Session 7: Cardiology I and II
Answer Explanations

Cardiology I

1. **Answer A: Intravenous heparin 4000-unit intravenous bolus, followed by a 1000-unit/hour continuous infusion.**

   The NSTE-ACS guidelines recommend the use of one anticoagulant during an acute event. Enoxaparin, unfractionated heparin, and bivalirudin are all recommended as class I agents for the invasive management of NSTE-ACS. However, fondaparinux (Answer C) is not optimal because increased risk of catheter-related thrombosis has been associated with fondaparinux use in the catheterization laboratory. The NSTE-ACS guidelines advise the use of additional heparin if fondaparinux was chosen as an initial anticoagulant when the patient underwent intervention, whereas the PCI guidelines give fondaparinux a class III or harmful recommendation. Of the remaining three options, unfractionated heparin (Answer A) is preferred because of its rapid clearance. Both enoxaparin (Answer B) and bivalirudin (Answer D) are appropriate options but would need to be dose adjusted, given this patient’s CrCl of <30 mL/minute. Dosages listed in Answer B and Answer D would be appropriate options for patients with a normal CrCl, however.

   **References**
   
   

2. **Answer A: Eptifibatide 180-mcg/kg double bolus with a 1-mcg/kg/minute infusion.**

   This patient is experiencing progression of ischemia, as evidenced by his rise in troponin and unrelieved chest pain. Glycoprotein inhibitors, which inhibit the final common pathway of platelet aggregation, provide a reduction in the composite of death and myocardial infarction (MI) and a need for revascularization, especially in high-risk patients who have not been pretreated with a P2Y12 receptor antagonist and in those receiving unfractionated heparin. This patient would be a good candidate at this time for this type of antiplatelet therapy because no loading dose of P2Y12 receptor antagonist has been given and because the anticoagulant used was unfractionated heparin. Of the three available glycoprotein inhibitors, eptifibatide (Answer A) is dosed correctly for a reduced creatinine clearance, which calls for a 50% reduction in infusion with a creatinine clearance below 50 mL/minute. Tirofiban (Answer B) requires a 50% reduction in infusion when the CrCl falls below 30 mL/minute, so the dosing in Answer B is inappropriate in this setting. Abciximab (Answer C) is not appropriate for the medical management of ACS in patients who are not undergoing...
catheterization, although it is the only glycoprotein inhibitor that is not renally cleared. Rivaroxaban (Answer D) was studied in the ATLAS ACS 2-TIMI 51 trial as add-on therapy to standard therapy in ACS; however, this treatment strategy was used not in the acute phase of ACS treatment. Patients were randomly assigned an average of 4.6 days after ACS. Because of a 3-fold increase in major bleeding, this anticoagulant strategy has not been approved by the U.S. Food and Drug Administration and would be inappropriate.

References

3. **Answer C**: Aspirin 81 mg indefinitely plus clopidogrel 75 mg daily for 12 months.
The choice of which P2Y12 receptor antagonist to use in the ACS setting depends on patient presentation and contraindications and on whether PCI is involved. The 2014 NSTE-ACS guideline gives a class I recommendation for clopidogrel, ticagrelor, and prasugrel in the ACS setting in patients undergoing PCI. This patient is 79 years old, and the age-related caution with using prasugrel in this age group is to generally avoid the drug unless the patient has diabetes or a history of MI. Therefore, Answer A and Answer D are inappropriate for this patient. Although the loading dose of aspirin is generally 162–325 mg in the acute setting, current guidelines state that it is reasonable to use lower doses of aspirin (i.e., 81 mg) in preference to higher doses (i.e., 325 mg) at the time of discharge. Furthermore, ticagrelor (Answer B) has a black box warning regarding reduced effectiveness when doses higher than 100 mg daily are used concomitantly. Finally, after DES placement in an ACS setting, the time recommended for dual antiplatelet therapy is a minimum of 12 months (Answer C).

References

4. **Answer D**: Give no β-blocker at this time.
Administration of β-blocker therapy carries a risk of causing heart failure decompensation, particularly when titrated too quickly or when initiated in patients who are not euvoletic.
Although administering β-blockers within the first 24 hours is a performance measure after STEMI, this patient has several risks that would be considered contraindications to initial β-blockade. The clinical condition of this patient suggests he is not euvolemic, and aggressive diuresis should be attempted before initiation of a β-blocker in this patient. In addition, intravenous β-blocker therapy (Answer B) would place this patient at an even greater risk for cardiogenic shock. Answer A and Answer C are not appropriate because the doses are too aggressive for a patient with an EF of 25%. Answer D is the correct choice, although, before discharge, this patient should be re-evaluated for the initiation of low-dose β-blocker therapy.

