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Question 4245

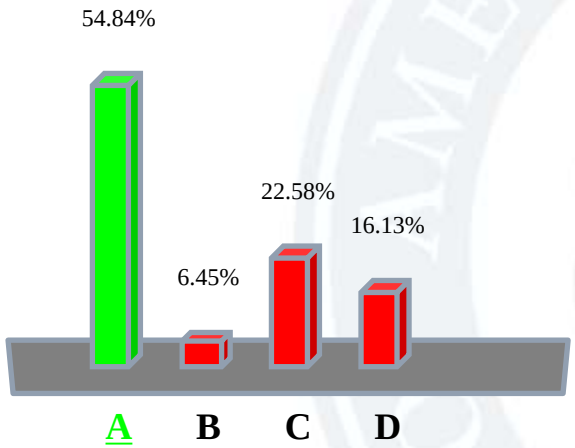
A 45-year-old man discharged from the hospital 6 weeks ago following an admission for unstable angina during which he undergoes stenting of the right coronary artery presents to the clinic. He reports no history of diabetes, smoking, hypertension, or a family history of premature heart disease. Discharge daily medications include metoprolol succinate 25 mg, aspirin 81 mg, atorvastatin 20 mg, and clopidogrel 75 mg. His body mass index is 27 kg/m^2, waist circumference is 42 inches, and blood pressure is 135/85 mm Hg.

His laboratory results (on admission) were:

- Total cholesterol 230 mg/dl
- Triglycerides 350 mg/dl
- High-density lipoprotein 35 mg/dl
- Low-density lipoprotein 125 mg/dl
- Fasting glucose 99 mg/dl

Which of the following is the most appropriate next step for this patient?

A. Increase atorvastatin to 80 mg
B. Continue current therapy
C. Add fenofibrate
D. Add ezetimibe



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Which of the following is the most appropriate next step for this patient?

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B. Continue current therapy
C. Add fenofibrate
D. Add ezetimibe

Commentary

Current guidelines recommend that this patient with atherosclerotic cardiovascular disease should be on a high-dose statin for maximal effect. He had elevated triglycerides on admission, but these should be reassessed on a higher-dose statin and with lifestyle changes prior to addition of any other pharmacologic therapy such as fenofibrate. This patient is not on a maximal dose of statin. Therefore, addition of ezetimibe at this time is not appropriate.

References

1. Stone NJ, Robinson JG, Lichtenstein AH, et al. 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014;63:2889-934.

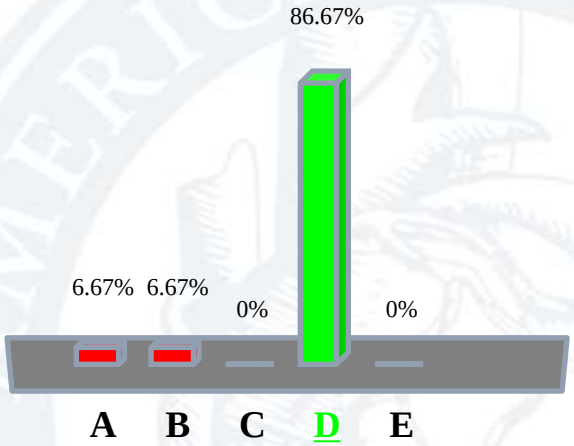
Question 25935

A 65-year-old woman with nonischemic dilated cardiomyopathy (left ventricular ejection fraction [EF] 35%) presents for routine follow-up. She complains of mild dyspnea when climbing one flight of stairs to her office, but this has been stable over the prior 6 months. Her medications are carvedilol 6.25 mg twice daily and losartan 50 mg daily.

On physical examination, her blood pressure (BP) is 137/84 mm Hg, and heart rate (HR) is 60 bpm. Her lungs are clear to auscultation. Cardiovascular (CV) examination reveals normal S1 and S2 with regular rate and rhythm, no jugular venous distension, and warm extremities without edema. Laboratory results reveal creatinine 0.9 mg/dL, potassium 4.3 mEq/L, hemoglobin 13.7 g/dL, and ferritin 70 ng/mL.

