MEDICAL-SURGICAL NURSING I · STUDY GUIDE

# Exam 4 Study Guide

This guide covers chapters 7 and 8. You will learn why pneumonia, a clot and a collapsed lung each break gas exchange in a different way and how a chest drain and a ventilator are kept safe, then how a ruptured plaque becomes an infarct and an infarct becomes heart failure. Work one chapter at a time. Read the "what to know" paragraphs, copy the tables out by hand, then try each worked case with the steps covered. Finish each chapter with its ten self-test items. The cram sheet at the end puts every number and rule in one place.

WHAT THIS GUIDE COVERS

- Chapter 7 · pneumonia as shunt, CAP versus HAP, VAP and aspiration, CURB-65, tuberculosis testing, airborne precautions and RIPE drugs, pleural effusion and thoracentesis, pulmonary embolism, anticoagulants and antidotes, chest trauma, tension pneumothorax, chest drainage, type I and II respiratory failure, ARDS and the P/F ratio, ventilator alarms and weaning.
- Chapter 8 · oxygen supply and demand, plaque rupture, the anginas, ACS, 12-lead territories and right ventricular infarction, troponin timing, the first ten minutes and the MONA critique, PCI and fibrinolysis clocks, post-cath care, complications, HFrEF and HFpEF, left versus right failure, BNP, NYHA and ACC/AHA, GDMT, decompensation and discharge teaching.

CHAPTER 7

## Respiratory Disorders: Infection, Trauma and Failure

Read it in full: **Chapter 7 in the textbook**. Practice it in the lab: **Read the Chambers, Make the First Move** and **Type I, Type II and Everything After the Tube**.

### What to know

In **pneumonia** the alveolus fills with exudate. Blood still flows past it but gets no air: an intrapulmonary **shunt**, which is why added oxygen helps less than expected. Fluid conducts sound, so expect crackles, bronchial sounds, dullness, more fremitus and egophony. Pleuritic pain

makes the patient splint and retain secretions. A tachypneic patient whose $PaCO_2$ is normal or rising is tiring.

CAP develops outside the hospital or within 48 hours of admission (S. pneumoniae, atypicals, viruses). HAP starts 48 hours or more after admission and VAP 48 hours or more after intubation, with more Pseudomonas and MRSA. Aspiration favors the right lower lobe when upright. **CURB-65** scores confusion, BUN over 19, RR 30 or more, SBP under 90 or DBP 60 or less, and age 65 or more: 0 to 1 outpatient, 2 floor, 3 to 5 consider ICU. Draw cultures but never hold the antibiotic for them. Nursing: upright, good lung down, 2 to 3 L of fluid a day if allowed, spirometry ten breaths an hour, early mobility. In older adults, confusion may be the only sign.

**Tuberculosis** spreads by droplet nuclei. Latent TB is not contagious; active TB classically gives a cough over three weeks, night sweats, weight loss and hemoptysis. Read a TST at 48 to 72 hours by induration: 5 mm positive in HIV, close contacts and immunosuppression; 10 mm in recent immigrants, congregate settings, diabetes and CKD; 15 mm with no risk. IGRA is preferred after BCG. Active TB: negative-pressure room, door closed, fit-tested N95 for staff, surgical mask on the patient for transport. Precautions end after two weeks of therapy, improvement and three negative smears.

RIPE therapy runs two months of four drugs then four months of isoniazid and rifampin, with directly observed therapy. Rifampin turns fluids orange and weakens contraceptives and warfarin. Isoniazid causes neuropathy (give vitamin B6) and hepatotoxicity. Pyrazinamide raises uric acid. Ethambutol causes optic neuritis; test vision and red-green color monthly. For thoracentesis the patient sits leaning over a table; remove no more than about 1,000 to 1,500 mL; watch for pneumothorax afterward.

**Pulmonary embolism** makes dead space: ventilated alveoli with no blood flow. The onset is abrupt: dyspnea, pleuritic pain, dread, tachypnea and tachycardia, and the gas shows hypoxemia with respiratory alkalosis. Unexplained tachypnea is the most consistent sign. D-dimer under about 500 rules PE out in a low-probability patient (age x 10 over 50). CT angiography is the test. Anticoagulate on suspicion; heparin aPTT 1.5 to 2.5 x control; watch platelets for HIT. Antidotes: protamine for heparin, vitamin K for warfarin, idarucizumab for dabigatran, four-factor PCC for

apixaban and rivaroxaban (andexanet alfa was withdrawn in December 2025). Nursing: stay, high Fowler, oxygen, monitor, call.

