1. Which of the following historical characteristics of chest pain is most likely due to myocardial infarction
    a) Pain associated with diaphoresis
    b) Pain radiated to the left arm
    c) Pain radiated to right arm or shoulder
    d) Pain described as pressure

2. Which description of chest pain is more likely due to AMI in origin
    a) Chest pain lasting < 1/2 minute
    b) Pain lasting up to 2 hours
    c) Pain lasting 12 hours
    d) Pain is positional

3. Which of the following is true regarding the nature of cardiac ischemia chest pain
    a) Up to 22% of patients with AMI have pain described as sharp or stabbing
    b) In AMIs up to 19% describe pain that is pleuritic
    c) In those that had an AMI 10% did not have chest pain upon presentation to hospital
    d) Women have less risk of vasospastic or microvascular angina (syndrome X)

4. Which of the following risk factors is **not** included in scoring for chest pain in emergency included in TIMI risk score for unstable angina, HEART score and EDACS
    a) Family history of coronary artery disease
    b) Hypertension and high cholesterol
    c) Current smoker
    d) Post-menopausal female

5. Which is true regarding AMI presentations in the emergency department
    a) Dyspnea without chest pain is less likely to have sudden cardiac death compared to a presentation with typical angina symptoms
    b) Up to 1/3 of all AMIs occur in patients with no coronary risk factors
    c) Pain responding to nitrites (GTN) has a >90% sensitivity for ACS
    d) 50% of elderly patients with falls or unexplained collapse presenting to ED have AMI as a cause or concurrently

6. Regarding non ACS causes of elevated troponin which is unlikely to cause an elevated high sensitive troponin
    a) Severe Sepsis
    b) Duchenne Muscular dystrophy
    c) Ischemic Stroke
    d) Hemolysis

7. Which is a correct statement about non-cardiac ischemia causes of chest pain
    a) All CXRs are abnormal (ie. pleural effusion, surgical emphysema or pneumomediastinum) in Boerhaaves syndrome
    b) The risk of having ACS or angina in a patient presenting with symptoms of Panic disorder is about 5%
    c) Pain from mitral valve prolapse typically occurs at rest
    d) In acute pericarditis the pain is often relieved by lying down

8. Regarding ECG changes in AMI, which is **incorrect**
    a) 80 lead ECGs significantly improves both sensitivity and specificity compared to 12 lead
    b) Less than 10% of patients with AMI have normal ECGs
    c) The positive predictive value of new ST elevations of >1mm in two contiguous leads is > 90%
    d) 20-30% of AMIs have new ST depression or T wave inversion

9. Regarding troponin characteristics which is correct
    a) Mortality does not increase in patients with chronically elevated troponins and renal failure compared to those with normal troponins
    b) Troponin assays can remain elevated for 7 to 10 days
    c) Troponin T has many assays whilst troponin I has only one assay and is thus more reproducible
    d) An AMI can be diagnosed with a positive high sensitive troponin only when the level is >99th percentile for the reference population

10. Regarding cardiac markers other than troponin which is **incorrect**
    a) CK elevates within 4 to 8 hours after coronary artery occlusion
    b) CK returns to normal between 3 to 4 days
    c) BNP levels are not recommended for routine use among ED chest pain patients either as a replacement or supplement to troponin
    d) Serum myoglobin rises later than CK after coronary artery occlusion

11. The anatomical variations of coronary circulation can produce
    a) A greater proportion of left dominant circulation compared to right
    b) Balanced right and left circulations occurring in about 30% of patients
    c) Left anterior descending branch as the main supply of the cardiac septum in the majority of patients
    d) Circumflex branch that predominantly supplies the anterior wall in the majority of patients

12. If a patient had a recent angiogram what probabilities are **not** correct in the following results
    a) 2/3 of arteries will have risk of total or near total occlusion if previous stenosis of > 50%
    b) 80% of arteries will have risk of total or near total occlusion if previous stenosis of > 70%
    c) Despite a normal angiogram, 50% of patients can develop new lesions within 2 years
    d) 95% of patients with 1 completely occluded artery will have a significant stenosis in at least one other artery