Which one of the following is the best next step in the management of this patient's heart failure (HF)?

A. Substitute spironolactone for losartan
B. Initiate ferrous sulfate
C. Increase losartan
D. Substitute sacubitril/valsartan for losartan
E. Reduce carvedilol



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C. Increase losartan
D. Substitute sacubitril/valsartan for losartan
E. Reduce carvedilol

Commentary

The most appropriate next step in management of this patient's HF is initiation of the angiotensin receptor–neprilysin inhibitor (ARNI) sacubitril/valsartan. ARNI therapy replaces angiotensin-converting enzyme inhibitor (ACEI) or angiotensin-receptor blocker (ARB) therapy (in this case, losartan). Guideline-directed medical therapy for patients with heart failure with reduced ejection fraction (HFrEF) includes beta-blockers and inhibition of the renin-angiotensin-aldosterone (RAA) axis. Although ACEIs, ARBs, or ARNIs are acceptable treatments for patients with HFrEF (EF <40% with New York Heart Association [NYHA] class II-III symptoms), ARNIs are preferred due to superior reduction in CV death and HF hospitalization due to superior reduction in CV death and HF hospitalization in the PARADIGM-HF (Prospective Comparison of ARNI With ACEI to Determine Impact on Global Mortality and Morbidity in Heart Failure; 4.7% absolute risk reduction) trial. When switching from an ARB to an ARNI, no washout period is required. When switching from an ACEI to an ARNI, a washout period of 36 hours is needed to avoid the risk of angioedema when an ARNI and an ACEI are administered together.

This patient has normal renal function and potassium, both of which should be rechecked 1 week after switching to ARNI therapy. It is incorrect to discontinue losartan and initiate spironolactone. Spironolactone is an additive therapy to patients with HFrEF who are already on a beta-blocker and RAA inhibition who still have appropriate renal function and BP. However, spironolactone should not replace first-line treatments. Beta-blockers (bisoprolol, carvedilol, and sustained release metoprolol) are first-line treatments for HFrEF. Resting HR 60 bpm does not suggest a need to reduce beta-blocker dosage. Although she needs better BP control (goal <130/80 mm Hg) and losartan may be increased further, ARNI therapy is superior to ARB therapy and a switch from an ARB to an ARNI is the preferred option in this case. She is not anemic but is iron deficient. In patients with iron deficiency and HFrEF, intravenous iron supplementation may be considered (American College of Cardiology/American Heart Association [ACC/AHA] Class IIB recommendation) for improvement of symptoms. Oral iron supplementation has not been demonstrated to improve outcomes in patients with HFrEF.

References

1. Maddox TM, Januzzi JL Jr, Allen LA, et al.; Writing Committee. 2021 update to the 2017 ACC expert consensus decision pathway for optimization of heart failure treatment: answers to 10 pivotal issues about heart failure with reduced ejection fraction: a report of the American College of Cardiology Solution Set Oversight Committee. J Am Coll Cardiol 2021;77:772-810.
2. McMurray JJ, Packer M, Desai AS, et al. Angiotensin–neprilysin inhibition versus enalapril in heart failure. N Engl J Med 2014;371:993-1004.

Question 16180

An 72-year-old man with hypertension, stage III chronic kidney disease, diabetes mellitus, interstitial lung disease, and peripheral vascular disease presents to your clinic with persistent chest pressure. His medications include aspirin 81 mg daily, metoprolol succinate 100 mg daily, lisinopril 5 mg daily, ranolazine 1000 mg twice daily, isosorbide mononitrate 60 mg daily, and insulin glargine. His vital signs include heart rate 58 bpm and blood pressure 90/60 mm Hg. Cardiac examination reveals a II/VI holosystolic murmur at the apex and midpeaking systolic murmur at the left upper sternal border. The lungs are clear, and the extremities are warm.

Laboratory evaluation reveals creatinine 1.9 mg/dL, hemoglobin 9.5 gm/dL, and hemoglobin A1c 7.2%.

