COMPREHENSIVE REVIEW TEST 1: CARDIOVASCULAR AND HEMODYNAMIC EMERGENCIES

1. A 62-year-old man presents with crushing substernal chest pain for 30 minutes. ECG shows 4 mm ST elevation in leads V2-V5. Troponin is pending. What is the immediate priority?

A. Wait for troponin results before treatment

B. Activate cardiac catheterization lab for primary PCI

C. Administer thrombolytics immediately

D. Start heparin drip and admit for observation

2. Which hemodynamic parameter distinguishes cardiogenic shock from septic shock?

A. Mean arterial pressure

B. Systemic vascular resistance

C. Heart rate

D. Central venous pressure

3. A patient in septic shock has received 30 mL/kg crystalloid with persistent hypotension. MAP is 58 mmHg. What is the next intervention?

A. Additional 30 mL/kg fluid bolus

B. Dobutamine infusion

C. Norepinephrine infusion

D. Vasopressin as sole agent

4. A 68-year-old woman with acute MI has BP 78/50 mmHg, HR 118, cold extremities, and pulmonary crackles. Cardiac index is 1.7 L/min/m². What is the hemodynamic profile?

A. Warm and dry

B. Warm and wet

C. Cold and dry

D. Cold and wet

5. What is the primary mechanism by which norepinephrine increases blood pressure?

A. Beta-1 receptor stimulation increasing heart rate

B. Alpha-1 receptor agonism causing vasoconstriction

C. Dopamine receptor activation

D. Phosphodiesterase inhibition

6. A patient with inferior STEMI develops hypotension, clear lungs, and JVD. Which intervention is most appropriate?

A. Furosemide 40 mg IV

B. Nitroglycerin infusion

C. IV fluid bolus

D. Dobutamine infusion

7. What is the door-to-balloon time goal for patients with STEMI?

A. 60 minutes

B. 90 minutes

C. 120 minutes

D. 180 minutes

8. A 55-year-old man with chest pain has ECG showing new left bundle branch block. He has no prior ECG for comparison. What is the appropriate management?

A. Serial troponins and observation

B. Stress testing before intervention

C. Treat as STEMI equivalent

D. Discharge with cardiology follow-up

9. Which medication should be avoided in right ventricular infarction?

A. Aspirin

B. Heparin

C. Nitroglycerin

D. Morphine

10. A patient with acute coronary syndrome is started on dual antiplatelet therapy. Which P2Y12 inhibitor provides the most potent platelet inhibition?

A. Clopidogrel

B. Prasugrel

C. Aspirin

D. Dipyridamole

11. What is the target MAP in septic shock per Surviving Sepsis Guidelines?

A. ≥55 mmHg

B. ≥65 mmHg

C. ≥75 mmHg

D. ≥85 mmHg

12. A patient develops pulseless ventricular tachycardia. After the third defibrillation, what medication should be administered?

A. Atropine 1 mg IV

B. Amiodarone 300 mg IV

C. Lidocaine 50 mg IV

D. Adenosine 6 mg IV

13. Which clinical finding is most specific for cardiac tamponade?

A. Hypotension

B. Tachycardia

C. Pulsus paradoxus >10 mmHg

D. Distant heart sounds

14. A patient with atrial fibrillation has a CHA_2DS_2-VASc score of 3. What is the recommended stroke prophylaxis?

A. Aspirin alone

B. Aspirin plus clopidogrel

C. Oral anticoagulation

D. No therapy needed

15. What is Beck's triad in cardiac tamponade?

A. Fever, murmur, petechiae

B. Hypotension, JVD, muffled heart sounds

C. Chest pain, dyspnea, hemoptysis

D. Hypertension, bradycardia, irregular breathing

16. A patient with WPW syndrome develops atrial fibrillation with rapid ventricular response. Which medication is contraindicated?