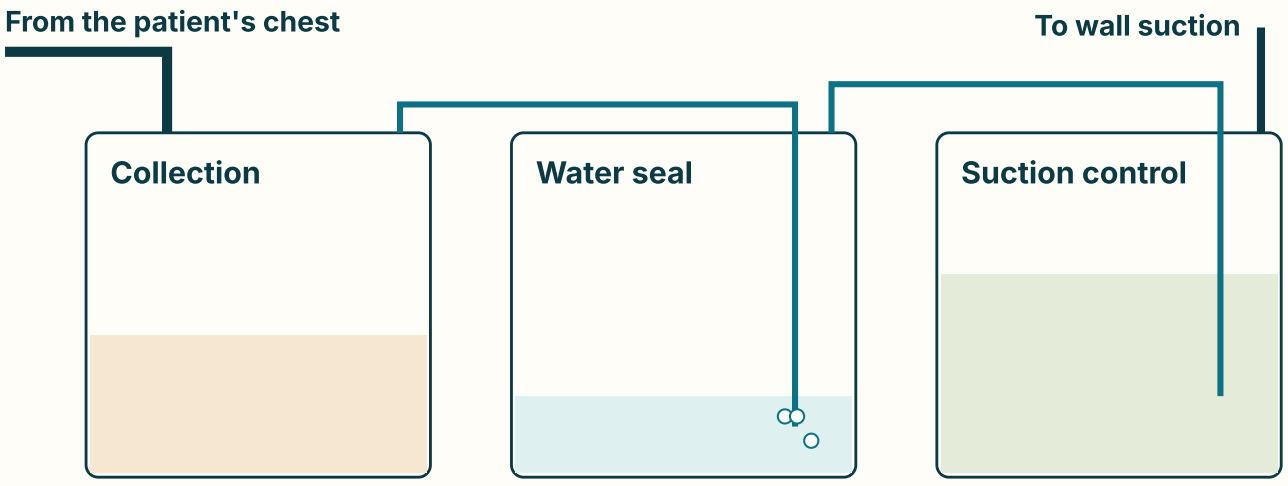
In chest trauma, rib fractures hurt through splinting; give strong analgesia and never a tight binder. Flail chest moves paradoxically, and the contusion beneath it is the real danger. A **tension pneumothorax** gives absent breath sounds, tracheal deviation away from the injured side, JVD and hypotension; it needs needle decompression now, not an x-ray. A sucking wound gets an occlusive dressing taped on three sides. A hemothorax is dull to percussion; initial drainage over 1,500 mL or about 200 mL an hour for 2 to 4 hours needs surgery.

With a chest tube, tidaling in the water seal is normal; continuous bubbling there is a leak. Keep the unit upright and below the chest, never strip or routinely clamp. If tubing disconnects, put the end in sterile water. If the tube comes out, cover with an occlusive dressing taped on three sides and call.

**Type I failure** is $PaO_2$ under 60 with a normal or low $PaCO_2$ (shunt, V/Q mismatch). **Type II failure** is $PaCO_2$ over 50 with pH under 7.35 (the bellows fail: opioids, COPD, neuromuscular disease). Restlessness is the earliest sign of hypoxia. **ARDS** is noncardiogenic edema with refractory hypoxemia; Berlin criteria need onset within a week, bilateral opacities, no full cardiac explanation and a P/F ratio of 300 or less on PEEP of at least 5 (mild 201 to 300, moderate 101 to 200, severe 100 or less). Ventilate with 6 mL/kg predicted weight, plateau 30 or less, higher PEEP and prone positioning.

Vent alarms: high pressure means resistance (secretions, biting, kinks, bronchospasm, pneumothorax); low pressure means loss (disconnection, cuff leak, extubation). If you cannot fix it fast, bag the patient on 100% oxygen. VAP bundle: head of bed 30 to 45 degrees, oral care, daily sedation interruption with a breathing trial. Weaning: $FiO_2$ 0.40 or less, PEEP 5 to 8, RSBI under 105. Stop a breathing trial for RR over 35, $SpO_2$ under 90% or a heart rate change over 20%.

### Three-chamber chest drainage unit (wet suction)




**Measures drainage.** Mark the level and time. Over 100 mL/hr or bright red and brisk: call.

**One-way valve (2 cm water).** Tidaling: normal. Continuous bubbling: an air leak.

**Sets suction (often 20 cm).** Gentle steady bubbling: normal. Vigorous bubbling only evaporates water.

**Keep the unit upright and below the chest. Never strip the tubing. Never clamp routinely.**

**Read the chambers left to right.** Tidaling in the water seal means the tube is patent. Continuous bubbling there means a leak: check the patient and dressing first, then the tubing.

#### LOCK THESE IN

- CURB-65: 0 to 1 home, 2 floor, 3 to 5 consider ICU.
- TB: N95 on staff, surgical mask on the patient. Ethambutol: vision; INH: B6.
- PE gas: low $PaO_2$, low $PaCO_2$, high pH. Unexplained tachypnea is the clue.
- Antidotes: protamine (heparin), vitamin K (warfarin), idarucizumab (dabigatran), four-factor PCC (Xa inhibitors; andexanet was withdrawn in December 2025).
- Tension pneumothorax: trachea away, absent sounds, JVD, hypotension; decompress now.
- Chest tube out: occlusive dressing taped on three sides. Disconnected: end in sterile water.
- Type I: $PaO_2$ under 60. Type II: $PaCO_2$ over 50 and pH under 7.35.
- ARDS: P/F 300 or less; 6 mL/kg, plateau 30 or less, PEEP, prone.

## CURB-65

| Item (1 point each) | Threshold |
|---|---|
| **Confusion** | New disorientation |
| **Urea (BUN)** | Greater than 19 mg/dL |
| **Respiratory rate** | 30/min or higher |
| **Blood pressure** | SBP under 90 or DBP 60 or less |
| **Age** | 65 or older |
| **Score meaning** | 0 to 1 outpatient; 2 admit to floor; 3 to 5 assess for ICU |

## RIPE drugs

| Drug | Signature effect | Monitor or teach |
|---|---|---|
| **Rifampin** | Orange-red body fluids; liver injury | Stains soft lenses; reduces contraceptives and warfarin |
| **Isoniazid** | Neuropathy; liver injury | Pyridoxine 25 to 50 mg; AST/ALT; no alcohol |
| **Pyrazinamide** | High uric acid, gout; liver injury | Uric acid; report joint pain |
| **Ethambutol** | Optic neuritis | Monthly acuity and red-green color vision |

## Chest drainage: what you see

| Observation | Meaning | Action |
|---|---|---|
| **Tidaling in water seal** | Normal; tube patent | Document |
| **Tidaling stops** | Lung re-expanded, or kink or clot | Assess patient, trace tubing |
| **Continuous water-seal bubbling** | Air leak | Check site and dressing, then clamp briefly to locate |
| **Over 100 mL/hr or bright red** | Active bleeding | Notify now; vitals, hemoglobin |
| **Tube disconnected** | Open to pleural space | Submerge end in sterile water |
| **Tube pulled out** | Open pneumothorax | Occlusive dressing taped on three sides |

## Worked cases

**WORKED CASE 1 · SCORING CURB-65**

Mr. Shaw, 78, has pneumonia. He is newly confused, BUN 28, RR 32, BP 108/68.

**STEP 1 · SCORE EACH ITEM**

Confusion 1. BUN 28 over 19: 1. RR 32: 1. BP: SBP 108 is not under 90 and DBP 68 is not 60 or less: 0. Age 78: 1.

**STEP 2 · ADD**

1 + 1 + 1 + 0 + 1 = **4**.

**STEP 3 · DECIDE**

A score of 3 to 5 means assess for ICU. Count his respirations yourself and escalate.

**WORKED CASE 2 · GRADING ARDS WITH THE P/F RATIO**

Ms. Lee is on the ventilator with PEEP 10. Day 1: $PaO_2$ 120 on $FiO_2$ 0.50. Day 2: $PaO_2$ 70 on $FiO_2$ 0.70.

**STEP 1 · DAY 1**

120 ÷ 0.50 = **240**: mild ARDS (201 to 300).

**STEP 2 · DAY 2**

70 ÷ 0.70 = **100**: severe ARDS (100 or less).

#### WHAT IT MEANS

More oxygen produced a lower ratio: refractory hypoxemia. Expect lung-protective settings, higher PEEP and prone positioning.

### WORKED CASE 3 · A SUSPECTED PE

Mr. Ruiz, 72, is post-op day two after a knee replacement. Sudden dyspnea, RR 34, HR 122, $SpO_2$ 86%. ABG: pH 7.49, $PaCO_2$ 30, $PaO_2$ 58.

#### STEP 1 · READ THE GAS

High pH with low $PaCO_2$: respiratory alkalosis from hyperventilating around dead space, with hypoxemia.

#### STEP 2 · ACT FIRST

Stay, raise the head of the bed, high-flow oxygen, monitor, IV access, call with SBAR.

#### THE D-DIMER CUT-OFF

Age-adjusted threshold = 72 x 10 = **720**. But he is high probability after surgery, so expect CT angiography regardless.

#### STEP 4 · ANTICOAGULATE

Enoxaparin 1 mg/kg every 12 hours for 82 kg = **82 mg** per dose, if ordered. Watch platelets for HIT.

#### SAFETY

Do not massage the leg and do not ambulate him.

### WORKED CASE 4 · A WEANING TRIAL

Mr. Ortiz is on $FiO_2$ 0.35 and PEEP 5. On a spontaneous breathing trial his RR is 28 and tidal volume 350 mL. An hour later RR is 36 and tidal volume 250 mL.

#### STEP 1 · FIRST RSBI

28 ÷ 0.35 L = **80**, under 105: favorable.

#### STEP 2 · SECOND RSBI

36 ÷ 0.25 L = **144**, over 105.

#### STEP 3 · STOP RULE

An RR over 35 alone is a reason to end the trial. Return him to support and report.

### TRAPS PEOPLE FALL INTO

- **Putting the N95 on the TB patient.** The N95 protects staff. The patient wears a surgical mask for transport.
- **Reading TST erythema.** Measure induration only.
- **Waiting for a chest x-ray for tension pneumothorax.** It is a clinical diagnosis. Decompress now.
- **Clamping a chest tube that is still leaking air.** That can create a tension pneumothorax.
- **Stripping or milking chest tubing.** The negative pressure damages tissue.
- **Calling restlessness agitation.** It is the earliest sign of hypoxia.
- **Turning up $FiO_2$ alone in ARDS.** The hypoxemia is refractory. PEEP and proning help more.
- **Silencing a vent alarm you have not explained.** If you cannot fix it fast, bag the patient on 100%.