Question 16180

An echocardiogram reveals anterior and apical left ventricular hypokinesis with an estimated ejection fraction (EF) of 25%. There is mild mitral regurgitation, peak aortic velocity of 2.5 m/sec, mean transvalvular aortic gradient of 25 mm Hg, and calculated aortic valve area of 1.5 cm2.

Cardiac catheterization shows 70% left main coronary artery stenosis.

Pulmonary function tests indicate forced expiratory volume in 1 second of 50% predicted and diffusing capacity for carbon monoxide of 40% predicted.

Which one of the following is the best next step?

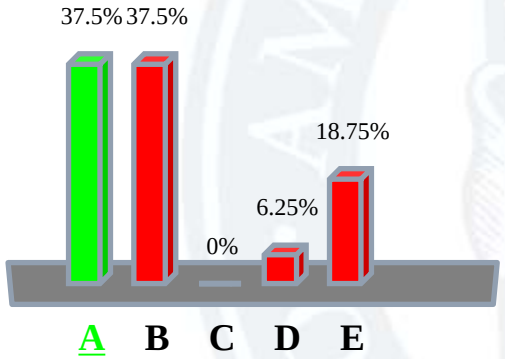
A. Left main percutaneous coronary intervention

B. Left main percutaneous coronary intervention plus transcatheter aortic valve replacement

C. Coronary artery bypass grafting

D. Coronary artery bypass grafting with aortic valve replacement

E. Continue current therapy



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B. Left main percutaneous coronary intervention plus transcatheter aortic valve replacement

C. Coronary artery bypass grafting

D. Coronary artery bypass grafting with aortic valve replacement

E. Continue current therapy

Commentary

This patient has stable angina refractory to maximally tolerated medical therapy and reduced left ventricular EF in the setting of isolated left main CAD. Meta-analyses of randomized controlled trial data as well as registry data demonstrate improved survival with CABG over medical therapy alone for patients with left main CAD. Moreover, this patient remains symptomatic despite maximally tolerated medical therapy, so continuing with current medical therapy alone would not be the next best step. PCI and CABG appear to have similar major clinical outcomes (including mortality) in left main disease although PCI is associated with increased need for repeat revascularization. Given this patient's high predicted surgical risk related to multiple comorbidities and reduced LVEF, consideration of percutaneous coronary revascularization of the left main coronary artery is the best next step. This will be a high-risk procedure, and shared decision making with the patient and heart team is crucial. It would not be appropriate to treat the progressive aortic stenosis at this time, although transcatheter aortic valve replacement may be required in the future.

References

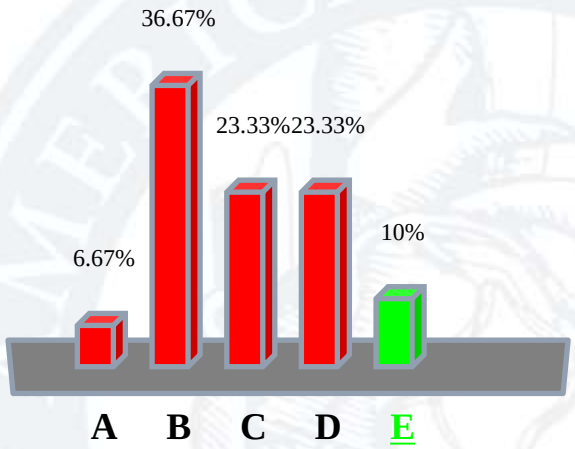
1. Fihn SD, Gardin JM, Abrams J, et al.; American College of Cardiology Foundation, American Heart Association Task Force on Practice Guidelines, American College of Physicians, American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, Society of Thoracic Surgeons. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, and the American College of Physicians, American Association for Thoracic Surgery, Preventive Cardiovascular Nurses Association, Society for Cardiovascular Angiography and Interventions, and Society of Thoracic Surgeons. J Am Coll Cardiol 2012;60:e44-e164.

