Child Health Nursing
Partnering with Children & Families

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Chapter 30

Alterations in Gastrointestinal Function
Basic GI anatomy
The internal anatomic structures of the stomach, including the pancreatic, cystic, and hepatic ducts; the pancreas; and the gallbladder.
Gastrointestinal System

• Digestion takes place in duodenum
• Enzymes aid in the digestion process
Infant vs. Children’s Gastrointestinal System

- Liver function immature at birth
- Enzymes deficient until 4 to 6 months old
- Abdominal distention from gas common with infants
- Stomach capacity smaller
- Emptying time
Stomach Capacity Increase Throughout Early Childhood

<table>
<thead>
<tr>
<th>Age</th>
<th>Capacity (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>10–20</td>
</tr>
<tr>
<td>1 week</td>
<td>30–90</td>
</tr>
<tr>
<td>2–3 weeks</td>
<td>75–100</td>
</tr>
<tr>
<td>1 month</td>
<td>90–150</td>
</tr>
<tr>
<td>3 months</td>
<td>150–200</td>
</tr>
<tr>
<td>1 year</td>
<td>210–360</td>
</tr>
<tr>
<td>2 years</td>
<td>500</td>
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</tbody>
</table>
Clues to Gastrointestinal Disorders in Children

• Vomiting/Regurgitation
• Abdominal pain
• Failure to thrive
• Stool changes
  – Diarrhea
  – Constipation
• Abdominal Distention
Assessment Techniques

• Subjective
  – Lifestyle and family factors
  – Diet
  – Elimination Patterns
GI assessment

• Objective
  – Observation
    • Abdominal distention
    • Symmetry, bumps, bulges or masses
    • Umbilicus
    • Peristaltic waves
      – *visible rippling waves= bowel obstruction
  – Palpation
GI Assessment

– Auscultation
  • Hyper/hyper bowel sounds
– Percussion
  • Tympany vs. dullness
– Palpation
  • Light palpation
  • Deep palpation
  • Rebound tenderness- peritoneal inflammation
  • McBurney’s point
Disorders of Gastrointestinal System

- Structural Defects
- Disorders of Motility
- Intestinal Parasitic Disorders
- Inflammatory disorders
- Disorders of Malabsorption
- Hepatic Disorders
- Injuries to the Gastrointestinal System
Structural Defects

• Cleft lip and cleft palate
  – Failure of the maxillary processes to fuse between 5 to 12 weeks gestation
  – Failure of the tongue to move down at the correct time prevents the palatine processes from fusing
  – Multifactorial causes
FIGURE 30–2  A, Unilateral cleft lip. *Courtesy of Dr. Elizabeth Peterson, Spokane, WA.*
FIGURE 30–2 (continued)  

B, Bilateral cleft lip. Courtesy of Dr. Elizabeth Peterson, Spokane, WA.
Cleft Lip and Cleft Palate

• Nursing care
• Pre- and postoperative care
• Nursing diagnosis
  – Pre-op
    • Imbalanced nutrition: less than body requirements
    • Risk of aspiration
    • Altered parenting
  – Post-op
    • Risk of injury & infection
    • Pain
    • Altered feeding patterns
Cleft Lip & Palate complications

- Feeding p. 1100 in text
- Speech
- Chronic otitis media
- Psychological concerns
- Dental problems
Structural Defects

• Esophageal atresia and tracheoesophageal fistula
  – Definition
  – Foregut fails to lengthen, separate, and fuse into two parallel tubes (esophagus and trachea) at 4 to 5 weeks gestation
  – Associated with maternal polyhydramnios
Esophageal Atresia and Tracheoesophageal Fistula

• Nursing care
  – Identifying signs and symptoms of these infants

• Pre- and postoperative care
  – Suction is important preoperatively
  – Care of the gastrostomy tube postoperatively
Types of esophageal atresia

Fig. 1

<table>
<thead>
<tr>
<th></th>
<th>Literature</th>
<th>Minnesota</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>8%</td>
<td>20%</td>
</tr>
<tr>
<td>b.</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>c.</td>
<td>86%</td>
<td>76%</td>
</tr>
<tr>
<td>d.</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>e.</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>
FIGURE 30–4  In the most common type of esophageal atresia and tracheoesophageal fistula, the upper segment of the esophagus ends in a blind pouch connected to the trachea; the fistula connects the lower segment to the trachea.
TE atresia

- Most of these babies (about 85%) will have an upper esophageal pouch that ends blindly and a lower esophageal segment that connects into the trachea (Figure 1c). For 8-10%, however, there will not be a connection between esophagus and trachea (no TEF). This is considered to be pure esophageal atresia (EA) with two blind esophageal ends (Figure 1a). For these babies, the distance between the two esophageal ends is usually longer (a long gap EA). Similarly, when the TEF is only between the upper pouch and the trachea, the lower end of the esophagus tends to be short leaving a long gap between the ends (Figure 1b).
TE Atresia

- **Clinical symptoms**
  - Excessive drooling
  - Cyanosis
  - Coughing
  - Choking
- **Diagnosis**
  - Pass NG tube into stomach
- **Treatment**
  - Surgical correction
- **Nursing Care**
  - IV fluids
  - Antibiotics
  - Gtube
Pathophysiology of structural defects