## Chapter 7 self-test · ten items

### 1. Why does oxygen help less than expected in dense pneumonia?

A. Oxygen dries the secretions
B. Alveoli have too much surfactant
C. Blood passes alveoli with no air
D. The patient retains $CO_2$

**C. Blood passes alveoli with no air** A fluid-filled alveolus is perfused but not ventilated: a shunt.

### 2. A patient with pneumonia scores 2 on CURB-65. What is the usual plan?

A. Outpatient therapy
B. Admit to a medical floor
C. Direct ICU transfer
D. Discharge without antibiotics

**B. Admit to a medical floor** A score of 2 means admit to a floor.

### 3. A recent close contact of a TB patient has a TST of 7 mm. How is this read?

A. Positive
B. Negative
C. Borderline; repeat
D. Invalid test

**A. Positive** 5 mm is positive in close contacts.

### 4. A patient on ethambutol should report which change?

A. Orange-colored urine
B. Tingling in both feet
C. Sudden pain in the big toe joint
D. Blurred or red-green vision

**D. Blurred or red-green vision** Ethambutol causes optic neuritis.

### 5. What ABG pattern is typical of a PE?

A. Low $PaO_2$, low $PaCO_2$, high pH
B. High $PaO_2$, high $PaCO_2$, low pH
C. Low $PaO_2$, high $PaCO_2$, low pH
D. Normal $PaO_2$, low $HCO_3$, low pH

**A. Low $PaO_2$, low $PaCO_2$, high pH** The patient hyperventilates around the dead space.

### 6. Which antidote reverses unfractionated heparin?

A. Vitamin K
B. Protamine sulfate
C. Idarucizumab
D. Andexanet alfa IV

**B. Protamine sulfate** Protamine binds heparin.

### 7. Trachea shifted to the left, absent breath sounds on the right, BP 78/50. What first?

A. Stat chest x-ray
B. Insert a urinary catheter
C. Start a heparin drip
D. Needle decompression

**D. Needle decompression** This is a right tension pneumothorax, a clinical emergency.

### 8. A chest tube pulls out of the chest. What is the first action?

A. Reinsert the chest tube
B. Clamp the drainage tubing
C. Occlusive dressing on 3 sides
D. Call radiology for a stat film

**C. Occlusive dressing on 3 sides** Cover the site at once, then stay and call.

### 9. $PaO_2$ 90 on $FiO_2$ 0.60 with bilateral infiltrates. What is the ARDS grade?

A. Mild (P/F 250)
B. Severe (P/F 90)
C. Not ARDS (P/F 350)
D. Moderate (P/F 150)

**D. Moderate (P/F 150)** 90 ÷ 0.60 = 150, in the 101 to 200 range.

### 10. A ventilator high-pressure alarm sounds. Which cause fits?

A. Circuit disconnection
B. Secretions in the airway
C. Cuff leak
D. An accidental extubation

**B. Secretions in the airway** High pressure means resistance; the others cause low-pressure alarms.

CHAPTER 8

# Cardiac Disorders: Coronary Artery Disease and Heart Failure

Read it in full: **Chapter 8 in the textbook**. Practice it in the lab: **What Do You Do FIRST: The ACS Priority Sorter** and **The Heart Failure Morning Med Pass**.

## What to know

The heart extracts about 75% of delivered oxygen at rest, so more demand must be met with more **flow**. Supply depends on artery diameter, hemoglobin and **diastolic time**; tachycardia raises demand and cuts supply in the same beat. A plaque limits exertional flow at about 70% and resting flow at about 90%. The LAD feeds the anterior wall (the widow-maker); the RCA feeds the inferior wall, right ventricle and usually the SA and AV nodes.

Vulnerable plaques have a thin cap over a large lipid core and are often not the tightest lesions. When the cap tears, platelets and clot form in minutes: partial occlusion gives unstable angina or NSTEMI, complete occlusion gives STEMI. Stable angina is predictable and relieved by rest or nitroglycerin within 5 minutes. Unstable angina breaks the pattern, and its troponin is normal. Vasospastic angina occurs at rest, often at night, and is treated with calcium channel blockers and nitrates. LDL goal under 100, under 70 with disease or diabetes.

Up to a third of infarcts have no chest pain. Women, people with diabetes and older adults may present with fatigue, dyspnea, nausea, confusion or a fall. Get a **12-lead ECG within 10 minutes** of symptoms. ST elevation in two contiguous leads, or a new LBBB with symptoms, starts the reperfusion clock. Inferior changes (II, III, aVF) mean bradycardia, block and possible right ventricular infarction: get V4R. Type 2 MI is supply-demand mismatch without rupture.

Troponin rises 3 to 6 hours after injury, peaks at 12 to 24 hours and stays up 7 to 14 days; high-sensitivity assays rise within 1 to 3 hours. One early negative value rules nothing out, and you never wait for troponin in a STEMI. CK-MB normalizes within 48 to 72 hours, so a second rise suggests reinfarction. Before stress tests: no caffeine for 12 to 24 hours.