References

5. **Answer A: Discontinue ticagrelor; go ahead with surgery after 24 hours; continue aspirin.** The U.S. guidelines for treating patients undergoing urgent coronary artery bypass grafting (CABG) surgery recommend discontinuing clopidogrel or ticagrelor for at least 24 hours in the setting of urgent CABG. For elective CABG, clopidogrel and ticagrelor should be discontinued for at least 5 days and prasugrel for at least 7 days before surgery. In addition, this patient had a DES placed 6 months ago. Guidelines recommend continuing a P2Y12 inhibitor for patients who had a stent placed less than 12 months ago; for patients at high risk of ischemic events, guidelines recommend continuing aspirin, so Answer A is correct. Answer B and Answer C are incorrect because aspirin should be continued. Answer D is incorrect because the P2Y12 inhibitor should be discontinued for at least 24 hours to minimize the risk of bleeding from CABG.

References
6. **Answer D**: Apixaban 5 mg twice daily indefinitely given a CHA₂DS₂VASc score of 4

This patient is 66 years and has diabetes, HFREF, and vascular disease giving him a CHA2DS2VASc score of 4 that equates to a 9.3% annualized stroke risk and is therefore considered high risk and should be anticoagulated. The American College of Chest Physicians guidelines recommend anticoagulation over aspirin therapy in patients with a CHA2DS2VASc score of > 2. Therefore, the choice of aspirin given a CHA2DS2VASc of 1 (Answer A) would be incorrect. His estimated CrCl is approximately 44 mL/minute. Because he is also taking amiodarone and has a CrCl less than 80 mL/minute, the combination of rivaroxaban with amiodarone is not recommended (Answer B and C). Apixaban (Answer D) does not have the same degree of interaction with amiodarone and it therefore the best option. Additionally, because this patient does not have two or more of the factors that would warrant a dose adjustment in apixaban (age 80 years or older, body weight less than 60 kg, or SCR of 1.5 mg/dL or greater), the appropriate apixaban dose in this patient would be 5 mg twice daily.

**References:**


7. **Answer C**: Increase lisinopril to 20 mg once daily to achieve a BP goal of < 140/90 mmHg

J.S. has a number of compelling indications that warrant specific anti-hypertensive therapy. She has diabetes and CKD. According to the 2014 evidence-based guideline for the management of high blood pressure in adults-report from the panel members appointed to the Eight Joint National Committee (JNC 8), patients with CKD or diabetes should be managed initially with an angiotensin receptor blocker (ARB) or angiotensin converting enzyme inhibitor (ACEI) and her blood pressure goal should be < 140/90 mmHg. Therefore making Answers A, B, and D incorrect. Because J.S. is only on 10 mg of lisinopril, increasing the dose to 20 mg would be the most appropriate to help achieve the recommended BP goal of < 140/90 mmHg over adding any additional blood pressure medications.(Answer D)

**References:**


8. **Answer A**: *Initiate amiodarone 400 mg two times a day x 2 weeks and adjust warfarin as needed.*

T.H is has HFpEF. Propafenone is considered contraindicated in patients with heart failure (Answer C) and should be avoided. While dronedarone may be used in Class I to class III heart failure, given his recent hospitalization for a CHF exacerbation, dronedarone should be avoided (Answer D). Sotalol is not contraindicated in T.H. however the atrial fibrillation guidelines do not recommend its use in patients with heart failure. Therefore, amiodarone (Answer A) is the most appropriate response as it appears safe in this patient population. Additionally, TH will have to have his INR checked more frequently secondary to amiodarone increasing warfarin levels.

**References:**


9. **Answer B**: *Initiate atorvastatin 20 mg once daily.*

B.M. is a candidate for moderate intensity statin therapy secondary to his diabetes and ASCVD risk of 6% (Answer B). Simvastatin at a dose of 20 mg is considered a high intensity statin but B.M. is also taking diltiazem and the maximum recommended dose simvastatin in combination with diltiazem is 10 mg (Answer A). Lovastatin 40 mg once daily is also a moderate intensity but again, this dose exceeds the recommended dose of 20 mg when combined with diltiazem (Answer C). Rosuvastatin does not interact with diltiazem but the dose of 20 mg is considered a high intensity statin (Answer D).

**References:**


10. **Answer A**: *NYHA Class II, Stage C.*

L.W. has a new diagnosis of HFpEF. He has an EF of 30%, rales on exam, distended neck veins, new S3, and rales bilaterally. He does not state that he is limited in doing any of his regular activities but is experiencing shortness of breath while conducting his normal level of activity. Therefore he falls into NYHA functional class II: Symptoms of HF with normal level of activity (Answer A). L.W. also has symptomatic heart failure and would be a Stage
C (Answer A). NYHA Class III (Answers B and D) would be incorrect as this patient does not have marked limitations at rest. Stage B (Answer C) would be incorrect as L.W. is experiencing heart failure symptoms and Stage B is for asymptomatic patients with structural heart disease or previous MI, left ventricular remodeling, left ventricular hypertrophy, or asymptomatic valvular disease.

References:
