
CHAPTER 5 – GASTROINTESTINAL SYSTEM

First Nations and Inuit Health Branch (FNIHB) Clinical Practice Guidelines for Nurses in Primary Care.
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ASSESSMENT OF THE GASTROINTESTINAL SYSTEM

The following characteristics of each symptom should be elicited and explored:

- Onset (sudden or gradual)
- Chronology
- Current situation (improving or deteriorating)
- Location
- Radiation
- Quality
- Timing (frequency, duration, pattern)
- Severity
- Precipitating and aggravating factors
- Relieving factors
- Associated symptoms
- Effects on daily activities
- Previous diagnosis of similar episodes
- Previous treatments
- Efficacy of previous treatments

CARDINAL SYMPTOMS

In addition to the general characteristics outlined above, additional characteristics of specific symptoms should be elicited, as follows.

Abdominal Pain

Ask about all of the characteristics (*see "Assessment of the Gastrointestinal System"*).

Nausea and Vomiting

- Frequency, amount
- Presence of bile
- Presence of blood and its colour (for example, bright red, dark, colour of coffee grounds)

Bowel Habits

- Usual and changes in the frequency, colour, consistency of stool
- Changes in the diameter of stool
- Presence of blood or melena
- Pain before, during or after defecation
- Sense of incomplete emptying after bowel movement
- Tenesmus
- Use of laxatives
- History of hemorrhoids, anal fissure
- Belching, bloating and flatulence

Jaundice

- History of acute hepatitis (Viral – A,B,C, Epstein-Barr, alcohol/drug induced)
- History of chronic liver diseases
- Scleral icterus
- Yellow skin tones
- Tea-coloured urine
- Clay-coloured bowel movements
- Itchy skin

Dysphagia

- Solids or liquids
- Site where food gets stuck
- Food is regurgitated
- Food/medication intake history
- Sensation that food is stuck, but improves with eating

Other Associated Symptoms

- Fever
- Malaise
- Headache
- Dry skin
- Dehydration
- Dry mouth
- Diet recall, appetite and foods avoided (including reasons for avoidance)
- Meal pattern (for example, small, frequent meals)
- Anorexia
- Recent weight loss or gain that is not deliberate

MEDICAL HISTORY

Gastrointestinal:

- Esophageal disease (gastroesophageal reflux disease [GERD], Barrett's esophagus, toxic injury)
- Gastric/duodenal disease (gastric ulcers, diabetic gastroparesis, hiatus hernia, peptic ulcer disease)
- Gallbladder disease (biliary colic, cholelithiasis, choledocholithiasis, cholecystitis)
- Liver disease (hepatitis, chronic diseases, cirrhosis)
- Pancreatic disease (pancreatitis)
- Small/large bowel disease (inflammatory bowel disease, ischemic colitis, diverticulosis/diverticulitis, polyps, history of bleeding)
- Functional bowel problems (irritable bowel syndrome [IBS], constipation, previous obstruction)

- Rectal/anal disease (anal fissure, proctitis)
- Presence of hernia, masses
- Blood transfusion
- Abdominal neoplasm
- Abdominal surgery
- Past and current use of medications, supplements, herbs (for example, nonsteroidal anti-inflammatories, estrogen, progesterone, calcium channel blockers, anticholinergics, antacids, antibiotics, thiazide diuretics, steroids, digoxin, azathioprine)

Nongastrointestinal considerations (may cause gastrointestinal illness/symptoms):

- Cardiovascular disease (myocardial infarction, congestive heart failure, vasculitis, hypertension)
- Renal disease (polycystic kidneys)
- Gynecologic conditions (pregnancy, endometriosis, ovarian cysts)

FAMILY HISTORY (SPECIFIC TO GASTROINTESTINAL SYSTEM)

- Alcoholism
- Any history related to the gastrointestinal system (*see “Medical History”*)
- Household contact with gastroenteritis, food poisoning
- Metabolic disease (for example, diabetes mellitus, porphyria)

- Cardiac disease
- Renal disease

PERSONAL AND SOCIAL HISTORY (SPECIFIC TO GASTROINTESTINAL SYSTEM)

- Alcohol use
- Smoking
- Caffeine intake
- Use of street drugs, including injection drugs
- Use of anabolic steroids
- Travel to area where infectious gastrointestinal conditions are endemic
- Body piercing or tattoos
- Stress at work, home or school
- Dietary intake of nitrates (for example, smoked foods)
- Diet (including wild game)
- Obesity
- Intake of untreated water
- Sanitation problems at home or in the community
- Sexual practices

OCCUPATIONAL OR SCHOOL ENVIRONMENT

- Health care occupation
- Institutional environment – workers or residents (for example, nursing home)
- Environmental exposure
- Chemical exposure

EXAMINATION OF THE ABDOMEN

- Apparent state of health
- Appearance of comfort or distress
- Preferred position of comfort (supine, sitting forward, lying on side)
- Colour (for example, flushed, pale, jaundiced)
- Nutritional status (obese or emaciated)
- State of hydration (skin turgor)
- Match between appearance and stated age

VITAL SIGNS

- Temperature and pulse
- Respiratory rate
- Blood pressure

ABDOMINAL INSPECTION

- Abdominal contour, symmetry, scars, dilatation of veins
- Movement of abdominal wall with respiration
- Visible masses, hernias, pulsations, peristalsis

AUSCULTATION

Auscultation should be performed *before* percussion and palpation so as not to alter bowel sounds.

- Presence, character and frequency of bowel sounds
- Presence of bruits (renal, iliac or abdominal aortic)

PERCUSSION

- Percuss from resonant to dull areas
- Liver: define upper and lower borders, measure span (normal: 6–12 cm in the mid-clavicular line)
- Spleen: confirm presence of normal resonance over lowest rib interspace in anterior axillary line
- Bladder: identify distention and fullness
- Identify other areas of dullness, increased resonance or tenderness
- Assess for ballotment if suspect ascites

LIGHT PALPATION

- Tenderness, muscle guarding, rigidity
- Superficial organs or masses

DEEP PALPATION

- Tender areas, rebound tenderness
- Liver: size, tenderness, whether edge is smooth or irregular, firm or hard
- Spleen: enlargement, tenderness, consistency
- Kidney: tenderness, enlargement, tenderness of ostovertebral angle
- Masses: location, size, shape, mobility, tenderness, movement with respiration, pulsation, hernias (midline, incisional, groin)
- Inguinal lymph nodes: enlargement, tenderness
- Femoral pulses

**ABDOMINAL EXAMINATION:
PERIPHERAL AREAS**

- Jaundice (scleral icterus, skin)
- Spider nevi on face, neck or upper trunk
- Palmar erythema, Dupuytren's contracture (both associated with chronic liver disease)
- Clubbing of fingers (late sign associated with inflammatory bowel disease, cancer)

RECTAL EXAMINATION

- For occult blood (which would indicate gastrointestinal [GI] bleeding)
- For referred pain (which occurs in appendicitis)
- For masses, hemorrhoids, anal fissures, sphincter tone, etc.
- Prostate exam in males (size, consistency, tenderness)

**CARDIOVASCULAR AND
PULMONARY EXAMINATION**

A cardiovascular and pulmonary exam should also be performed.

- Heart sounds
- Lungs (crackles, bronchial breath sounds in lower lobes)
- Peripheral pulses (may be altered or asymmetric with aortic aneurysm)
- In shock, vital signs and capillary refill may be altered
- Abdominal pain (may be referred from the lungs in pneumonia, heart in myocardial infarction)

Considerations for the Elderly

- Classic symptom patterns for disease are not reliable with older adults due to decreased pain perception, comorbid conditions and reduced organ function due to the aging process
- Tend to present later in the course of the illness
- Symptoms may be nonspecific and/or poorly localized, complicating differential diagnosis
- More likely to have cognitive deficits and/or alterations in mentation at presentation, complicating assessment and diagnosis
- Delirium and confusion common with constipation, inadequate hydration, anemia secondary to gastrointestinal blood loss
- May have absence of fever, even with serious infection
- Have decreased pain perception so may not have classic presentation of an acute abdomen
- At higher risk for certain conditions and complications to conditions due to the aging process (cardiovascular disorders [abdominal aortic aneurysm, mesentary ischemic disease], gallbladder disease, bowel obstruction, peptic ulcer disease, constipation)
- Consider prostate screening in males > 50 by digital rectal exam (DRE) and/or prostate specific antigen (PSA) test¹

COMMON PROBLEMS OF THE GASTROINTESTINAL SYSTEM

ANAL FISSURE^{2,3,4}

Painful, linear tear in anal mucosa.

CAUSES

- Chronic constipation
- Trauma to anal canal (from hard stool, anal intercourse, foreign object)
- Complication of Crohn’s disease, ulcerative colitis, HIV/AIDS, syphilis, leukemia, tuberculosis, cancer

Once an anal tear occurs, a pattern of repeat injury occurs from anal sphincter spasm that retracts the wound edges impairing healing and repeat injury with defecation which may lead to a chronic fissure. Suspect an underlying etiology for the fissure when the wound does not respond to therapy.

HISTORY

- Acute pain during and after defecation (pain may be severe, often described as “tearing”)
- Pain may persist for several hours post-defecation
- Spotting of bright red blood with defecation
- Bleeding tends to be minimal (often only seen on toilet paper after wiping)
- Perianal itching or irritation
- Constipation caused by fear of pain
- Tends to occur in young and middle-aged adults
- Most common cause of chronic perianal pain

PHYSICAL FINDINGS

To examine anal area, have client lie on left side with the knees drawn up to the chest. Firmly retract buttocks to adequately visualize anal tissues.