A. Procainamide

B. Amiodarone

C. Diltiazem

D. Ibutilide

17. What is the first-line vasopressor for anaphylactic shock?

A. Norepinephrine

B. Epinephrine

C. Vasopressin

D. Phenylephrine

18. A 70-year-old man with STEMI develops a new holosystolic murmur on day 4 with acute pulmonary edema. What is the most likely complication?

A. Papillary muscle rupture

B. Pericarditis

C. Ventricular aneurysm

D. Reinfarction

19. Which ECG leads show ST elevation in an inferior MI?

A. V1-V4

B. I, aVL, V5-V6

C. II, III, aVF

D. V1-V2, aVR

20. A patient with acute MI has the following: BP 85/60 mmHg, HR 42, and complete heart block. The MI is inferior. What is the most appropriate initial treatment?

A. Transcutaneous pacing immediately

B. Atropine 0.5-1 mg IV

C. Dopamine infusion

D. Epinephrine infusion

21. What is the recommended initial fluid resuscitation for septic shock?

A. 10 mL/kg crystalloid

B. 20 mL/kg colloid

C. 30 mL/kg crystalloid

D. 50 mL/kg crystalloid

22. A patient with hypertensive emergency (BP 230/130 mmHg) presents with acute pulmonary edema. What is the first-line treatment?

A. Oral captopril

B. IV labetalol

C. IV nitroglycerin

D. Sublingual nifedipine

23. In hypertensive emergency, what is the maximum recommended BP reduction in the first hour?

A. 10% of MAP

B. 25% of MAP

C. 50% of MAP

D. Normalize BP immediately

24. A patient presents with severe tearing chest pain radiating to the back. BP is 180/100 mmHg in the right arm and 140/80 mmHg in the left arm. What is the most likely diagnosis?

A. Acute MI

B. Pulmonary embolism

C. Aortic dissection

D. Esophageal rupture

25. What is the first medication administered in acute aortic dissection?

A. Nitroprusside

B. Hydralazine

C. IV beta-blocker

D. IV ACE inhibitor

26. A patient with Stanford Type A aortic dissection is hemodynamically stable. What is the definitive treatment?

A. Medical management with BP control

B. Emergent surgical repair

C. Endovascular stent placement

D. Observation with serial imaging

27. What lactate level indicates severe tissue hypoperfusion in shock?

A. >1 mmol/L

B. >2 mmol/L

C. >4 mmol/L

D. >8 mmol/L

28. A patient with cardiogenic shock has CI 1.5 L/min/m² and PCWP 28 mmHg despite IV furosemide. What is the most appropriate inotrope?

A. Phenylephrine

B. Dobutamine

C. Vasopressin

D. Norepinephrine alone

29. What is the mechanism of action of milrinone?

A. Beta-1 receptor agonism

B. Alpha-1 receptor agonism

C. Phosphodiesterase-3 inhibition

D. Calcium channel activation

30. A patient with acute decompensated heart failure has BP 160/95 mmHg and severe dyspnea. What is the most appropriate initial treatment?

A. Dobutamine infusion

B. IV nitroglycerin

C. Aggressive fluid resuscitation

D. Digoxin loading

31. Which finding on echocardiogram confirms cardiac tamponade?

A. Left ventricular hypertrophy

B. RA and RV diastolic collapse

C. Mitral regurgitation

D. Aortic stenosis

32. What is the definitive treatment for cardiac tamponade?

A. IV fluid bolus

B. Inotropic support

C. Pericardiocentesis

D. Diuresis

33. A patient with massive pulmonary embolism has BP 80/50 mmHg and RV dysfunction. What is the most appropriate treatment?

A. Heparin anticoagulation alone

B. IVC filter placement

C. Systemic thrombolysis

D. Observation with oxygen

34. What is the Wells score used to assess?

A. Stroke risk in atrial fibrillation

B. Pre-test probability of DVT/PE

C. Bleeding risk on anticoagulation

D. Heart failure prognosis

35. A patient has a Wells score of 1.5 for PE and D-dimer of 420 ng/mL (normal <500). What is the next step?

A. CT pulmonary angiography

B. PE is excluded

C. Start anticoagulation

D. V/Q scan

36. What is the antidote for unfractionated heparin?

A. Vitamin K

B. Protamine sulfate

C. Idarucizumab

D. Fresh frozen plasma

37. A patient on dabigatran requires emergent surgery. What is the appropriate reversal agent?

A. Vitamin K

B. Protamine sulfate

C. Idarucizumab

D. 4-factor PCC

38. What is the most common cause of pulseless electrical activity?

A. Hyperkalemia

B. Hypovolemia

C. Hypothermia

D. Hydrogen ion excess

39. A patient develops torsades de pointes. What is the first-line treatment?

A. Amiodarone 300 mg IV

B. Magnesium sulfate 2 g IV

C. Lidocaine 100 mg IV

D. Synchronized cardioversion

40. What is the epinephrine dose for cardiac arrest?

A. 0.1 mg IV every 3-5 minutes

B. 0.5 mg IV every 3-5 minutes

C. 1 mg IV every 3-5 minutes

D. 3 mg IV once

41. What is the earliest ECG finding in hyperkalemia?

A. Widened QRS

B. Peaked T waves

C. Absent P waves

D. Sine wave pattern

42. A patient with potassium of 7.2 mEq/L has peaked T waves on ECG. What is the first treatment?

A. Insulin and glucose

B. Calcium gluconate

C. Sodium bicarbonate

D. Kayexalate

43. What is the recommended chest compression rate for adult CPR?

A. 60-80/min

B. 80-100/min

C. 100-120/min

D. 120-140/min

44. What is the compression-to-ventilation ratio for adult CPR without an advanced airway?

A. 15:2

B. 30:2

C. 15:1

D. 30:1

45. A patient with atrial fibrillation has been symptomatic for 3 days. What is required before elective cardioversion?

A. Immediate cardioversion

B. 3 weeks anticoagulation or TEE

C. Aspirin for 48 hours

D. Rate control only

46. What is the initial energy for synchronized cardioversion of atrial fibrillation (biphasic)?

A. 50 joules

B. 100 joules

C. 120-200 joules

D. 360 joules

47. A patient with narrow complex tachycardia at 180 bpm is hemodynamically stable. Vagal maneuvers fail. What is the next treatment?

A. Amiodarone 150 mg IV

B. Adenosine 6 mg rapid IV push

C. Metoprolol 5 mg IV

D. Synchronized cardioversion

48. What is the half-life of adenosine?

A. Less than 10 seconds

B. 1-2 minutes

C. 5-10 minutes

D. 30 minutes

49. A patient with symptomatic bradycardia (HR 38, BP 80/50) does not respond to atropine. What is the next intervention?

A. Epinephrine infusion

B. Dopamine infusion

C. Transcutaneous pacing

D. Observation

50. What is the CHA_2DS_2-VASc score component worth 2 points?

A. Hypertension

B. Age 65-74

C. Prior stroke/TIA

D. Diabetes mellitus

51. A patient with acute MI develops complete heart block. The MI is anterior. What is the prognosis?

A. Usually transient, responds to atropine

B. Poor prognosis, requires pacing

C. Self-limiting within hours

D. No intervention needed

52. What is the mechanism of action of vasopressin in shock?

A. Beta-1 receptor stimulation

B. V1 receptor agonism

C. Alpha-2 receptor activation

D. Dopamine receptor activation

53. A patient with STEMI and cardiogenic shock has multivessel disease. According to CULPRIT-SHOCK, what is the recommended approach?

A. Complete revascularization of all lesions

B. Culprit lesion-only PCI

C. Medical therapy without PCI

D. Emergent CABG for all patients

54. Which inotrope provides both inotropy and afterload reduction?

A. Norepinephrine

B. Phenylephrine

C. Milrinone

D. Vasopressin

55. A patient with acute coronary syndrome has CrCl 25 mL/min. Which anticoagulant requires dose adjustment?

A. Unfractionated heparin

B. Bivalirudin

C. Enoxaparin

D. Argatroban

56. What is the loading dose of clopidogrel for ACS patients undergoing PCI?

A. 75 mg

B. 150 mg

C. 300-600 mg

D. 900 mg

57. Which P2Y12 inhibitor is contraindicated in patients with prior stroke or TIA?

A. Clopidogrel

B. Ticagrelor

C. Prasugrel

D. Cangrelor

58. A patient on ticagrelor requires urgent CABG. How long should the medication be held?

A. 24 hours

B. 3 days

C. 5-7 days

D. 14 days

59. What is the target INR for a patient with mechanical mitral valve?

A. 1.5-2.0

B. 2.0-2.5

C. 2.5-3.5

D. 3.5-4.5

60. A patient with suspected HIT has a 4T score of 6. What is the next step?

A. Continue heparin and monitor

B. Stop heparin and start argatroban

C. Switch to warfarin immediately

D. Transfuse platelets

Answer Key with Explanations

1. B - Anterior STEMI (V2-V5 ST elevation) requires immediate reperfusion. Primary PCI is preferred when door-to-balloon time ≤90 minutes. Do not delay for troponin results when ECG is diagnostic.

2. B - Cardiogenic shock has high SVR (compensatory vasoconstriction) while septic shock has low SVR (pathologic vasodilation). Both have hypotension but opposite vascular resistance patterns.

3. C - After 30 mL/kg crystalloid, persistent hypotension requires vasopressor initiation. Norepinephrine is first-line per Surviving Sepsis Guidelines due to potent alpha-adrenergic vasoconstriction with modest beta-1 effects.

4. D - Cold (low CI <2.2) plus wet (pulmonary congestion with elevated PCWP) indicates the most severe heart failure profile requiring both inotropic support and diuresis.

5. B - Norepinephrine primarily acts on alpha-1 receptors causing vasoconstriction, which increases SVR and blood pressure. It has modest beta-1 effects but vasoconstriction predominates.

6. C - RV infarction causes hypotension with clear lungs and elevated JVP. The failing RV is preload-dependent; IV fluids increase RV filling. Avoid nitrates and diuretics which reduce preload.

7. B - Door-to-balloon time goal is ≤90 minutes for primary PCI in STEMI. This minimizes myocardial necrosis and improves outcomes. If >120 minutes expected, consider thrombolytics.

8. C - New LBBB with ischemic symptoms is treated as STEMI equivalent per guidelines. Activate cath lab for emergent reperfusion without delay for further testing.

9. C - Nitroglycerin causes venodilation and reduces preload. In RV infarction, the failing RV depends on preload; nitrates can cause profound hypotension and should be avoided.

10. B - Prasugrel provides most potent and consistent platelet inhibition among P2Y12 inhibitors. Ticagrelor is also more potent than clopidogrel. Prasugrel is contraindicated with prior stroke/TIA.

11. B - Surviving Sepsis Campaign recommends MAP ≥65 mmHg. Higher targets (80-85 mmHg) have not improved outcomes except possibly in patients with chronic hypertension.

12. B - After third shock in refractory VF/pVT, give amiodarone 300 mg IV push per ACLS guidelines. A second dose of 150 mg can be given if needed. Epinephrine 1 mg is given every 3-5 minutes.

13. C - Pulsus paradoxus >10 mmHg (drop in SBP during inspiration) is most specific for tamponade. It reflects exaggerated ventricular interdependence from pericardial constraint.

14. C - CHA_2DS_2-VASc ≥2 in men or ≥3 in women indicates anticoagulation benefit. Score of 3 warrants oral anticoagulation (DOAC preferred over warfarin in non-valvular AF).

15. B - Beck's triad: hypotension (decreased cardiac output), JVD (impaired venous return), and muffled heart sounds (fluid around heart). Classic but not always present in tamponade.

16. C - AV nodal blockers (diltiazem, verapamil, digoxin, adenosine) are contraindicated in WPW with AF. They block the AV node, forcing conduction down the accessory pathway, risking VF.

