Types of Diarrhea and Management Strategies

Release Date: 06/03/2011
Expiration Date: 06/06/2014

FACULTY:
Valerie Sisson, MSN, RN, CNP, CWOCN
Wellness Partners

FACULTY AND ACCREDITOR DISCLOSURE STATEMENTS:

Valerie Sisson has no actual or potential conflict of interest in relation to this program.

ACCREDITATION STATEMENT:

Pharmacy
PharmCon Inc is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education.
Program No.: 00798-0000-11-034-H01-P/T
Credits: 1 contact hour, 0.1 CEU

Nursing
Pharmaceutical Education Consultants, Inc. has been approved as a provider of continuing education for nurses by the Maryland Nurses Association which is accredited as an approver of continuing education in nursing by the American Nurses Credentialing Center’s Commission on Accreditation.
Program No.: N-668
Credits: 1 contact hour, 0.1 CEU
TARGET AUDIENCE:

This accredited program is targeted nurses and pharmacists practicing in hospital and community pharmacies. Estimated time to complete this monograph and posttest is 60 minutes.

DISCLAIMER:

PharmCon, Inc does not view the existence of relationships as an implication of bias or that the value of the material is decreased. The content of the activity was planned to be balanced and objective. Occasionally, authors may express opinions that represent their own viewpoint. Participants have an implied responsibility to use the newly acquired information to enhance patient outcomes and their own professional development. The information presented in this activity is not meant to serve as a guideline for patient or pharmacy management. Conclusions drawn by participants should be derived from objective analysis of scientific data presented from this monograph and other unrelated sources.

Program Overview:

To provide participants with an understanding current types of diarrhea and management strategies.

OBJECTIVES:

After completing this program, nurses and pharmacists will be able to:

- State the difference between acute and chronic diarrhea.
- Differentiate between secretory diarrhea, osmotic diarrhea and motility disorders.
- Review the classifications of drugs used to treat diarrhea.

After completing this program, pharmacy technicians will be able to:

- In general terms, describe the signs and symptoms of diarrhea.
- Identify the medications used to treat diarrhea.
Types of Diarrhea and Management Strategies

Diarrhea is a common complaint for all age groups. It has been estimated that upwards of 375 million diarrheal episodes occur in the United States yearly (Bushen & Guerrant, 2003). Of those episodes, 11% resulted in emergency department visits in 2003 (Bushen & Gurrant,) with the hospitalization of 200,000 people for symptom management (Amerine & Keirsey, 2006). Diarrhea is an annoying and occasionally deadly symptom of an acute or chronic health problem.

Diarrhea is defined by the World Health Organization (WHO) as three or more watery or loose bowel movements in a 24 hour period (2009). However, the lay population may claim they have diarrhea when they, in fact, have other problems, such as fecal impaction (Schiller, 2009). Therefore when evaluating a person with complaints of diarrhea, it is imperative to closely question the patient about associated signs and symptoms. The goal of this monograph is to aid in the differentiation amongst the various types of diarrhea in order to facilitate treatment.

Classification of diarrhea

Duration

Acute diarrhea.

Diarrhea can be classified by several methods with duration of the symptom being foremost. Diarrhea lasting less than 2 weeks is considered acute (Hall, 2010). This phenomenon is most likely caused by an infectious agent, such as bacterial,
parasitic or viral invasion, or by a non-infectious agent such as dietary indiscretion or a new medication (Amerine & Keirsey, 2006). Acute diarrhea is typically self limiting and resolves quickly with no lasting sequelae (Amerine & Keirsey).