- Overlying anal mucosa may conceal hemorrhoid
- Acute fissure appears like a fresh laceration
- Swelling, skin tag, fibrosis or sphincter muscle visualized at wound base (chronic fissure)
- Usually one fissure, at posterior midline (suspect other underlying diagnosis if not midline or if multiple)
- Digital rectal exam causes acute pain

DIFFERENTIAL DIAGNOSIS

- Thrombosed external hemorrhoids
- Perianal or perirectal abscess
- Inflammatory bowel disease (Crohn’s disease, ulcerative colitis)

- Sexually transmitted infections (HIV/AIDS, syphilis)
- Ano-rectal malignancy
- Tuberculosis
- Leukemia
- Proctitis

COMPLICATIONS

- Constipation
- Chronic anal fissure
- Secondary sphincter spasm and pain

DIAGNOSTIC TESTS

- None

MANAGEMENT

Goals of Treatment

- Relieve pain, sphincter spasm
- Promote healing
- Relieve underlying constipation
- Prevent recurrence
- Prevent stricture formation

Nonpharmacologic Interventions

- Most acute fissures are superficial and will heal spontaneously over 4–6 weeks
- Sitz baths 3 or 4 times daily for 20 minutes with warm salt water

Client Education

- Instruct client about proper perianal hygiene and prevention of infection
- Counsel client about lifestyle and diet (increase dietary fibre, fluids, exercise)

Pharmacologic Interventions

Reduction of Local Pain and Discomfort

Local topical preparations without corticosteroids may be useful:

zinc sulfate ointment (Anusol), bid and after each bowel movement

An ointment is better than a suppository because it remains within the affected area.

Promote Healing, Reduce Ongoing Injury with Stools

stool-bulking agents and stool softeners
(see “Constipation”, “Pharmacologic Interventions”)

Monitoring and Follow-Up

Follow up in 1–2 weeks.

Referral

Arrange consultation with a physician if fissure does not heal in 4–6 weeks, chronic history of fissure, client is experiencing intolerable pain, non-midline position, history of or suspected inflammatory disease or other underlying causative disorder.

CONSTIPATION^{5,6,7,8,9,10,11,12,13,14,15,16,17,18}

According to the Rome III criteria for functional bowel disorder, constipation is defined by the presentation of two or more of the following symptoms for at least 12 weeks with onset at least 6 months prior to diagnosis:^{17,19}

- Less than 3 stools per week
- During at least 25% of defecations there is any one or more of:
 - straining
 - lumpy or hard stools
 - sensation of incomplete emptying of rectum
 - sensation of blockage/obstruction at the anorectum
 - use of manual maneuvers to pass stool (for example, digital extraction, supporting pelvic floor)

In addition: Loose stools are rarely present without laxative use. The criteria for irritable bowel syndrome are not met (see “Irritable Bowel Syndrome”).

CAUSES

- Ignoring urge to defecate (habitual, to avoid discomfort from hemorrhoids or anal fissure)
- Insufficient fibre and fluid in diet
- Poor bowel habits
- Physical inactivity
- Pregnancy
- Side effects of medications
- Abuse of laxatives
- Cancer of colon or rectum
- Large bowel disorder (slow transit, dyssynergic defecation, irritable bowel syndrome)
- Myotonic dystrophy

- Systemic sclerosis
- Bowel strictures (secondary to inflammatory bowel disease, post-surgical)
- Endocrine disorders (hypothyroidism, diabetes mellitus, panhypopituitarism)
- Neurogenic disorders (autonomic neuropathy, Hirschsprung’s disease, Chagas’ disease, intestinal pseudo-obstruction, multiple sclerosis, spinal cord injury, Parkinson’s disease)

MEDICATIONS ASSOCIATED WITH CONSTIPATION

- Amantadine
- Antipsychotics
- Anticholinergics
- Antihistamines (first generation)
- Anticonvulsants (for example, phenytoin, carbamazepine)
- Cation-containing agents (for example, aluminum antacids, calcium supplements, iron preparations)
- Calcium channel blockers
- Diuretics
- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Opioid analgesics
- Pseudoephedrine
- Tricyclic antidepressants

HISTORY

Constipation is a symptom, not a diagnosis, and a careful, accurate history and physical examination is important to identifying the underlying causes.

- Routine bowel habits
- Duration of constipation (recent or chronic problem)
- Recent change in pattern of defecation, consistency of stool
- Frequency of bowel movements
- Difficulty in passing stool (straining, manual manipulation, sensation of obstruction/blockage, incomplete emptying)
- Any associated rectal blood (hemorrhoids)
- Diarrhea (overflow)
- Abdominal pain, cramping and bloating and relationship to bowel function
- Pain on defecation (hemorrhoids, anal fissure)
- Tenesmus
- Time of most recent bowel movement
- Fluid intake
- Dietary intake (fibre content)
- Activity and exercise patterns

- Current medication, previous and current use of laxatives
- Presence of emotional stress, anxiety or depression (especially in the elderly)
- Eating disorders
- Pregnancy (current)
- Endocrine disorders (for example, diabetes mellitus, hypothyroidism)
- Neurological disorders (for example, Parkinson's disease, multiple sclerosis)
- Collagen vascular disorders (for example, systemic sclerosis)
- Client's understanding of normal bowel function

PHYSICAL FINDINGS

- Usually no distress
- Client looks well
- Abdomen may be distended, may be tympanic on percussion
- Bowel sounds normal but may be reduced in chronic constipation
- Bowel sounds normal to dull in left lower quadrant; sometimes similar findings in right lower quadrant
- Stool may be palpable in left or right lower quadrant
- Left and right lower quadrant may be tender
- Hard, pebbly stool in rectum, or rectum may be empty
- Hemorrhoids or anal fissures may be present

DIFFERENTIAL DIAGNOSIS

- Irritable bowel syndrome
- Diverticular disease
- Partial bowel obstruction
- Rectal fissure
- Anal fissure or hemorrhoids
- Physical inactivity
- Cancer of colon, rectum or other organ
- Diseases of the large bowel
- Endocrine problems (for example, hypothyroidism)
- Neurological diseases (for example, Parkinson's disease)

COMPLICATIONS

- Chronic abdominal pain
- Hemorrhoids
- Anal fissure
- Fecal impaction
- Fecal and urinary incontinence
- Urinary retention
- Inguinal hernia from straining
- Intestinal obstruction

DIAGNOSTIC TESTS

- Test stool for occult blood
- Measure hemoglobin

MANAGEMENT

Goals of Treatment

- Establish regular bowel function
- Eliminate contributing factors
- Identify and manage underlying disease
- Prevent and treat complications (for example, fecal impaction, hemorrhoids, anal fissures, rectal prolapse, fecal incontinence, bowel obstruction)
- Eliminate need to strain and prevent adverse effects of straining (for example, hernia, gastroesophageal reflux, coronary and cerebral dysfunction in the elderly)

Nonpharmacologic Interventions

- Ensure fluid intake of 1.5–2 L/day
- Dietary fibre intake of 20–30 g/day: bran, whole grains, fruits and vegetables, prune juice, stewed prunes and figs can be tried
- Discontinue medications with constipating effects if possible
- Minimize use of laxatives
- Encourage relaxation exercises for the pelvic floor and external anal sphincter muscles

Client Education

- Explain what constipation is and ways of preventing it
- Reinforce the importance of passing stool when urge presents, as ignoring the urge decreases the sensitivity to the sensation over time
- Encourage establishing a bowel routine of toileting after meals when colonic activity has been stimulated to help develop a conditioned reflex for bowel action (early morning after breakfast is the best time)

- Avoid prolonged straining on toilet
- Encourage increased physical activity for sedentary older clients
- Advise client that bowel retraining may take months (patience and persistence are required and dietary changes must be maintained over the long term)

Pharmacologic Interventions

To relieve initial constipation, medications may be required. Avoid starting client on a long-term course of laxatives.

Acute Constipation

If client needs urgent relief, use osmotic laxative agents:

magnesium hydroxide (Milk of Magnesia),
30–60 mL PO daily (may take in divided doses).
Avoid if decreased renal function suspected.

or

lactulose 15–30 mL PO daily

May add stimulant laxative for severe constipation that is not responding to osmotic laxatives:

sennosides (Senokot), 1–2 tabs once or twice daily
until establishment of bowel movements

It is also recommended to suggest a bulk-forming agent (must be taken with adequate fluids):

psyllium (Metamucil), 1 tsp (5 mL) in 8 oz (250 mL)
fluid PO 1–4 times daily

The patient can obtain Metamucil with a prescription through an NIHB pharmacy provider.

Begin bulk-forming agents with a single daily dose, and increase frequency of dose every 2–3 days as tolerated.

If symptoms of difficult defecation are present, add:

glycerin suppository, 1 or 2 prn daily

or

Fleet enema prn over 3–4 days

When fecal impaction is present, manually disimpact as necessary. Use enemas (for example, Fleet, saline, oil retention). Follow up closely until regular bowel function is achieved.

Chronic Constipation

The following medications may be used in conjunction with nonpharmacologic approaches

Step 1: Suggest a bulk-forming agent (must be taken with adequate fluids):

psyllium (Metamucil), 1 tsp (5 mL) in 8 oz (250 mL)
fluid PO 1–3 times daily

The patient can obtain Metamucil with a prescription through an NIHB pharmacy provider.

Begin bulk-forming agents with a single daily dose and increase frequency of dose every 2–3 days as tolerated.

Step 2: If client needs more urgent relief, add osmotic laxative agents:

magnesium hydroxide (Milk of Magnesia),
15–40mL PO daily. Avoid if decreased renal
function is suspected. May cause cramping.

or

lactulose 15–30 mL PO daily. May increase bowel gas

May add stimulant laxative for severe constipation that is not responding to osmotic laxatives:

sennosides (Senokot), 1–2 tabs once or twice daily
until establishment of bowel movements

Step 3: If symptoms of difficult defecation, add:

glycerin suppository, 1 or 2 prn daily

Monitoring and Follow-Up

Follow up regularly every 2–4 weeks until regular bowel function is achieved. Bulk-forming agents should be maintained in the long term. When constipation resolved, step-down therapy to the lowest level to maintain regular bowel function.

Docusate sodium (Colace) is a stool softener. It is better used in situations where straining needs to be avoided for a discrete period rather than as a laxative.

Long-term use of stimulant laxatives (sennosides) and Fleet enemas should be avoided.

Referral

Refer to a physician to arrange further investigation if:

- testing of stool for occult blood is positive
- hemoglobin is low
- there is evidence of other organic disease
- this constipation represents a new change in bowel habit in a person > 50 years of age
- the constipation is not resolving with appropriate treatment

Severe straining at stool or a continued sensation of rectal fullness even when rectum is empty warrants a more thorough evaluation.

DEHYDRATION (HYPOVOLEMIA)^{20,21,22,23,24,25,26}

Abnormal decrease in volume of circulating plasma.

