118. PB is a 43-year-old man with type 1 diabetes and unstable proliferative retinopathy. What type of exercise would be contraindicated for him?

A. Swimming laps with lane guards

B. Stationary cycling

C. Treadmill walking

D. Push-ups

119. A 65-year-old woman with obesity and recently diagnosed with type 2 diabetes. She has a past medical history of hypertension, heart failure (New York Heart Association Class III), and chronic kidney disease. Her exam today reveals the following: A1C 7.5%, serum creatinine 1.6 mg/dL, eGFR 34 mL/min, blood pressure 110/70 mm Hg. Which of the following would be the *best* choice to improve her glycemic level?

A. Saxagliptin

B. Metformin XR

C. Empagliflozin

D. Rosiglitazone

120. Participant eligibility for the Medicare Diabetes Prevention Program (MDPP) includes:

A. A previous diagnosis of gestational diabetes, no end-stage renal disease, a high-risk score on the *Prediabetes Risk Test* and Medicare Part B coverage

B. No history of type 1 or type 2 diabetes, a previous diagnosis of gestational diabetes mellitus, and a fasting glucose of 110–125 mg/dl, Medicare Part B coverage

C. No end-stage renal disease, a fasting glucose of 100–125 mg/dl, a high-risk score on the *Prediabetes Risk Test*, Medicare Part B coverage

D. No end-stage renal disease, A1C test with value of 5.7% to 6.4%, no history of type 1 or type 2 diabetes, Medicare Part B coverage

121. MR is an 87-year-old woman with a body mass index of 32 kg/m^2, osteopenia, and sarcopenia (muscle wasting). Which of the following statements is *not* a valid consideration in determining an appropriate nutrition/health behavior intervention?

A. A weight-loss plan with a 1,000-calorie deficit along with regular exercise would be appropriate considering she has obesity.

B. Calcium and vitamin D supplementation may be necessary to meet the requirements for older adults, because they are often difficult to meet with food alone.

C. A modest reduction in calories with an emphasis on nutrient-dense foods and physical activity may help with weight management, bone density, and sarcopenia.

D. Older adults may need to be encouraged to consume more foods containing high-quality protein due to the contribution of protein undernutrition to sarcopenia and morbidity.

in behavior. A learning objective relates to the completion of a teaching session, although learning objectives are also measurable (B). A goal is the big-picture, directional guide. It is the focal point for and the end results of meeting the learning and behavioral objectives (D). An assessment is conducted by the diabetes care and education to gather sufficient information about the person with diabetes to help identify goals and an individual education plan (A).

39. **B.** SMART is a simple acronym to guide diabetes care and education specialists in assessing the completeness of their behavioral objectives. A behavioral objective is a planned change in behavior that is expected to result in improved health or quality of life. Answers A, C, and D are incorrect because SMART is not applicable to a learning objective, action plan, or evaluation.

40. **C.** Methods of instruction that focus on nonprint media are more effective for individuals with low literacy skills. The other responses (A, B, and D) are incorrect because they do not represent effective teaching strategies.

41. **B.** The primary nutrition goal for individuals with type 1 diabetes is to establish an insulin plan that fits into their preferred eating routine and health behavior. The total and type of carbohydrate in meals and snacks directly affect glucose levels, so this is the primary area of focus. Those individuals on a fixed insulin plan should strive for consistency in carbohydrate intake, while those on a flexible insulin plan or insulin pump should adjust their insulin and food based on their insulin-to-carbohydrate ratio. As a result, B is the correct answer, and answers A, C, and D are incorrect.

42. **D.** Computers is correct. Appropriately designed computer programs are well suited for on-demand, self-directed learning. Discussions (A) with people with diabetes are useful but may not be as convenient as computer resources. Printed handouts (B) are useful information but tend to be very linear in the presentation of information. Computer programs are often designed to repeat sections where individuals do not perform up to certain expectations. Role-playing (C) is useful to reinforce problem-solving but may not be convenient for people with busy schedules.

43. **C.** The focus of this question is appropriate referral. The Gestational Diabetes Mellitus Evidence-Based Nutrition Practice Guidelines from the Academy of Nutrition and Dietetics state that it is imperative for women diagnosed with gestational diabetes to be referred to a registered dietitian nutritionist (RDN) as soon as possible because glycemic goals should be achieved within a tight timeframe. Referrals should be made to an RDN who has experience working with individuals with diabetes or is a diabetes care and education specialist (C). The need for initiation of MNT following diagnosis of gestational diabetes is not weight-driven (A) or by the individual's preference (B). Gestational diabetes MNT referrals should be made sooner than 3 weeks after diagnosis (D).

44. **C.** SP's prepregnancy BMI is in the *overweight* category (BMI 25.0 to 29.9 kg/m^2). According to the Institute of Medicine (IOM), the corresponding recommended

(2) decreased glucagon release from alpha cells (A); (3) decreased gastric emptying (D); and (4) increased centrally mediated satiety (B).

16. **C.** Currently, there is not consistent evidence linking blood pressure (BP) reduction with resistance training. There is strong evidence to show that weight loss reduces BP even if the degree of weight loss is small. The 2017 ACC/AHA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults summary reports that a 5 to 10 mm Hg reduction in systolic BP is possible per 10 kg of weight loss (A). Reducing sodium intake by at least 1,000 mg/day lowers BP, even if the desired daily sodium intake is not yet achieved (B). Following a dietary plan similar to the DASH eating plan that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, and nuts; and limits intake of sweets, sugar-sweetened beverages, and red meats has been shown to lower BP in individuals with hypertension (D).

17. **C.** Consumption of omega-3 fatty acids is an effective strategy to lower triglyceride levels but has been shown to increase total and LDL cholesterol. Current Dietary Guidelines for Americans no longer recommend a specific dietary cholesterol intake, in part because limiting saturated fat intake, eating more fiber, fruits and vegetables, and weight loss appear to be more effective in reducing LDL cholesterol. The American Heart Association suggests a dietary cholesterol limit of 200 mg per day for individuals with diabetes, but reported there is no scientific evidence for this recommended intake.

18. **D.** Irbesartan is correct. Individuals with renal artery stenosis may display a rise in serum creatinine following administration of an ACE inhibitor or ARB. Although ACE inhibitors and ARBs decrease glomerular pressure by vasodilating the efferent arterioles, individuals with renal artery stenosis are unable to provide compensatory constriction of the afferent arterioles to maintain a minimum glomerular pressure. The result is inadequate filtration of creatinine and elevation in the plasma. None of the other options (A or B) affect blood flow through the kidney, though elimination of metformin (C) depends on good kidney function.

19. **B.** Walk 150 minutes per week is correct. African Americans are at high risk of developing diabetes and the church members should be encouraged to make positive behavior changes (D). The diabetes prevention program (DPP) enrolled individuals at high risk to develop diabetes and randomized them to usual care, intensive health behavior modification, or metformin. The group that engaged in intensive health behavior modifications, including loss of 7% body weight and 150 minutes of exercise each week, was least likely to develop diabetes. Fad diets such as frequent fasting (A) and focus on specific foods (C) are not sustainable and rarely supported by the literature.

20. **A.** Level A is the correct answer, indicating clear evidence from well-conducted, generalizable randomized controlled trials. Levels B and C indicate supportive evidence from cohort studies of ineffectively controlled or uncontrolled studies, respectively. Level E indicates expert consensus or clinical experience.

100. **D.** Sodium does not influence the glycemic effect of a food. Fiber (A), ripeness of fruits (B), and cooking time of starches (C) have all been studied and have been shown to affect glycemia.

101. **B.** Glycemic management has been shown to prevent diabetes-related peripheral and cardiac autonomic neuropathy in person with type 1 diabetes (T1D and may slow the progression in persons with type 2 diabetes (T2D). Persons with T2D should be screened at diagnosis and annually thereafter (A). Persons with T1D at 5 years after diagnosis and annually. Electrophysiological assessment is rarely needed (C) Pharmacologic and nonpharmacologic interventions are available to help with pain reduction and to improve quality of life (D)

102. **C.** Decrease bedtime insulin glargine is correct. Nocturnal hypoglycemia is a significant issue for people and must be addressed regardless of the current A1C level (D). The basal insulin (glargine) inhibits hepatic glucose output and determines the fasting glucose level. Neither the breakfast (A) nor the lunchtime (B) bolus insulin doses will affect fasting glucose value.