• Pyloric stenosis
  – Hypertrophy of circular muscle of pyloric canal
  – Etiology unknown, but often affects first-born males.
  – Diagnosis by ultrasound
  – Stenosis occurs between stomach and duodenum
In pyloric stenosis, the hypertrophied pyloric muscle causes symptoms of projectile vomiting and visible peristalsis.
Pyloric Stenosis

• Clinical Manifestations:
  – Good eater until week 3
  – Projectile vomiting
  – Appears hungry, lethargic, fails to gain weight

• Nursing care  Pre- and postoperative care
  – Fluid and electrolyte management
  – IV
  – NG tube
  – Analgesics
  – Prevent infection
  – support
Intussusception

- Intestine invaginates into another (like a sock)
- Mesentary becomes inflamed and obstruction can occur leading to ischemia
- Multifactorial causes

• Classic triad of Intussusception
  - Severe episodic pain
  - "Currant jelly" stool
  - transverse tubular abdominal mass
FIGURE 30–7 In infants, intussusception is commonly associated with measles, viral disease, and gastroenteritis syndromes.
Intussusception

- More common in children with cystic fibrosis, celiac disease and gastroenteritis
- Etiology is multifactorial
- Diagnosis: history, x-ray, contrast enema
- Nursing management:
  - Vital signs
  - Check for distention
  - Fluids and electrolytes
  - Intake and output
  - pain
Intussusception presentation

• Physical:
  • Usually, the abdomen is soft and nontender early, but it eventually becomes distended and tender.
  • A vertically oriented mass may be palpable in the right upper quadrant.
  • Currant jelly stools are observed in only 50% of cases.
  • Most patients (75%) without obviously bloody stools have stools that test positive for occult blood.
  • Fever is a late finding and is suggestive of enteric sepsis.
Intussusception

• **Emergency Department Care:**
  – Provide rehydration and stabilization as needed.
  – Contrast enema is diagnostic in approximately 95% of intussusception cases. It is therapeutic and curative in most cases with less than 24-hour duration.

• **Inpatient Care**
  – Admission is indicated for all patients because up to 10% of those with successful radiologic reduction have a recurrence, usually in the first 24 hours.
Structural Defects
Abdominal Wall Defects

• Gastroschisis and omphalocele
  – Definition
  – Gastroschisis usually occurs to the right of the umbilicus and omphalocele occurs through the umbilical cord
  – Occurs in week 11 of gestation when abdominal contents fail to return to the abdomen
  – Multifactorial causes
Structural Defects
Anorectal Malformations

• Anal stenosis and anal atresia
  – Failure of growth of urorectal septum, lateral mesoderm structures, and ectodermal structures
  – Associated anomalies up to 70% of the time
Structural Defects
Umbilical Hernia

• Umbilical hernia
  – Results from imperfect closure of the umbilical muscle ring
  – Often associated with diastasis recti (lateral separation of the abdominal muscles.
  – Etiology unknown
  – Around week 11 gestation the obliterated umbilical vessels occupy the space in the umbilical ring
The umbilical hernia of the newborn usually closes as the muscles strengthen in later infancy and childhood.

Disorders of Motility

- Vomiting
- GE reflux
- Constipation
- Encopresis
- Hirschsprung disease
- Gastroenteritis
Disorders of Motility
Gastroesophageal Reflux

- Gastroesophageal reflux
  - Definition
  - Three mechanisms allow reflux to occur
    - Lower esophageal relaxations
    - Incompetent lower esophageal sphincter
    - Anatomic disruption of esophagogastric junction
  - Reflux acidity damages the esophageal mucosa
  - Causes
What is GER/ GERD?

- Gastroesophageal refers to the stomach and esophagus, and reflux means to flow back or return.
- Gastroesophageal reflux (GER) is the NORMAL physiologic passage of acidic stomach juices, or food and fluids, back up into the esophagus.
- Gastroesophageal reflux disease (GERD) refers to the pathophysiologic outcomes. It is persistent or recurrent symptoms or complications that are caused by gastric acid flowing from the stomach into the esophagus,

GER is very common in infants, though it can occur at any age. It is the most common cause of vomiting during infancy, but usually resolve by first birthday.
**Clinical Manifestations** of Gastroesophageal Reflux and Gastroesophageal Reflux Disease