Question 13054

A 59-year-old woman with a history of hypertension and hyperlipidemia comes in for follow-up. Her medications include losartan 100 mg daily, hydrochlorothiazide 25 mg daily, and carvedilol 25 mg twice daily, which she states she takes routinely. She denies any nonsteroidal anti-inflammatory drug use. On examination, her height is 66 inches, weight is 150 lbs (body mass index 24 kg/m2), blood pressure (BP) is 152/96 mm Hg, heart rate is 59 bpm, and physical examination is unremarkable. Her 24-hour BP monitor mean is 142/88 mm Hg. Transthoracic echocardiogram shows preserved biventricular function, mild left ventricular hypertrophy, and no significant valvular abnormalities. Basic metabolic panel, thyroid stimulating hormone, and urinalysis are unremarkable.

Her hypertension is classified as which of the following?

A. Refractory
B. Essential
C. Pseudoresistant
D. Masked
E. Resistant



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A. Refractory
B. Essential
C. Pseudoresistant
D. Masked
E. Resistant

Commentary

Resistant hypertension is defined as persistent hypertension despite the use of three antihypertensive agents at or near maximal dose, of different classes including a diuretic if possible. This patient has hypertension above goal (130/80 mm Hg) despite the maximal dose of three antihypertensive drugs. Pseudoresistant is excluded because the 24-hour ambulatory monitor verifies the elevated BPs. Nonadherence to medical therapy needs to be excluded. This patient is likely compliant with her medications, as evidenced by her resting heart rate of 59 bpm. Masked hypertension is characterized by office readings suggesting normal BP but out-of-office readings that are consistently above normal. This patient has elevated BPs in both settings. Refractory hypertension is defined as hypertension not adequately controlled with five antihypertensive medications, including chlorthalidone and a mineralocorticoid receptor antagonist.

References

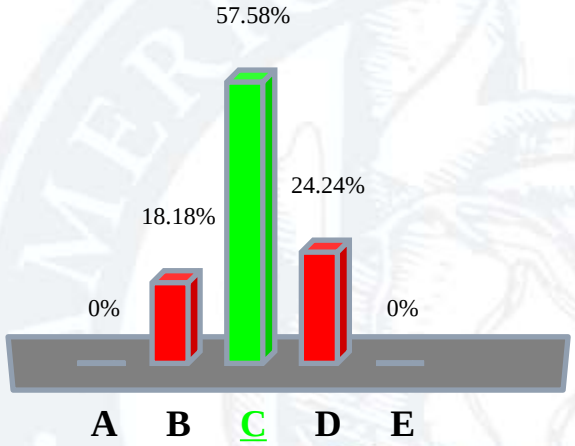
1. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APha/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol 2018;71:e127-e248.

Question 16161

A 57-year-old postmenopausal woman presents for evaluation of chest pain. She has no significant past medical history and takes no medications. She is a nonsmoker. On examination, her blood pressure is 132/72 mm Hg and heart rate is 72 bpm. Her examination is unremarkable. She develops substernal chest pain when walking up one flight of stairs, which is relieved with rest. Exercise myocardial perfusion imaging reveals 1 mm ST depression in lateral leads and inferior wall ischemia. Left ventricular ejection fraction is 60%. Coronary angiography shows no obstructive disease.

Which one of the following is most appropriate in the patient?

A. Losartan
B. Estrogen replacement therapy
C. Metoprolol
D. Reassurance
E. Sildenafil



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D. Reassurance
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Commentary

The presence of ischemia without evidence of obstructive epicardial disease is a manifestation of microvascular dysfunction and is called microvascular angina. Patients may develop chest pain, electrocardiogram (ECG) changes, and evidence of ischemia without obstructive coronary artery disease. This can be evaluated by coronary flow reserve by positron emission tomography or Doppler flow wire during angiography. Treatment includes aggressive risk-factor modification. Additionally, several medications have been used to treat microvascular angina, but the most effective are beta-blockers. Calcium channel blockers may also be useful if there is a vasospastic component to the angina. Nitrates can also be used with relief of angina in some patients. Estrogen replacement therapy can be beneficial in patients with microvascular angina, but in studies has been shown to increase cardiovascular risk in postmenopausal women. There are some small studies showing potential benefit with sildenafil, but this should not be first-line therapy. Losartan can be used for treatment of blood pressure in patients with microvascular disease if ACE inhibitors are not tolerated. ACE inhibitors have been effective in treating microvascular angina. This is not a false-positive stress test given typical symptoms and evidence of ischemia by ECG and perfusion study, so reassurance alone is not appropriate.