Infectious agents are one of the factors associated with acute diarrhea. Some of these pathogens can cause an inflammatory response in the gut where the epithelial lining is damaged either by a toxin produced by the organism or by an organism invading the mucosa (Bliss, Doughty, Heitkemper, 2006). Some organisms that cause an inflammatory response are “Cytomegalovirus, Herpes simplex virus, Shigella, Salmonella, Chlamydia, Nisseria gonorrheae, Campylobacter jejuni, Clostridium difficile, Escherichia coli O157:H5, Entamboeba histolytic” (Bliss et al., p. 427). Symptoms of acute inflammatory diarrhea include fever (higher than 38.5C), lethargy, and a stool that contains pus, blood, leukocytes and/or mucus (Bliss, et al.).

There are organisms that cause acute diarrhea that do not produce an inflammatory response although the person may have a low grade fever, malaise, nausea and vomiting as well as diarrhea. These causative organisms include “Norwalk virus, Rotovirus, Staphylococcus aureus, Clostridum perfringens, Vibrio cholerae and enterotoxigenic Escherichia coli …” (Bliss, Doughty, Heitkemper, 2006, p. 427). Less commonly, protozoa such Giardia or Cryptosporidium may be the causative factor (Armerine & Keirsey, 2006).

Norovirus, formerly known as the Norwalk-like virus, is one of the prime causes of outbreaks of viral gastroenteritis and is usually the culprit in outbreaks aboard cruise ships (CDC, 2009). Norovirus has been implicated in over 23 million cases of gastroenteritis and results in 23,000 hospitalizations of children under five yearly in the
US (CDC, 2010). The elderly are more apt to have a longer illness and have the potential for poorer outcomes than other age groups (CDC).

Rotavirus was the primary cause of severe, acute gastroenteritis in the very young population worldwide prior to 2006. WHO estimates there were 527,000 deaths of children under the age of five attributable to this disease in 2004 (2010). This acute cause of diarrhea accounted for over 400,000 physician visits yearly in the US from the 1990s to mid 2000s (Cortese, 2009). In 2006 a live, oral vaccine was introduced for infants and was recommended by the Advisory Committee on Immunization Practices (ACIP) to become a standard vaccine for American children (Cortese).

**Chronic Diarrhea.**

Diarrhea lasting longer than two weeks but resolving within a month is known as persistent diarrhea (Bushen, & Guerrani, 2003). This is typically a slower to resolve infection or continuing use of an offending agent (Amerine. & Keirsey, 2006). Chronic diarrhea, on the other hand, lasts longer than four weeks (Bliss, Doughty, Heitkemper, 2006). Approximately 3%-5% of the American population is thought to suffer from chronic diarrhea during any given period of time (Schiller, 2009). Chronic diarrhea can be the result of disease processes, medication, genetic abnormalities, or a variety of other causes (Doughty, 2006; Marchiondo, 2009).

**Pathological disorders**

Approximately 10 liters of fluid can move through the small intestine in a 24 hour period from food, fluids, and secretion of various enzymes and fluids necessary for
digestion (Kent & Banks, 2010). The small and large intestines have the ability to reabsorb that and even more fluid when functioning normally (Kent & Banks). This normal gut physiology relies on a functioning enteric nervous system that coordinates the gut ion transport and motor activity (Binder, 2006). When any of these pathways are disrupted, diarrhea can result. These disruptions result in osmotic, secretory, motility or mixed diarrhea (Bliss, Doughty, Heitkemper, 2006).

**Secretory Diarrhea.**

Secretory diarrhea occurs when there is an increase in the amount of fluid being drawn into the lumen of the bowel such that the ability of the intestines to reabsorb is overwhelmed (Bliss, Doughty, Heitkemper, 2006). Typically, infectious agents are the cause of secretory diarrhea but any substance (secretagogue) that causes fluid to be pulled into the bowel can be the culprit (Strasinger & Di Lorenzo, 2008).

Infectious secretagogues include *Vibrio cholerae, E. coli, Camylobacter jejuni, Salmonella, Shigella,* and *Clostridium difficile* (Farthing, 2006). These pathogens secrete toxins that bind with the structures within the gut, altering, sometimes irreversibly, the amount of fluid secreted into the bowel (Bliss, Doughty, Heitkemper, 2006). As an example, the toxin excreted by the pathogen cholera causes massive secretory diarrhea which, during its acute phase, can be as much as 24 liters in 24 hours (Farthing).