13. Regarding ECGs in STEMI which is correct
    a) If ST elevation in lead II > than lead III it is highly suggestive of right ventricular infarct
    b) Initial 12 lead ECG should be obtained and interpreted within 30 minutes of ED presentation with AMI symptoms to best identify a STEMI
    c) ST depression in V1 with accompanied ST elevation in V2 is highly specific for right ventricular myocardial infarct
    d) Tall and peaked “hyperacute” precordial T waves are seen in early stages of a STEMI

14. Which is **not** an ECG criteria for the diagnosis of a STEMI or STEMI equivalent that warrants urgent cath lab activation or thrombolysis according to American Heart Association criteria 2013
    a) New LBBB with a Sgarbossa criteria score of 2
    b) New ST elevation at the J point of ≥1.5mm in a female in leads V2 and V3
    c) New ST elevation at the J point of ≥1mm in a male in leads V5 and V6
    d) New ST elevation at the J point of ≥1mm in lead aVR with multilead ST depressions

15. Regarding Sgarbossa Criteria for LBBB on ECG with chest pain which is correct
    a) A score of ≥ 2 has a specificity of 98% of having an AMI
    b) ST elevation ≥ 1mm concordant with QRS complex in any lead highly indicates an AMI
    c) A score of 0 rules out a STEMI
    d) ST depression ≥ 1mm in lead V1, V2 or V3 only does not meet the score that will yield a specificity of 98% of having an AMI

16. Which scenario would likely mandate a need for urgent thrombolysis instead of transfer for urgent PCI in a patient presenting with a STEMI
    a) Patient presents with 25 minutes of chest pain in a facility that could do a PCI in 50 minutes
    b) Patient presents with 15 hours of chest pain in cardiogenic shock in a facility that could do a PCI in 80 minutes
    c) Patient presents with 45 minutes of chest pain in a facility that could do a PCI in 80 minutes
    d) Patient presents with 10 hours of chest pain in a facility that could do a PCI in 80 minutes

17. Which is **not** an absolute contraindication to thrombolysis for STEMI
    a) Past history: Hemorrhagic stroke 10 years ago
    b) Past history: Ischemic stroke 5 months ago
    c) GIT bleed secondary to liver cirrhosis and Varices 2 months ago
    d) A patient with hemophilia A

18. Regarding drug therapies in conjunction with PCI which is correct
    a) Drug eluting stents should have a shorter course of antiplatelet agents such as clopidogrel compared to bare metal stents
    b) Heparin or enoxaparin should be given routinely (unless contraindicated) in all STEMI undergoing PCI regardless of other agents used
    c) GP IIb/IIIa inhibitors such as abciximab is routinely recommended if dual antiplatelet therapy (aspirin and a P2Y12 such as clopidogrel) is also being given
    d) PCI should be done 24 to 48 hours after a successful thrombolysis for STEMI

19. Which is **not** true of adjuvant medications to STEMI presentations in ED
    a) Nitrates should be avoided in inferior wall infarcts
    b) Oral beta blockers is preferred to IV beta blockers in AMIs
    c) ACE-I should be given but not necessarily in the ED
    d) Calcium channel blockers should be given instead of beta blockers

20. Which time course is typical for complications after an AMI
    a) Free wall rupture usually occurs 8 to 10 days post
    b) Post AMI pericarditis occurs 2 to 4 days post
    c) Dressler's Syndrome occurs about 7 days post
    d) In-stent restenosis in drug eluting stents occur about 6 months after stent has been placed

21. Regarding cardiogenic shock which is correct
    a) A normal B-type natriuretic peptide (BNP) rules out cardiogenic shock
    b) Mortality from cardiogenic shock is approximately 20%
    c) A cardiac index of 2.5 L/min per m^2 suggests cardiogenic shock
    d) Half of cardiogenic shock after AMI is caused by mechanical complications

