Heart Failure Training Module – Knowledge Questions

Questions 1-5 refer to the following case study.

A 32-year-old firefighter presents at your clinic with dyspnea on exertion. He reports he has trouble keeping up with his squad and can no longer carry his 40-lb pack. He reports 2 months of nocturnal cough, a 10-lb weight loss, and fatigue. He denies any history of smoking, and he drinks 2-3 six-packs of beer daily at weekends.

He presented 3 weeks ago to Urgent Care, where he was told he had pneumonia and asthma. He was started on antibiotics and a β–agonist but still does not feel well.

1. Which of the following findings is least specific in making a diagnosis?
   A. Elevated jugular venous pulsation (JVP)
   B. Pulsus alternans
   C. Wheezing
   D. S3 gallop
   E. Cephalization on chest radiograph

2. Physical examination reveals decreased breath sounds one third of the way up on both sides. He has JVP to the angle of the jaw, hepatojugular reflux, and 2+ pitting edema to the knees. He has a grade 2-3/6 systolic murmur along the left sterna border and apex radiating to the axilla. He is diagnosed with congestive heart failure (CHF). What laboratory test would have been helpful in confirming the etiology of this patient’s symptoms?
   A. Total bilirubin
   B. C-reactive protein
   C. Troponin I
   D. Creatinine
   E. B-type natriuretic peptide (BNP)

3. Which test would provide the most information to assess his condition?
   A. Electrocardiogram
   B. Arterial blood gas analysis
   C. Echocardiogram
   D. Chest radiograph
   E. Pulmonary function tests

4. The patient has 4-chamber dilation with a ventricular ejection fraction of 15%. He has moderate mitral regurgitation, moderate tricuspid regurgitation, with an estimated pulmonary artery systolic pressure of 70 mmHg. He has a moderate pleural effusion, elevated liver function tests, hypokalemia, and hypomagnesemia. His blood pressure is 115/60 mmHg, his heart rate is 110 bpm, his respiratory rate is 30 breaths/min., and his saturation on room air is 88%. You decide to admit the patient. Initial therapy should include all the following EXCEPT:
   A. Intravenous loop diuretics
   B. Angiotensin converting enzyme (ACE) inhibitors
   C. Digoxin
   D. β–blocker
   E. Electrolyte replacement
5. All the following statements regarding β–blocker therapy in the treatment of heart failure are correct EXCEPT:
   A. β–blockers are classified based on their receptor specificity and are not uniform as a class of drugs
   B. β–blocker therapy results in greater improvement in ejection fractions among those with nonischemic cardiomyopathy compared to ischemic cardiomyopathy
   C. β–blocker therapy should be initiated only when the patient is euvolemic
   D. β–blocker therapy should not be initiated in patients with severe class IV CHF
   E. β–blocker therapy may result in improved left ventricular function without improvement in exercise tolerance

6. Drugs proven to improve survival in patients with reduced systolic function and congestive heart failure include:
   A. Angiotensin converting enzyme (ACE) inhibitors
   B. Digoxin
   C. Hydralazine
   D. Diuretics
   E. All of the above

7. Which of the following drugs have a negative inotropic effect?
   - Digoxin
   - Angiotensin converting enzyme (ACE) inhibitors
   - β–blockers
   - Amlodipine
   - Diltiazem
   - Verapamil

   A. Amlodipine
   B. Angiotensin converting enzyme (ACE) inhibitors and diltiazem
   C. Digoxin and β–blockers
   D. β–blockers, diltiazem and verapamil
   E. Amlodipine, diltiazem and verapamil

8. Which of the following is the LEAST appropriate advice for a patient with heart failure?
   A. 2000 mg daily sodium restriction
   B. 2 liters daily fluid restriction
   C. 6000 mg daily sodium restriction
   D. 3000 mg daily sodium restriction
   E. Regular light to moderate exercise

9. Only one of the following statements is TRUE regarding the physical examination of a patient with heart failure.
   A. The presence of rales on lung exam is a critical physical sign in the diagnosis of decompensated heart failure
   B. The presence of a third heart sound (S₃) is a sensitive sign for the presence of elevated cardiac filling pressures
   C. The presence of elevated jugular venous pulsation (JVP) is a sensitive and specific sign for the presence of elevated cardiac filling pressures
D. Hypotension, low pulse pressure and cool peripheries is usually caused by overdiuresis and hypovolemia
E. The finding of an enlarged, tender, pulsatile liver usually signifies severe mitral regurgitation