CAUSES

- Excessive urine production (for example, use of diuretics, unexplained polyuria or polydipsia)
- Excessive gastrointestinal (GI) losses (through vomiting, diarrhea, third spacing of fluid in the abdomen as a result of ascites or pancreatitis)
- Excessive losses through the skin (because of burns, fever, exfoliative dermatitis)
- Inadequate intake of food or fluids (because of gastrointestinal illness, immobility, loss of consciousness, cognitive impairment)

TYPES**Hypotonic Dehydration**

- Primarily due to a sodium deficit (more salt than water is being lost)
- May result from replacing gastrointestinal losses (vomiting and diarrhea) with low-solute fluids such as dilute juice, cola, weak tea
- Symptomatic earlier than isotonic or hypertonic dehydration (use estimated weight loss as a guide: 3% = mild dehydration, 6% = moderate dehydration, 9% = severe dehydration)
- Lethargy and irritability are common, and vascular collapse can occur early

Isotonic Dehydration

- Combined water and sodium deficit (proportionate loss of water and salt)
- Symptoms less dramatic than in hypotonic dehydration (use estimated weight loss as a guide: 5% = mild dehydration, 10% = moderate dehydration, 15% = severe dehydration)

Hypertonic Dehydration

- Primarily due to a water deficit (more water than salt is being lost)
- May occur as a result of using high solute fluid as replacement, renal concentration with large free-water losses (diuretics), large insensible water losses (heat exposure), diabetes insipidus, infections, fever
- Typical symptoms include thick, doughy texture to skin (tenting is uncommon), tachypnea, intense thirst
- Shock is a very late manifestation

PHYSICAL EXAMINATION

- Assess for orthostatic hypotension if supine blood pressure appears normal (take supine blood pressure after the patient is lying for 5–10 minutes, then take the blood pressure as soon as the patient sits up or stands and again in this position after 2–3 minutes; a drop in systolic blood pressure ≥ 20 mm Hg or a drop in diastolic blood pressure ≥ 10 mm Hg from supine indicates orthostatic hypotension²⁷)
- Assess for orthostatic tachycardia (afebrile pulse > 100 beats/minute or a pulse change of 10–20 beats/minute with position change as described in the previous bullet)
- Check weight (acute weight loss can help define degree of dehydration)
- Estimate volume deficit – 1 L loss equals about 1 kg of weight (*see Table 1, “Physical Findings in Association with Degree of Dehydration”*)

Table 1 – Physical Findings in Association with Degree of Dehydration

Clinical Sign	Mild Dehydration	Moderate Dehydration*	Severe Dehydration*
Fluid loss (% of body weight)	< 6 %	6 % to 10 %	> 10 %
Radial pulse	Normal	Rapid, weak	Very rapid, feeble
Respiration	Normal	Deep	Deep, rapid
Systolic blood pressure	Normal	Low or orthostatic >10 mm Hg change	Very low or undetectable
Skin turgor	Retracts rapidly	Retracts slowly	Retracts very slowly
Eyes	Normal	Sunken	Very sunken
Mentation	Alert	Restless	Drowsy, comatose
Urine output	Normal	Scant	Oliguria
Voice	Normal	Hoarse	Inaudible

*If dehydration is moderate to severe, there may be associated electrolyte disturbances.

CONSIDERATIONS IN THE ELDERLY

- Present with nonspecific signs and symptoms
- Acute weight loss is the most specific finding (Note: elderly have lower total body water relative to weight, therefore there is a greater reduction in extracellular water volume with weight loss)
- There may be other explanations for findings that suggest hypovolemia (for example, dry mouth may be due to medications, muscle weakness associated with disuse and atrophy)
- At higher risk for hypernatremia due to impaired thirst stimulus and limitations to increased fluid intake due to immobility, impaired swallowing
- Elderly individuals at risk for volume depletion include:
 - female gender
 - age > 85 years
 - > 4 chronic conditions
 - > 4 medications
 - bedridden
 - laxative use
 - chronic infections

MANAGEMENT

Goals of Treatment

- Restore normal state of hydration
- Identify and rectify cause of dehydration

Nonpharmacologic Interventions

See “Shock” in the chapter “General Emergencies and Major Trauma”.

General Principles of Rehydration

Fluid therapy involves two components: maintenance (for ongoing fluid losses) and replacement (to correct water and electrolyte deficits)

- Be sure to calculate required fluid volume as: known losses (for example, urine output, emesis) + maintenance fluids + replacement fluids
- If client is eating, calculate fluid intake at 75% of total
- In hypotonic or isotonic dehydration, calculate total fluids (maintenance + replacement) for the first 24 hours, and give half this amount over the first 8 hours, and the other half over the next 16 hours
- In hypertonic dehydration, correct the fluid deficits slowly (over about 48 hours)
- Do not add potassium to intravenous (IV) line until urine output is established (diabetic ketoacidosis may be an exception, where correction of hyperglycemia and acidosis may lead to rapid development of hypokalemia)

The search for the underlying cause of the dehydration should be concurrent with rehydration therapy to prevent the re-emergence of dehydration from ongoing fluid losses.

Rehydration Methods**Oral**

- Oral rehydration therapy is the initial method of treatment unless oral intake is unfeasible or the volume of the deficit and the resulting severity of symptoms make IV therapy necessary
- Oral rehydration fluids are effective thus rehydration should be attempted in clients with adequate blood pressure who are able to take fluids orally
- Oral rehydration fluids should contain both sodium and sugar to maximize absorption of these two components

An oral rehydration solution can be made at home with table salt and sugar: 1 tsp (5 mL) salt, 8 tsp (40 mL) sugar (any form of raw sugar), 4 cups (1 L) water. Caution should be used when recommending this as there is potential for major mixing errors.²⁸ Commercially prepared solutions are also available (for example, Gastrolyte).

Intravenous

- Normal saline or Ringer’s lactate are the fluids of choice for rehydration
- Rapid infusion in patients with a history of cardiac failure or in the elderly may result in fluid overload

Maintenance²⁹

The requirement for maintenance fluids varies with the weight of the adult (*see Table 2, “Hourly Maintenance Fluid Requirements in Adults Weighing 20–80 kg (1 hour periods)”*). Various medical conditions will also affect these requirements (*see Table 3, “Conditions Modifying Daily Maintenance Fluid Requirements”*). Increase daily maintenance fluids by 100–150 mL/day for every degree Celsius body temperature above 37.0°C (oral). Maintenance fluids can be given intravenous or by mouth.

Table 2 – Hourly Maintenance Fluid Requirements in Adults Weighing 20–80 kg (1 hour periods)²⁹**Calculation**

- 4 mL/kg/hour for first 10 kg of body weight
- + 2 mL/kg/hour for the next 10 kg of body weight (over the initial 10 kg of body weight)
- + 1 mL/kg/hour for each kilogram over 20 kg of body weight

****Maximum of 120 mL/hour or 3000 mL a day needed for maintenance**

Examples

For 20 kg adult: (10 kg x 4 mL/kg/hour) + (5 kg x 2 mL/kg/hour) = 50 mL/hour = 50 mL/hour
 For 45 kg adult: (10 kg x 4 mL/kg/hour) + (10 kg x 2 mL/kg/hour) + (25 kg x 1 mL/kg/hour) = 85 mL/hour

Table 3 – Conditions Modifying Daily Maintenance Fluid Requirements²⁹

Requirements Increased	Requirements Decreased
Fever, sweating	Renal failure
Ongoing significant vomiting or diarrhea	Edematous states (for example, heart failure, cirrhosis)
Diabetes	Hypothyroidism
Burns	

Note: with a fever, daily maintenance fluids should be increased by 100–150 mL/day for every degree Celsius body temperature above 37.0°C (oral)

Replacement²⁹

Therapy is dependent on the amount of fluid lost.

No formula accurately estimates fluid deficit, unless the amount of weight lost is known. Clinical indicators, like blood pressure, skin turgor, mental status and urine output are used to estimate the volume lost. Replacement therapy depends on the extent of dehydration. To determine the degree of dehydration *see Table 1, “Physical Findings in*

Association with Degree of Dehydration.” These indicators are also used to monitor response and need for further fluid therapy.

The following guidelines will have to be modified in states of hypernatremia and hyponatremia to ensure no neurologic damage results.

Mild to Moderate Dehydration

- Administer 50–100 mL per hour orally, if possible, in addition to any continued losses (for example, emesis, urine output, diarrhea) and in addition to maintenance requirement (*see Table 2, “Hourly Maintenance Fluid Requirements in Adults Weighing 20–80 kg”*)
- Give fluid frequently and in small amounts
- Fluid intake in the first 24–48 hours should be enough to replace the initial deficit plus any ongoing loss of fluid through the GI and genitourinary tracts and the skin

Severe Dehydration

- Start 2 large-bore IV lines (16- or 18-gauge) with normal saline or Ringer’s lactate
- Give normal saline or Ringer’s lactate 20 mL/kg IV rapidly over 15 minutes as a bolus (infuse more slowly if cardiac failure risk and for older clients)
- Reassess for signs of continuing hypovolemic shock and cardiac and respiratory function
- If shock persists, continue to administer fluid in 500–1000 mL boluses, reassessing with each infusion
- Aim for pulse rate < 100 bpm, systolic blood pressure > 90 mm Hg and normal mental status
- Adjust IV rate according to clinical response (ongoing IV therapy is based on response to initial fluid resuscitation, continuing losses and underlying cause of dehydration)
- Consult physician as soon as possible after rehydration is initiated

Potassium

- For mild dehydration, potassium may not be required
- For moderate-to-severe dehydration caused by GI or renal losses, *potassium replacement* (for example, potassium chloride) *may be required*; consult a physician for an order

Monitoring and Follow-Up (h5)

Monitor hydration, general condition and vital signs frequently until stable. Follow up in 24 hours (sooner if oral intake is not keeping up with losses).

Referral

Medevac any client who:

- is moderately dehydrated (6% to 10% weight loss) if the blood pressure and mental status does not stabilize in the normal range within 1 hour of initiating rehydration therapy
- is severely dehydrated ($\geq 10\%$ weight loss)
- is elderly and has multiple medical problems
- is unable to tolerate fluids by mouth
- in whom bowel sounds are absent
- has abdominal tenderness or rebound tenderness
- has high fever and appears acutely ill

DIARRHEA^{30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52}

Episodes of frequent loose or liquid stool (may be of large or small volume).

