# Introduction to Clinical Pharmacology

- Chapter 38
  Upper Gastrointestinal System Drugs

# Helicobacter pylori

- Stomach bacterium that causes peptic ulcer
- Also known as *H. pylori*

# Upper GI System Drugs #1

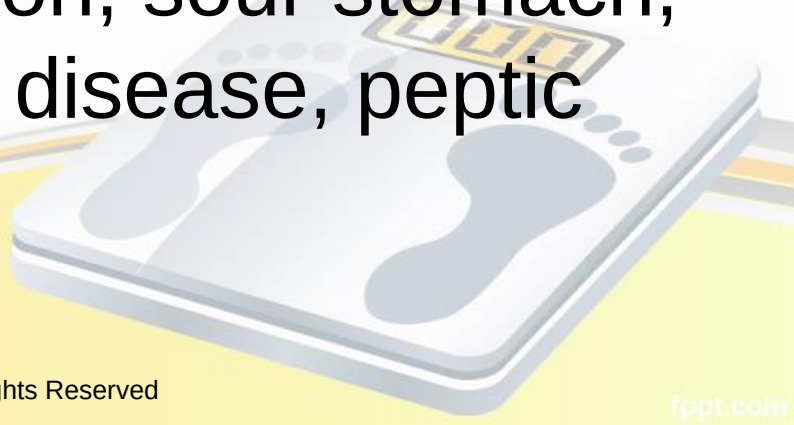
- Antacids (“against acids”) are drugs that neutralize or reduce the acidity of stomach and duodenal contents by combining with HCl and increasing the pH of the stomach acid.
- Drugs that reduce the production and release of HCl include histamine type 2 receptor ($H_2$) antagonists, proton pump inhibitors, and miscellaneous acid-reducing agents.

# Upper GI System Drugs #2

- Proton pump inhibitors are particularly important in the treatment of *Helicobacter pylori* infection in patients with active duodenal ulcers. *H. pylori* are believed to cause a type of chronic gastritis and some peptic and duodenal ulcers as well.
- GI stimulants facilitate emptying of stomach contents into the small intestine and are used both as ulcer treatments and as antiemetics.
- Antiemetics are used to treat and prevent nausea and vomiting.

# Acid Neutralizers: Antacids #1

- Actions:
  - Neutralize or reduce acidity of stomach and duodenal contents by combining with HCl and increasing the pH of the stomach acid
- Used in treatment of hyperacidity caused by:
  - Heartburn, acid indigestion, sour stomach, gastroesophageal reflux disease, peptic ulcer



# Acid Neutralizers: Antacids #2

- Adverse reactions:
  - Aluminum-containing antacids: constipation, intestinal impaction, anorexia, weakness, tremors, bone pain
  - Magnesium-containing antacids: severe diarrhea, dehydration, hypermagnesemia
  - Calcium-containing antacids: rebound hyperacidity, metabolic alkalosis, hypercalcemia, vomiting, confusion, headache, renal calculi, neurologic impairment
  - Sodium bicarbonate: systemic alkalosis; rebound hyperacidity

# Acid Neutralizers: Antacids #3

- Contraindications and precautions:
  - Contraindicated in patients with severe abdominal pain of unknown cause and during lactation
  - Sodium-containing antacids: contraindicated in patients with cardiovascular problems and those on sodium-restricted diets
  - Calcium-containing antacids: contraindicated in patients with renal calculi or hypercalcemia

# Acid Neutralizers: Antacids #4

- Contraindications and precautions (cont.)
  - Aluminum-containing antacids: used cautiously in patients with gastric outlet obstruction, upper GI bleeding
  - Magnesium- and aluminum-containing antacids: used cautiously in patients with decreased kidney function
  - Calcium-containing antacids: used cautiously in patients with respiratory insufficiency, renal impairment, cardiac disease

# Acid Neutralizers: Antacids #5

- Interactions

| Interactant drug | Effect of interaction |
|---|---|
| Digoxin, isoniazid, phenytoin, and chlorpromazine | Decreased absorption of the interactant drugs results in a decreased effect of those drugs |
| Tetracycline | Decreased effectiveness of anti-infective |
| Corticosteroids | Decreased effectiveness of anti-inflammatory properties |

# Acid Neutralizers: Antacids #6

- Interactions (cont.)

| Interactant drug | Effect of interaction |
| --- | --- |
| Salicylates | Pain reliever is excreted rapidly from the urine |