17. B - Epinephrine is first-line for anaphylaxis (0.3-0.5 mg IM). It provides alpha-mediated vasoconstriction, beta-1 inotropy, and beta-2 bronchodilation addressing all anaphylaxis manifestations.

18. A - New holosystolic murmur post-MI with pulmonary edema suggests papillary muscle rupture causing acute severe mitral regurgitation. VSD also presents similarly but has different murmur characteristics.

19. C - Inferior MI shows ST elevation in leads II, III, aVF. These leads face the inferior (diaphragmatic) surface supplied by RCA (90%) or LCx (10%).

20. B - Inferior MI with complete heart block often involves the AV node (RCA territory). Atropine is first-line as it may restore AV conduction. These blocks are often transient unlike anterior MI blocks.

21. C - Surviving Sepsis Guidelines recommend 30 mL/kg crystalloid within first 3 hours for sepsis-induced hypoperfusion. Reassess hemodynamics and tissue perfusion after bolus.

22. C - Hypertensive emergency with pulmonary edema requires IV vasodilators. Nitroglycerin reduces preload and afterload, rapidly improving pulmonary congestion. Nitroprusside is an alternative.

23. B - Reduce MAP by no more than 25% in the first hour to avoid cerebral hypoperfusion. Then gradually reduce to 160/100 mmHg over 2-6 hours. Rapid normalization risks ischemic stroke.

24. C - Tearing pain radiating to back with >20 mmHg BP differential between arms is classic for aortic dissection. Immediate imaging (CT angiography or TEE) and BP/HR control required.

25. C - IV beta-blocker (esmolol or labetalol) is first-line to reduce heart rate and dP/dt, minimizing shear stress. Give before vasodilators to prevent reflex tachycardia.

26. B - Stanford Type A (involving ascending aorta) requires emergent surgical repair regardless of stability due to high mortality risk from rupture, tamponade, or coronary involvement.

27. C - Lactate >4 mmol/L indicates severe tissue hypoperfusion with mortality >30%. It triggers aggressive resuscitation and is a marker for inadequate oxygen delivery.

28. B - Dobutamine is preferred inotrope for cardiogenic shock increasing contractility via beta-1 stimulation. Often combined with norepinephrine if hypotension persists. Milrinone causes more vasodilation.

29. C - Milrinone is a phosphodiesterase-3 inhibitor increasing intracellular cAMP. This provides inotropy plus vasodilation (inodilator). Useful in HF but can worsen hypotension.

30. B - Hypertensive acute decompensated HF benefits from IV nitroglycerin reducing preload and afterload, decreasing pulmonary congestion. Inotropes not indicated with adequate BP.

31. B - RA collapse in late diastole and RV diastolic collapse are echocardiographic signs of tamponade physiology indicating elevated pericardial pressure exceeding chamber pressures.

32. C - Pericardiocentesis is definitive treatment for tamponade, removing fluid and restoring cardiac filling. IV fluids provide temporary bridge. Emergent surgical drainage if pericardiocentesis fails.

33. C - Massive PE with hemodynamic instability (hypotension, RV dysfunction) warrants systemic thrombolysis with alteplase. Catheter-directed therapy is alternative if thrombolysis contraindicated.

34. B - Wells score assesses pre-test probability for DVT and PE. Combined with D-dimer, it guides need for imaging. Low Wells plus negative D-dimer effectively excludes PE.

35. B - Low Wells score (≤4) plus negative D-dimer (<500) effectively excludes PE with >99% negative predictive value. No further imaging needed; pursue alternative diagnosis.

36. B - Protamine sulfate reverses unfractionated heparin by forming a stable complex. Dose: 1 mg per 100 units heparin given in last 2-3 hours. Maximum single dose 50 mg.

37. C - Idarucizumab (Praxbind) is specific reversal agent for dabigatran. Dose is 5 g IV. It's a monoclonal antibody fragment binding dabigatran with high affinity.

38. B - Hypovolemia is the most common cause of PEA among the H's and T's. Always consider and treat reversible causes during resuscitation.