<table>
<thead>
<tr>
<th>Clinical Manifestations</th>
<th>Clinical Therapy</th>
<th>Nursing Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gastroesophageal Reflux</strong></td>
<td>Thicken formula with up to 1 tablespoon of rice cereal per 2–4 ounces of liquid or use specially thickened formula Consider change to hypoallergenic formula if condition persists</td>
<td>Teach parents recommended feeding techniques Monitor weight gain Monitor growth and development Assess for feeding difficulties</td>
</tr>
<tr>
<td>Regurgitation with normal weight gain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No signs and symptoms of esophagitis, respiratory infection, excessive crying</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gastroesophageal Reflux Disease</strong></td>
<td>Thicken formula as noted above or change type of formula for a trial period</td>
<td>Teach parents of infants:</td>
</tr>
<tr>
<td>Regurgitation with poor weight gain</td>
<td></td>
<td>• Burp infant every 1–2 ounces of formula or after breastfeeding on each side</td>
</tr>
<tr>
<td>Persistent irritability due to pain</td>
<td>Treatment with antacids, histamine H₂ receptor blockers, or proton pump inhibitors (see medications table on page 1121)</td>
<td>• Avoid overfeeding</td>
</tr>
<tr>
<td>Respiratory symptoms such as apnea, cyanosis, wheezing, pneumonia, cough</td>
<td></td>
<td>• Hold infant upright for 30 minutes after feeding; avoid use of infant seat</td>
</tr>
<tr>
<td>Gastrointestinal symptoms such as hematemesis and iron deficiency anemia</td>
<td></td>
<td>• Raise the head of the crib about 30 degrees so that the head is higher than the stomach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teach parents of older child:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Avoid foods that may cause reflux: caffeine, chocolate, spicy foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Serve smaller, more frequent meals and snacks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The child should avoid eating 2–3 hours before bedtime</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Encourage weight reduction if the child is overweight</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Raise the head of the bed by about 6 inches</td>
</tr>
</tbody>
</table>

Foods and GERD

• Some foods seem to affect the muscle tone of the lower esophageal sphincter, allowing it to stay open longer than normal. These include, but are not limited to, the following:

• Chocolate.
• Peppermint.
• High-fat foods.
GERD

• Other foods increase acid production in the stomach, including:

  • Citrus foods.
  • Tomatoes and tomato sauces.
Why is gastroesophageal reflux (GERD) a concern?

- Some infants and children who have gastroesophageal reflux may not vomit, but may still have stomach contents move up the esophagus and spill over into the windpipe. This can cause asthma, pneumonia and possibly even SIDS (sudden infant death syndrome).

- Infants and children with GERD who vomit frequently may not gain weight and grow normally.

- Inflammation (esophagitis) or ulcers (sores) can form in the esophagus due to contact with stomach acid. These can be painful and also may bleed, leading to anemia (too few red blood cells in the bloodstream).

- Esophageal narrowing (stricture) and Barrett's esophagus (abnormal cells in the esophageal lining) are long-term complications from inflammation.
What are the symptoms of GERD?

- Belching.
- Refusal to eat.
- Stomachache.
- Fussiness around mealtimes.
- Frequent vomiting.
- Hiccups.
- Gagging.
- Choking.
- Frequent cough.
- Coughing fits at night.
- Wheezing.
- Frequent upper respiratory infections (colds).
- Rattling in the chest.
- Frequent sore throats in the morning.
- Sour taste in the mouth.
How is GERD diagnosed?

• Vomiting, pain associated with regurgitation, arching back and feeding refusal
• Difficult to differentiate between normal GER, and Colic
• Physical Exam
• Chest x-ray - a diagnostic test to look for evidence of aspiration.
• Upper GI (gastrointestinal) series -
• Endoscopy -
• Esophageal manometric studies.
• pH testing.
• Gastric emptying studies.
• http://www.laparoscopy.com/pictures/lapniss.html
Nonpharmacological Treatment

• Watch child's food intake - limit fried and fatty foods, peppermint, chocolate, drinks with caffeine (such as colas, Mountain Dew™ and tea), citrus fruit and juices and tomato products.
• Offer smaller portions at mealtimes and include small snacks in-between meals if child is hungry. Avoid letting child overeat. Allow child to let you know when hungry or full.
• If child is overweight, consult your physician to set weight loss goals.
• Do not allow child to lie down or go to bed right after a meal. Serve the evening meal early - at least two hours before bedtime.
• After feedings, place infant on the stomach with the upper body elevated at least 30°, or hold in a sitting position in your lap for 30 minutes.
• If bottle-feeding, keep the nipple filled with milk so infant does not swallow too much air while eating. Try different nipples to find one that allows your baby's mouth to make a good seal with the nipple during feeding.
• Adding rice cereal to feeding may be beneficial for some infants.
• Burp baby several times during bottle or breast feeding. Child may reflux more often when burping with a full stomach
Medications.

- **H2 receptor blockers** help decrease the amount of acid the stomach makes, which, in turn, will cut down on the heartburn associated with reflux.
  - cimetidine (Tagamet ®)
  - ranitidine (Zantac ®).
  - Famotidine (Pepcid)

- **proton-pump inhibitors** prevent excess acid secretion in the stomach
  - omeprazole (Prilosec ®) and
  - lansoprazole (Prevacid ®). These medications are taken daily to.

- Another type of medicine helps the stomach empty faster. Used as adjunct with PPI on short term basis. Is used to reduce nausea post op. Side effects limit use.
  - (Reglan ®). This medicine is usually taken three to four times a day, before meals or feedings and at bedtime.
Calorie supplements.

Some infants with reflux will not be able to gain weight due to frequent vomiting.

• Adding rice cereal to baby formula.
• Adding a prescribed supplement (such as Polycose™ or Moducal™) to formula or breast milk to make the milk higher in calories than normal.
Tube feedings.

- Some babies with reflux have other conditions that make them tired, such as congenital heart disease or prematurity. In addition to having reflux, these babies may not be able to drink very much without becoming sleepy. Other babies are not able to tolerate a normal amount of formula in the stomach without vomiting and would do better if a small amount of milk was given continuously. In both of these cases, tube feedings may be recommended. Formula or breast milk is given through a nasogastric tube. Nasogastric tube feedings can be given in addition to or instead of what a baby takes from a bottle.
Surgery.

