

6. As a gastroenterologist, you recommend the use of a histamine H₂-blocker for a patient who has a history of atrial fibrillation, for which he takes warfarin. Your office receives a call from his primary physician, who has admitted the patient for warfarin toxicity. Which of the following H₂-blockers has the patient likely been taking?

- (A)** Cimetidine
- (B)** Ranitidine
- (C)** Scopolamine
- (D)** Famotidine
- (E)** Nizatidine

1. A 74-year-old man presents to his oncologist for the management of stage IV pancreatic cancer. Due to his age, the oncologist chooses a less toxic chemotherapy regimen that will include gemcitabine plus albumin-bound paclitaxel. He also prescribes a medication to prevent chemotherapy-induced nausea and vomiting. What is the most likely mechanism of action for the prescribed medication?

- (A) Cannabinoid (CB₁)-receptors antagonist
- (B) Dopamine (D₂)-receptor agonist
- (C) Glucagon-like peptide (GLP-1)-receptor agonist
- (D) Histamine (H₁)-receptor agonist
- (E) Serotonin (5-HT₃)-receptor antagonist

2. A 65-year-old woman presented to the infusion center for her first cycle of chemotherapy for stage III breast cancer. She is started on doxorubicin plus cyclophosphamide. The oncologist prescribes ondansetron and dexamethasone to prevent nausea and vomiting. In addition, he writes a prescription for a medication that will prevent delayed nausea and vomiting and augment the effect of the other antiemetic medications. What medication was most likely prescribed?

- (A) Aprepitant
- (B) Dronabinol
- (C) Lorazepam
- (D) Meclizine
- (E) Metoclopramide

3. A 57-year-old man presents to his physician with concerns about a history of motion sickness. He has plans to go on a cruise for his 25th wedding anniversary and does not want to be sick during his trip. The doctor writes a prescription for a medication to help prevent nausea and vomiting while on the cruise ship.

What is the mechanism of action for the medication that was most likely prescribed?

- (A) Cannabinoid (CB₁)-receptor agonist
- (B) Dopamine (D₂)-receptor antagonist
- (C) Muscarinic (M₁)-receptor antagonist
- (D) Neurokinin (NK₁)-receptor antagonist
- (E) Serotonin (5-HT₃)-receptor antagonist

4. A 53-year-old woman presents to her physician with complaints of bloody diarrhea and severe abdominal pain. She has a history of irritable bowel syndrome (IBS), in which diarrhea is the predominant symptom. Her doctor asks her to immediately discontinue the medication she takes for the management of IBS, until further testing is completed to rule out ischemic colitis. Which of the following medications was the patient most likely taking for IBS?

- (A) Alosetron
- (B) Dicyclomine
- (C) Linaclotide
- (D) Lubiprostone
- (E) Simethicone

5. A 35-year-old woman presents to her family physician for her routine physical. The patient is obese, with a body mass index of 31 kg/m². She is currently on lisinopril for hypertension and pravastatin for dyslipidemia. The patient tells the doctor that she is interested in taking an over-the-counter medication for weight loss but hesitant to start due to the side effects that may include rectal leakage, gas, and diarrhea. Which of the following medications is the patient interested in taking?

- (A) Liraglutide
- (B) Lorcaserin
- (C) Megestrol
- (D) Orlistat
- (E) Phentermine

6. A 43-year-old man is admitted to the hospital for gastrointestinal bleeding. The patient has a history of atrial fibrillation, for which he is currently being treated with warfarin. Laboratory results show that his hemoglobin is 9.4 g/dL and his international normalized ratio (INR) is 7.1. The pharmacist performs a medication reconciliation and discovers that the patient recently started a new over-the-counter medication for heartburn. She is worried about a potential drug interaction with warfarin. Which of the following medications did the patient most likely take for heartburn?

- (A) Aluminum hydroxide
- (B) Calcium carbonate
- (C) Cimetidine
- (D) Pantoprazole
- (E) Sucralfate

7. A 34-year-old man presents to his gastroenterologist for further evaluation of persistent burning stomach pain, heartburn, and nausea. In the past, he has been treated with ranitidine for peptic ulcer disease. His laboratory results are positive for elevated levels of gastrin. A colonoscopy reveals evidence of ulcers involving the jejunum. The patient is diagnosed with Zollinger-Ellison syndrome and started on a new medication that inhibits gastric acid production. What is the patient at risk for with the medication that was most likely prescribed?