103. **C.** The literature is mixed on the impact of high and low glycemic index/glycemic load due to the number of variables that affect the glycemic response. Research studies vary in the definitions of high, moderate, and low glycemic index or load, making it difficult to interpret study results (A). In general, fruits, sugars, and sweets have been shown to have a moderate or low glycemic effect compared with white bread or glucose (B). Research has also shown that the glycemic response to a food varies from individual to individual (D).

104. **D.** Heart failure is correct. The most serious risk related to metformin therapy is lactic acidosis. Because both metformin and lactic acid are eliminated through the kidney, disease states that decrease kidney function represent contraindications to metformin. People with eGFRs >30 mL/min are safe to take metformin; this man has an eGFR of 95 to 102 mL/min depending on the formula employed (C). Although hypertension can worsen kidney disease, it is not a contraindication to metformin therapy (B). Severe liver dysfunction may also predispose people to metabolic acidosis; however, the consumption reported by this man is not problematic (A).

105. **C.** The American Diabetes Association 2023 *Standards of Care* recommends people with diabetes limit or avoid sugar-sweetened beverages, including high-fructose corn syrup, to reduce the risk of weight gain and worsening of cardiometabolic risk profile. Fructose is a monosaccharide, not a disaccharide, and part of the sucrose molecule (A). It may cause less of a rise in glucose compared with sucrose or starch (B). Consumption of excessive amounts of fructose (>12% of energy) may increase triglycerides (D).

106. **C.** Tirzepatide is a dual GIP/GLP-1 agonist that promotes weight loss by slowing gastrointestinal motility and promoting satiety centrally, resulting in up to 11% weight loss in 1 year (C). SGLT-2 inhibitors, such as empagliflozin (D), promotes minimal weight loss via glucose excretion in the kidneys. DPP-IV inhibitors, such as saxagliptin, (C)

are considered weight neutral. TZDs, such as pioglitazone (A), activate PPAR-gamma receptors that promote deposition of free fatty acids into subcutaneous adipose tissue. Deposition of free fatty acids reduces circulating plasma levels, leading to improved insulin resistance, but also results in weight gain.

107. **D.** Glycemic management has been shown to reduce the risk of diabetes-related peripheral and cardiac autonomic neuropathy in persons with type 1 diabetes (T1D) and may slow the progression in persons with type 2. Persons with type 2 should be screened at diagnosis and annually thereafter, persons with T1D at 5 years after diagnosis and annually. Electrophysiological procedure is rarely needed (C). Pharmacologic and nonpharmacologic interventions are available to help with pain reduction and improve quality of life (D).

108. **B.** Resistance or strength training is used to improve muscular fitness and includes free weights, weight machines, resistance bands, isometric exercises, and calisthenics using body weight as resistance (eg, push-ups). Cycling, jogging, and sprinting are examples of aerobic exercises (A, C, and D).

109. **A.** Weight loss is correct. Pioglitazone is associated with multiple side effects, including bladder cancer (B), heart failure exacerbation (C), and osteoporosis and increased fracture risk (D).

110. A. For example, walking slowly at a lower intensity prior to a brisk walk would be an example of a proper warm-up activity. It is unclear whether stretching reduces risk of injury (A). The warm-up allows a gradual increase of the heart rate and breathing (B). Although flexibility or stretching exercises can be included as part of the warm-up, their use alone is not a recommended type of warm-up activity (C).

111. **D.** Add predinner (6 PM) aspart is correct. This woman has fasting and predinner (6 PM) glucose levels that are at goal, but her bedtime values are elevated. Increasing her detemir doses will result in hypoglycemia 8 to 10 hours later (A and B). Because the duration of action for metformin is so long, moving the evening dose from 6 PM to 10 PM will not affect glycemic stability (C). The most likely cause of the elevated bedtime (10 PM) glucose levels is inadequate mealtime insulin.

112. **B.** Glimepiride is correct. Glimepiride is a short-acting secretagogue that increases release related to meals. The other three agents primarily improve fasting glucose levels. Pioglitazone (A) decreases insulin resistance, metformin (C) inhibits hepatic glucose output, and glargine (D) increases circulating basal insulin levels.