• In severe cases of reflux, a surgical procedure called **fundoplication** may be performed if the child is not gaining weight due to vomiting, has frequent respiratory problems or has severe irritation in the esophagus.
  – This procedure is usually done laparoscopically,

• The top portion of the stomach is wrapped around the esophagus, creating a tight band that greatly decreases reflux.
Fundoplication
Pt. with GERD and sleep apnea
Gastroesophageal Reflux

• Nursing care
  – Risk for aspiration related to reflux
  – Fluid volume deficit related to reflux
  – Imbalanced nutrition, less than body requirements.

• Important education
  – Feeding techniques
  – positioning
Motility disorders

Colic

• Colic
  – Paroxysmal abdominal pain of intestinal origin and severe crying
  – Occurs between 2 weeks old and 3 months old
  – Etiology unknown
Disorders of Motility

constipation and encopresis

• Constipation is a common complaint and accounts for 25% of GI referrals
  – Defined by criteria of
    • Pebble-like hard stools for a majority of bowel movements for 2 weeks
    • Firm stools more than twice per week for 2 weeks
  – Constipation can be caused by underlying disease, diet, or psychological factors
  – Three types of constipation
    • Normal-transit constipation
    • Defacatory disorders
    • Slow-transit constipation
  – Primary vs. secondary encopresis
Constipation and Encopresis

• Nursing care
• Important education
  – Dietary
  – Medications
  – Fluids
Medications

• Osmotic Laxatives
  – Lactulose
  – Sorbitol
  – Milk of magnesia
  – Polyethylene glycol
• Lubricants
  – Mineral oil
• Stimulant laxatives
  – Dulcolax
  – Senna
• Stool softeners
  – Colace
Disorders of Motility
Hirschsprung Disease

- Definition AKA congenital aganglionic magacolon
- Congenital absence of ganglion cells in the rectum and colon which prevents peristalsis at that portion of colon.
- Often accompanies other genetic defects (trisomy 21, cleft palate, polydactyly, cardiac septal defects, craniofacial anomalies)
- Genetically acquired and occurs when there is failure of the migration of neural crest cells in utero
- Colon becomes a “megacolon”
Hirschspring’s Disease

• Diagnosis:
  – bowel pattern, history,
  – Contrast studies (barium enema)
  – rectal biopsy.
  – Rectum is small and does not contain stool

• Assessment:
  – Fluids and electrolytes
  – Intake and output
  – Abdominal distention
  – Stooling pattern
Disorders of Motility

- Gastroenteritis
  - Definition
  - Acute vs. chronic diarrhea caused by viruses, bacterial or parasites
  - Causes of diarrhea in children
Hirschsprung disease
clinical manifestations

• Newborns
  – Failure to pass meconium
  – Refusal to suck
  – Abdominal distention
  – Bile-stained emesis
• Older child
  – Failure to gain weight
  – Delayed growth
  – History of severe constipation alternating with diarrhea
  – Vomiting
  – Ribbon-like stool
Hirschsprung’s disease treatment

• Surgical removal of involved aganglionic bowel, and either
  – End to end anastomosis to the anal canal
  – Temporary colostomy may be necessary for severe cases with closure of the colostomy in 3-6 months.

• NG tube is generally inserted preop to relieve distention and is left in place X 24 hrs.

• Milder cases
  – Dietary modification, stool softeners, and isotonic irrigations to prevent impaction.
Hirschsprung’s disease complication

• Enterocolitis (inflammation of the intestine)
  – 20-60% of children after surgery
  – GI bleeding
  – Diarrhea

• Treatment
  – TPN
  – Lactose free diet
Hirschsprung’s disease
nursing care

• Monitor fluid and electrolyte balance
• Maintain nutrition
• Preop and postop care
• Pain relief
• Promote bowel elimination
Diarrhea

• **What is diarrhea?** Diarrhea is defined either as watery stool or increased frequency (or both) when compared to a normal amount. It is a common problem that may last a few days and disappear on its own.

• **Acute** (short-term, lasting less than two weeks), which is usually related to bacterial or viral infections.

• **Chronic** (long-term, lasting longer than two weeks), which is usually related to functional disorders, such as irritable bowel syndrome, or may be due to diseases such as ulcerative colitis, Crohn's disease, celiac sprue or Giardia.
What causes diarrhea?

• Diarrhea in children may be caused by a number of conditions, including the following:
  • Bacterial infection.
  • Viral infection.
  • Food intolerances or allergies.
  • Parasites.
  • Reaction to medications.
What are the symptoms of diarrhea?