- (A) *C. difficile*-associated diarrhea
- (B) Gastrointestinal perforation
- (C) Ischemic colitis
- (D) Lipid pneumonitis
- (E) Milk-alkali syndrome

8. A 63-year-old woman is admitted to the hospital with complaints of early fullness after very small meals and vomiting undigested food. She has a long-standing history of poorly controlled diabetes. The physician is concerned about diabetic gastroparesis and starts her on an antiemetic medication that will also help increase gastric motility. What medication was most likely started?

- (A) Dimenhydrinate
- (B) Droperidol
- (C) Prochlorperazine
- (D) Metoclopramide
- (E) Ondansetron

9. A 61-year-old woman is admitted to the hospital for severe constipation, unresponsive to stool softeners and stimulant laxatives. She has a history of stage IV breast cancer that metastasized to the spine. She is on a fentanyl patch

to manage severe pain due to the metastasis. In addition, she takes a hydrocodone-acetaminophen combination as needed for her back pain. Considering her past medical history and current medications, which of the following agents would be most appropriate to manage her constipation?

- (A) Diphenoxylate
- (B) Methylcellulose
- (C) Mineral oil
- (D) Naldemedine
- (E) Polycarbophil

10. A 33-year-old man presents to his primary care physician for a routine physical examination. The patient tells the doctor that he will be traveling to Mexico for a vacation the following month and is concerned about developing traveler's diarrhea. Which of the following agents can the physician recommend for prophylaxis against this condition?

- (A) Bismuth subsalicylate
- (B) Liraglutide
- (C) Lorcaserin
- (D) Octreotide
- (E) Simethicone

11. A 45-year-old man presents to his infectious disease specialist for the management of acquired immune deficiency syndrome (AIDS). The patient complains of nausea and decreased appetite. The physician is concerned that the patient has lost about 15 lb over the past 2 months. Which of the following medications may help manage these symptoms?

- (A) Dimenhydrinate
- (B) Dronabinol
- (C) Metoclopramide
- (D) Ondansetron
- (E) Phentermine

12. A 65-year-old man presents to his gastroenterologist with a 3-month history of watery diarrhea. Further testing reveals that the patient is hypokalemic with an absence of hydrochloric acid in his gastric secretions. He also has an elevated serum level of vasoactive intestinal peptide. The patient is diagnosed with a pancreatic islet cell tumor (VIPoma). Which agent would be most appropriate to treat the patient's symptoms?

- (A) Bismuth subsalicylate
- (B) Gastrin
- (C) Glucagon
- (D) Octreotide
- (E) Sulfasalazine