113. **D.** Detemir insulin 25 units at bedtime is correct. Initiation of insulin for people with type 2 diabetes should begin with basal insulin using an intermediate or long-acting product. Regular insulin may be used to cover meals or correct for glucose excursions, but would not be appropriate on a scheduled basis (B). A dose of 10 units is appropriate for some individuals (A); however, a higher weight-based dose of 0.2 or 0.3 units

per kg may be appropriate for obese individuals. 0.1 unit per kg dose may not be sufficient for obese individuals (C).

114. **B.** Although prior recommendations stated that individuals with severe peripheral neuropathy should avoid weight-bearing activities to lower their risk of foot ulceration, recent studies have shown that moderate-intensity walking does not increase risk of foot ulcers and may delay the progression of peripheral neuropathy (A). Individuals with a foot injury or open sore should avoid weight-bearing exercises (C). Using chair exercises exclusively is not necessary in all individuals with severe peripheral neuropathy (D).

115. C. Persons with diabetes are at an increased risk of oral fungal infections. It is important to educate person with diabetes to be aware of the increased risk of oral problems and to report them to their dentist. The recommendation is to brush at least twice/day and floss once a day (A) and see the dentist twice a year (B). Dental caries occurs at a higher rate in persons with diabetes (D).

116. **C.** One unit to lower glucose to target range, plus 3.5 units to cover the carbohydrate in the meal.

117. **B.** Increases glucagon secretion from alpha cells (B) is correct. Agents that mimic GLP-1 activity improve glycemic levels through 4 actions: (1) promoting satiety in the brain (A); (2) decreasing glucagon secretion (B); (3) decreasing gastric emptying (C); and (4) enhancing insulin secretion (D).

118. **D.** Resistance exercises such as push-ups would not be recommended due to the risk of triggering vitreous hemorrhage or retinal detachment. Swimming, stationary cycling, and walking on a treadmill would not pose significant risk (A, B, and C).

119. **C.** Empagliflozin (C) is correct. This woman has New York Heart Association (NYHA)

Class III heart failure, which is characterized by fatigue, shortness of breath, and angina with minimal exertion. Metformin (B) depends on renal elimination, which may be reduced in this woman with heart failure and chronic kidney disease. Saxagliptin and rosiglitazone (A and D) may worsen symptoms of heart failure.

120. **D.** The MDPP eligibility criteria: Medicare Part B coverage or Medicare Advantage; results from 1 of 3 blood tests within 1 year of first core session, fasting glucose of 110–125 mg/dl, A1C test with a value of 5.7% to 6.4%, or an oral glucose tolerance test with a value of 140–199; BMI of at least 25, or 23 if self-identified as Asian; no history of T1D or T2D; no end-stage renal disease; has not previously received MDPP services

121. **A.** A modest reduction in calories would be more appropriate with an increase in nutrient-dense foods to ensure adequate intake of protein, vitamins, minerals, and other nutrients is most appropriate (C). A 1,000-calorie deficit likely would be too aggressive for MR considering her age because it may worsen her sarcopenia, bone

170. **C.** Add saxagliptin is correct. The maximum effective dose of metformin is 2 g per day (A). The primary reason why this man's A1C remains above 7% is that he has insufficient insulin production in response to his large evening meal. Adding basal insulin (glargine, B) or a sulfonylurea (glipizide, D) could cause hypoglycemia during the day. A DPP-4 inhibitor would provide this man with postprandial excursions and avoid hypoglycemia and weight gain. According to American Diabetes Association 2023 *Standards of Care* treatment algorithm, sulfonylureas like glipizide should be reserved only if cost is an issue for the man.

171. **B.** The prelunch glucose levels are elevated and it is the prebreakfast Lispro that has the strongest action during this period.

172. **D.** The recommendation is that individuals monitor every 2 to 4 hours while symptomatic and glucose levels are elevated. Insulin should not be stopped or held in individuals with type 1 diabetes, because they are insulinopenic and could quickly develop DKA (B). Eight ounces of fluid per hour is recommended to reduce dehydration (C). Carbohydrate and insulin are needed to reverse ketosis (A).