22. Which of the following regarding ACS in the ED is **incorrect**
    a) A patient is unlikely to develop a significant epicardial stenosis with a normal angiogram <2 years ago
    b) The results from previous stress testing are not likely to be helpful in determining current incidence of ACS
    c) A normal ECG still has a 1 to 6% risk of a NSTEMI
    d) <50% stenosis in an artery on angiogram have <1% of infarction or death at 12 months

23. Which sensitivities are correct for the following cardiac tests
    a) Stress ECG = 80%
    b) Stress Echo = 50%
    c) Sestamibi test = 85%
    d) CT coronary angiogram = 70%

24. Which is **incorrect** regarding CT coronary angiograms
    a) Unsatisfactory images can be up to 24%
    b) Heart rate needs to be <80 bpm for an accurate image
    c) A negative result has a 30 day death or AMI rate of <0.6%
    d) Image quality is reduced if previous coronary stents insitu

Answers

1. C (Pain radiating to right arm or both arms more likely to be due to AMI than radiating to left arm > diaphoresis > nausea > similar to previous angina pain > pain is a pressure sensation)
2. B (typical angina pain lasts 2 to 20 minutes but can last for 2 hours, pain lasting only a few seconds is unlikely, pain lasting >12 hours is unlikely and pain that is positional is unlikely)
3. A (Pleuritic chest pain in 6% of AMIs, 33% did not have chest pain upon presentation 27% men and 37% women, women have greater risk of atypical pain and atypical disorders such as syndrome X)
4. D (Although age and gender are factored in EDACS but gender is not in HEART and TIMI the menopausal status is not factored in any score. Other factors include TIMI: age, prior known coronary stenosis, diabetes, use of aspirin, crescendo angina, ECG changes, troponin. HEART: clinical suspicion, ECG changes, age, diabetes, obesity, troponin. EDACS: age, gender, diabetes,

previous coronary disease, diaphoresis, pain radiation, pleuritic pain, reproduced on palpation. MDCALC.com 2016, http://www.cardiocast.net/ohds/TIMI_Score.pdf)