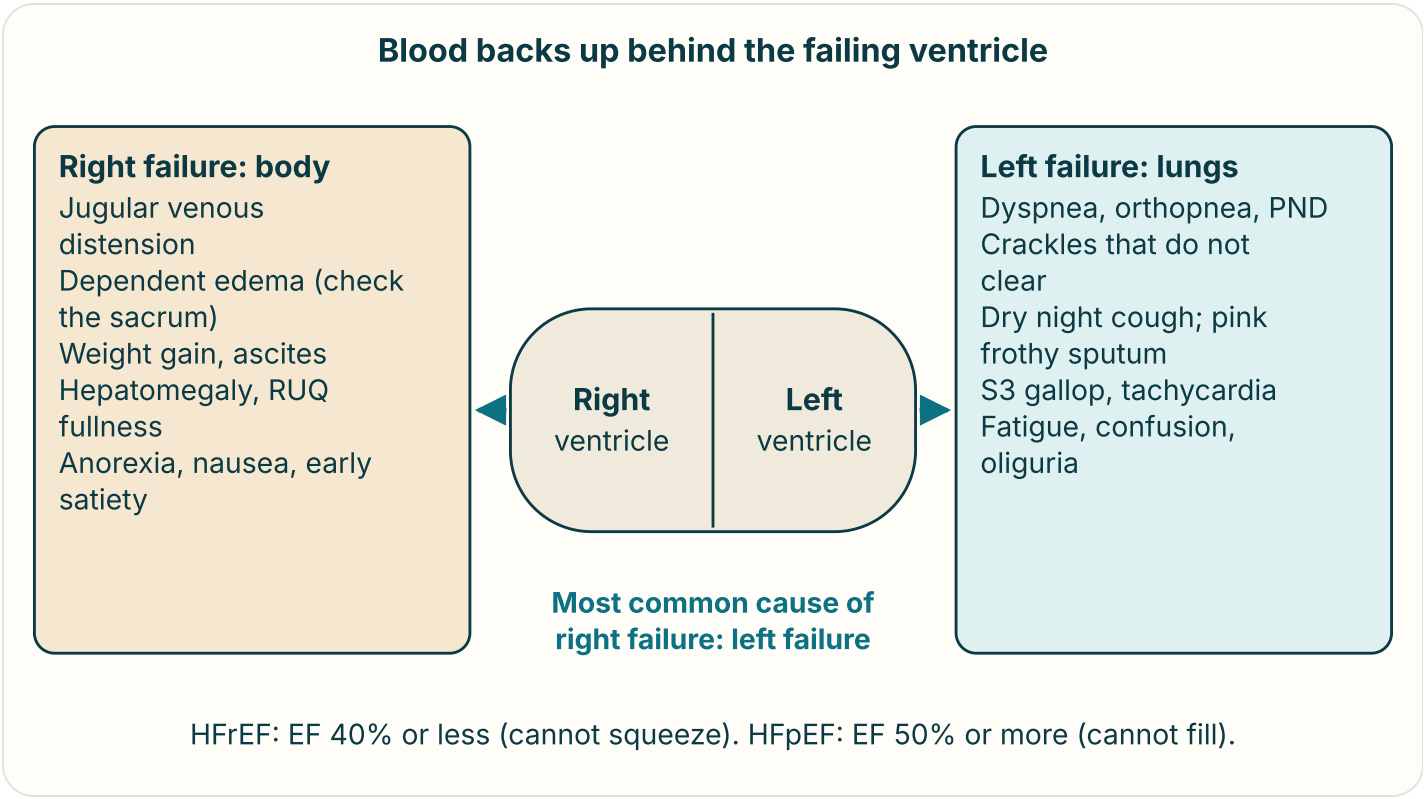
First actions overlap: stay, monitor, ECG in 10 minutes, IV access, troponin, and **aspirin 162 to 325 mg chewed**. Oxygen only if $SpO_2$ is under 90% or the patient is dyspneic. Nitroglycerin 0.4 mg SL every 5 minutes up to three doses; hold for SBP under 90 or a 30 point drop, HR under 50 or over 100, right ventricular infarction or a PDE5 inhibitor (sildenafil or vardenafil within 24 hours, tadalafil within 48). Morphine 2 to 4 mg IV only for pain that persists. In an inferior MI that drops its pressure after nitroglycerin: stop the nitrate, lay flat, raise the legs, give fluids.

Primary PCI goal: first medical contact to device within 90 minutes (120 with transfer). If PCI is not possible within 120 minutes, give fibrinolytics within 30 minutes of arrival. Absolute contraindications include any prior intracranial bleed, ischemic stroke within three months, active bleeding and suspected dissection. After a femoral cath, keep the leg straight and the head of the bed no higher than about 30 degrees; check site and distal pulses every 15 minutes at first. Flank or back pain with hypotension suggests retroperitoneal bleeding. Never let dual antiplatelet therapy lapse after a drug-eluting stent.

Complications follow a timeline: dysrhythmias first (VF is the main early killer), then pump failure and cardiogenic shock, then mechanical rupture on days 2 to 7. Any **new murmur** after MI is an emergency. Dressler syndrome is pericarditis 1 to 8 weeks later.