39. B - Magnesium sulfate 2 g IV is first-line for torsades de pointes regardless of serum magnesium level. It suppresses early afterdepolarizations that trigger torsades.

40. C - Epinephrine 1 mg IV every 3-5 minutes for cardiac arrest. Higher doses have not improved outcomes. Give after second shock in shockable rhythms, immediately in non-shockable.

41. B - Peaked T waves are the earliest ECG finding in hyperkalemia. Progression: peaked T waves → PR prolongation → QRS widening → sine wave → VF/asystole.

42. B - Calcium gluconate is first treatment for hyperkalemia with ECG changes. It stabilizes cardiac membrane within minutes. Does not lower potassium but protects against arrhythmias.

43. C - ACLS recommends compression rate of 100-120/min. Rates >120/min are associated with inadequate chest recoil and decreased coronary perfusion pressure.

44. B - Compression-to-ventilation ratio is 30:2 for adult CPR without advanced airway. With advanced airway, give continuous compressions with asynchronous ventilations at 10/min.

45. B - AF >48 hours (or unknown duration) requires either 3 weeks therapeutic anticoagulation before cardioversion OR TEE to exclude left atrial thrombus before proceeding.

46. C - Biphasic cardioversion for AF starts at 120-200 joules. AF requires higher energy than flutter (50-100J) due to disorganized atrial activity.

47. B - Adenosine 6 mg rapid IV push is first-line for stable narrow complex tachycardia after vagal maneuvers fail. If ineffective, give 12 mg. Terminates AVNRT/AVRT by blocking AV node.

48. A - Adenosine has ultra-short half-life <10 seconds due to rapid cellular uptake and metabolism. Must be given rapid IV push followed by saline flush through proximal IV.

49. C - Transcutaneous pacing when atropine fails for symptomatic bradycardia. Alternative is dopamine or epinephrine infusion while preparing for transvenous pacing.

50. C - Prior stroke/TIA/thromboembolism is worth 2 points in CHA_2DS_2-VASc. Age ≥75 is also 2 points. All other components are 1 point each.

51. B - Complete heart block in anterior MI indicates extensive septal necrosis (LAD territory). Poor prognosis, often doesn't respond to atropine, requires pacing. Unlike inferior MI blocks which are often transient.

52. B - Vasopressin acts on V1 receptors on vascular smooth muscle causing vasoconstriction. It works independently of catecholamine pathways, useful when catecholamine resistance develops in septic shock.

53. B - CULPRIT-SHOCK trial showed culprit-only PCI had lower 30-day mortality than immediate multivessel PCI in STEMI with cardiogenic shock. Staged revascularization can be performed later if needed.

54. C - Milrinone is an inodilator providing inotropy (increased contractility) plus vasodilation (afterload reduction) through PDE-3 inhibition. Useful in cardiogenic shock but can cause hypotension.

55. C - Enoxaparin requires dose adjustment in renal impairment (CrCl <30 mL/min) because it's renally cleared. Reduce to 1 mg/kg once daily or use unfractionated heparin instead.

56. C - Clopidogrel loading dose is 300-600 mg for ACS/PCI. Higher loading (600 mg) achieves faster platelet inhibition. Maintenance dose is 75 mg daily.

57. C - Prasugrel is contraindicated in patients with prior stroke/TIA due to increased intracranial bleeding risk without net clinical benefit in this population (TRITON-TIMI 38).

58. C - Ticagrelor should be held 5-7 days before CABG to reduce bleeding risk. Prasugrel also requires 7 days. Clopidogrel requires 5 days.

59. C - Mechanical mitral valve requires INR 2.5-3.5 due to higher thrombotic risk than aortic position. Mechanical aortic valve target is 2.0-3.0.

60. B - 4T score of 6 (high probability) for HIT warrants immediate heparin cessation and initiation of non-heparin anticoagulant (argatroban or bivalirudin). Send confirmatory testing but don't wait for results to treat.