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Canadian Cardiovascular Society Academy

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Mock Written Exam

Adult Cardiology Trainee Review Program

Supported by the Canadian Cardiovascular Society Academy

2021

BOOKLET 1

2021 Adult Cardiology Trainee Review Program
Practice Short Answer Written Exam

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1. A 25-year-old female is referred to you with progressive dyspnea and a finding of severe pulmonary hypertension on an echocardiogram.

    a. List the five classification groups of pulmonary hypertension and an example from each that would be a plausible etiology in this patient. (10)

    b. What is the formula for calculating pulmonary vascular resistance in the cardiac catheterization lab? What are the units and normal values? (2)

    c. List five (5) classes of pharmacologic therapy that have been shown to improve 6-minute-walk distance in patients with pulmonary arterial hypertension. (5)

2. Briefly describe the specific mechanisms of action of the following medications.

    a) Aspirin (2)

b) Carvedilol (2)

c) Fondaparinux (2)

What is the mechanism of action of clopidogrel and ticagrelor? (2) What are their principal differences in terms of how each of these specific molecules interacts with its target(5)?

3. A 52-year-old woman receives a bi-leaflet mechanical mitral valve replacement for severe rheumatic mitral stenosis.

a) What specific anti-thrombotic regimen is indicated? (3)

Assuming this patient takes the appropriate anti-thrombotic regimen as prescribed, define her approximate annual risk of:

b) Thromboembolism (1)

c) Major bleeding (1)

The patient has done well for five years after mitral valve replacement. She is active and denies any chest pain or shortness of breath. Now 57, she requires extensive dental work below the gum-line, and interruption of her anti-coagulant is mandatory. Her dental surgeon refers the patient to you requesting “management/optimization of this patient prior to dental surgery under general anesthesia.” Provide your recommendations as per your consultation letter, as well as a prescription if appropriate. (6)

4. a) Define the following terms:

i) Hibernating myocardium (2)

ii) Stunned myocardium (2)

5. A 28-year-old woman with progressive shortness of breath over one year is catheterized with the following saturation results:

Sampling Site:	Oxygen Saturation
High SVC	67
Low SVC	67
High RA	78
Mid RA	92
Low RA	81
Hi IVC	71
Low IVC	71
RV Inflow	90
Mid RV	87
RV Outflow	88
PA	88
Aorta	98
Pulmonary vein	98

a) What is the most likely diagnosis? (1)

b) Calculate the Qp / Qs ratio. (2)

b) How should this patient be managed at this point in time? (2)

6. List four (4) anatomical differences that distinguish the right from the left atrioventricular valve. (4)

7. List six (6) genetic or chromosomal conditions that predispose to aneurysm formation in and dissection of the thoracic aorta and that are considered when screening is discussed. (6) For three of these, list the gene product that is deficient or defective. (3)

8. What defines a left ventricular aneurysm on angiography? Contrast the pathology, angiographic appearance and natural history of a left ventricular aneurysm from an LV pseudo-aneurysm. (8)

9. For each of the following conditions, list one (1) commonly associated cardiovascular abnormality: (3)

   a) Friedreich's ataxia

   b) Tuberous sclerosis

   c) Hereditary hemorrhagic telangiectasia

10. List the three most common forms of congenital long QT syndrome. For each of these, list the adversely affected gene product, describe the typical appearance on ECG and describe the classic clinical presentation. (12)

11. List four (4) Class I indications for early surgery for native valve infective endocarditis. (4)

12. SGLT-2 inhibitors have an evolving role in the management of cardiovascular patients.

a) What is the mechanism of action of this class of medications? (2)

b) Summarize the findings of the DAPA-HF trial. (3)

13. In the initial reports of Brugada Syndrome, three types of ST segment elevation were described. The contemporary definition of Brugada Syndrome is the Type 1 ECG pattern in one or more right precordial leads (i.e. V1 or V2); the Type 1 pattern is diagnostic of Brugada Syndrome whether present spontaneously or with provocation. Describe the Type 1 pattern of ST segment elevation (3).

The Type 2 pattern of ST segment elevation raises suspicion of Brugada Syndrome, but the diagnosis requires the emergence of a Type 1 pattern with provocation. Describe the Type 2 pattern (3). List two agents that can be used to provoke a Type 1 ECG pattern? (2)

What is the relevance of a Type 3 pattern of ST segment elevation? (1)

14. List six (6) causes of elevated fasting triglycerides. (6)

15. The following pressures were obtained at right heart catheterization in a patient with heart failure undergoing transplant assessment. Interpret the hemodynamics. Could this patient be listed for transplant now? Show your work and rationale. (5)

RA 15 mean
RV 45/5/15
PA 45/30/37
PCWP 15/20/17
PA sat 61%
Ao sat 95%
CO 4 L/min

16. a) Define resistant hypertension: (3)

b) In what conditions is the 4th Korotkoff sound recommended as the diastolic BP? (2)

17. Outline the Modified WHO Classification of Maternal Cardiovascular Risk. List eight (8) cardiac conditions where pregnancy is generally considered contraindicated and where termination of pregnancy would be discussed? (8)

18. A 48-year-old woman has breast cancer. Treatment with doxorubicin is being considered. What is the most clinically important cardiac side effect of this medication? (1) List six (6) strategies to decrease the adverse cardiac effects of doxorubicin in this patient. (6)

19. a) What is the definition of a continuous murmur? (2)

b) List eight (8) conditions that can produce a continuous murmur. (8)

20. List eight (8) interventions that decrease the risk of atrial fibrillation around the time of cardiac surgery, independent of the procedure itself? (8)

21. Place the following oxygen saturations in order from highest to lowest. Explain. (4)

IVC
SVC
Coronary Sinus
Pulmonary vein

22. a) Define Ebstein's anomaly. (4)

b) List the ECG findings associated with Ebstein's anomaly. (2)

c) Why may an adult patient with significant Ebstein's become cyanotic with exercise but have normal saturations at rest? (1)

23. List ten (10) absolute contraindications to intravenous fibrinolysis in the context of STEMI. (10)

24. List four (4) medications that can improve symptoms of refractory angina, and outline the mechanism of action of each. (8)

25. Several scores have been developed to estimate a patient's risk of bleeding in the context of oral anticoagulation for atrial fibrillation. Name one of these and describe how it is used. (7)

26. List five (5) indications for ICD implantation that are endorsed as Class I by either the CCS or ACC/AHA clinical practice guidelines. (5)

27. A 68-year-old man and his 38-year-old daughter are referred to you for non-valvular atrial fibrillation. What is “non-valvular AF?” (3)

They are both asymptomatic on diltiazem for rate control. Both have $CHADS_2$ scores of 0, and neither has a history nor clinical evidence of atherosclerosis. State the antithrombotic regimen recommended for each patient and refer to the relevant guidelines (CCS, AHA or ESC) that justify your response. (4)

28. Novel Oral Anticoagulants (NOACs) are all the rage for stroke prevention in atrial fibrillation. Name the four NOACs currently approved for stroke prevention in AF, the mechanism of action of each, the respective large randomized clinical trials that support the use of each, and state the degree to which (as a percent of ingested drug) these agents are renally excreted. (16)

29. List five conditions that should be met before cardiac resynchronization therapy is considered definitely indicated. (10)

30. What are the effective regurgitant orifice (ERO) and regurgitant volume criteria for chronic severe mitral regurgitation when the etiology is primary vs secondary? List the Class I and IIa indications for proceeding with mitral valve surgery in chronic severe primary mitral regurgitation. List the Class I and IIa indications for mitral valve surgery in chronic severe secondary mitral regurgitation. (11)

31. State the valve hemodynamics for each of the following varieties of aortic stenosis: (15)

a. Mild AS
b. Moderate AS
c. Severe high-gradient AS
d. Very severe AS
e. Severe low-flow/low-gradient AS with reduced LVEF
f. Paradoxical low-flow severe AS

State the strength of the recommendation for surgery in each of the following cases: (6)

a. Mild AS, no symptoms
b. Moderate AS, patient requires CABG
c. Severe high-gradient AS, patient has symptoms
d. Very severe AS, no symptoms
e. Severe low-flow/low-gradient AS with reduced LVEF, patient has symptoms
f. Paradoxical low-flow severe AS, patient has symptoms

32. List five underlying conditions that can predispose to (non-atherosclerotic) spontaneous coronary artery dissection (SCAD)? Describe the angiographic classification of SCAD. (8)