- *Acute diarrhea*: lasting less than 14 days
- *Persistent diarrhea*: lasting more than 14 days
- *Chronic diarrhea*: lasting more than 30 days

Diarrhea is a symptom, not a diagnosis. A careful, in-depth, accurate history and physical examination are mandatory to establish the underlying cause. Acute diarrhea is usually caused by viral, bacterial or parasitic infection and is self-limited. Symptoms that persist beyond 14 days require further investigation for other causative factors.

CAUSES**Acute Diarrhea**⁵³

- Viral infection (most common cause): norovirus, rotavirus; in immunocompromised clients, cytomegalovirus, adenovirus and herpes simplex, hepatitis A
- Bacterial infection: *Campylobacter*, *Clostridium difficile* (*recent antibiotics and immunocompromise are risk factors*), *Escherichia coli*, *E. coli O157:H7*, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Yersinia*, *Clostridium perfringens*, *Bacillus cereus*, *Vibrio parahaemolyticus*
- Parasitic infection *Giardia lamblia*, *Cryptosporidia*, *Microsporidia*, *Isospora*, *Cyclospora*

Persistent or Chronic Diarrhea⁵⁴

- Osmotic diarrhea: magnesium, phosphate or sulphate ingestion, carbohydrate malabsorption
- Fatty diarrhea: malabsorption (short bowel syndrome, post-resection), maldigestion syndromes (pancreatic exocrine insufficiency)
- Inflammatory diarrhea: inflammatory bowel disease (ulcerative colitis, Crohn’s disease, diverticulitis), ischemic colitis, neoplasia
- Secretory diarrhea: medications (antibiotics, antacids, laxatives), disorder motility (irritable bowel syndrome, post-vagotomy), vasculitis, endocrine conditions (hyperthyroidism, diabetes mellitus), neoplasia, neuroendocrine tumours
- Other: factitious, overflow secondary to constipation

During “spring break-up” and in late summer, community outbreaks of *E. coli* diarrhea are common if water quality is poor. *E. coli* and parasites may also be involved if there has been recent travel. Botulism is a rare form of clostridial infection that releases botulinum toxin causing neurologic symptoms.

HISTORY

- Onset, frequency, duration and volume of loose, watery bowel movements
- Presence of blood, pus or mucus, melena, steatorrhea (fatty, greasy, bulky stool)
- Abdominal pain (possibly cramping)
- Association of symptoms to specific food ingestion
- Fecal incontinence (may be confused with diarrhea)
- Current or recently used medications, supplements, herbs, traditional medicines
- Recent travel
- Dietary and fluid intake in past 24 hours
- Recent intake of untreated water
- Associated symptoms: (for example, nausea or vomiting, fever, headache, thirst, light-headedness, joint pain, mouth ulcers)
- Decreased urine output (may be present if diarrhea is severe or prolonged)
- History of personal or family bowel disease (for example, inflammatory bowel disease, diverticulosis)
- Sexual history (may have proctitis, HIV infection)
- Recent hospitalization

If the client is passing bloody diarrhea, consider bacterial infection (*Shigella*, *Salmonella*, *E. coli* O157:H7), inflammatory or ischemic bowel disease.

PHYSICAL FINDINGS

- Temperature may be elevated (if cause is infectious or inflammatory bowel disease)
- Heart rate may be increased (if dehydration, fever or metabolic derangement)
- Weight loss (if dehydration or chronic)
- Blood pressure low if severely dehydrated
- Postural blood pressure drop if moderately dehydrated
- Client appears mildly to severely ill (depending on cause and severity)
- Mucous membranes may be dry
- Eyes may be sunken with dark circles underneath
- Skin may feel dry, turgor may be poor
- Jaundice of sclera, skin (hepatitis A)
- Abdomen may be slightly distended with gas
- Bowel sounds hyperactive
- Abdomen hyperresonant if excess gas is present
- Abdomen may be mildly tender in all areas
- Abdominal mass may be present (depending on underlying cause, for example, Crohn’s disease)
- Rectal exam (gentle) for tenderness (proctitis), masses, fecal impaction (causing overflow diarrhea)
- Perianal area may be inflamed or excoriated
- Neurologic symptoms of blurred vision, paresthesia, motor weakness (botulism)

DIFFERENTIAL DIAGNOSIS

- Viral infection
- Bacterial infection
- Parasitic infection
- Diet induced (for example, excess consumption of alcohol or fruit)
- Medication induced (for example, current or recent antibiotic use, laxatives, supplements)
- Irritable bowel syndrome
- Inflammatory bowel disease (Crohn’s colitis, ulcerative colitis, ischemic colitis)
- Fecal impaction with overflow diarrhea
- HIV or AIDS
- Malabsorption syndrome (for example, lactase deficiency)

See other “causes” (in “Diarrhea” section).

COMPLICATIONS

- Dehydration (*see “Dehydration (Hypovolemia)”*)
- Malabsorption (wasting, anemia)
- Fissure, fistula
- Rectal prolapse
- Hemorrhoids
- Systemic infection (sepsis)
- Hemolytic-uremic syndrome

DIAGNOSTIC TESTS

- Test stool for occult blood
- Test stool for culture and sensitivity, ova and parasites for severe disease, diarrheal symptoms for several days, history of inflammatory bowel disease, bloody diarrhea
- Stool for *C. difficile* if recent antibiotic therapy or hospitalization
- Test for HIV (in chronic diarrhea or if risk behaviours present)
- Blood cultures if suspected sepsis

MANAGEMENT**Goals of Treatment**

- Relieve symptoms
- Establish normal bowel function
- Prevent complications (for example, dehydration)
- Avoid complications of antidiarrheal medications (for example, constipation, toxic megacolon)

Appropriate Consultation

Consult a physician if the client is moderately or severely dehydrated or has bloody diarrhea.

Nonpharmacologic Interventions**Dietary Adjustments**

- Client may need to stop solid foods for a brief period (6 hours) if stool is frequent and watery or if vomiting occurs in association with diarrhea
- A combination of clear broths, oral rehydration solutions and a modest amount of hypotonic fluids (for example water, juices, soft drinks) may be the best strategy for managing acute diarrhea
- There is evidence that a lactose-free general diet will decrease the duration and severity of diarrhea (secondary lactose malabsorption is common following infectious enteritis)

- A normal diet should be resumed as soon as the patient can tolerate it. The BRAT diet (that is, bananas, rice, applesauce, toast) is no longer recommended as it does not provide adequate protein and caloric intake⁵⁵
- Client may consider avoiding coffee, alcohol, most high fibre fruits and vegetables, red meats and heavily seasoned foods initially
- For persistent or chronic diarrhea, a therapeutic trial of a lactose-restricted diet for 2 weeks may confirm lactose intolerance as a cause

Client Education

- Inform client that proper hand-washing prevents the spread of infection
- Teach client how to prevent recurrent diarrhea (by boiling drinking water for at least 20 minutes)
- Teach client to recognize symptoms and signs of dehydration and advise client to return to clinic if they occur
- If possible, temporarily discontinue any medications associated with diarrhea
- Witch-hazel cotton pads (Tucks) may provide relief of the raw perianal area

Fluid Therapy

Fluid therapy involves two components: maintenance (for ongoing fluid losses) and replacement (to correct water and electrolyte deficits).

Oral

- Oral rehydration fluid therapy is effective in treating acute diarrheal illness and should be used for clients with adequate blood pressure who are able to take fluids orally
- Elderly and debilitated clients in particular are at risk for dehydration, and early use of oral rehydration fluids is recommended
- Water, juices and soft drinks do not replace electrolytes because they are low in sodium. Too much of these hypotonic fluids can lead to hyponatremia
- Oral rehydration fluids should contain sodium, potassium and sugar to maximize absorption of these components
- An oral rehydration solution can be made at home with table salt and sugar: 1 tsp (5 mL) salt, 8 tsp (40 mL) sugar (any form of raw sugar), 4 cups (1 L) water. Caution should be used when recommending this as there is potential for major mixing errors.⁵⁶ Commercially prepared solutions are also available (for example, Gastrolyte)

Maintenance

The requirement for maintenance fluids varies with the weight of the adult (*see Table 2, "Hourly Maintenance Fluid Requirements in Adults Weighing 20–80 kg" under "Dehydration"*). Various medical conditions will also affect these requirements (*see Table 3, "Conditions Modifying Daily Maintenance Fluid Requirements" under "Dehydration"*). Increase daily maintenance fluids by 12% for every degree Celsius body temperature above 37.5°C (rectal). Maintenance fluids can be given intravenous or by mouth.

Replacement²⁹

Therapy is dependent on the amount of fluid lost. No formula accurately estimates fluid deficit, unless the amount of weight lost is known. Clinical indicators, like blood pressure, skin turgor, mental status and urine output are used to estimate the volume lost. Replacement therapy depends on the extent of dehydration. To determine the degree of dehydration *see Table 1, "Physical Findings in Association with Degree of Dehydration"*. These indicators are also used to monitor response and need for further fluid therapy.

The following guidelines will have to be modified in states of hypernatremia and hyponatremia to ensure no neurologic damage results.

Mild to Moderate Dehydration

Administer 50–100 mL per hour orally, if possible, in addition to any continued losses (for example, emesis, urine output, diarrhea) and in addition to maintenance requirement (*see Table 2, "Hourly Maintenance Fluid Requirements in Adults Weighing 20–80 kg" under "Dehydration"*)

- Give fluid frequently and in small amounts
- Re-evaluate the client frequently for responses to therapy
- Fluid intake in the first 24–48 hours should be enough to replace the initial deficit plus any ongoing loss of fluid through the GI and genitourinary tracts and the skin

Severe Dehydration

- Start 2 large-bore IV lines (16- or 18-gauge) with normal saline or Ringer's lactate
- Give normal saline or Ringer's lactate 20 mL/kg IV rapidly over 15 minutes as a bolus (infuse more slowly if cardiac failure risk and for older clients)

- Reassess for signs of continuing hypovolemic shock, and cardiac and respiratory function
- If shock persists, continue to administer fluid in 500–1000 mL boluses and reassess with each infusion
- Aim for pulse rate < 100 bpm, systolic blood pressure > 90 mm Hg and normal mental status
- Adjust IV rate according to clinical response (ongoing IV therapy is based on response to initial fluid resuscitation, continuing losses and the underlying cause of dehydration)
- Consult physician as soon possible after intravenous rehydration is initiated

Pharmacologic Interventions

Control nausea and vomiting if significant:

dimenhydrinate (Gravol), 25–50 mg IM as a single dose, then 50 mg PO q4-6h prn

Antidiarrheals may help to relieve symptoms:

loperamide hydrochloride (Imodium), 4 mg to start, then 2 mg after each loose bowel movement to a maximum of 16 mg/day, then 2–4 mg bid

Antispasmodics may help relieve abdominal cramping:

hyoscine butylbromide (Buscopan), 20 mg IM/IV, then 10 mg PO 3–4 times daily

Monitoring and Follow-Up

Monitor hydration, general condition and vital signs frequently until stable. Follow up in 24 hours (sooner if oral intake is not keeping up with losses).