# Histamine $H_2$ Antagonists: Actions and Uses

- Actions:
  - Inhibit the action of histamine at $H_2$ receptor cells of the stomach, which then reduces the secretion of gastric acid
- Used in treatment of:
  - Heartburn, acid indigestion, sour stomach, GERD, gastric or duodenal ulcer, gastric hypersecretory conditions

# Histamine $H_2$ Antagonists: Adverse Reactions

- Adverse reactions:
  - Dizziness, somnolence, headache
  - Confusion, hallucinations, diarrhea, and reversible impotence

# Histamine $H_2$ Antagonists: Contraindications and Precautions

- Contraindicated in patients with known hypersensitivity to the drugs
- Used cautiously in patients with renal or hepatic impairment and in severely ill, elderly, or debilitated patients
- Cimetidine: used cautiously in patients with diabetes
- Histamine $H_2$ antagonists: used with caution during pregnancy and lactation

# Histamine $H_2$ Antagonists: Interactions

| Interactant drug | Effect of interaction |
|---|---|
| Antacids and metoclopramide | Decreased absorption of the $H_2$ antagonists |
| Carmustine | Decrease in white blood cell count |
| Opioid analgesics | Increased risk for respiratory depression |
| Oral anticoagulants | Increased risk for bleeding |
| Digoxin | May decrease serum digoxin levels |

# Proton Pump Inhibitors: Actions, Uses, and Adverse Reactions

- Action: suppress gastric acid secretion by inhibition of hydrogen-potassium adenosine triphosphatase enzyme system of the gastric parietal cells
- Used in treatment of gastric and duodenal ulcers, GERD and erosive esophagitis, pathologic hypersecretory conditions
- Adverse reactions: headache, nausea, diarrhea, abdominal pain

# Proton Pump Inhibitors: Contraindications and Precautions

- Contraindicated in patients:
  - Hypersensitive to any of the drugs
- Used cautiously in older adults and in patients with hepatic impairment
- Omeprazole, lansoprazole, rabeprazole, pantoprazole: contraindicated during pregnancy and lactation

# Proton Pump Inhibitors: Interactions #1

| Interactant drug | Effect of interaction |
|---|---|
| Sucralfate | Decreased absorption of the proton pump inhibitor |
| Ketoconazole and ampicillin | Decreased absorption of the anti-infective |
| Oral anticoagulants | Increased risk for bleeding |
| Bisphosphonates | Increased risk of fracture |

# Proton Pump Inhibitors: Interactions #2

| Interactant drug | Effect of interaction |
|---|---|
| Digoxin | Increased absorption of digoxin |
| Benzodiazepines, phenytoin | Risk for toxic level of antiseizure drugs |
| Clarithromycin with omeprazole specifically | Risk for an increase in plasma levels of both drugs |

# Miscellaneous Acid Reducers

- Cholinergic blocking drugs: reduces gastric motility and decreases the amount of acid secreted by the stomach
- Pepsin inhibitor: binds with protein molecules to form a viscous substance which buffers acid and protects the mucosal lining
- Prostaglandin drug: reduces the risk of nonsteroidal anti-inflammatory drug (NSAID)-induced gastric ulcers in high risk patients

# Gastrointestinal Stimulants: Actions, Uses, and Adverse Reactions

- Actions: increase the motility of the upper GI tract without increasing the production of secretions
- Used in treatment of GERD, gastric stasis
- Higher doses or prolonged administration: produce central nervous system (CNS) symptoms

# Gastrointestinal Stimulants: Contraindications and Precautions

- Contraindicated in patients:
  - With known hypersensitivity to drugs, GI obstruction, gastric perforation, hemorrhage, pheochromocytoma, Parkinson disease, seizure disorder
- Used cautiously in patients:
  - With diabetes, cardiovascular disease
  - Metoclopramide: used with caution during pregnancy and lactation

# Gastrointestinal Stimulants: Interactions

| Interactant drug | Effect of interaction |
|---|---|
| Cholinergic blocking drugs or opioid analgesics | Decreased effectiveness of metoclopramide |
| Cimetidine | Decreased absorption of cimetidine |
| Digoxin | Decreased absorption of digoxin |
| Monoamine oxidase inhibitors (MAOIs) | Increased risk for hypertensive episode |
| Levodopa | Decreased effectiveness of metoclopramide and levodopa |