Non-infectious secretagogues include chemicals produced by certain types of cancer, prostaglandins produced in patients with bowel inflammation and substances not well absorbed such as fatty acids and bile acid (Bliss, Doughty, Heitkemper, 2006).
Persons with secretory diarrhea will typically have stool volume of more than one liter daily, with neutral pH and have no change in the amount of stool produced with fasting (Bliss, Doughty, Heitkemper, 2006).

**Osmotic Diarrhea.**

Osmotic diarrhea occurs when there is a dysfunction in the ability of the intestine to reabsorb fluid as it flows through the lumen (Kent & Banks, 2010). This may be caused by incomplete breakdown or malabsorption of nutrients in the small intestine allowing a larger and more liquid mass to enter the colon (Strasinger & Di Lorenzo, 2008). This fecal matter then creates a negative osmotic gradient causing leakage of more fluid into the gut increasing the stool volume (Bliss, Doughty, Heitkemper, 2006). The causes of this type of osmotic diarrhea are varied but can be broken down into decreased enzymatic availability (lactose intolerance), a genetic abnormality that decreases or eliminates the ability of the body to absorb certain nutrients (celiac sprue), sugars that are poorly absorbed (sorbitol, mannitol or lactose), "laxatives, magnesium-containing antacids, amebiasis and antibiotic administration", (Strasinger & Di Lorenzo, p. 247) as well as malabsorption of certain fats (Bliss, et al.).

Other causes have more to do with changes within the bowel that decrease the ability to reabsorb fluid and nutrients as the stool is propelled through the lumen. Malnutrition, especially protein-calorie malnutrition causes “reversible atrophy of the villi and brush border” (Bliss, Doughty, Hietkemper, 2006, p. 430), the structures within the intestine responsible for absorption. Resection of parts of the bowel, especially the terminal ileum, will mechanically decrease the body’s ability to absorb due to decreased
length of intestine available (Bliss et al.). Inflammation of the bowel due to infection or
disease processes (Crohn’s disease) can be another cause of osmotic diarrhea.

Typically, osmotic diarrhea responds with decreased stooling when the individual
fasts (Binder, 2006). A person with osmotic diarrhea will have stool volume under one
liter per day, the stool will be acidic and more potassium will be lost than sodium (Bliss,
Doughty, Hietkemper, 2006).

Motility disorders.

During normal functioning of the intestines, solids and fluid are moved through
the gut with peristaltic waves of the smooth muscles within the intestines. This
movement is slow and may take 3-5 hours for the mass to move from the pyloric valve
at the proximal point of the small intestine to the large intestine (Guyton & Hall, 2000). It
may take as long as 24+ hours for the mass to move from the small intestine to the
rectum to be expelled during defecation (Guyton & Hall).

When the intestines are not functioning normally, motility can be either increased
or decreased and both can lead to diarrhea (Bliss, Doughty, Hietkemper, 2006).
Increased motility can be caused by infectious agents, changes within the bowel by
inflammatory bowel disease or by irritable bowel syndrome (Bliss, et al.) This increased
motility results in faster transport of stool through the bowel so there is less chance for
re-absorption of fluid from the large intestine.

Counter-intuitively, decreased motility can also lead to diarrhea. Typically,
dehased mobility will lead to constipation, which, in its most severe form, can allow a
large bolus of stool to form in the lower intestine and cause an impaction (Bliss,
Doughty, Heitkemper, 2006). The stool behind this bolus may become liquid again due to the action of bacteria on the stool (Bliss, et al.). This results in liquid stool leaking around the bolus and causing diarrhea (Bliss, et al.).