Referral

Refer the stable client with persistent or chronic diarrhea to a physician as soon as possible for evaluation.

Consider medevac for any client who:

- is moderately dehydrated (6% to 10% weight loss) if his or her heart rate and/or blood pressure does not stabilize in the normal range within 1 hour of initiating rehydration therapy
- is severely dehydrated ($\geq 10\%$ weight loss)
- is elderly and has multiple medical problems
- is unable to tolerate fluids by mouth
- in whom bowel sounds are absent
- has abdominal tenderness or rebound tenderness
- has high fever and appears acutely ill

DIVERTICULAR DISEASE^{57,58,59,60,61,62,63,64}

Diverticular disease encompasses diverticulosis (*see* “*Diverticulosis*”) and the complications of diverticular hemorrhage, diverticulitis (*see* “*Diverticulitis*”) and the associated secondary complications of perforation, abscess, fistula and obstruction.

DIVERTICULUM (PL. DIVERTICULA)

The most common colonic diverticula are pseudodiverticula, which are herniations of the mucosa and submucosa through the muscularis at the sites of penetration of nutrient arteries. Most occur in the sigmoid and descending colon.

Diverticular Bleeding

Hemorrhage results from progressive injury and weakness of the artery supplying the segment of bowel that has herniated, predisposing the artery to rupture and bleeding into the lumen (*see* “*Lower Gastrointestinal Bleeding*” in the section “*Emergencies of the Gastrointestinal System*”).

DIVERTICULITIS

Inflammation and infection in one or more diverticula. Often involves the sigmoid colon.

Micro or macroperforation of the diverticular wall due to increased pressure from inspissated food particles or increased intraluminal pressure. Small perforations are frequently mild and resolve spontaneously, however if not well contained, a localized abscess may form. Complications of fistula formation with adjacent tissues, obstruction, larger perforation and peritonitis may develop.

HISTORY

- Abdominal pain (left lower quadrant most common) may present acutely, but more often develops over hours to days
- Fever and chills
- Anorexia
- Nausea and vomiting
- Dysuria if inflammation adjacent to bladder

PHYSICAL FINDINGS

- Fever
- Tachycardia
- Abdominal tenderness to palpation with possible rebound tenderness
- Palpable mass may be present, representing an abscess or inflammatory phlegmon
- Bowel sounds may be active if there is partial obstruction, or hypoactive or absent if peritonitis has developed
- Rectal exam may help to localize the abscess or inflammatory mass

DIFFERENTIAL DIAGNOSIS

- Appendicitis
- Inflammatory bowel disease
- Ischemic colitis
- Colon cancer
- Other causes of bowel obstruction
- Urologic or gynecologic disorders

COMPLICATIONS

- Abscess
- Perforation
- Fistula into bladder, vagina or abdominal wall Peritonitis
- Sepsis

DIAGNOSTIC TESTS

- Test stool for occult blood
- Perform urinalysis

MANAGEMENT

Goals of Treatment

- Rest the bowel
- Relieve symptoms
- Prevent complications

Appropriate Consultation

Consult a physician.

Nonpharmacologic Interventions

- Nothing by mouth

Adjuvant Therapy

- Start IV therapy with normal saline to maintain hydration in client with moderate to severe symptoms
- Insert nasogastric tube if upon consultation a physician supports its use

Pharmacologic Interventions

- Broad-spectrum antibiotics such as ciprofloxacin with metronidazole are used; consult a physician before starting IV antibiotics
- Antibiotics should be continued for 7–10 days

Referral

Medevac. Surgery may be required if there is peritonitis, with or without evidence of perforation, unresolved obstruction or development of a fistula. Other indications for surgical intervention are failure to improve after several days of medical treatment and recurrence after successful treatment.

DIVERTICULOSIS

Presence of multiple diverticula. Does not imply a pathologic condition.

HISTORY

- Risk factors:
 - low intake of dietary fibre
 - age (prevalence of 5% at age 40, 30% by age 60)
 - lack of exercise
- Most people with colonic diverticula are asymptomatic (70%)
- If symptomatic, clients may describe:
 - cramping (usually in left lower abdomen)
 - bloating
 - flatulence
 - irregular defecation (constipation, diarrhea)
- May be difficult to differentiate symptoms from those of irritable bowel syndrome
- Earlier onset of diverticular disease is found in those with connective tissue disorders (for example, Marfan's syndrome) and in polycystic kidney disease
- Often found as an incidental finding during other investigations

PHYSICAL FINDINGS

- May have no findings of significance
- Tenderness may be present
- Firm, feces-filled sigmoid colon in the left lower abdomen (suggests constipation)
- Rectal exam may reveal firm, guaiac-negative stool

DIFFERENTIAL DIAGNOSIS

- Irritable bowel syndrome
- Diverticulitis
- Colon cancer
- Inflammatory bowel disease
- Urologic or gynecologic disorder

DIAGNOSTIC TESTS

- Tests may not be indicated if symptoms are mild and the client is otherwise healthy
- If symptoms are more severe or if the client has occult blood in stool, weight loss or other symptoms of concern, a complete blood count should be obtained
- Consult a physician about sigmoidoscopy, barium enema or colonoscopy

MANAGEMENT

- Similar to irritable bowel syndrome (IBS)
- Recommend high-fibre diet
- Recommend avoidance of cathartic laxatives

Nonpharmacologic Interventions

- Recommend dietary modifications (for example, regular meals, gradual increase of fibre)
- Recommend increase in fibre content of diet (for example, raw bran, brown bread, popcorn, All Bran, Puffed Wheat or Shredded Wheat cereal); when raw (miller's) bran is used, start with a small amount and increase gradually to ¼ to ½ cup daily to avoid bloating and flatulence
- Recommend avoidance of foods that are known to cause symptoms (these vary from person to person)
- Recommend that client consume an adequate amount of fluid when using bulking agents
- Recommend elimination of nicotine and codeine-containing drugs

Pharmacologic Interventions

Suggest a stool-bulking agent:

psyllium (Metamucil), 1–2 tsp (5–10 mL) orally
two or three times daily with 8 oz (250 mL) fluid

The patient can obtain Metamucil with a prescription through an NIHB pharmacy provider.

Monitoring and Follow-Up

- Follow up in 1–2 weeks
- Adjust the dose of fibre depending on response
- Use less fibre temporarily if gas and bloating are prominent
- Use more fibre if there has been little clinical response

Referral

Refer to a physician if concerned that symptoms or signs are caused by something other than organic bowel disease or if symptoms do not improve with management.

DYSPEPSIA

Dyspepsia describes a variety of symptoms from the upper gastrointestinal tract. The most common patterns of dyspepsia include:

Reflux-like dyspepsia symptoms include:

- heartburn
- regurgitation of stomach contents
- retrosternal burning

Ulcer-like or acid dyspepsia characterized by symptoms of:

- burning sensation in the epigastric area
- hunger-like pain with food
- relief with antacid and/or antisecretory medications

Indigestion called functional dyspepsia which is defined under the Rome III criteria as:

- a sensation of fullness after eating that causes discomfort (postprandial distress syndrome)
- the inability to eat a normal meal (early satiation)
- epigastric burning or pain (epigastric pain syndrome – occurs between the lower end of the sternum to umbilicus)

ALARM SYMPTOMS AND SIGNS^{65,66}

These symptoms are all indications for which a prompt diagnostic endoscopy is appropriate:

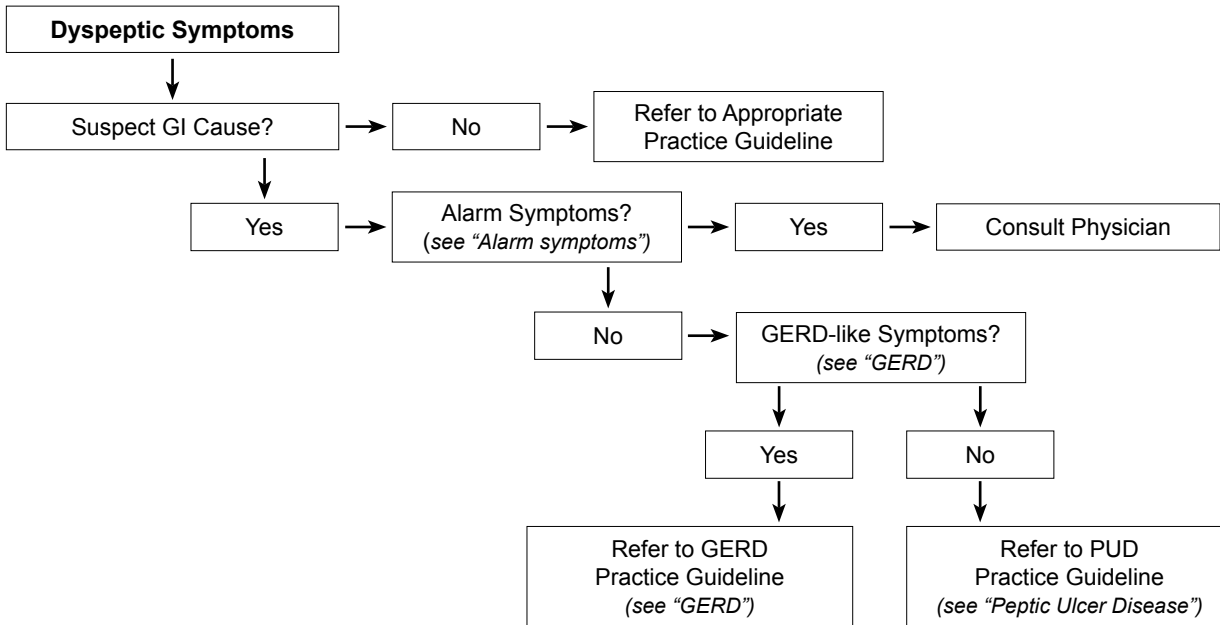
- Any persistent dyspepsia in patient aged over 55 years with recent (less than 1 year) onset of dyspepsia of at least 4 weeks' duration
- Unexplained weight loss (more than 3 kg or > 10 % body weight)
- Unexplained iron deficiency anemia
- Gastrointestinal bleeding
- Progressive dysphagia and odynophagia
- Previous gastric surgery
- Persistent vomiting
- Epigastric mass
- Previous esophagogastric malignancy
- Suspicious barium meal
- Previous peptic ulcer
- Epigastric pain severe enough to hospitalize patient
- Early satiety
- Family history of gastrointestinal cancer
- Lymphadenopathy

CAUSES

The most common disorders that may cause dyspepsia symptoms include:

- Gastroesophageal reflux
- Peptic ulcer disease
- Biliary pain
- Alcohol/drug induced gastritis/gastropathy
- Diabetic gastroenteropathy
- Irritable bowel syndrome

There may be significant overlap of symptoms, thus determining the cause of dyspepsia without investigation can be difficult. Nonetheless, a thorough history will aid in identifying the possible cause and taking appropriate action (*see "Dyspepsia Algorithm"*).