33. What does FFR stand for? How is it calculated (i.e. what is the simplified equation for FFR)? How is it performed? How is it used clinically, and list the two major trials that support this clinical use of FFR. (9)

34. What is the ankle brachial index (ABI), i.e. how is it calculated? How should ABI results be reported, i.e. what are the four possible result categories, and what are the corresponding numerical ranges? (12)

35. In 2014, neprilysin inhibition, in combination with an ARB, was demonstrated to be an effective treatment for systolic heart failure when compared with an ACE-inhibitor. What is the mechanism of benefit of a neprilysin inhibitor? Why does co-administration with an inhibitor of the renin-angiotensin-aldosterone system (RAAS) make biologic sense? Why should a neprilysin inhibitor not be co-administered with an ACE-I? (6)

36. What are the driving restrictions (private and commercial) in each of the following conditions? (6)

a) Stable CCS 2 angina

b) Stable NYHA III, LVEF 38%

c) One episode of unexplained syncope

List five indications for supplemental oxygen during a commercial airline flight. (5)

37. You are seeing a 40-year-old man with hypertrophic cardiomyopathy (HCM).

a) What conditions constitute a Class I indication for ICD referral? (3)

b) If this patient develops atrial fibrillation, how do you decide about oral anticoagulation to reduce the risk of stroke? And if an antiarrhythmic drug is indicated, which two medications are preferred? (4)

38. The Revised Cardiac Risk Index (RCRI) score has six components. One of these is high-risk surgery. What constitutes high-risk surgery (be specific)? (3)

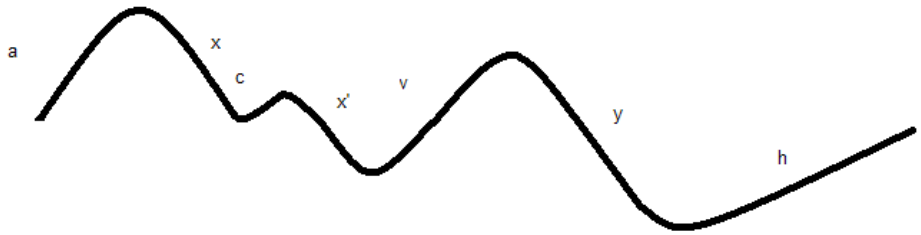
List the five other components of the RCRI score (be specific). (5)

The CCS guidelines recommend testing before elective non-cardiac surgery when the RCRI score is >= 1 (or if the patient is >= 65 years of age or is 45-64 years of age and has significant cardiovascular disease). What test is recommended? (1) How is this test used (be specific)? (4)

39. List the three most common forms of amyloidosis based on the chemical classification of the disease. One of these forms has two subtypes, one that is genetic and the other that is acquired; name them. Which form of amyloidosis is the most commonly encountered worldwide? Which of the above forms of amyloidosis does not typically involve the heart? Which form of amyloidosis is the most likely to present with low voltages on the ECG? For each of the above forms of amyloidosis, including the two subtypes of one form, what is the mainstay of therapy?

40. Physical exam theory!

a) Identify the mechanism of each labeled phase of the normal jugular venous pulsation tracing depicted below: (7)



b) Describe the jugular venous findings expected in each of the conditions below:

Pericardial constriction (3)

Cardiac tamponade (2)

Acute right ventricular myocardial infarction (3)

Atrial fibrillation (2)

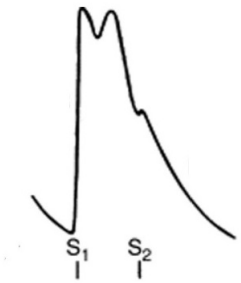
c) Define a paradoxically split S2; list four conditions where this would be an expected finding (5)

d) In a patient with severe aortic insufficiency, a low-pitched diastolic rumble at the apex is also heard. List three findings on precordial auscultation that would suggest associated mitral stenosis as opposed to an Austin Flint phenomenon as the cause for the second murmur. (3) In the above context, how could administration of amyl nitrite distinguish between MS and Austin Flint? Explain. (2)

e) List four circumstances in which pulsus paradoxus is <u>not</u> present despite the presence of pericardial effusion causing pericardial tamponade. (4)

f) Define a Graham Steell murmur. (2)

g) Identify the following arterial pulse contour? (2) List two causes. (2)



h) Identify the following arterial pulse contour? (2) List four causes. (4)