People with altered gut motility and diarrhea will have low volume, liquid stool and cramping (Bliss, Doughty, Heitkemper, 2006). However, disordered motility may be just one factor in a complex mechanism of abnormal gut functioning as seen in infectious diarrhea, and inflammatory bowel disease (Bliss, et al.).

**Mixed disorders.**

As with most every disease that can befall mankind, there are usually multiple physiological changes within the body that cause diarrhea. Rarely is diarrhea only caused by osmotic or secretory or motility problems. Most diarrheal states have more than one component. As an example, the bacteria *Clostridium difficile* produce toxins that are secretagogues promoting secretory diarrhea (Bliss, Doughty, Heitkemper, 2006). However, the bacteria also produce a pseudomembrane that alters the absorptive ability of the gut, promoting osmotic diarrhea (Bliss, et al.)

Medications causing diarrhea also fall under the category of mixed disorders. There are a number of drugs that are known to cause diarrhea either as a side effect or as the desired effect of the drug. The mechanism of causing diarrhea can vary from drug to drug. Some offending drug categories include: antibiotics, magnesium and phosphate containing antacids, osteoarthritis medications, cardiac medications, chemotherapeutic medications, Alzheimer’s disease medications and oral hyperglycemic drugs (Zarowitz, 2009).
Treatment Options

Symptom management

The major concern with diarrhea is dehydration, regardless of the cause of the diarrhea. Oral rehydration is an important aspect in the prevention of dehydration (Kent & Banks, 2009). Oral rehydration can be accomplished by the intake of commercially prepared fluids that contain specific quantities of electrolytes and glucose and should be started with the onset of diarrhea (Burpee & Duggan, 2008). A well known, commercially prepared oral rehydration solution (ORT) is Pedialyte®. Many stores will have their own brand of oral rehydration solution (ORT). As well as oral rehydration, a person with diarrhea needs to continue to eat to maintain adequate caloric intake as well as meeting the needs of increase fluids (Burpee & Duggan).

Correction of underlying causes

Especially in chronic diarrhea, a thorough history and physical examination by a qualified practitioner should be done to determine the cause of the loose stools. If the cause is found to be a medication, the offending medication should be stopped if possible and another substituted if needed (Zarowitz, 2009). If the underlying problem is found to be intolerance to a particular food, such as lactose or one of the other sugars known to promote osmotic diarrhea, the diet should be changed to exclude or limit the food (Bliss, Doughty, Heitkemper, 2006). In the case of lactose intolerance, adding a substance such as Lactaid® may allow the individual to enjoy dairy products.
without the worry of diarrhea (Marchiondo, 2009). If the diarrhea is found to be caused by malabsorption of fats, a low fat diet may be appropriate (Bliss, et al.).

Dietary measures

As noted in the previous section, altering food intake depending on the etiology of the diarrhea is one method to control the volume and consistency of the stool. Adding fiber, both soluble and insoluble, is another dietary measure that is known to alter stool consistency. Although usually used as a means to control constipation, fiber should be thought of as “normalizing” the stool and can be used for certain types of diarrhea to diminish the fluid state of the liquid stool (Bliss, Doughty, Heitkemper, 2006). Other dietary measures are more “common sense” and include limiting the amount of caffeine consumed, decreasing or eliminating spices that make foods hot and increasing fluid intake in general (Bliss, et al.). A common diet for people with acute diarrhea to follow is the BRAT diet which consists of Bananas, Rice, Applesauce and Toast (Amerine & Keirsey, 2006).

Medications

There are several medication classifications available to control loose stools. They fall into several categories which include opiates, antibiotics, bile acid sequestrants and heavy metals.
**Opiates.**

The medications that are included in the opiate category are either derived from opium or are synthetic opiates (Kent & Banks, 2010). These medications have been shown to slow transit time within the intestine to permit more re-absorption of fluid (Kent & Banks). The drugs in this classification most often used to treat chronic diarrhea are loperamide (Imodium®) and diphenoxylate with atropine (Lomotil®) (Bliss, Doughty, Heitkemper, 2006). Imodium® has the added benefit of increasing anal sphincter tone (Kent & Banks.).