DYSPEPSIA ALGORITHM**GALLBLADDER DISEASE**^{61,67,68,69,70,71,72,73,74,75,76,77}

Gallbladder disease includes asymptomatic gallstones, biliary colic, cholecystitis, choledocholithiasis and cholangitis.

CAUSES

Cholelithiasis is the presence of gallstones within the gall bladder. Most gallstones (60% to 80%) are asymptomatic. Small stones are more likely to be symptomatic than large ones.

Biliary colic usually results from the gallbladder contracting and pressing a stone against the gallbladder outlet or cystic duct opening causing increased intragallbladder pressure and pain. Over time, the gallbladder relaxes and the stone drops back, resolving the symptoms. Multiple episodes of biliary colic, particularly in relation to large or heavy meals are common. Similar symptoms may occur from microlithiasis or thick bile called biliary sludge.

Choledocholithiasis occurs when the stones become lodged in the common bile duct; from this, cholangitis, ascending cholangitis or acute pancreatitis may occur.

Cholecystitis is inflammation of the gallbladder caused by obstruction of the cystic duct, usually by a gallstone (calculous cholecystitis). The inflammation may be sterile or bacterial. The obstruction may be acalculous (usually in the critically ill) or caused by sludge.

Cholangitis develops when biliary duct obstruction creates bile stasis, providing a medium so that bacteria can track up from the duodenum. The high pressure in the blocked duct promotes migration of the bacteria into the blood stream causing a systemic infection.

Previous cholecystectomy or absence of gallstones does not rule out biliary colic as stones may form within the bile ducts giving rise to similar symptoms.

RISK FACTORS

- Cholelithiasis is more common in women (though men have a higher rate of cholecystitis)
- Increasing age (adolescents and young adults have the same risk factors and can develop gallbladder disease)
- Family history of gallstones
- Obesity
- Pregnancy (unknown if women who are pregnant or have multiple pregnancies are more likely to have gallstones or if they simply have more symptoms of the stones)
- Medications that contribute to cholelithiasis include estrogen and oral contraceptives, clofibrate, ceftriaxone and octreotide
- Conditions that promote gallbladder stasis (diabetes mellitus, total parenteral nutrition, vagotomy, somatostatinoma, spinal cord injury, cirrhosis, hemolytic anemias, hypertriglyceridemia, terminal ileal resection)

- Reduced activity (men)
- Rapid weight loss (illness, very low calorie diet, surgical therapy for morbid obesity)

Considerations in the Elderly

- Have a higher rate of cholelithiasis due to increased age
- May have asymptomatic gallstones
- More likely to have serious complications, particularly in the absence of biliary colic symptoms

HISTORY

Onset of symptoms is usually sudden and constant. The client may describe symptoms in association with fatty meals or nighttime onset of pain. They may also describe similar episodes in the past. The client may be aware that they have gallstones. Indigestion, belching, bloating and intolerance of fatty food are thought to be typical symptoms of gallstones; however, these symptoms are just as common in people without gallstones.

Most patients experience symptoms before complications occur, the exception being the elderly who may present with acute complications in the absence of biliary colic symptoms. Clients presenting with unremitting pain beyond 6 hours or fever are at risk for complications of cholecystitis. A thorough history with an in-depth symptom inquiry and careful physical examination is important to identifying clients at risk for complications.

Biliary Colic

- 1–6 hours of constant epigastric and/or right upper quadrant pain that is often described as dull, boring or pressure-like
- Usually, intensity varies from mild at onset building to a the maximum intensity within the first hour, then resolves within 6 hours
- Pain may radiate to the right scapular region or back
- Onset of pain often occurs hours after a meal
- Night onset of pain is common and may wake the client from sleep
- Pain is unchanged by movement, though the client may change position frequently in search of relief
- Antacids, flatus and bowel movements do not provide relieve
- Associated symptoms include nausea, vomiting, diaphoresis, pleuritic pain (Note: unremitting, severe epigastric pain with vomiting may indicate an acute pancreatitis from a gallstone obstructing the pancreatic duct)
- NSAIDs or opioid analgesics may provide some relief

Cholecystitis

- Present with symptoms of biliary colic that persists beyond 6 hours and may have been present for days
- Pain may be more severe than in previous episodes of biliary colic
- Nausea, vomiting and anorexia are more common with cholecystitis
- Low-grade fever
- Elevated white blood cell count (may also be normal)
- Jaundice (< 20% of patients)

Cholangitis

- Fever
- Jaundice
- Severe right upper quadrant pain
- Hypotension and confusion if the illness has progressed to systemic infection

PHYSICAL FINDINGS

- Vitals signs parallel the degree of illness
- Clients with biliary colic have relatively normal vital signs
- Tachycardia and fever present with cholangitis, may also be present with cholecystitis
- Hypotension may present in clients with cholangitis
- Voluntary/involuntary guarding
- Fever may be absent, especially in elderly clients
- Jaundice (due to choledocholithiasis, cholecystitis, cholangitis)

ABDOMINAL EXAMINATION IN GALLBLADDER COLIC AND CHOLECYSTITIS

- Epigastric or right upper quadrant tenderness
- Murphy's sign (an inspiratory pause on palpation of the right upper quadrant; specific but not sensitive for gallbladder disease)
- Guarding on palpation
- Peritoneal signs of rebound tenderness in the right upper quadrant (with cholecystitis, cholangitis)
- Palpable gallbladder or fullness in the right upper quadrant may be palpated

As in anyone with abdominal pain, a complete physical examination must be performed (including rectal and pelvic examinations in women). In elderly and diabetic clients, occult cholecystitis or cholangitis may be the source of fever, sepsis or changes in mental status.

DIFFERENTIAL DIAGNOSIS

- Appendicitis
- Acute bowel obstruction
- Ascending cholangitis
- Cholelithiasis
- Esophageal conditions (esophageal spasm, esophagitis)
- Diverticular disease
- Gastroenteritis
- Gastritis
- Hepatitis
- Inflammatory bowel disease
- Mesenteric ischemia
- Pancreatitis
- Peptic ulcer disease
- Viscus perforation
- Abdominal abscess
- Aortic aneurysm
- Cardiac disease (myocardial ischemia, myocardial infarction, angina, pericarditis)
- Right sided pneumonia
- Complications of pregnancy (eclampsia, ruptured ectopic pregnancy, hyperemesis gravidarum)
- Right kidney disease (calculus, pyelonephritis, polycystic disease, tumour)

COMPLICATIONS

- Cholelithiasis (stones descending into the biliary and pancreatic ducts)
- Cholecystitis
- Pancreatitis (due to gallstone blocking pancreatic duct)
- Cholecystofistula (fistula between perforated gallbladder and duodenum or jejunum)
- Gallstone ileus (due to gallstone obstruction of a cholecystofistula)
- Gallbladder perforation
- Gangrenous gallbladder
- Emphysematous cholecystitis (due to infection from gas-producing organisms)
- Peritonitis
- Cholangitis
- Septic shock
- Abscess

DIAGNOSTIC TESTS

The choice of laboratory tests will depend on whether the client is well enough to be treated as an outpatient or requires a more in-depth laboratory investigation in the hospital. The results of lab tests should be completely normal if the client has cholelithiasis or gallbladder colic. Elevation of liver function tests indicates complications within the biliary system.

- Complete blood count with differential and liver function tests (LFTs) levels (alanine aminotransferase [ALT] aspartate aminotransferase [AST], bilirubin and alkaline phosphate [ALP]) may be helpful in the diagnosis of cholecystitis and cholangitis
- Choledocholithiasis may cause elevation of ALP and a significant rise in the AST and ALT
- An elevated bilirubin > 3.5 µmol/L and elevated alkaline phosphatase may indicate a stone in the common bile duct or ascending cholangitis
- Cholecystitis may cause elevation of the WBC and mild rise in the ALP, AST and ALT, though there may be no appreciable change
- Mild elevation of amylase (to up to 3 times normal level) may be present in cholecystitis, especially if there is gangrene
- Cholangitis causes a rise in the WBC with an increase in bands on the differential, as well as elevation of liver function tests
- Elevated lipase is indicative of pancreatitis
- In febrile clients, blood cultures should be drawn prior to antibiotic therapy if possible
- Urinalysis
- Pregnancy test for women of childbearing age
- Abdominal ultrasound, upon consultation a physician

MANAGEMENT

Uncomplicated presentations of biliary colic may be managed without medical evacuation. Research has demonstrated that nonsteroidal anti-inflammatory (NSAID) medication is equivalent to narcotics for pain management. Patients who have received NSAIDs also have a lower likelihood of progressing to cholecystitis⁷⁸

Appropriate Consultation

Clients with pain that does not resolve within 6 hours require consultation and further medical evaluation for complications of gallbladder disease or other underlying medical conditions. Severe pain unresponsive to usual therapy, fever, hypotension

or peritoneal signs are also indicators for consultation. Clients presenting with severe unremitting, gnawing constant right upper quadrant/epigastric pain with/without radiation to the back and nausea and vomiting may have pancreatitis (*see “Pancreatitis” in the section “Emergencies of the Gastrointestinal System”*).

BILIARY COLIC

Goals of Treatment

- Relieve pain, nausea and vomiting
- Prevent complications

Appropriate Consultation

Consult physician if pain does not resolve within 6 hours, if fever develops or if significant vomiting continues, as these symptoms indicate that a complication may be developing.