Heart failure compensations (sympathetic drive, RAAS, ADH) help briefly and then drive remodeling. **HFrEF** has an EF of 40% or less; **HFpEF** 50% or more; 41 to 49% is mildly reduced. Left failure floods the lungs (orthopnea, PND, crackles, S3); right failure floods the body (JVD, edema, hepatomegaly, ascites). BNP under 100 makes failure unlikely; over 400 supports it. Obesity lowers BNP; kidney disease and AF raise it; sacubitril raises BNP, so follow NT-proBNP. NYHA classes move both ways; ACC/AHA stages only move forward.

The four mortality-reducing pillars for HFrEF are an ARNI (or ACE inhibitor or ARB), an evidence-based beta blocker (carvedilol, metoprolol succinate, bisoprolol), an MRA and an SGLT2 inhibitor. Diuretics relieve symptoms only; push furosemide no faster than about 20 mg/min. A 36-hour washout is required between an ACE inhibitor and sacubitril/valsartan. Digoxin: apical pulse a full minute, hold under 60, level 0.5 to 2.0 (0.5 to 0.9 in HF); low potassium raises toxicity. For flash pulmonary edema, sit the patient up with legs dependent, then oxygen, IV diuretic, nitroglycerin if the pressure allows and BiPAP. Teach daily weights: call for **2 to 3 lb in a day or 5 lb in a week**, sodium 2 to 3 g, fluid 1.5 to 2 L when ordered, no salt substitutes with potassium.




**Name the failing side, predict the findings.** Left failure floods the lungs; right failure floods the body. Most hospitalized patients show both.

### LOCK THESE IN

- Coronaries fill in diastole. Tachycardia raises demand and cuts supply.
- Unstable angina: normal troponin. NSTEMI: elevated troponin, no ST elevation.
- 12-lead within 10 min. Inferior STEMI: get V4R; hold nitrates in RV infarct.
- Troponin rises 3 to 6 h, peaks 12 to 24 h, lasts 7 to 14 days.
- Aspirin 162 to 325 mg chewed first. $O_2$ only if $SpO_2$ under 90%.
- Door to device 90 min; door to needle 30 min.
- HFrEF EF 40% or less; HFpEF 50% or more. BNP under 100 makes HF unlikely.
- Call for weight gain of 2 to 3 lb in a day or 5 lb in a week.

## ECG territories

| Territory | Leads | Artery | Anticipate |
|---|---|---|---|
| **Septal** | V1, V2 | LAD | Bundle branch block |
| **Anterior** | V3, V4 | LAD | Pump failure, shock |
| **Lateral** | I, aVL, V5, V6 | Circumflex | Often with anterior |
| **Inferior** | II, III, aVF | RCA | Bradycardia, AV block, RV involvement |
| **Right ventricle** | V4R | Proximal RCA | Hypotension with nitrates |
| **Posterior** | Tall R and ST depression V1, V2 | Circumflex or RCA | Easily missed; confirm V7 to V9 |

## Heart failure drugs

| Class | Example | Watch |
|---|---|---|
| **Loop diuretic** | Furosemide | Weight, I&O, K, Mg, hearing; push no faster than 20 mg/min |
| **ACE inhibitor** | Lisinopril | K, creatinine, cough, angioedema |
| **ARNI** | Sacubitril/valsartan | 36 h washout from ACE inhibitor; follow NT-proBNP |
| **Beta blocker** | Carvedilol, metoprolol succinate | Pulse and BP before dose; never stop abruptly |
| **MRA** | Spironolactone | Hyperkalemia; avoid if K over 5.0 or eGFR under 30 |
| **SGLT2 inhibitor** | Dapagliflozin | Genital infection, volume loss, euglycemic DKA |
| **Digoxin** | Digoxin | Apical pulse 1 min, hold under 60; level 0.5 to 2.0; low K raises toxicity |

## NYHA class and ACC/AHA stage

| System | Levels |
|---|---|
| **NYHA (symptoms, can move both ways)** | I no limit; II slight; III marked with less than ordinary activity; IV symptoms at rest |
| **ACC/AHA (structure, only forward)** | A at risk; B structural disease, no symptoms; C symptoms now or before; D refractory |

## Worked cases

**WORKED CASE 1 · CHEST PAIN IN THE FIRST TEN MINUTES**

Mrs. Nolan, 68, with diabetes, reports nausea and jaw ache at rest. $SpO_2$ 96%, BP 142/84, HR 96. She took tadalafil yesterday evening for pulmonary hypertension.

**STEP 1 · START TOGETHER**

Stay, call for help, cardiac monitor, 12-lead ECG within 10 minutes, IV access, troponin.

**STEP 2 · ASPIRIN**

Give 162 to 325 mg chewed unless allergic or bleeding.

**STEP 3 · OXYGEN**

$SpO_2$ 96% and not dyspneic: no routine oxygen.

**STEP 4 · NITROGLYCERIN**

Tadalafil within 48 hours is an absolute contraindication. Hold the nitrate and tell the provider.

**WHY HER SYMPTOMS COUNT**

Women and people with diabetes often present without chest pain. Do not wait for classic pain to obtain the ECG.