10. One of the following statements is FALSE regarding the evaluation of a patient with heart failure.
A. A search for potentially reversible or treatable causes of heart failure is important
B. Correct identification of myocarditis is important as it offers the potential of proven, effective therapy
C. A serum B-type natriuretic peptide (BNP) is potentially useful for the diagnosis of heart failure
D. An EKG may offer information on a specific etiology of heart failure
E. Thyrotoxicosis and hemochromatosis are potentially treatable causes of heart failure

11. Which of the following etiologies of heart failure is associated with the best prognosis of the conditions listed?
A. Ischemic cardiomyopathy
B. Anthracycline-related cardiotoxicity
C. Familial cardiomyopathy
D. Infiltrative cardiomyopathy e.g. cardiac amyloid
E. Hypertensive cardiomyopathy

12. All of the following are important prognostic markers for patients with heart failure EXCEPT:
A. Hyponatremia
B. Left ventricular ejection fraction
C. Left ventricular end diastolic dimension
D. Anemia
E. Hypokalemia

13. Which of the following is NOT strongly associated with increased thromboembolic risk in patients with heart failure?
A. Non-sustained ventricular tachycardia
B. Atrial fibrillation
C. Atrial flutter
D. Prior thromboembolic event
E. Presence of left ventricular thrombus

14. Only one of the following therapies is appropriate for the problem listed.
A. Atrial fibrillation – coumadin
B. Non-sustained ventricular tachycardia – digoxin
C. New York Heart Association Class I (mild) symptoms of heart failure – spironolactone
D. Creatinine clearance < 30 mLs/min. – spironolactone
E. Angiotensin-converting enzyme inhibitor related hyperkalemia – substitute an angiotensin receptor antagonist

15. One of the following pairs in NOT correctly related.
A. Digoxin – reduced hospitalizations for heart failure
B. Beta-blockers – early improvement in exercise capacity and symptoms of heart failure
C. Spironolactone – gynecomastia
D. Spironolactone – hyperkalemia  
E. Beta-blockers – fatigue

16. Beta-blockers may be associated with the following adverse effects EXCEPT:  
A. Worsening heart failure  
B. Bronchospasm  
C. Bradycardia  
D. Angioedema  
E. Hypotension

17. Angiotensin-converting enzyme inhibitors may be associated with the following adverse effects EXCEPT:  
A. Cough  
B. Worsening heart failure  
C. Worsening renal function  
D. Hyperkalemia  
E. Taste disturbances

18. Only one of the following statements is TRUE:  
A. Carvedilol therapy is typically initiated at a dose of 25 mg bid  
B. Beta-blocker dosage is typically uptitrated at intervals of no less than 2 weeks  
C. There is little evidence of a dose-response relationship for beta-blockers  
D. Atenolol, metoprolol tartrate, and carvedilol have equivalent efficacies for the treatment of systolic heart failure  
E. An angiotensin-converting enzyme inhibitor should always be started before a beta-blocker

19. Therapy with an aldosterone receptor antagonist (e.g. spironolactone) should be considered in only one of the following:  
A. Serum K+ 5.5  
B. Serum creatinine 2.9 mg/dL  
C. New York Heart Association Class III-IV symptoms of heart failure  
D. New York Heart Association Class I-II symptoms of heart failure  
E. Men

20. Only one of the following statements is TRUE of digoxin:  
A. Digoxin should be started early to improve symptoms of heart failure prior to initiation of a beta-blocker  
B. Digoxin has been shown to improve survival in patients with heart failure  
C. Digoxin is metabolized in the liver  
D. Digoxin therapy is safe as it has a wide therapeutic window  
E. Digoxin has only limited effectiveness when used as a rate-control agent in atrial fibrillation

21. Which of the following are appropriate indications for an implantable cardiac defibrillator?  
I. Non-ischemic cardiomyopathy with LVEF 30%, New York Heart Association Class I symptoms of heart failure  
II. Ischemic cardiomyopathy with LVEF 30%, New York Heart Association Class I symptoms of heart failure
III. Advanced cardiomyopathy, LVEF 10%, New York Heart Association Class IV symptoms of heart failure, life expectancy < one year

IV. Non-ischemic cardiomyopathy with LVEF 45%, New York Heart Association Class I symptoms of heart failure, short, asymptomatic runs of non-sustained ventricular tachycardia

A. II
B. I and II
C. I and IV
D. III and IV
E. All the above

22. Which of the following are appropriate indications for biventricular cardiac pacing?
I. Cardiomyopathy with LVEF 30%, New York Heart Association Class I symptoms of heart failure, QRS complex duration 140 msec
II. Cardiomyopathy with LVEF 30%, New York Heart Association Class III symptoms of heart failure, QRS complex duration 130 msec
III. Cardiomyopathy, LVEF 10%, New York Heart Association Class IV symptoms of heart failure, QRS complex duration 125 msec
IV. Cardiomyopathy with LVEF 45%, New York Heart Association Class III symptoms of heart failure, QRS complex duration 140 msec

A. I and IV
B. II, III and IV
C. II
D. I and III
E. II and III

23. A 70 year old man has a history of coronary artery disease and stenting of the left anterior descending (LAD) and circumflex arteries, heart failure with LVEF 30% (last assessed by an echocardiogram in November 2006), hypertension, obesity, sleep apnea, chronic renal insufficiency (creatinine ~2.2 mg/dL). He had been well with stable NYHA class II symptoms of heart failure and now comes to you for a routine clinic visit. He reports an increase in dyspnea over the past 6 weeks, without paroxysmal nocturnal dyspnea, orthopnea, leg edema, palpitations or chest pain. His vital signs are as follows:
Heart rate 88 beats/min, BP 100/74 mmHg, Respiratory rate 16/min. Weight 264 lbs., an increase of 5 lbs. from his weight in March 2009.
On physical examination, you note his pulse is irregularly irregular. Physical examination reveals jugular venous pulsation (JVP) 12-14 cm, hepatojugular reflux positive, normal heart sounds with added sounds or murmurs, chest exam is clear, 1-2+ leg edema (new since May 2009), and is otherwise unremarkable.
EKG confirms your suspicion of atrial fibrillation but is otherwise unchanged from his last EKG performed in May 2009.

Which of the following is the most appropriate management strategy?
A. Initiate therapy with Coumadin
B. Increase his diuretic dosage
C. Start digoxin
D. Increase his beta-blocker dosage, arrange follow-up with Cardiology in a month
E. Increase his diuretic, start digoxin and Coumadin, arrange follow-up with Cardiology
24. Which of the following is NOT a sign or symptom of right heart failure?
   A. Fatigue
   B. Edema
   C. Abdominal distension
   D. Pulmonary edema
   E. Tricuspid regurgitation murmur

25. Select ONE situation where therapy with the listed drug treatment could reasonably be held or stopped:
   A. ACE inhibitors – increase in serum creatinine from 1.4 to 1.7 mg/dL when initiating treatment
   B. ACE inhibitors – BP drops to 85/58 mmHg, asymptomatic
   C. Beta-blockers – BP drops to 70/55 mmHg, cool peripheries, severe fatigue, orthopnea
   D. Beta-blockers – mild worsening of heart failure symptoms with uptitration of dose
   E. Beta-blockers – mild worsening bronchospasm

26. A 34 year old presents to urgent care with 5 days of fever and shortness of breath. He is diagnosed with a viral infection and sent home. Five months later, he is in your office for a clinic visit, feeling well apart from fatigue. On examination, he appears healthy and in no distress. His BP is 96/50 mmHg, with an HR of 71 bpm and a respiratory rate of 12/min. His neck veins are not distended, and his examination is unremarkable apart from an enlarged heart. You do not appreciate an S3. You order an echo, which shows an EF of 20% with a dilated heart. There is no valvular abnormality. Which of the following is your recommendation?
   A. Begin ACE inhibitor, beta blockers, and steroid
   B. Begin ACE inhibitor and beta-blockers
   C. Begin ACE inhibitor, beta-blockers, diuretics and digoxin
   D. Begin ACE inhibitor, beta-blockers, diuretics and spironolactone
   E. He is well compensated; nothing needs to be done

27. Which of the following treatments most consistently improves LVEF in patients with systolic heart failure?
   A. Diuretics
   B. Beta-blockers
   C. Angiotensin converting enzyme inhibitors
   D. Vasodilators
   E. All the above

28. Common precipitating causes of acute decompensated heart failure include all of the following EXCEPT:
   A. Exercise
   B. Non-steroidal anti-inflammatory drug use
   C. Non-compliance with diet and medication
   D. Infection
   E. Verapamil

29. Which of the following is/are true?
   I. ACE inhibitors decrease the risk of death in mild ventricular systolic dysfunction by 50%.
II. Patients with symptomatic heart failure (NYHA class II-III) despite standard therapy with digoxin, diuretics, and ACE inhibitors, have a 50-60% 5-year survival rate, and should be considered for beta-blockade.

III. Patients with symptomatic heart failure (NYHA class IV) despite standard therapy with digoxin, diuretics, and ACE inhibitors, have a 70% one-year survival rate, and should be considered for beta-blockade.

IV. Patients with left ventricular systolic dysfunction do not require treatment until they become symptomatic.

V. Patients with asymptomatic left ventricular systolic dysfunction should be treated with ACE inhibitors to slow ventricular remodeling and the onset of heart failure symptoms.

A. I, II, III and V
B. II and III
C. I, II, III and IV
D. II, III and V
E. I and IV

30. Regarding the epidemiology of heart failure, which ONE of the following statement(s) is true?
A. The number of new cases of heart failure in the United States has reached a plateau due to improved treatment of coronary artery disease and acute infarction.
B. The prevalence of heart failure is decreasing due to improved medical therapy such as ACE inhibitors and beta-blockers.
C. Risk factors for the development of heart failure in the absence of coronary artery disease include advancing age, hypertension, and diabetes.
D. Women have a worse prognosis than men.
E. Left ventricular hypertrophy on EKG or echocardiography in a patient who has well-controlled (normal) blood pressure is not at risk for heart failure.

31. Regarding beta-blocker therapy in stable patients with mild to moderate symptoms of heart failure, ONE of the following statements is true:
A. Metoprolol is a non-selective beta-blocker with alpha-one blocking properties and antioxidant activity.
B. Cardioselective agents have greater survival benefit than non-selective agents.
C. Patients may feel worse on beta-blocker therapy at the beginning of treatment, but may improve significantly after a few months.
D. The dose of beta-blocker can be rapidly titrated up to target dose within 2 weeks.
E. If a patient who has been on a stable dose of carvedilol for several months has an acute exacerbation of heart failure, the carvedilol should be discontinued.

32. A 50-year old man recently diagnosed with cardiomyopathy and heart failure has had hypertension for 15 years and was prescribed a thiazide diuretic and an ACE inhibitor for 8 years. Recently, the latter was changed to a calcium channel blocker after he complained of symptoms of exertional and recumbent coughing and dyspnea. His symptoms have been slowly progressive, but he feels fatigued and cannot finish his routine chores or leisure activities without symptoms. At times he gets out of breath while showering and getting dressed. He uses a cart while playing golf, having last walked the course without limitation 6 months ago. Evaluation to date includes an EKG showing LBBB and his CXR showing LV and LA enlargement. An echocardiogram report states his LV end diastolic dimension is 7.0 cm and the LVEF is 20%
with severe global hypokinesis. There were no significant valvular abnormalities; moderate LVH was noted. BP is 120/80 mmHg and HR 70 bpm. Exam demonstrates an elevated jugular venous pulsation (JVP). Lab studies are not contributory. The best recommendation for initial medical therapy is:

A. Discontinue the calcium channel blocker and thiazide. Start a loop diuretic and an angiotensin receptor blocker (titrate to target dose as tolerated).
B. Discontinue the calcium channel blocker and thiazide. Start a loop diuretic and a beta-blocker (titrate to target dose as tolerated).
C. Discontinue the calcium channel blocker and thiazide. Start a loop diuretic and an ACE inhibitor (titrate to target dose as tolerated).
D. Change the calcium channel blocker to amlodipine (titrate to target dose as tolerated) and change the thiazide to a loop diuretic.
E. Discontinue the calcium channel blocker and start an ACE inhibitor (titrate to target dose as tolerated).

33. Two months later, the same patient returns to see you, feels markedly improved, and thinks you are wonderful. He was successfully titrated to the target dose of the agent you chose (without side effects) and has a stable weight 10 lbs. lower than his weight at the initial visit. The cough has completely resolved, and he “usually” can finish his normal activities with only mild dyspnea, though it takes a bit longer than it used to. He still uses a cart while playing golf, “until I get back into shape”. His BP is 110/70 mmHg and his heart rate is 85 bpm. His serum creatinine has been stable at 1.4 mg/dL. The best recommendation for medical therapy now is:

A. No change since he is happy that he is doing so well and “really doesn’t want to take more pills”.
B. Add spironolactone 25 mg daily. Check electrolytes in 2 weeks.
C. Add digoxin and spironolactone.
D. Add a low dose beta-blocker (titrated to target dose as tolerated).
E. Add a low dose beta-blocker (titrated to target dose as tolerated) and spironolactone.
F. Add a low dose beta-blocker (titrated to target dose as tolerated), spironolactone and digoxin.

34. The main physiologic source of B-type natriuretic peptide (BNP) is:
A. The brain
B. The liver
C. The lungs
D. The heart
E. The kidney

35. Which of the following conditions does NOT affect BNP levels?
A. Renal failure
B. Cachexia
C. Age
D. Obesity
E. Pulmonary embolus
Answers
1. C
2. E
3. C
4. D
5. D
6. A
7. D
8. C
9. C
10. B
11. E
12. E
13. A
14. A
15. B
16. D
17. B
18. B
19. C
20. E
21. A
22. E
23. E
24. D
25. C
26. B
27. B
28. A
29. D
30. C
31. C
32. C
33. D
34. D
35. B

Sept 2009