Nonpharmacologic Interventions

- Bed rest
- Clear fluids if vomiting

Client Education

- Explain disease process and prognosis
- Counsel client about appropriate use of medications (dose, frequency)
- Recommend low-fat food as tolerated, once pain resolves

Pharmacologic Interventions

Analgesia

ketorolac 30 mg IM q6h as needed (maximum 120 mg/24 hours). Not for use in those with an active peptic ulcer or recent GI bleed.

If not responding, renal impairment or allergy/intolerance:

morphine 5–10 mg IM or SC q3–4h as needed

Antiemetics to relieve nausea and vomiting:

dimenhydrinate (Gravol), 25–50 mg IM q4–6h as needed

Monitoring and Follow-Up

Monitor for a few hours. When nausea and vomiting have resolved, push clear fluids. Follow-up in 24 hours is recommended. Clients without renal or gastrointestinal risk may use ibuprofen 400 mg orally at the onset of pain with future attacks.

Referral

The risk of complications from gallstones within 2 years of the first incident of biliary colic is about 70%. Refer the client as soon as possible to a physician for abdominal ultrasound if there is no history of gallstones or if there is new onset of biliary colic with known asymptomatic gallstones.

CHOLECYSTITIS OR CHOLANGITIS

Goals of Treatment

- Relieve pain, nausea and vomiting
- Prevent complications

Appropriate Consultation

Suspected cholecystitis or cholangitis requires consultation with a physician and possible medical evacuation.

Adjuvant Therapy

- IV therapy with normal saline, rate adjusted according to age, state of hydration and pre-existing medical problems
- Oxygen, if client is unstable on presentation
- Two large-bore IV lines and administration of IV fluids to unstable clients
- Draw aerobic and non-aerobic blood cultures for febrile clients (prior to administering antibiotics)
- Insert nasogastric tube if upon consultation a physician supports its use. Attach to straight drainage

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth

Pharmacologic Interventions

Analgesia

Several recent studies have shown that early pain control in patients with abdominal pain does not hinder the diagnosis. Therefore, pain control should be given early, without waiting for the diagnosis or surgical consult.⁷⁹

ketorolac 30 mg IM q6h as needed (maximum 120 mg/24 hours)

If not responding, renal impairment or allergy/intolerance:

morphine 5–10 mg IM or SC q3–4h as needed

Antiemetics to relieve nausea and vomiting:

dimenhydrinate (Gravol), 25–50 mg IM q4–6h
as needed

Antibiotics

For uncomplicated cholecystitis, where inflammation is the primary process, prophylactic antibiotics are usually given to prevent secondary bacterial infection from bile stasis although evidence of benefit is lacking. If the client is febrile, antibiotic therapy with more broad-spectrum coverage is usually initiated.

Prophylactic therapy:

cefazolin 1 g IV every 8 hours

or

ampicillin 2 g IV every 6 hours

and

metronidazole (Flagyl), 500 mg IV q12h

Monitoring and Follow-Up

Monitor pulse oximetry, vital signs (frequent), blood glucose, intake and output.

Severe cholecystitis can evolve into sepsis, cholangitis or death, especially in diabetic or elderly clients in whom the diagnosis may be delayed.

Referral

Medevac as soon as possible; surgical consult is required.

GASTROESOPHAGEAL REFLUX DISEASE (GERD)^{80,81,82,83,84,85,86,87,88,89,90,91}

Reflux of gastric contents into the esophagus, which results in esophageal irritation or inflammation.

CAUSES

Presence of acidic stomach contents in the esophagus due to laxity of the lower esophageal sphincter.

Predisposing Factors

- Obesity
- Pregnancy
- Estrogen therapy
- Medications (for example, nitrates, anticholinergics, calcium channel blockers)
- Tobacco use
- Alcohol use
- Genetic factors

- Defective esophageal clearance
- Hypersecretion of gastric acid
- High-fat diet
- Concomitant hiatus hernia and diabetes
- Delayed gastric emptying

HISTORY

- Heartburn, most often after eating
- Retrosternal burning sensation radiating upward (may radiate as far up as the throat)
- Acidic stomach contents may be regurgitated
- Disturbed sleep from symptoms
- Dry cough at night
- Associated symptoms may include:
 - cough, sore throat, hoarseness, wheezing
 - difficulty swallowing (from erosive esophagitis or narrowing of esophagus)
 - painful swallowing (from esophageal ulcer)
 - nausea
 - hypersalivation (water brash)
 - night cough, night awakenings due to pain
 - globus sensation (feeling of something stuck in throat)
- Aggravating factors may include:
 - large meals, lying down and bending over
 - certain foods (common irritants include caffeine, chocolate, alcohol, peppermint, fatty foods)
 - tight-fitting clothes
 - increased perception of symptoms with stress
- Alleviating factors may include:
 - relief with antacids, gum chewing
 - sitting up, lifting head of bed
 - avoidance of certain foods or beverages to limit symptoms

Clients who complain about heartburn and/or regurgitation at least twice weekly are considered to have gastroesophageal reflux disease (GERD) unless they have additional symptoms or a trial of therapy for ERD has failed.

PHYSICAL FINDINGS

Assess weight. Mild epigastric tenderness may be present.

DIFFERENTIAL DIAGNOSIS

- Peptic ulcer disease
- Esophageal motility disorder

- GI bleeding
- Esophageal tumour
- Esophagitis (pill esophagitis, infectious esophagitis, eosinophilic esophagitis)
- Anginal/cardiac pain
- Medication-induced epigastric pain
- Biliary pain
- Pancreatitis
- Gastritis

COMPLICATIONS

- Barrett's esophagus (pre-malignant mucosal changes due to chronic GERD, most common over age 50)
- Esophagitis/esophageal ulcer
- Esophageal stricture
- Nocturnal aspiration (choking, cough, asthma, recurrent pneumonitis)
- Posterior laryngitis, chronic hoarseness
- Dental erosions
- Chronic sinusitis
- Pharyngitis
- Subglottic stenosis
- Laryngeal/esophageal cancer

DIAGNOSTIC TESTS

- Test stool for occult blood
- Measure hemoglobin level
- Test for *H. pylori* (by serology or breath test, which must be ordered by a physician)

MANAGEMENT

The severity of GERD cannot be determined by symptom presentation, though dysphagia may indicate erosive esophagitis or esophageal ulceration due to reflux. Any symptoms of dysphagia need urgent consultation and investigation.

Goals of Treatment

- Relieve symptoms, especially heartburn
- Promote healing of the esophagus
- Prevent complications such as stricture, bleeding, Barrett's esophagus
- Prevent recurrence

Appropriate Consultation

Consult a physician if the following alarm symptoms are detected:

- Weight loss due to severity or duration of symptoms
- Difficult or painful swallowing
- Sticking of solids or liquids in esophagus area
- Persistent vomiting
- Pain radiating to back, neck, jaw, left arm or shoulder
- Anemia
- Active gastrointestinal bleeding (black stools, hematemesis) (*see "Gastrointestinal Bleeding (Upper and Lower)" in the section "Emergencies of the Gastrointestinal System"*)
- Stool positive for occult blood

Nonpharmacologic Interventions

- Elevate the head of the bed 15 cm (6 in) using wooden blocks
- Encourage weight loss (if weight > 20% of ideal body weight for age and sex)
- Eliminate (when possible) drugs that impair esophageal motility and lower esophageal sphincter tone (for example, calcium channel blockers, beta-blockers, tricyclic antidepressants, anticholinergics, theophyllines)

Client Education

- Counsel client about appropriate use of medications (dose, frequency)
- Recommend:
 - dietary modifications (decrease or eliminate coffee, tea, chocolate, nicotine, alcohol and fatty foods)
 - smoking cessation (decreases salivation)
 - small, frequent meals to prevent over-distention of the stomach
 - avoidance of eating large meals/snacks 2-3 hours before bedtime
 - postural modifications (daytime and nocturnal) to prevent acid from entering the esophagus (elevate head of bed 15 cm [6 in] using blocks)
 - client avoid bending at the waist (especially after meals), as well as lying down immediately after a meal
 - avoidance of tight-fitting clothing

Pharmacologic Interventions

Clients with frequent symptoms (> 3 days per week) would benefit from acid repression therapy (H₂-receptor antagonist [H₂RA] or proton pump inhibitors [PPI]) to provide more effective relief of symptoms than antacids. Proton pump inhibitors such as Losec are used to treat moderate to severe or refractory GERD. They are more effective for healing esophageal ulceration and maintaining remission of symptoms from GERD.

If symptoms occur less than 3 times per week:

Antacids as needed to control symptoms:

aluminum hydroxide/magnesium hydroxide (Maalox, Alumag), 30 mL orally after meals and before bed, increase as needed

or

H₂-receptor antagonists:

ranitidine (Zantac), 150 mg orally twice daily

In elderly clients and those with reduced renal function, the doses should be one-half to one-quarter the usual doses.

If symptoms occur 3 or more times per week, or if no response to antacids and lifestyle modification within 4 weeks, in consultation with the physician or nurse practitioner consider proton pump inhibitor therapy (PPI).

rabeprazole sodium (Pariet), 20 mg orally daily for 4 weeks

Monitoring and Follow-Up

Monitor every 4 weeks. Continue therapy to which client is responding for 8–12 weeks. Reassess for symptom relapse in 4–8 weeks when therapy complete. If symptoms recur, resume previous therapeutic regimen and refer client to physician.

Referral

Refer to a physician any client with:

- refractory symptoms not controlled with initial therapy after 8–12 weeks
- atypical chest pain
- chronic reflux and over 55 years of age
- symptoms suggesting complications of GERD:
 - cough, sore throat, hoarseness, wheezing
 - night cough, night awakenings due to pain

HEMORRHOIDS^{92,93,94,95,96,97}

Blood vessels beneath the anal canal mucosa (internal) and perianal skin (external) that have become engorged.