References

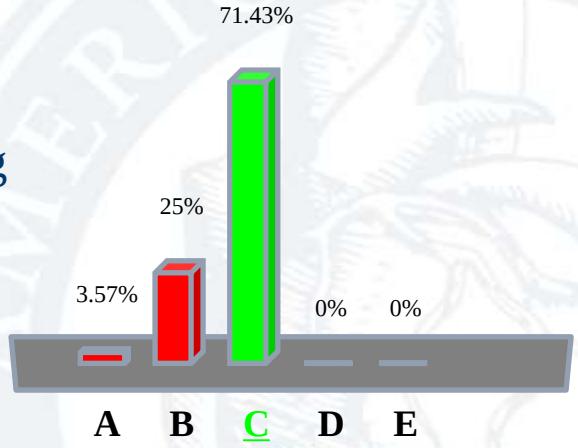
1. Montalescot G, Sechtem U, Achenbach S, et al.; Task Force Members. 2013 ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. Eur Heart J 2013;34:2949-3003.

Question 25945

A 56-year-old woman presents for consultation in the clinic. She was referred by her oncologist after being diagnosed with estrogen receptor, progesterone receptor, and human epidermal growth factor receptor 2 (HER2)–negative disease (triple-negative breast cancer). She underwent a mastectomy with negative sentinel lymph node biopsy. Her oncologist plans to initiate adjuvant chemotherapy with doxorubicin and cyclophosphamide followed by paclitaxel.

Which one of the following is indicated for baseline cardiac evaluation?

A. Multigated acquisition scanning
B. Cardiac magnetic resonance imaging
C. Transthoracic echocardiography
D. B-type natriuretic peptide
E. Vasodilator myocardial perfusion imaging



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A. Multigated acquisition scanning
B. Cardiac magnetic resonance imaging
C. Transthoracic echocardiography
D. B-type natriuretic peptide
E. Vasodilator myocardial perfusion imaging

Commentary

The correct answer choice is transthoracic echocardiography. A joint expert consensus statement from the American Society of Echocardiography (ASE) and European Association of Cardiovascular Imaging (EACVI) recommends surveillance of possible chemotherapy-associated cardiotoxicity based on the type of chemotherapy received. For patients undergoing an anthracycline-based chemotherapy regimen, echocardiography (with global longitudinal strain [GLS] if available) is recommended at baseline, at the end of treatment, and 6 months after treatment has ended because the majority of anthracycline-associated cardiomyopathy occurs within 1 year of treatment. If the cumulative dose is >240 mg/m2, then an echocardiogram is recommended prior to each successive dose of 50 mg/m2. There is no indication for cardiac magnetic resonance imaging if echocardiographic images are adequate and ejection fraction (EF) is normal. Multigated acquisition scans are no longer routinely used given exposure to ionizing radiation. B-type natriuretic peptide (NP) measurement is not uniformly recommended because there are conflicting data on the role of NPs in predicting a decline in left ventricular EF or subsequent heart failure after anthracyclines. There is no role for pharmacologic stress testing with vasodilator myocardial perfusion imaging prior to chemotherapy.

References

1. Plana JC, Galderisi M, Barac A, et al. Expert consensus for multimodality imaging evaluation of adult patients during and after cancer therapy: a report from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. J Am Soc Echocardiogr 2014;27:911-39.

Question 12588

A 27-year-old Caucasian woman presents with chest pain. She reports this pain occurring more frequently over the last 1-2 months and describes it as a pressure-like sensation that is exacerbated with exertion and relieved by rest. She reports no symptoms at rest. Her pain is associated with shortness of breath and is becoming progressive such that she now cannot walk up more than 1 flight of stairs without symptoms. She reports no past medical history, no medications, and has no allergies. She does not smoke, uses alcohol occasionally, and uses no illicit medications. She reports being adopted and her family history is unknown.