Answers and Explanations

- 1. The answer is E.** 5-HT₃-receptor antagonists, such as ondansetron, are highly effective in the treatment of chemotherapy-induced nausea and vomiting. The other options are not appropriate for the treatment of nausea and vomiting. Antagonists at histamine and dopamine receptors can help with nausea and vomiting, but agonists will not have this effect. Cannabinoid-receptor agonists can help manage nausea, but antagonists at this receptor will not have this effect. Glucagon-like peptide-1-receptor agonists are used for weight management, not nausea and vomiting.
- 2. The answer is A.** Aprepitant is the first available substance P antagonist used for the prevention of both sudden and delayed chemotherapy-induced nausea and vomiting. It can be used synergistically with serotonin 5-HT₃ antagonists, such as ondansetron, and corticosteroids, such as dexamethasone. While the other drugs are used for the management of nausea and vomiting, they do not necessarily augment the effect of ondansetron and dexamethasone. In addition, they are not approved to help with delayed nausea and vomiting.
- 3. The answer is C.** The patient was most likely prescribed scopolamine, a muscarinic (M₁)-receptor antagonist, where it blocks the action of acetylcholine in the vestibular nuclei. The vestibular center is important for sensory information about motion, equilibrium, and spatial orientation. It may play an important role in motion sickness. Scopolamine reduces the excitability of labyrinthine receptors and depresses conduction from the vestibular apparatus to the vomiting center. It is approved for motion sickness. The other mechanisms are for drugs that help with nausea, but they do not act in the vestibular center and are not approved for motion sickness.
- 4. The answer is A.** Alosetron, a 5-HT₃-receptor antagonist, has been shown to provide some relief of irritable bowel syndrome (IBS). It is approved for the treatment of women with severe IBS in whom diarrhea is the predominant symptom. Due to the risk for ischemic colitis, it should be discontinued immediately in patients who experience rectal bleeding, bloody diarrhea, or sudden worsening of abdominal pain (until further evaluation). Dicyclomine is an antispasmodic agent used in IBS. Lubiprostone and linaclotide are chloride channel activators used for IBS. Simethicone is used for flatulence. These agents do not carry the same risk for ischemic colitis.
- 5. The answer is D.** The patient is interested in taking orlistat, a reversible lipase inhibitor of gastric and pancreatic lipases. Orlistat inactivates the enzymes, making them unavailable to digest dietary fats. It can be used for weight loss and obesity management in conjunction with a reduced calorie and low-fat diet. The adverse effects are gastrointestinal related and may include oily rectal leakage, fecal spotting, flatulence, and diarrhea. It can also prevent absorption of fat-soluble vitamins (A, D, E, K); therefore, supplementation may be necessary. Liraglutide, lorcaserin, and phentermine are used for weight loss but do not have these adverse effects. Megestrol stimulates appetite.
- 6. The answer is C.** Cimetidine, a H₂-antagonist, is a competitive inhibitor of the P-450 system, which thereby increases the half-life of warfarin. This can lead to supratherapeutic levels of the drug and an increased bleeding risk. The other medications do not have this drug-drug interaction.
- 7. The answer is A.** The patient was most likely started on a proton pump inhibitor (PPI). Compared to antacids and H₂-antagonists, PPIs are more potent acid suppressors. They are used for the treatment of Zollinger-Ellison syndrome. PPIs carry the risk for *C. difficile*-associated diarrhea. The other conditions are not likely with PPI therapy. Antacids, H₂-antagonists, and mucosal protective agents are not indicated for Zollinger-Ellison syndrome.

8. **The answer is D.** Poor gastric emptying is a manifestation of the neuropathy that accompanies long-standing diabetes. Metoclopramide is a prokinetic agent used in the treatment of diabetic gastroparesis. It is a dopamine-receptor antagonist used for nausea and vomiting but also enhances the response to acetylcholine of tissue in upper GI tract, causing enhanced motility and accelerated gastric emptying. The other agents can help with the management of nausea and vomiting but do not enhance gastric motility.
9. **The answer is D.** The patient most likely has constipation due to opioids. Naldemedine is a peripherally acting opioid-receptor antagonist that is indicated for opioid-induced constipation. Methylcellulose and polycarbophil are bulk-forming laxatives; they are most likely not strong enough to treat the patient's constipation. Naldemedine would also be a better option than mineral oil, a lubricating agent. Diphenoxylate is an opioid-receptor agonist and used for the treatment of diarrhea. It would make the patient's constipation worse.
10. **The answer is A.** Bismuth subsalicylate is effective for both the treatment and prophylaxis of traveler's diarrhea, most often due to *Escherichia coli*-contaminated water. Octreotide is used for severe diarrhea associated with carcinoid syndrome or excessive release of GI tract hormones. Liraglutide and lorcaserin are used for weight loss. Simethicone is used for flatulence.
11. **The answer is B.** Dronabinol contains Δ -9-tetrahydrocannabinol, the active cannabinoid in marijuana. It acts by inhibiting the vomiting center through stimulation of a CB₁ subtype of cannabinoid receptors. It may also enhance appetite by acting on these same receptors. It may help with the nausea and is also approved for anorexia in patients with acquired immune deficiency syndrome. Dimenhydrinate, metoclopramide, and ondansetron are also used for the management of nausea but would not help increase the patient's appetite. Phentermine is a sympathomimetic drug used for weight loss.
12. **The answer is D.** Octreotide is used in the treatment of endocrine tumors, such as gastrinomas, glucagonomas, and VIPomas, to help alleviate the diarrhea. Bismuth subsalicylate is used to treat traveler's diarrhea, and sulfasalazine is used to treat such inflammatory bowel disease, such as Crohn disease. Gastrin is a GI hormone.

1. A 54-year-old man with a 75-pack/year history of tobacco abuse and alcohol abuse has developed carcinoma of the larynx. His treatment includes concurrent high-dose cisplatin and radiation therapy. He has developed significant nausea and vomiting. Which would be the best agent to treat these side effects?

