECG. Which of the following would be consistent with cardiac tamponade?
A. Third degree heart block
B. ST elevations in leads II, III, and AVF
C. Tall R waves
D. Alternating voltage

5. A patient who was in a motor vehicle crash in which the airbag was deployed complains of sternal soreness. The 12-lead ECG indicates sinus tachycardia at a rate of 110 bpm and development of right bundle branch block with occasional premature ventricular contractions. A bedside echocardiogram is performed that show mild wall motion abnormalities. These findings are consistent with which of the following conditions?
A. Myocardial contusion
B. Pulmonary contusion
C. Cardiac chamber rupture
D. Cardiac tamponade

6. A patient is admitted to the ICU after a motor vehicle crash in which the air bag was deployed. The initial assessment of the patient reveals the following findings: heart rate 120 bpm, BP 90.76 mmHg, RR 28, SpO₂ 94%. Breath sounds are equal bilaterally and shallow. The patient has bulging jugular veins, and heart tones are distant. Which of the following interventions is most appropriate to relieve the patient’s condition?
A. Prepare for chest tube insertion
B. Prepare for endotracheal intubation
C. Prepare for pericardiocentesis
D. Prepare for needle thoracostomy

References