- The following are the most common symptoms for diarrhea. However, each child may experience symptoms differently. Severe diarrhea may indicate a serious disease, making it important to consult your child's physician if any or all of the following symptoms persist:
  - Cramping.
  - Abdominal pain.
  - Bloating.
  - Nausea.
  - Urgent need to use the restroom.
  - Fever.
  - Bloody stools.
### Table 30–6: Causes of Diarrhea in Children

<table>
<thead>
<tr>
<th><strong>ETIOLOGY</strong></th>
<th><strong>BOWEL MANIFESTATIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional stress (anxiety, fatigue)</td>
<td>Increased motility</td>
</tr>
<tr>
<td>Intestinal infection</td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td></td>
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<tr>
<td><em>Salmonella</em></td>
<td></td>
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<tr>
<td><em>Shigella</em></td>
<td></td>
</tr>
<tr>
<td>Viral</td>
<td></td>
</tr>
<tr>
<td>Human rotavirus</td>
<td>Inflammation of mucosa</td>
</tr>
<tr>
<td>Enteric</td>
<td>Increased mucous secretion in colon</td>
</tr>
<tr>
<td>Adenovirus fungal overgrowth</td>
<td></td>
</tr>
<tr>
<td>Food sensitivity</td>
<td>Decreased digestion of food</td>
</tr>
<tr>
<td>Gluten</td>
<td></td>
</tr>
<tr>
<td>Cow milk</td>
<td></td>
</tr>
<tr>
<td>Food intolerance</td>
<td>Increased motility</td>
</tr>
<tr>
<td>Lactose</td>
<td>Increased mucous secretion in colon</td>
</tr>
<tr>
<td>Introduction of new foods</td>
<td>Increased air trapping</td>
</tr>
<tr>
<td>Overfeeding</td>
<td></td>
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<tr>
<td>Medications</td>
<td>Irritation and superinfection</td>
</tr>
<tr>
<td>Iron</td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
</tr>
<tr>
<td>Colon disease</td>
<td>Inflammation and ulceration of intestinal walls</td>
</tr>
<tr>
<td>Colitis</td>
<td>Reduced absorption of fluid</td>
</tr>
<tr>
<td>Necrotizing enterocolitis</td>
<td>Increased intestinal motility</td>
</tr>
<tr>
<td>Enterocolitis</td>
<td></td>
</tr>
<tr>
<td>Surgical alterations (short bowel syndrome)</td>
<td>Reduced size of colon</td>
</tr>
<tr>
<td></td>
<td>Decreased absorption surface</td>
</tr>
</tbody>
</table>
Warning signs of severe diarrhea:

- Abdominal pain.
- Blood in the stool.
- Frequent vomiting.
- Loss of appetite for liquids.
- High fever.
- Dry, sticky mouth.
- Weight loss.
- Urinates less frequently (wets fewer than 6 diapers per day).
- Frequent diarrhea.
- Extreme thirst.
- No tears when crying.
Disorders of Motility
Gastroenteritis Diarrhea

- Gastroenteritis is an inflammation of the stomach and intestines that may be accompanied by vomiting and/or diarrhea.

- Causative agents include
  - Virus
  - Bacteria

- Described as
  - Mild
  - Moderate
  - Severe
Parasitic Disorders

• Chart on page 1132 of text reviews major parasites
Medications used to diarrhea

• Metronidazole (Flagyl)
  – Used to treat anaerobic bacteria and certain parasites,
    • Giardiasis
    • In combination for H Pylori

• Antidiarrea
  – Imodium
Inflammatory Disorders

- Peptic Ulcer
- Appendicitis
- Necrotizing Enterocolitis
- Meckel’s Diverticulum
- Recurrent Abdominal Pain
- Inflammatory Bowel Disease
Peptic Ulcer

- H Pylori
- Review in Med surg text
Inflammatory Disorders of GI tract

• Appendicitis
  – Definition
  – Caused by an obstruction of the appendiceal lumen, causing edema
  – As edema continues, vascular supply is compromised and bacteria invade, which can lead to a ruptured appendix
• appendectomy

http://video.google.com/videoplay?docid=-3315659114004055
Appendicitis

- Acute appendicitis is one of the most common causes of abdominal pain and is the most frequent condition that leads to emergent abdominal surgery in children.
FIGURE 30–14  McBurney’s point is the common location of pain in children and adolescents with appendicitis.
Appendicitis

• Nursing care
• Pre- and postoperative care
Appendicitis Preop care

- Correction of fluid and electrolyte deficits
- Antibiotics
Appendicitis post op care

• Nursing diagnoses
  – Pain
  – Risk of infection
  – Anxiety
Inflammatory Disorders
Necrotizing Enterocolitis

• Potentially life-threatening inflammatory disease of the intestinal tract that occurs primarily in premature infants.
• Most common gastrointestinal emergency occurring during the neonatal period
• SIGNS OF NEC
  – Abdominal distention
  – Bilious vomiting
  – Bloody stools
Inflammatory Disorders

• Meckel’s diverticulum
  – Omphalomesenteric duct fails to atrophy
  – Outpouching of the ileum remains and contains gastric contents causing ulceration
  – Bowel obstruction, perforation, or peritonitis can occur
Meckel’s diverticulum nursing management

• Preop
  – IV for fluid and electrolyte imbalances
  – Test stools for occult blood
    • Vital signs q 2 hours

• Post-op
  – Abdominal surgery
  – Teaching parents re: feeding, medications
Inflammatory Bowel Disease
(Crohn’s Disease and Ulcerative Colitis)

• Nursing care
• Important education
Inflammatory Bowel disease

Most common chronic GI disease of childhood and adolescence
Inflammatory Disorders