Question 12588

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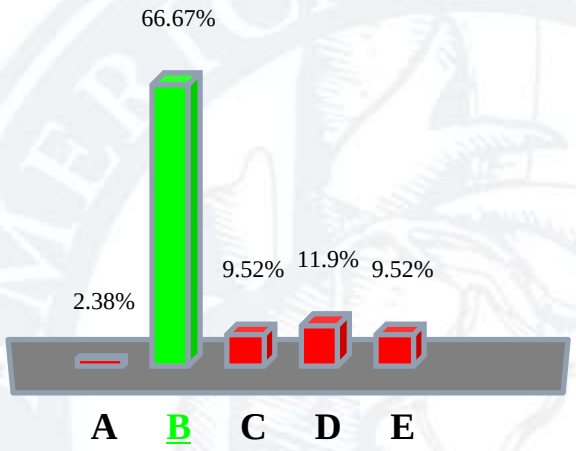
The underlying metabolic disorder likely present in this patient is characterized by which pattern of inheritance?

A. Spontaneous mutation
B. Autosomal dominant
C. X-linked recessive
D. X-linked dominant
E. Autosomal recessive



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D. X-linked dominant
E. Autosomal recessive

Commentary

Familial hypercholesterolemia (FH) is an autosomal dominant disorder of the apo B/E (low-density lipoprotein [LDL]) receptor that leads to decreased LDL clearance from the circulation, thereby resulting in early atherosclerosis. This is one of the most common familial dyslipidemias leading to markedly elevated LDL levels in this patient who is presenting with accelerating angina. The figure demonstrates xanthlasmas, which are characteristic of familial dyslipidemias. Heterozygous FH is a common genetic disorder, inherited in an autosomal dominant pattern, occurring in 1:500 people in most countries; homozygous FH is much rarer, occurring in 1 in a million births.

References

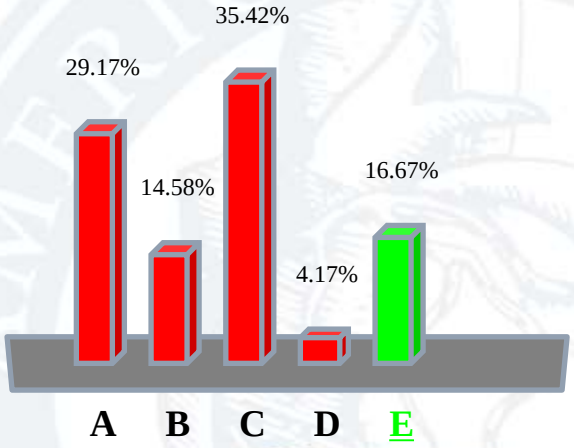
1. Rader DJ, Cohen J, Hobbs HH. Monogenic hypercholesterolemia: new insights in pathogenesis and treatment. *J Clin Invest* 2003;111:1795–803.
2. Dahl AA. Xanthelasma (Medscape website). 1994-2018. Avaliable at: https://emedicine.medscape.com/article/1213423-overview.

Question 13049

You are seeing a 56-year-old African American woman in clinic for a routine annual visit. She has a history of type 2 diabetes mellitus, hypertension, and obstructive sleep apnea. Her medications include metformin 500 mg twice daily, lisinopril 40 mg daily, amlodipine 5 mg daily, and atorvastatin 40 mg daily. Her body mass index is 34.6 kg/m^2. Her blood pressure is 134/82 mm Hg and heart rate is 72 bpm. Her examination is unremarkable.

From an epidemiologic perspective, which of the following risk factors present in this patient is most responsible for an increased population burden of heart failure with preserved ejection fraction (HFpEF)?