# Antiemetics: Actions, Uses, and Adverse Reactions

- Prevent vomiting caused by drugs, radiation, and metabolic disorders
- Reduce the non-GI adverse effects
- Tested for use in irritable bowel syndrome
- Common adverse reactions:
  - Varying degrees of drowsiness

# Antiemetics: Contraindications

- Contraindicated in patients with known hypersensitivity to these drugs, with severe CNS depression
- Prochlorperazine: contraindicated in patients with bone marrow depression, blood dyscrasia, Parkinson disease, or severe liver or cardiovascular disease

# Antiemetics: Precautions

- Cholinergic blocking antiemetics: used cautiously in patients with glaucoma, obstructive disease of GI or genitourinary system
- Promethazine: used cautiously in patients with hypertension, sleep apnea, or epilepsy
- 5-HT3 receptor antagonists: used cautiously in patients with cardiac conduction problems, electrolyte imbalances

# Antiemetics: Interactions

| Interactant drug | Effect of interaction |
|---|---|
| CNS depressants | Increased risk for sedation |
| Antihistamines | Increased adverse cholinergic blocking effects |
| Antacids | Decreased absorption of antiemetics |
| Rifampin with 5-HT3 receptor antagonists | Decreased effectiveness of 5-HT3 receptor antagonists |
| Lithium with prochlorperazine | Increased risk for extrapyramidal effects |

# Emetics

- Emetics are used to empty the stomach rapidly when an individual has accidentally or intentionally ingested a poison or drug overdose.

# Nursing Process: Assessment #1

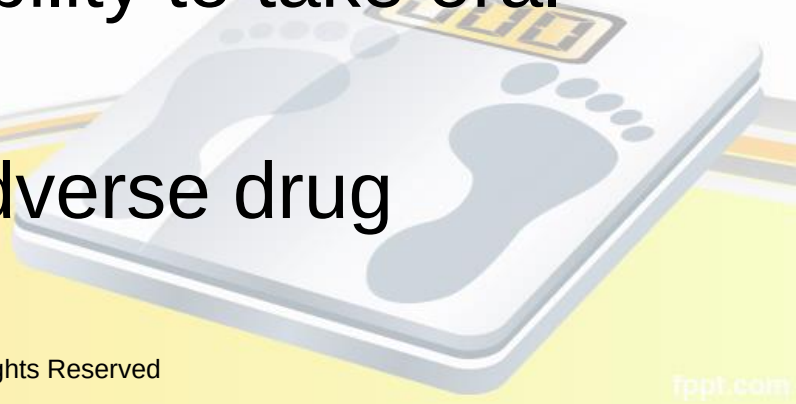
- Preadministration assessment:
  - Question the patient regarding type and intensity of symptoms.
  - Document number of times the patient has vomited and approximate amount of fluid lost.
  - Take vital signs and assess for signs of fluid and electrolyte imbalances.
  - Ask about any situations of nausea or vomiting when anticipating the therapy that will occur.

# Nursing Process: Assessment #2

- Ongoing assessment:
  - Monitor for continued complaints of pain, sour taste, or spitting up of blood or coffee-ground-colored emesis.
  - Monitor for signs and symptoms of electrolyte imbalance.
  - Measure and document intake and output.
  - Weigh patient with repeated episodes of vomiting daily to weekly.

# Nursing Process: Diagnoses

- **Risk for Deficient Fluid Volume** related to diarrhea, nausea, and vomiting
- **Imbalanced Nutrition: Less Than Body Requirements** related to impaired ability to ingest and retain food and fluids, or offensive tastes and smells
- **Individual Effective Self-Health Management** related to inability to take oral form of medication
- **Risk for Injury** related to adverse drug effects of drowsiness

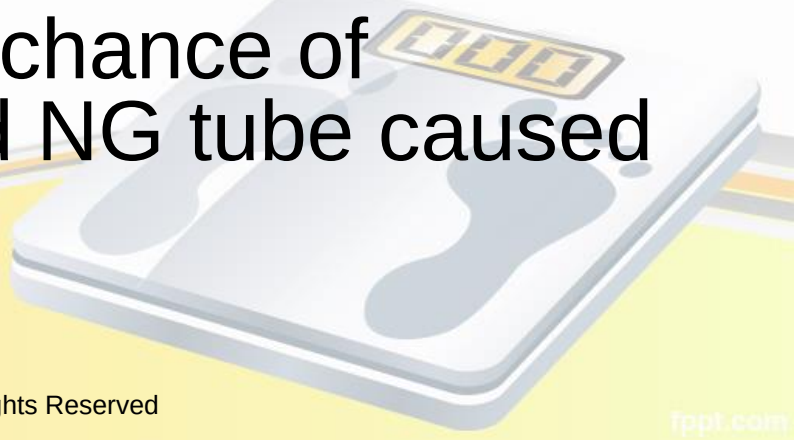


# Nursing Process: Planning

- Expected outcomes:
  - Optimal response to drug therapy
  - Support of patient needs related to management of adverse reactions
  - Understanding of drug regimen