- Inflammatory bowel disease (Crohn’s disease and ulcerative colitis)
  - Faulty regulation of the immune response of the intestinal mucosa
  - Usually genetically triggered
  - Crohn’s disease can cause inflammation and ulcers anywhere throughout the GI tract
  - Ulcerative colitis effects large intestine and rectal mucosa
Crohn’s disease

• Inflammation and swelling of the wall of the small or large intestine causes
  • abdominal pain
  • Diarrhea
  • Fever
  • Weight loss

• Can effect anywhere in the GI tract
Crohn’s disease complications

- Intestinal blockage
  - Thickening of the intestinal wall with swelling and scar tissue

- Fistulas
  - Tunnels through affected area to surrounding tissues of bladder, vagina, skin

- Nutritional complications
  - Deficiencies of proteins, calories, vitamins
Crohn’s disease pharmacologic treatment

- **Anti-inflammatory drugs**
  - Sulfasalazine (po caplet)
  - Mesalamine (po or pr suspension)
- **Systemic steroids**
  - Prednisone (po)
  - Methylprednisolone (solumedrol) IV
- **Immune system suppressors**
  - Immuran
  - 6-mercaptopurine
- **Antibiotics**
  - Flagyl
- **Probiotics**
  - Lactobacillus (granules) 1 packet tid
- **Antidiarrheal agents**
Ulcerative Colitis

- Cause inflammation and ulcers in the lining of the rectum and colon
- Surgery cures disease
  - Ileostomy
  - Ileoanal anastomosis “pull through”
- 5% of ulcerative colitis develop colon cancer. Risk increases with the duration of disease
Support for children with IBD

• Reach out for youth with ileitis and colitis, inc.
  – Founded in 1979 to help children with Crohn’s disease, ulcerative colitis and other GI diseases.
  – Volunteer organization help children and their families through personal support and education
<table>
<thead>
<tr>
<th>Clinical manifestations</th>
<th>Ulcerative Colitis</th>
<th>Crohn’s Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anal or perianal lesions</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Anorexia</td>
<td>Mild to moderate</td>
<td>Can be severe</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Often severe</td>
<td>Moderate</td>
</tr>
<tr>
<td>Growth retardation</td>
<td>Mild</td>
<td>Significant</td>
</tr>
<tr>
<td>Pain</td>
<td>Present</td>
<td>Common</td>
</tr>
<tr>
<td>Rectal bleeding</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
</tbody>
</table>

**TABLE 30–7**  Comparison of Ulcerative Colitis and Crohn’s Disease

- **Type of lesions**
  - Ulcerative Colitis: Continuous, superficial involvement
  - Crohn’s Disease: Segmental, transmural (through the wall) involvement

- **Risk of cancer**
  - Ulcerative Colitis: Slightly increased
  - Crohn’s Disease: Greatly increased
Malabsorption disorders

• Malabsorption occurs when a child is unable to digest or absorb nutrients in the diet. Disorders of malabsorption
  – SHORT BOWEL SYNDROME
  – CELIAC DISEASE
  – LACTOSE INTOLERANCE
  – CYSTIC FIBROSIS
Disorders of Malabsorption

- **Short bowel syndrome**
  - Due to shortened intestine after surgical resection of a portion of the intestines.
  - Symptoms depend on which area of the bowel was resected

<table>
<thead>
<tr>
<th>Ileum</th>
<th>Bile salts, fluids, and electrolyte absorption decrease causing diarrhea. Steatorrhea, decreased absorption of fat-soluble vitamins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colon</td>
<td>Fluid and electrolyte management is impaired</td>
</tr>
<tr>
<td>Jejunum</td>
<td>Mostly compensated for effectively by the remaining bowel</td>
</tr>
</tbody>
</table>
Celiac Disease

- gluten-sensitive enteropathy

- Celiac disease
  - Chronic malabsorption syndrome more common in white European children
  - Immunologic disorder characterized by intolerance for gluten found in wheat, barley, rye and oats. Affects fat absorption
  - ?genetic factors
Celiac Disease

• Clinical manifestations
  – Diarrhea
  – FTT
  – Abdominal pain
  – Large quantities of fat in stool.
  – Stools are greasy, foul smelling, frothy, and excessive.
  – Eventually may develop protein deficiency with wasted musculature, and abd distention.
Celiac Disease

• Diagnostic tests
  – Fecal fat content
  – Duodenal biopsy
  – Trial of gluten free diet with improvement
  – Serum screening for IgA

• Treatment
  – Total exclusion of gluten from diet
## Gluten free diet

<table>
<thead>
<tr>
<th>What can you eat</th>
<th>What is eliminated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>Some types of chocolate candy</td>
</tr>
<tr>
<td>Corn</td>
<td>Prepared hamburgers, hotdogs</td>
</tr>
<tr>
<td>Tapioca</td>
<td>Milk preparations, malted milk</td>
</tr>
<tr>
<td>Beans</td>
<td>Canned soup</td>
</tr>
<tr>
<td>Millet</td>
<td>Catsup</td>
</tr>
<tr>
<td>Arrowroot</td>
<td>vinegar</td>
</tr>
<tr>
<td>Distilled products</td>
<td>Hydrolyzed vegetable protein</td>
</tr>
<tr>
<td>Potato flour</td>
<td>Modified food starch</td>
</tr>
<tr>
<td>soy</td>
<td>PLAYDOUGH, LIPSTICK, MEDICATION</td>
</tr>
</tbody>
</table>

[www.celiac.org](http://www.celiac.org)
Disorders of Malabsorption
Lactose Intolerance

• Inability to digest lactose due to deficiency of enzyme Lactase, which is produced by the cells that line the small intestine.