**WORKED CASE 2 · AN INFERIOR MI THAT DROPS ITS PRESSURE**

Mr. Alvarez has ST elevation in II, III and aVF. After one SL nitroglycerin his BP falls from 112/70 to 82/50 and his HR is 48.

**STEP 1 · SUSPECT**

Inferior MI with right ventricular involvement. The RV depends on preload, and the nitrate removed it.

**STEP 2 · ACT**

Stop the nitrate, lay him flat, raise the legs and open the IV fluids as ordered.

**STEP 3 · CONFIRM**

Obtain a right-sided lead (V4R).

**STEP 4 · CALL**

SBAR: new hypotension and bradycardia after nitroglycerin in an inferior STEMI; request the provider now and ask about the cath lab.

**WORKED CASE 3 · READING A WEIGHT LOG**

Mr. Banks, HFrEF, weighed 181.0 lb on Monday, 182.0 Wednesday, 181.5 Thursday, 184.5 Friday and 186.0 Saturday.

**STEP 1 · DAY TO DAY**

Thursday to Friday: 184.5 minus 181.5 = **3.0 lb** in one day, which meets the 2 to 3 lb rule.

**STEP 2 · WEEK**

Monday to Saturday: 186.0 minus 181.0 = **5.0 lb**, which meets the 5 lb in a week rule.

**STEP 3 · CONVERT**

5 lb ÷ 2.2 = about 2.3 L of retained fluid.

**STEP 4 · ACT**

He should have called on Friday. Assess lungs, edema, JVD and orthopnea, and notify the provider about diuretic adjustment.

**WORKED CASE 4 · A DIGOXIN AND FUROSEMIDE MED PASS**

Mrs. Cole has HFrEF. Apical pulse 56 for a full minute, potassium 3.2, digoxin level 1.1. Ordered: digoxin 0.125 mg PO and furosemide 40 mg IV push.

**STEP 1 · DIGOXIN**

Apical pulse under 60: hold and notify.

**STEP 2 · POTASSIUM**

K 3.2 is low, which raises digoxin toxicity. Report it, and expect replacement by mouth or diluted IV infusion, never push.

**STEP 3 · FUROSEMIDE RATE**

40 mg at no faster than 20 mg/min takes at least **2 minutes**.

**CHECK IT**

Her level of 1.1 is inside 0.5 to 2.0 but above the 0.5 to 0.9 heart failure target. Low potassium makes even this level risky.

TRAPS PEOPLE FALL INTO

- **Giving oxygen to every chest pain patient.** Only for $SpO_2$ under 90% or distress; extra oxygen can constrict coronaries.
- **Waiting for troponin in a STEMI.** The ECG triggers reperfusion.
- **Trusting one early negative troponin.** Draw serial values.
- **Giving nitroglycerin in a right ventricular infarct.** Preload loss causes profound hypotension.
- **Forgetting to ask about PDE5 inhibitors.** Ask every patient, privately.
- **Saying the pump is fine because EF is 60%.** HFpEF can still flood the lungs.
- **Starting a beta blocker during acute decompensation.** Start when euvolemic and stable.
- **Assuming a diuretic lowers potassium in every HF patient.** ACE inhibitors, ARNIs and MRAs push it up. Check the number.

## Chapter 8 self-test · ten items

### 1. Why does tachycardia worsen angina?

A. It raises the hemoglobin
B. It dilates the coronary arteries
C. It shortens diastolic filling
D. It lowers wall tension