# Nursing Process: Implementation #1

- Promoting an optimal response to therapy
  - Antacids: make certain adequate supply of water and cups for measuring dose are available.
  - Non-oral methods of drug administration:
    - Check to see if pill can be crushed or capsule opened.
    - Request liquid form when administration is in tube to decrease chance of problems with clogged NG tube caused by improper flushing.



# Nursing Process: Implementation #2

- Promoting an optimal response to therapy (cont.)
  - Prevention of nausea in patients undergoing cancer therapy:
    - Administer the drugs before chemotherapy is given.
    - Give first dose IV during therapy; ask patient to take it orally when at home for specified time period.
    - Explain the importance of taking the drug as directed.

# Nursing Process: Implementation #3

- Monitoring and managing patient needs
  - Imbalanced fluid volume:
    - Keep accurate record of fluid intake and output along with description of the diarrhea stool
    - Monitor input and output; document findings every 8 hours
    - Contact primary health care provider if signs of dehydration or electrolyte imbalance occur

# Nursing Process: Implementation #4

- Monitoring and managing patient needs (cont.)
  - Imbalanced nutrition: less than body requirements:
    - Provide emesis basin; check the basin at frequent intervals; empty emesis basin; measure and document volume in the chart
    - Give damp washcloth, towel to wipe hands and face
    - Remove items with strong smells, odors

# Nursing Process: Implementation #5

- Monitoring and managing patient needs (cont.)
  - Individual effective therapeutic regimen management:
    - Inform primary health care provider if patient has dislike for taste of antacid or has difficulty chewing tablet form
    - Contact primary health care provider if oral form has been ordered and patient cannot retain the drug

# Nursing Process: Implementation #6

- Monitoring and managing patient needs (cont.)
  - Risk for injury
    - Instruct patient to remain in bed and provide call light for assistance
    - Observe patient receiving metoclopramide for adverse reactions related to the CNS
    - Report signs of extrapyramidal symptoms or tardive dyskinesia

# Nursing Process: Implementation #7

- Educating the patient and family
  - Emphasize avoiding driving or performing other hazardous tasks due to drowsiness
  - Explain the correct method to take the drugs
  - Explain the necessity of contacting the primary health care provider immediately if any adverse symptoms occur

# Nursing Process: Evaluation #1

- Therapeutic effect is achieved
- Nausea or pain is controlled
- Adverse reactions are identified, reported, and managed successfully
- No evidence of fluid volume deficit, nutritional imbalance, or electrolyte imbalance is seen

# Nursing Process: Evaluation #2

- No evidence of injury is apparent
- Patient verbalizes importance of complying with prescribed treatment regimen
- Patient and family demonstrate an understanding of the drug regimen

# Question #1

- Is the following statement true or false?
- The upper GI system includes the mouth, esophagus, and stomach. We take in food and fluids that are processed and absorbed for use by our cells.

# Answer to Question #1

- True
- The upper GI system includes the mouth, esophagus, and stomach. We take in food and fluids that are processed and absorbed for use by our cells.

# Question #2

- Is the following statement true or false?
- Hydrochloric acid is secreted in the esophagus to help in the digestion process.

# Answer to Question #2

- False
- Hydrochloric acid is secreted in the stomach to help in the digestion process.

# Question #3

- Is the following statement true or false?
- Problems occur when the digestive juices reverse and go into the esophagus or backflow into the stomach from the large intestine.

# Answer to Question #3

- False
- Problems occur when the digestive juices reverse and go into the esophagus or backflow into the stomach from the small intestine.

# Question #4

- Is the following statement true or false?
- Antacids do not actually coat the stomach; instead, they neutralize the acid in the stomach.

# Answer to Question #4

- True
- Antacids do not actually coat the stomach; instead, they neutralize the acid in the stomach.