These medications should not be used if there is fever, blood or leukocytes in the stool or if there is a suspicion the causative agent could be *E. coli* (Bushen & Guerrant, 2003). Side effects include dry mouth, dizziness, and drowsiness (PDR, 2011b, c).

According to the Physician Desk Reference (PDR) online (2011c), contraindications for Lomotil® include obstructive jaundice and enterotoxin producing bacteria such as *C. difficile* as the causative factor. The PDR also states Lomotil® is not to be used for children under the age of two years and care should be utilized with any child, especially those children with Down’s syndrome. Lomotil® should be discontinued if the patient develops abdominal distention or other associated symptoms. This drug should be used with caution in patients with severe renal or liver disease. The PDR online (2011c) also reports adverse reactions to Lomotil® which include toxic megacolon, pancreatitis, paralytic ileus, anorexia, rash, itching and nausea and vomiting. Drug interactions include monoamine oxidase inhibitors (MAOIs) which may cause a hypertensive crisis. Diphenoxylate may potentiate tranquilizers, alcohol and
barbiturates. Lomotil® is Pregnancy category C and nursing mothers should exercise caution (PDR).

Imodium® has pediatric doses for children weighing 24 pounds or more (PDR, 2011b). The warnings and precautions for this drug include not to use if there is blood in the stools or if the stool is black; to use caution in the presence of liver disease; if diarrhea lasts longer than 2 days or has associated symptoms of abdominal swelling (PDR). There are few drug interactions (Turkoski, Lance, Bonfiglio, 2007). Safety in pregnancy and nursing has not been studied (PDR).

**Antibiotics**

Another medication grouping used to combat diarrhea are antibiotics. Antibiotics are indicated for infectious diarrhea but should be used with caution due to the increasing problem with resistant bacteria (Kent & Banks, 2010). Kent and Banks (2010) propose the use of selected antibiotics only when:

1. Traveler’s diarrhea, in which *E coli* is the likely pathogen and treatment can shorten the duration of the illness.
2. Persistent diarrhea, suggestive of giardiasis
3. Febrile diarrheal illnesses consistent with invasive disease
4. *Clostridium difficile* infection. (p. 499)

The type of antibiotic used will depend on the pathogen. The precautions, contraindications, usage indications and pregnancy categories will vary depending on
the antibiotic used. It is recommended to research the appropriate antibiotic before administering.

**Bile Acid Sequestrant**

Bile acid diarrhea can occur when a person has had the gall bladder removed or when there is a problem with the terminal ileum, either through an inflammatory bowel disease or when the ileum has been resected (Kent & Banks, 2010). Bile acids may build up in the colon, leading to osmotic diarrhea (Bliss, Doughty, Heitkemper, 2006). Cholestyramine (Questran®) is a drug that binds with bile acid in the bowel, effectively neutralizing the acid (Kent & Banks, 2010). Cholestyramine’s contraindications include complete biliary obstruction (PDR, 2011d). Warnings and precautions include the need to use with caution in renal insufficiency and dehydration and that constipation may occur with continued use (PDR). Adverse reactions include constipation, heartburn, nausea and vomiting, diarrhea, flatulence, rash and fat soluble vitamin deficiency (PDR). Cholestyramine has the potential to decrease the availability of certain drugs, including but not limited to warfarin, thiazide diuretics, propranolol, tetracycline, penicillin G, phenobarbital, thyroid medications, estrogens, progestins and digitalis (PDR). Therefore, cholestyramine should be taken either one hour before or four hours after other medications (Turkoski, Lance, Bonfiglio, 2007)