5. B (Dyspnea without chest pain has twofold increase in sudden death from cardiac cause compared to classical angina symptoms, pain responding to GTN has a 72% sensitivity for ACS, 10% of elderly patients with collapse have an AMI.
   Clinical assessment of suspected ACS. DUNN RJ emergencymedicinemanual.com 2016)
6. D (Hemolysis can reduce hsTNT or minimally increase hsTNI. Non ACS causes of elevated troponin. DUNN RJ emergencymedicinemanual.com 2016)
7. C (The risk of ACS or stable angina with panic disorder is 25%, pain is typically worsened by lying down in pericarditis, 12% of Boerhaaves syndrome have normal CXR based on uptodate 2016 on article Han SY Perforation of the esophagus: correlation of site and cause with plain film findings. AJR Am J Roentgenol 1985; 145(3):537)
8. A (80 lead ECGs have 9% more sensitivity and 5% more specificity than 12 lead. The ECG in acute coronary syndromes DUNN RJ emergencymedicinemanual.com 2016)
9. B (Chronically elevated troponin levels in patients with renal dysfunction will have a significantly higher mortality, troponin T has only one assay whilst troponin I has many assays, a positive troponin is classified as >99th percentile OR >50% increase above initial baseline level.
   2011 addendum to the National Heart Foundation of Australia/Cardiac Society of Australia and New Zealand guidelines for the management of acute coronary syndromes (ACS) 2006. Heart, Lung and Circulation 2011;20(8):487-502.)
10. D (Myoglobin rises 3 hours after AMIs and normalizes within 24 with normal renal function)
11. C (Circumflex supplies some anterior and posterior wall but predominantly supplies lateral wall, balanced circulation in 60-65%, right dominant in 20-25%, left dominant 10-15%. Coronary artery disease. DUNN RJ emergencymedicinemanual.com 2016)
12. B (97% risk of sudden total or near total occlusion when stenosis >70%. Coronary artery disease. DUNN RJ emergencymedicinemanual.com 2016)
13. D (Initial 12 lead ECG should be obtained within 10 minutes of presentation to ED with AMI symptoms most common KPI in hospitals, RV infarct pattern: ST elevation in lead III > II; ST elevation in V1 > V2; or ST elevation in V1 and depression in V2; or ST isoelectric in V1 and depression in V2. LITFL 2016 Right ventricular infarct, and LITFL 2016 T wave ECG basics)
14. A (New LBBB no longer considered STEMI equivalent unless it score ≥ 3 in Sgarbossa criteria, new ST elevation at J point in men of 2 contiguous leads ≥2mm in leads V2-V3, new ST elevation at J point in women of 2 contiguous leads ≥1.5mm in leads V2-V3, new ST elevation of ≥1mm in other contiguous chest or limb leads, ST elevation in aVR with mutilead ST depression, ST depression in ≥ 2 precordial lead V1-V4 may indicate, and hyperacute T wave changes may indicate. O'Gara et al. 2013 ACCF/AHA guideline for the management of ST-Elevation Myocardial Infarction. Circulation 2013;127:00-00)
15. A (Sgarbossa criteria: ST elevation ≥1mm and concordant with QRS odds ratio=25 and score=5, ST depression ≥ 1mm in V1 or V2 or V3 odds ratio=6 and score=3, ST elevation ≥ 5mm and discordant with QRS complex odds ratio=4.3 and score=2, a score of ≥ 3 had a specificity of 98% for an AMI, a score of 0 does not rule out STEMI. Online Data Supplement 1 in O'Gara et al. 2013 ACCF/AHA guideline for the management of ST-Elevation Myocardial Infarction. Circulation 2013;127:00-00)

16. C (Chest pain within 12 hours or some groups outside 12 hours ie those in cardiogenic shock: should have a PCI if chest pain is within 1 hour and PCI can be done within 60 minutes, should have a PCI if chest pain is >1 hour and PCI can be done within 90 minutes, all others should have thrombolysis. ANZCOR guidelines 14.3 January 2016)
17. C (absolute contraindications: hemorrhagic stroke at any time, brain neoplasm or AVM, ischemic stroke within 6 months, major surgery or trauma within 3 weeks, GIT bleed within 1 month, bleeding disorder, aortic dissection. Relative contraindications include liver cirrhosis, oral anticoagulants, pregnancy, traumatic resus. ANZCOR guidelines 14.3 January 2016)
18. B (Drug eluting stents require a longer duration usually 1 year of dual antiplatelet therapy, GP IIb/IIIa not routine if dual antiplatelet therapy can be used, PCI should be done 3 to 24 hours after successful thrombolysis. See ANZCOR and AHA references previous questions)
19. D (beta blockers and ACE-I should be given within 24 h, calcium channel blockers do not reduce mortality and may be harmful so should only be given if b-blocker contraindicated)
20. B (Free wall rupture occurs 1 to 5 days post, Dressler's occurs 2 to 10 weeks post, in-stent restenosis occurs 9 to 12 months after a drug eluting stent usually once clopidogrel ceased)
21. A (Mortality is 50%, CI < 2.2 L/min/m^2 suggests cardiogenic shock, ¼ of cardiogenic shock following AMI is due to mechanical complications)
22. D (<50% stenosis on angio has a 2.1% risk of infarct or death at 12 months due to plaque rupture, small myocardial vessel disease or coronary vasospasm.)
23. C (stress ECG 68%, stress echo 80%, sestamibi 85%, CTCA 85%. Other diagnostic modalities in ACS. DUNN RJ emergencymedicinemanual.com 2016)
24. B (HR need to be <65 bpm. Other diagnostic modalities in ACS. DUNN RJ emergencymedicinemanual.com 2016)