• Symptoms include
  – Explosive, watery diarrhea,
  – Abdominal distention
  – Excessive flatus

• Diagnosis is made by
  – History
  – Hydrogen breath test
  – Stool acidity test (lactic acid buildup)
Lactose intolerance treatment and nursing management

- Reduce lactose in diet
- Switch to soy based formula
- Lactaid tablets for older children
- Assure enough calcium in diet

Which food has more calcium? Sardines? Or Tuna?
Calcium content of common foods

<table>
<thead>
<tr>
<th>Food item</th>
<th>Calcium content</th>
<th>Lactose Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soymilk</td>
<td>200-300 mg/ 1 cup</td>
<td>0</td>
</tr>
<tr>
<td>Sardines 3 oz.</td>
<td>270 mg</td>
<td>0</td>
</tr>
<tr>
<td>Salmon, canned 3 oz.</td>
<td>205 mg</td>
<td>0</td>
</tr>
<tr>
<td>Broccoli, raw 1 cup</td>
<td>90 mg</td>
<td>0</td>
</tr>
<tr>
<td>Orange, 1 medium</td>
<td>50 mg</td>
<td>0</td>
</tr>
<tr>
<td>Pinto beans</td>
<td>40 mg</td>
<td>0</td>
</tr>
<tr>
<td>Tuna 3 oz.</td>
<td>10 mg</td>
<td>0</td>
</tr>
</tbody>
</table>
Hepatic disorders

– Biliary atresia
– Viral hepatitis
– Cirrhosis
Signs of Hepatic Disorders

- Jaundice
- Easy bruising, intense itching
- White or clay-colored stools
- Tea-colored urine
Clinical Risk Factors for Development of Severe Hyperbilirubinemia

Important risk factors for severe hyperbilirubinemia in infants more than 35 weeks’ gestation include breastfeeding, gestation less than 38 weeks, hyperbilirubinemia in a sibling, and visible jaundice prior to discharge (AAP, 2004, p. 301).

Additional risk factors for development of severe hyperbilirubinemia include:

- Bilirubin level higher than normal prior to hospital discharge
- Visible jaundice in the first 24 hours of life
- Blood group incompatibility or known hemolytic disease such as G6PD deficiency
- Significant bruising or cephalhematoma
- Problems with breastfeeding, especially if accompanied by excessive weight loss
- East Asian race

A term infant who is formula feeding is at very low risk of developing severe hyperbilirubinemia (AAP, 2004).
Table 30–8  Comparison of Major Hepatitis Types

<table>
<thead>
<tr>
<th>TYPE</th>
<th>INCUBATION</th>
<th>% Icteric</th>
<th>% WHO BECOME CHRONIC CARRIERS</th>
<th>CLINICAL FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children &lt;5 years</td>
<td>4 weeks (10–50 days)</td>
<td>&lt;5</td>
<td>0</td>
<td>More acute onset; frequently subclinical in young children</td>
</tr>
<tr>
<td>Adults</td>
<td></td>
<td>50–75</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infants</td>
<td>1–6 months</td>
<td>&lt;5</td>
<td>&gt;90</td>
<td>Extrahepatic manifestations more common</td>
</tr>
<tr>
<td>Adults</td>
<td></td>
<td>20–60</td>
<td>5–10</td>
<td></td>
</tr>
<tr>
<td>Hepatitis C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All ages</td>
<td>6–7 weeks</td>
<td>20–30</td>
<td>≥60</td>
<td>Frequently manifests without jaundice; predisposes to hepatocellular carcinoma</td>
</tr>
<tr>
<td>Hepatitis D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coinfection with HBV</td>
<td>2–8 weeks</td>
<td>Not known</td>
<td>&lt;5</td>
<td>Most common viral cause of fulminant hepatitis</td>
</tr>
<tr>
<td>Superinfection of HBV</td>
<td></td>
<td></td>
<td>&gt;80</td>
<td></td>
</tr>
<tr>
<td>carrier</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All ages</td>
<td>2–9 weeks</td>
<td>~ 10</td>
<td>0</td>
<td>Severe in pregnant women; high mortality and fetal loss</td>
</tr>
</tbody>
</table>

The hepatitis virus causes degeneration and necrosis of the liver, which results in abnormal liver function and illness.
The Studies of Pediatric Liver Transplantation (SPLIT) had registered 1,144 child liver transplants in the United States and Canada by June 2000. Survival rate was 85% at 1 year and 77% at 2 years. Of the survivors, 89% of the school-age children attended school full time by 18 months after transplant (SPLIT Research Group, 2001).
Injuries to the Gastrointestinal system

- Accidents and environmental gastrointestinal disturbances
  - Abdominal trauma
  - Ingestion of foreign substances or objects
  - Lead poisoning
Abdominal Trauma

- Provide emotional support
- Follow care orders
- Prevention teaching once stabilized
Poison Ingestion

• Do not use ipecac
• Airway, hemodynamic stability, remove toxin, and support
• Education on prevention
• Most common poison?
Lead Poisoning
Heavy Metal poisoning

• Healthy People 2010 goal: eliminate childhood lead poisoning as a public health issue in the United States.