A. Diabetes mellitus
B. Obesity
C. Obstructive sleep apnea
D. Female sex
E. Hypertension



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D. Female sex
E. Hypertension

Commentary

Among the listed risk factors, hypertension is the risk factor with the highest population attributable risk (PAR) for incident HFpEF. Women are more likely to be diagnosed with HFpEF than men, but the PAR for female sex over male sex is less prominent than the PAR for hypertension. Diabetes mellitus and obesity have been reported to confer higher risk of incident HFpEF with less powerful effects than hypertension. This has been shown across races. Not included in the options is history of coronary artery disease, which also confers increased risk of HFpEF diagnosis.

References

1. Eaton CB, Pettinger M, Rossouw J, et al. Risk factors for incident hospitalized heart failure with preserved versus reduced ejection fraction in a multiracial cohort of postmenopausal women. Circ Heart Fail 2016;9:doi: 10.1161/CIRCHEARTFAILURE.115.002883.

Question 13053

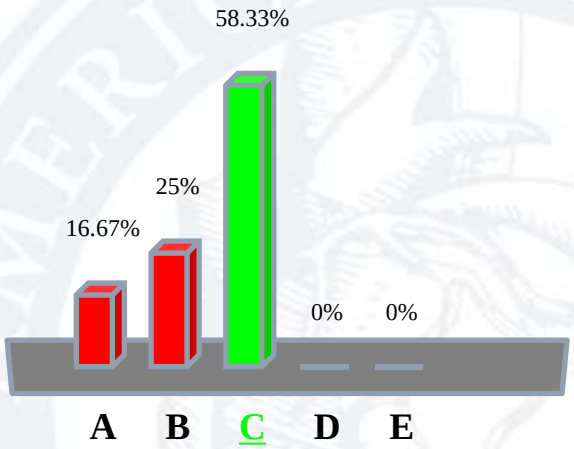
A 56-year-old man with coronary artery disease status/post right coronary artery stenting 3 years prior, hypertension, type II diabetes mellitus, and hyperlipidemia presents to clinic for annual follow-up evaluation. He reports that he is currently asymptomatic.

His blood pressure (BP) is 146/91 mm Hg with heart rate of 72 bpm. His height is 5 feet 8 inches and his weight is 218 lbs. On examination, he is euvolemic with a soft S4 gallop and no murmurs. There is no peripheral edema. His electrocardiogram demonstrates sinus rhythm with left ventricular hypertrophy (LVH). An echocardiogram performed the year prior showed preserved ejection fraction, LVH, and no significant valvular abnormalities. Laboratory values reveal potassium 4.0 mmol/L, creatinine (Cr) 1.2 mg/dL, total cholesterol 170 mg/dL, low-density lipoprotein 64 mg/dL, and hemoglobin A1c 6.2%. Urinalysis reveals microalbuminuria. His daily medications include rosuvastatin 40 mg, aspirin 81 mg, and metoprolol succinate 50 mg.

Lisinopril 10 mg daily is started. He returns to clinic 1 week later and his BP is 122/78 mm Hg. Repeat laboratory values reveal potassium 4.4 mmol/L and Cr 1.5 mg/dL.

What is the best next step in his care?

A. Reduce lisinopril to 5 mg daily
B. Stop lisinopril, add amlodipine 5 mg daily
C. Continue current therapies
D. Add spironolactone 12.5 mg daily
E. Add sacubitril/valsartan



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C. Continue current therapies
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E. Add sacubitril/valsartan

Commentary

This patient has diabetes mellitus with renal insufficiency and microalbuniuria for which an angiotensin-converting enzyme inhibitor (ACEI) or angiotensin II receptor blocker (ARB) is indicated to treat the hypertension and slow the rate of renal dysfunction. An expected effect of the addition of an ACEI or ARB is a rise in serum Cr of ≤30%, which was observed in this patient. This is not an indication to change dose or stop lisinopril. This patient does not have resistant hypertension or heart failure, and his BP is reasonably controlled on his current regimen. Therefore, addition of spironolactone is incorrect. Similarly, sacubitril/valsartan is indicated in patients with reduced ejection fraction and heart failure, which this patient does not have.

References

1. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol 2018;71:2199-269.

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