**Heavy Metals.**

Heavy metals, such as bismuth, have been found to decrease liquid stools. Pepto-Bismol® and Kaopectate® are two of the brand names of over-the-counter
medications which contain bismuth subsalicylate (Turkoski, Lance, Bonfiglio, 2007). Bismuth has anti-inflammatory, anti-infective and anti-secretory properties and works well for traveler’s diarrhea, an infectious diarrhea usually caused by enterotoxigenic *E coli* (Kent & Banks, 2010). According to the PDR (2011a), bismuth subsalicylate is not to be used for children younger than 12 years of age and should not be used for children or teens with chicken pox or flu symptoms. The PDR cautions against the use of bismuth subsalicylate in conjunction with aspirin or aspirin containing products. This drug should be discontinued if signs and/or symptoms of aspirin toxicity occur. Bismuth subsalicylate has the potential to interact with anticoagulants, anti-diabetic, anti-arthritic and anti-gout medications (PDR). Safety with pregnancy and nursing has not been established (PDR). The patient should be cautioned that bismuth subsalicylate may cause stools to turn black and this may continue for several days after the medication has been stopped (PDR).

**Special Populations**

*Elderly*

The elderly are at higher risk for more severe outcomes from diarrhea than the younger population (Schiller, 2009). They tend to have less reserve to withstand the insult to the body from dehydration or decreased caloric intake (Schiller). The gastrointestinal tract changes with advancing age resulting in slowed transit time and decreased blood flow to the gut (Zarowitz, 2009). Other organs are affected by aging and play a part in availability of medication in the blood. These changes may result in more circulating drug in the elder’s blood stream and toxicity can become an issue.
(Zarowitz). It may be prudent to decrease dosages of drugs and to lengthen the time between doses to guard against toxicity (Zarowitz).

Zarowitz (2009) states loperamide and bismuth subsalicylate have safety profiles that allow these drugs to be used for non-infectious diarrhea in the elderly. However, she goes on to caution against the use loperamide if *C. difficile* infection is suspected and against the use of bismuth subsalicylate if the patient is on blood thinners. Zarowitz also reports drugs such as diphenoxylate should be used with caution in the elderly due to the possibility of sedation, potentially leading to falls.

*Children*

Children, especially infants, are more vulnerable to dehydration since their body surface to volume ratio is higher than adults, their metabolism is higher and their functional reserves are lower (Burpee & Duggan, 2008). Caregivers should be made aware of the signs of dehydration and encouraged to seek medical attention if these signs are encountered (Koslap-Petraco, 2006).

ORT is the first line of defense for children and infants to ward off dehydration. It should be started as soon as it is determined the diarrheal episode was not a one time event (Burpee & Duggan, 2008). All ages should continue to eat age appropriate foods if they are not dehydrated to maintain caloric needs (Koslap-Petraco, 2006).

Few medications are indicated for treatment of diarrhea in the very young. If diarrhea persists after ORT is started or if dehydration occurs, the child should be evaluated rather than being given over the counter medications. Of special note, children should not be given medications with bismuth subsalicylate when they have flu.
like symptoms or chicken pox because of the potential complication of Reye’s syndrome (Turkoski, 2007).

**Conclusion**

Diarrhea can be an uncomfortable and on occasion life threatening symptom. Differentiating between the various types of diarrhea may make choosing the appropriate intervention easier. It is important to remember that oral rehydration therapy is the mainstay for treatment of acute diarrhea. Caregivers and patients need to be made aware of the signs and symptoms of dehydration and when to seek medical treatment. Persons with diarrhea lasting longer than four weeks should be referred to their primary care practitioners to ascertain the cause of the symptom, even though there are over-the-counter drugs available to assist with control of diarrhea.
References


CDC finalizing norovirus outbreak guidelines. (2010). *Hospital Infection Control & Prevention*, 37(12), 139-140.


Koslap-Petraco, M.B. (2006). Homecare issues in rotavirus gastroenteritis,


Turkowski, B.B. (2007). Medicating the young or very young patients-part II. *Orthopaedic Nursing* (26) 3, 194-201.