**C. It shortens diastolic filling** Coronaries fill in diastole, so a fast rate cuts supply while raising demand.

### 2. What separates unstable angina from NSTEMI?

A. Severity of pain
B. Troponin elevation
C. ST elevation
D. Age of the patient

**B. Troponin elevation** NSTEMI has an elevated troponin; unstable angina does not.

### 3. Within what time must a 12-lead ECG be done for chest pain?

A. 10 minutes
B. 30 minutes
C. 60 minutes
D. 2 hours

**A. 10 minutes** Ten minutes is the national standard.

### 4. A patient with chest pain has $SpO_2$ 97% and is not short of breath. Should oxygen be given?

A. Yes, at 15 L/min
B. Yes, at 2 L/min
C. Only with morphine
D. No, not routinely

**D. No, not routinely** Oxygen is given only for $SpO_2$ under 90% or distress.

### 5. When is nitroglycerin contraindicated?

A. Sildenafil taken 12 hours ago
B. Systolic BP of 132 mm Hg
C. Heart rate of 84 per minute
D. ST elevation in V3 and V4

**A. Sildenafil taken 12 hours ago** PDE5 inhibitors within 24 hours (48 for tadalafil) cause refractory hypotension.

**6. After a femoral cath, a patient reports back pain and has BP 88/52 and HR 120. What is suspected?**

A. Muscle strain
B. Late contrast allergy reaction
C. Retroperitoneal bleed
D. Vasovagal reaction

**C. Retroperitoneal bleed** Flank or back pain with shock after femoral access is retroperitoneal bleeding.

**7. Which finding points to right-sided failure?**

A. Bibasilar crackles
B. Jugular venous distension
C. Three-pillow orthopnea at night
D. Pink frothy sputum

**B. Jugular venous distension** Right failure backs up into the systemic veins.

**8. Which drug class relieves HF symptoms but does not reduce mortality?**

A. SGLT2 inhibitors
B. Aldosterone blockers
C. ARNI combinations
D. Loop diuretics

**D. Loop diuretics** Diuretics relieve congestion only.

**9. A patient’s apical pulse is 54 before digoxin. What should the nurse do?**

A. Hold it and notify
B. Give half the dose
C. Give it and recheck
D. Check the radial pulse

**A. Hold it and notify** Hold digoxin for a pulse under 60.

**10. A HF patient gained 3 lb since yesterday. What does the nurse teach?**

A. Wait one more week
B. Call the provider today
C. Skip the next diuretic
D. Drink more water

**B. Call the provider today** Gains of 2 to 3 lb in a day or 5 lb in a week need a call.

ONE PAGE

# Cram sheet

Everything from chapters 7 and 8 in one place. Cover the right column and see if you can rebuild each row.

## Numbers to know

| Item | Value | Note |
|---|---|---|
| **CAP vs HAP vs VAP** | Before 48 h; 48 h or more after admission; 48 h or more after intubation | HAP and VAP skew to Pseudomonas, MRSA |
| **TST cut-offs** | 5 mm, 10 mm, 15 mm by risk | Read at 48 to 72 h; induration only |
| **TB isolation ends** | 2 weeks therapy, improving, 3 negative smears | Smears 8 h apart, one early morning |
| **D-dimer** | Under about 500; age x 10 over 50 | Rules out only low-probability PE |
| **Heparin** | aPTT 1.5 to 2.5 x control; anti-Xa 0.3 to 0.7 | HIT: platelets fall over 50% |
| **Hemothorax surgery trigger** | Over 1,500 mL at once or about 200 mL/h for 2 to 4 h | Chest tube over 100 mL/h: call |
| **Respiratory failure** | Type I $PaO_2$ under 60; type II $PaCO_2$ over 50, pH under 7.35 | Restlessness is the earliest sign of hypoxia |
| **ARDS** | P/F 300 or less; mild 201 to 300, moderate 101 to 200, severe 100 or less | 6 mL/kg; plateau 30 or less |
| **Weaning** | $FiO_2$ 0.40 or less, PEEP 5 to 8, RSBI under 105 | Stop for RR over 35, $SpO_2$ under 90% |
| **ETT cuff** | 20 to 30 cm $H_2O$ | Confirm with waveform capnography |
| **Troponin** | Rises 3 to 6 h, peaks 12 to 24 h, lasts 7 to 14 days | hs-troponin rises in 1 to 3 h |
| **ACS clocks** | ECG 10 min; device 90 min (120 transfer); needle 30 min | Fibrinolysis best within 12 h |
| **Nitroglycerin** | 0.4 mg SL every 5 min, up to 3 | Hold SBP under 90, HR under 50 or over 100 |
| **EF** | Normal 55 to 70%; HFrEF 40 or less; HFpEF 50 or more | 41 to 49% mildly reduced |

| Item | Value | Note |
|---|---|---|
| **BNP** | Under 100 unlikely; over 400 likely | NT-proBNP under 300 rules out |
| **Digoxin** | 0.5 to 2.0 ng/mL; 0.5 to 0.9 in HF | Hold apical pulse under 60 |
| **HF teaching** | Call for 2 to 3 lb/day or 5 lb/week; Na 2 to 3 g | Fluid 1.5 to 2 L if ordered |

## Key terms and comparisons

| Term | Meaning |
|---|---|
| **Shunt vs dead space** | Perfused, not ventilated (pneumonia); ventilated, not perfused (PE) |
| **Simple vs tension pneumothorax** | Diminished sounds, trachea midline; absent sounds, trachea away, JVD, hypotension |
| **Pneumothorax vs hemothorax** | Hyperresonant; dull with signs of shock |
| **Type 1 vs type 2 MI** | Plaque rupture; supply-demand mismatch |
| **Ischemia, injury, infarction** | ST depression or T inversion; ST elevation; Q wave |
| **HFrEF vs HFpEF** | Cannot squeeze; cannot fill |
| **Left vs right failure** | Lungs: crackles, orthopnea; body: JVD, edema, hepatomegaly |

## Rules that are not equations

| Topic | The rule |
|---|---|
| **TB masks** | N95 on staff; surgical mask on the patient for transport. |
| **PE first actions** | Stay, high Fowler, oxygen, monitor, IV, call; no leg massage. |
| **Chest tube** | Upright, below the chest, no stripping, no routine clamping. |
| **Vent alarm** | Cannot fix it fast: bag on 100% and call. |
| **Chest pain order** | Monitor, ECG, IV, aspirin chewed; oxygen only if needed; nitrate after screening. |
| **RV infarct hypotension** | Stop nitrate, flat, legs up, fluids, call. |
| **Post-cath** | Leg straight, check pulses; back pain plus shock is a retroperitoneal bleed. |
| **Delegation** | UAP weighs and records I&O; RN assesses, teaches, titrates drips. |

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