• From 1991 to 1994 4.4% of children ages 1-6 in the US had blood lead levels above the limit of lead toxicity of 10ug/dL

• 1971 the Lead Based Point Poisoning Prevention Act was passed to ban interior lead-based paint in residential homes.
Lead Poisoning
Routes of Exposure

• Mostly through lead-based paint in older homes
  – Low income areas
  – Antique high-end homes under renovation
• Paint can chip, flake and chalk into dust which then settles on floor or dirt.
• Children put more things in their mouth
• Child’s breathing zone is near the floor where dust and chips of lead may lie.
Other sources of lead exposure

- Water from lead pipes
- Lead solder on canned food
- Lead ammunition
- Pool cue chalk
- Collectible toys
- Jewelry
Cultural issues which contribute to lead poisoning in children

- **Mexican**
  - Azarcon, bright orange powder
  - Greta, bright yellow powder
  - Both are used as medicinal treatment of GI problems

- **Tamarind**
  - Jellied candy from Mexico packaged in ceramic jars contaminated with lead

- **Southeast Asia:**
  - Paylooah remedy for rash and fever

- **Eastern Indian**
  - Surma, a black powder applied to the eyelids to improve eyesight
Lead Poisoning
Toxicology/ absorption

There are three major routes for absorption of lead in children’s body.

- **Lead exposure**
  - **Gastrointestinal**
    - Absorbed from GI tract into blood stream
  - **Inhalation**
    - Absorbed into blood stream through alveoli
  - **Transplacental**
    - Absorbed from mother into fetus through placenta
Lead Poisoning
Toxicology/ Distribution

• At least 99% of absorbed lead is bound to erythrocytes upon entry into the bloodstream.
  – 70% is stored in bone
    • Accumulates throughout life, but can be released during stress
    • Can have a half-life of as many as 20 years.
  – 30% moves to major soft tissue storage sites
    • Liver
    • Kidney
    • Bone marrow
    • BRAIN
Lead Poisoning Pathophysiology

• Lead toxicity can affect any soft tissue of the body including:
  – Hematological
  – Renal
  – GI
  – Skeletal, endocrine
  – Central nervous system

LEAD’S MOST DETRIMENTAL PATHOPHYSIOLOGY IS NEUROTOXICITY WITHING THE PEDIATRIC CENTRAL NERVOUS SYSTEM
Lead Poisoning
Pathophysiology/ signs & symptoms

• Acute lead poisoning
  – Nausea,
  – Vomiting
  – Anorexia
  – Constipation
  – Abdominal pain
Chronic lead poisoning

- **Neurocognitive effects**
  - Developmental delay
  - Lower IQ
  - Speech and language problems
  - Reading skills deficits
  - Learning disabilities
  - Lowered academic success

- **Behavioral effects**
  - Aggression
  - Hyperactivity
  - Impulsivity
  - Delinquency
  - Disinterest
  - Withdrawal
## Lead Poisoning Diagnosis 6 classes

<table>
<thead>
<tr>
<th>Class</th>
<th>Blood lead level</th>
<th>Signs and symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt;9</td>
<td>asymptomatic</td>
</tr>
<tr>
<td>IIA</td>
<td>10-14</td>
<td>Usually asymptomatic, but can exhibit some impairment in cognition, fine motor skills and growth</td>
</tr>
<tr>
<td>IIB</td>
<td>15-19</td>
<td>Usually asymptomatic, but can exhibit some impairment in cognition, fine motor skills and growth</td>
</tr>
<tr>
<td>III</td>
<td>20-44</td>
<td>Increased motor impairment and lethargy, possible abdominal pain</td>
</tr>
<tr>
<td>IV</td>
<td>45-69</td>
<td>Hyperirritable behavior, intermittent lethargy, decreased interest in play, N/V anorexia</td>
</tr>
<tr>
<td>V</td>
<td>&gt;70</td>
<td>Encephalopathy, loss of developmental skills, seizures</td>
</tr>
</tbody>
</table>
Treatment of lead poisoning

• Primary Prevention

• Secondary prevention
  – Chelation therapy is indicated if BLL >45ug/dL
    • Succimer (Chemet) only oral chelating drug
    • Ethylenediaminetetraacetic Acid (EDTA)
    • British antilewisite (BAL) not if Fe therapy

• Tertiary Prevention
Foreign Object Ingestion

• Assessment important
• Prepare child and parents for x-rays and possible removal
• Education on prevention
Let’s review
Potential Signs of Gastrointestinal Emergencies in **Infants**

- Excessive salivation with cyanosis, coughing, and choking in newborn
  - Esophageal atresia and tracheoesophageal fistula

- Abdominal viscera outside the abdominal cavity when born
  - Gastroschisis and omphalocele

- Anorectal malformations
Potential Signs of Gastrointestinal Emergencies in Children

• Abdominal pain starting midabdomen and moving to right quadrant
  – Appendicitis

• Various symptoms of ingestion of poisons