- (A)** Metoclopramide
- (B)** Ondansetron
- (C)** Meclizine
- (D)** Promethazine
- (E)** Loperamide

3. A 74-year-old man went on a cruise to celebrate his 50th wedding anniversary. Concerned about a history of motion sickness, the patient saw his primary care physician about a medication to take. He is now seen by the onboard physician with complaints of blurred vision, confusion, constipation, and urinary retention. Which of the following did the primary care physician likely prescribe?

- (A)** Scopolamine
- (B)** Metoclopramide
- (C)** Haloperidol
- (D)** Dronabinol
- (E)** Ondansetron

6. As a gastroenterologist, you recommend the use of a histamine H₂-blocker for a patient who has a history of atrial fibrillation, for which he takes warfarin. Your office receives a call from his primary physician, who has admitted the patient for warfarin toxicity. Which of the following H₂-blockers has the patient likely been taking?

- (A)** Cimetidine
- (B)** Ranitidine
- (C)** Scopolamine
- (D)** Famotidine
- (E)** Nizatidine

7. A 34-year-old man is seen over multiple visits for complaints of “ulcers,” despite the use of ranitidine. Further studies, finding elevated levels of gastrin and evidence of ulcers involving the jejunum, suggest a diagnosis of Zollinger-Ellison syndrome. Which of the following agents would be most useful in the management of this patient?

- (A)** Famotidine
- (B)** Lansoprazole
- (C)** Misoprostol
- (D)** Propantheline
- (E)** Pepto Bismol

8. A 63-year-old man with long-standing, poorly controlled diabetes is admitted for yet another episode of ketoacidosis. Now

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that he is out of the intensive care unit and beginning to eat, he complains of regurgitation of food following even small meals. You suspect the development of diabetic gastropathy, a consequence of his autonomic neuropathy. Which of the following might help his condition?

- (A)** Sucralfate
- (B)** Metoclopramide
- (C)** Scopolamine
- (D)** Misoprostol
- (E)** Pepto Bismol

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- (A) Sucralfate
- (B) Metoclopramide
- (C) Scopolamine
- (D) Misoprostol
- (E) Pepto Bismol

9. A 78-year-old woman sees her primary care physician with complaints of "heart-burn." Her history includes only hypertension. She lives on a fixed income and has no prescription coverage. Her doctor recommends over-the-counter antacids to be used regularly. Which of the following would be a good choice and why?

- (A) Sodium bicarbonate because it is good for long-term use
- (B) Calcium carbonate because it is good for long-term use and she could use the calcium
- (C) Magnesium hydroxide for short-term use only because of her hypertension
- (D) A combined agent to balance the constipation associated with magnesium hydroxide and the diarrhea associated with aluminum hydroxide
- (E) A combined agent to balance the diarrhea associated with magnesium hydroxide and the constipation associated with aluminum hydroxide

10. An otherwise healthy 33-year-old man sees his physician for a routine physical

examination. The patient has no complaints and is planning on vacationing in Mexico next month. However, he is afraid of developing traveler's diarrhea. You recommend that he take which of the following drugs for prophylaxis?

- (A) Glucocorticoids
- (B) Loperamide
- (C) Bismuth subsalicylate
- (D) Kaolin
- (E) Diphenoxylate

11. A 72-year-old man with a 150-pack/year history of cigarette smoking presents for further workup of a large mass seen on a recent chest X-ray. The patient reports a 50-lb unintentional weight loss over the last 3 months and a poor appetite. In addition to beginning chemotherapy, the oncologist decides to add which agent to promote his appetite?

- (A) Aprepitant
- (B) Lorazepam
- (C) Ondansetron
- (D) Megestrol

12. A 65-year-old man presents to his family physician with a 3-month history of watery diarrhea. He is referred to a gastroenterologist, who finds that the patient is also hypokalemic and achlorhydric and has an elevated serum level of vasoactive intestinal peptide due to a pancreatic islet cell tumor (VIPoma). Which agent would be best to treat the patient's symptoms?

- (A) Gastrin
- (B) Octreotide
- (C) Glucagon
- (D) Bismuth subsalicylate
- (E) Sulfasalazine

Answers and Explanations

- 1. The answer is B.** Ondansetron is a 5-HT₃ antagonist that is highly effective in the treatment of cisplatin-induced chemotherapy, better so than metoclopramide. Both meclizine and promethazine are antagonists of H₁-receptors used in the treatment of motion sickness, true vertigo, and pregnancy-associated nausea. Loperamide is an antidiarrheal agent.
- 2. The answer is E.** Aprepitant is the first available substance P antagonist used for the prevention of both sudden and delayed chemotherapy-induced nausea and vomiting. It can be used synergistically with serotonin 5-HT₃ antagonists such as ondansetron. The other antagonists, cholinergic (i.e., scopolamine), histaminic (i.e., promethazine), and dopaminergic (i.e., metoclopramide), are used to treat nausea and vomiting, although not in this setting.
- 3. The answer is A.** Scopolamine is a cholinergic antagonist that is likely associated with all the patient's new symptoms. Metoclopramide can cause extrapyramidal effects, as can haloperidol. Dronabinol can cause sedation, dry mouth, psychotic effects, and orthostatic hypotension. Ondansetron can cause mild headache.
- 4. The answer is D.** Alosetron has been shown to provide some relief of irritable bowel syndrome (IBS). Infliximab is a biologic agent used in the management of inflammatory bowel disease (IBD). Diphenoxylate is a morphine analog used to treat diarrhea. Cimetidine is used to treat esophageal reflux. Orlistat is an agent used to manage obesity.
- 5. The answer is B.** Megestrol is used to stimulate appetite in patients with cancer-related cachexia. Dronabinol is used in the treatment of AIDS wasting, specifically to increase appetite. Granisetron is effective for nausea and vomiting in chemotherapy. The other agents, phentermine and dextroamphetamine, are used to aid in weight loss.
- 6. The answer is A.** Cimetidine is a competitive inhibitor of the P-450 system, which thereby increases the half-life of warfarin. This can lead to supratherapeutic levels of the drug and bleeding problems. The other H₂-blockers, including ranitidine, famotidine, and nizatidine, are not metabolized by the P-450 system.
- 7. The answer is B.** Lansoprazole is an H⁺/K⁺-ATPase proton pump inhibitor useful in the treatment of patients who have failed histamine H₂-blocker therapy and patients with Zollinger-Ellison syndrome. Famotidine is a histamine H₂-blocker. Misoprostol is used to prevent ulcers in patients taking nonsteroidal anti-inflammatory drugs (NSAIDs). Propantheline is a cholinergic agent used in conjunction with other agents, and rarely alone. Ulcers associated with *Helicobacter pylori* can be treated with Pepto Bismol.
- 8. The answer is B.** Poor gastric emptying is a manifestation of the neuropathy that accompanies long-standing diabetes. Metoclopramide is a prokinetic agent used in the treatment of diabetic gastroparesis. Sucralfate, scopolamine, and misoprostol are used to treat gastric ulcers. Pepto Bismol is added in the case of peptic ulcers due to *Helicobacter pylori*.
- 9. The answer is E.** Both sodium bicarbonate and calcium carbonate are not for long-term use. In addition, sodium bicarbonate is contraindicated in patients with hypertension. A combined agent like Maalox or Mylanta II provides a balance between the diarrhea associated with magnesium hydroxide and the constipation associated with aluminum hydroxide.

10. **The answer is C.** Bismuth subsalicylate is effective for both the treatment and prophylaxis of traveler's diarrhea, most often due to *Escherichia coli* (*E. coli*)-contaminated water. Loperamide and diphenoxylate are good to treat diarrhea, but generally are not used for prophylaxis. Glucocorticoids are for diarrhea refractory to normal treatment.
11. **The answer is D.** Megestrol acetate is used as an appetite stimulant and results in weight gain in some patients with cancer. Aprepitant, lorazepam, and ondansetron, while having different mechanisms, are all used for nausea and vomiting, which he may experience eventually with his chemotherapy.
12. **The answer is B.** Octreotide is used in the treatment of endocrine tumors such as gastrinomas, glucagonomas, and VIPomas to help alleviate the diarrhea. Bismuth subsalicylate is used to treat traveler's diarrhea, and sulfasalazine is used to treat such inflammatory bowel disease, such as Crohn's disease. Gastrin is a GI hormone.

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- (A)** Aluminum hydroxide
- (B)** Calcium carbonate
- (C)** Cimetidine
- (D)** Pantoprazole
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