173. **C.** This individual is ready to change in the near future and is taking steps to begin making a change.

174. **B.** Thiazolidinediones (TZDs) cause fluid retention and edema, especially when used in combination with insulin. Individuals taking TZDs have a twofold increase in the risk of heart failure. Dose-related weight gain occurs with TZDs and is thought to be related to a combination of fluid retention and subcutaneous fat accumulation.

175. **A.** This screening measures a glucose-like sugar named 1,5-AG, which is found in most foods. The screening assesses the amount of time over a 2-week period that glucose exceeds the renal threshold. Whenever the glucose is >180 mg/dL, the body loses 1,5-AG. The more the glucose spikes, the lower the result. Its validity is limited in individuals with advanced kidney and liver disease, as well as during pregnancy.

176. **C.** The American Diabetes Association *Standards of Care* recommends weighing the risks/benefits of ASA therapy before initiating use as primary prevention in individuals at increased risk for cardiovascular disease (C). This recommendation is based on the elevated bleeding risk seen in people with diabetes in the ASCEND trial. Individuals who benefit from aspirin therapy for primary prevention include both men and women aged 50 years and older with diabetes and at least one additional major risk factor (family history of premature ASCD, hypertension, dyslipidemia, smoking, or CKD/albuminuria) who are not at increased risk of bleeding.

177. **C.** Colesevelam is classified in pregnancy Category B, no evidence of risk in humans, whereas other bile acid resins (cholestyramine and colestipol) are Category C. Fenofibrate is also in pregnancy Category C (A). Atorvastatin, like all statins, is classified in pregnancy Category X and should not be used during pregnancy (B). Evolocumab is a PCSK-9 inhibitor that has not been used in pregnancy; however, IgG antibodies cross

the placenta, and fetal exposure to evolocumab would be expected especially in the second and third trimesters (D).

178. **A.** According to the American Diabetes Association *Standards of Care,* insulin therapy should be initiated for the treatment of persistent (checked on 2 occasions) hyperglycemia starting at a threshold of no greater than 180 mg/dL and then maintained in a range of 140 to 180 mg/d for the majority of critically ill people with diabetes (PWD). More stringent goals may be appropriate for some PWD if they can be achieved without significant hypoglycemia.

179. **D.** Weight loss, not weight gain, increases the risk of hypoglycemia. Risk of hypoglycemia is increased when an individual has not eaten for several hours (A), when an individual takes medications that enhance insulin secretion, and/or during periods of significantly increased physical activity (C). Alcohol consumption, without food intake, may also result in hypoglycemia (B).

180. **D.** Individuals with diabetes should be screened, advised, and assessed for readiness to quit smoking at every diabetes care visit.

181. **D.** Large trials in type 2 diabetes have demonstrated improvements in microvascular disease among individuals with tight glycemic management, but not an improvement in cardiovascular outcomes (C). Strict glycemic management is associated with a decrease in triglycerides (B) but has also been associated with weight gain (A).

182. **C.** Insulin resistance is lowest during the first trimester and increases throughout gestation, leading to increased insulin requirements. Insulin requirements drop dramatically following delivery.

183. **B.** For individuals who may become hypoglycemic and are unable to mount a counterregulatory response, using smaller boluses is indicated to reduce the risk of hypoglycemia.

184. **D.** Glipizide, metformin, and acarbose, as well as glyburide, are all considered compatible with breastfeeding.

185. **D.** Diabetes-related distress is particularly common, with prevalence rates of 18% to 35% and an 18-month incidence of 38% to 48%. It has a greater impact on behavioral and metabolic outcomes than does depression. Diabetes-related distress is responsive to interventions, including DSMES (diabetes self-management education and support) and focused attention.

186. B. Unopened and opened vials of insulin may be stored at room temperature for 1 month (B). Because insulin left at room temperature should be discarded after 28 to 32 days it is recommended that unopened insulin be refrigerated. Refer to the insulin package insert for storage guidelines (A). Regardless of whether insulin is opened or unopened it should not be used past the expiration date (C). The insulin pen in use may be stored at room temperature but the pen needle should be removed and discarded appropriately after each use.