CAUSES

- Advancing age (most common ages 45–65)
- Late pregnancy
- Chronic straining at bowel movements
- Constipation (may be drug related), repeated passage of hard stool
- Prostatic enlargement with chronic straining to urinate
- Prolonged sitting

HISTORY

Assess for symptoms suggestive of other underlying bowel pathology

External Hemorrhoid

- Tendency to thrombose
- Soft skin tags may be present (indicates previous thrombosed hemorrhoids)
- Discomfort or irritation frequently present
- Painful if thrombosed
- Palpable perianal lump

Internal Hemorrhoid

- Bright red bleeding with bowel movements
- Blood on stool surface only, not mixed in with stool; often seen on toilet tissue
- Pain, pressure, mucus production with prolapsed hemorrhoids (may feel pressure or tissue “sticking out of rectum”)
- May indicate inability to push hemorrhoid back inside
- Prolapsed hemorrhoids may strangulate or incarcerate

Internal hemorrhoids may be graded by history:

Grade I – bleeding without prolapse

Grade II – prolapse with spontaneous reduction

Grade III – prolapse with manual reduction

Grade IV – incarcerated, irreducible prolapse

Grade I and II hemorrhoids are often successfully treated with conservative medical treatment. Grade III and Grade IV hemorrhoids may require surgery.

PHYSICAL FINDINGS

To examine anal area, have client lie on left side with the knees drawn up to the chest; retract the buttocks.

- Both internal and external hemorrhoids may be present
- Usually located in left lateral, right anterior and right posterior positions
- Internal hemorrhoids covered by thin, pink anal mucosa are not readily palpable (internal palpable masses/lumps need referral for further investigation)
- External hemorrhoids covered by skin (Note: a thrombosed external hemorrhoid is a bluish purple, globular, irreducible, tender lump at the edge of the anus)
- Typically 1 to 3 swellings around anal opening, the size of a finger tip; pink, purple or blue in colour
- Rectal examination may reveal concealed internal hemorrhoids
- Assess whether prolapsing hemorrhoids are easily reducible
- Anal fissure may also be present (found in 20% of patients with hemorrhoids)

DIFFERENTIAL DIAGNOSIS

- Rectal polyp or prolapse
- Skin tag(s)
- Anal warts
- Other causes of pruritus ani and perianal dermatitis
- Perianal or perirectal abscess
- Anal fissure
- Complicated hemorrhoid (thrombosed, prolapsed, incarcerated)
- Crohn's disease
- Tumour of the rectum or sigmoid colon

COMPLICATIONS

- Thrombosed or strangulated internal hemorrhoid
- Thrombosed external hemorrhoid
- Bleeding (may drip, bleed briskly or squirt)
- Ulceration of overlying skin
- Stool incontinence

DIAGNOSTIC TESTS

- Stool may test positive for occult blood

MANAGEMENT**Goals of Treatment**

- Relieve symptoms
- Keep anal region clean
- Promote easy passage of stool on a regular basis

Appropriate Consultation

Contact a physician as soon as possible if unable to reduce a prolapsed internal hemorrhoid, or if there is an acutely thrombosed, bleeding or ulcerated hemorrhoid.

Nonpharmacologic Interventions

- Gently try to reduce painful prolapsed internal hemorrhoid. Apply a topical anesthetic (for example, lidocaine [Xylocaine] jelly 2%), wait 15 minutes, then gently try to reduce it. Do not use force!
- Warm sitz baths 3 or 4 times daily for 15–20 minutes followed by gentle drying of the skin to cleanse the area, soothe local irritation and relax the anal sphincter

Client Education

- Instruct client to gently reduce (push back up) painless prolapsed internal hemorrhoid(s)
- Instruct client to cleanse the perianal area after each bowel movement with plain water, salt water or medicated witch-hazel cotton pads (Tucks), and dry area well
- Counsel client about appropriate use of medications (dose, frequency, dangers of overuse)
- Teach client proper perianal hygiene and to avoid sitting on toilet for prolonged periods
- Instruct client to return to clinic for reassessment if severe pain or bleeding develops (incision drainage of thrombosed external hemorrhoid may be required)
- Instruct client to apply an ice pack (20 minutes on, 20 minutes off) to help reduce swelling and pain if a thrombosed hemorrhoid is suspected
- Advise client to increase dietary fibre and fluids

Pharmacologic Interventions

Relief of Local Pain/Irritation

For mildly sore and edematous “inflamed” external hemorrhoid, treat with hemorrhoidal ointments or suppositories without corticosteroids (ointments are better):

zinc sulfate 0.5% ointment or suppository (for example, Anusol) every morning and evening and after each bowel movement for 3–7 days

For perianal dermatitis, hemorrhoidal ointment with corticosteroids (for anti-inflammatory properties) may be used to reduce itch and discharge:

zinc sulfate 0.5% with hydrocortisone 0.5% ointment (for example, Anusol HC)

Note: Topical corticosteroids should not be used for more than 7 days as they may have deleterious effects on tissues.

Promote Ease of Stool Passage

bulking agents and stool softeners (see “Pharmacologic Interventions” in the section “Constipation”)

Monitoring and Follow-Up

Follow up in 1 week to determine if symptoms have improved.

Referral

For acute pain of recent onset (1–2 days) that is increasing despite treatment, contact a physician for advice and to rule out an abscess.

HERNIA^{75,76,77,78,79}

Protrusion of part of the abdominal contents (bowel, omentum) through a weakness in the abdominal wall. Hernias may occur through physiologic openings (inguinal, femoral) or at weak points of the abdominal muscles (ventral hernias – umbilicus, between muscles, incision sites).

CAUSES

- Defect of abdominal wall muscles

Predisposing Factors

- Abdominal surgery (incisional hernia – increased risk if had post-operative wound infection, obese, a smoker, immunocompromised, undernourished, have connective tissue disorder or the surgical technique was poor)

- Increased intra-abdominal pressure (obesity, pregnancy, ascites, peritoneal dialysis)
- Age
- Heavy lifting
- Chronic cough
- Chronic straining to pass stool or to urinate
- Congenital defect of abdominal wall

HISTORY

Groin Hernia

- Presence of predisposing factor
- May be asymptomatic or cause sense of heaviness or dull discomfort
- Sensation may be increased with abdominal straining, long periods of standing or at the end of the day when physically active
- Soft, non-tender bulge that may appear when standing, straining or during times of increased intrabdominal pressure (bowel movements, cough, sneeze)
- Bulge disappears when lying down unless incarcerated
- Pain indicates development of complications

Abdominal Hernia

- Presence of predisposing factor
- Bulge through abdominal wall at umbilicus, epigastrium or an incision site
- May cause discomfort that is worse with straining
- Pain indicates development of complications
- Men present with incarceration of umbilical hernias more commonly than women

PHYSICAL FINDINGS

Groin Hernia

Examine the client in the standing position to help identify swelling. Have the client cough, strain or perform a Valsalva maneuver.

- Bulge may be seen in groin, may extend into scrotum
- Bulge may be seen on upper anterior thigh (femoral hernia) or abdomen
- Hernia disappears upon lying down, reappears upon standing up or bearing down
- Hernia may be palpable across the inguinal/femoral/inguinal region during straining

- In men, a hernia may be felt by invaginating the scrotal skin, gently extending the finger into the inguinal canal along the spermatic cord and asking the client to cough/strain – additional pressure on the side or tip of the finger aside from the circumferential pressure of the external ring may be a hernia
- Hernias should be gently reduced by gently pressing the contents back into the abdominal cavity
- Tender/painful hernias or those associated with nausea/vomiting should not be reduced
- A painful or non-reducible inguinal mass should be considered a strangulated hernia until it is proven otherwise

Abdominal Hernia

- Bulge in abdominal wall
- May be tender with palpation
- Weakness in abdominal wall is palpable with incisional hernias, (palpate the entire length as there may be more than one defect)
- Bulge at umbilicus (may appear asymmetric)
- Epigastric hernias are located along the midline between the xiphoid process and umbilicus and usually present as a small lump (usually < 1 cm in diameter); incarceration is common
- Discomfort may increase when lying down with epigastric hernias
- A bulge in the abdominal wall along the midline that appears when a supine client lifts his head is caused by a separation between the left and right abdominus rectus muscles (diastasis recti) is not a true hernia as the fascia is intact; the client may experience difficulty lifting due to the separation
- Obesity may conceal hernias; multiple hernias is not uncommon; there is greater risk of incarceration
- Strangulated abdominal hernia may present as a small bowel obstruction

DIFFERENTIAL DIAGNOSIS

Groin Hernia

- Testicular torsion (acute emergency)
- Epididymitis
- Epididymal cyst
- Hydrocele
- Testicular mass
- Dilated vein (varicocele)
- Enlarged inguinal lymph node

COMPLICATIONS

- Strangulated hernia
- Incarcerated hernia
- Ischemic bowel (due to strangulation or incarceration)
- Bowel obstruction

DIAGNOSTIC TESTS

- None

MANAGEMENT

Goals of Treatment

- Reduction of the hernia
- Support weak abdominal wall
- Relieve discomfort
- Prevent recurrence and further enlargement

Appropriate Consultation

Consult a physician immediately if the hernia is not reducible, if it is painful, or if it is associated with symptoms and signs of bowel obstruction. Consult a physician immediately if a painless femoral hernia is suspected.

Nonpharmacologic Interventions

With client lying down, attempt to reduce the inguinal or incisional hernia with gentle manual reduction.

- Do not use force
- Do not attempt to reduce a femoral hernia
- Use abdominal or groin truss for support

Client Education

- Explain disease process, expected course and need for follow-up
- Demonstrate application of truss, and encourage its daily use
- Demonstrate proper lifting techniques
- Teach client signs and symptoms of complications and advise him or her to return to the nursing station if these occur

Pharmacologic Interventions

Analgesia for discomfort:

acetaminophen (Tylenol), 325 mg 1–2 tabs orally every 4–6 hours as required (maximum 4 g daily)

or

acetaminophen with codeine (Tylenol #3), 1–2 tabs orally every 4 hours as needed (maximum 4 g acetaminophen daily)

Monitoring and Follow-Up

Follow as necessary until surgical consult takes place. Monitor for the development of bowel obstruction (see “Obstruction of the Small or Large Bowel” in the section “Emergencies of the Gastrointestinal System”).

Referral

Arrange elective follow-up with physician for surgical consult. Medevac if there are symptoms of strangulation or bowel obstruction.

IRRITABLE BOWEL SYNDROME^{103,104,105,106,107,108,109,110,111,112,113,114,115}

Irritable bowel syndrome is a functional bowel disorder of abdominal pain associated with passing stool or with altered bowel habits and features of disordered defecation (Rome III Criteria).

Rome III Diagnostic Criteria for Irritable Bowel Syndrome¹¹⁵

Recurrent abdominal pain or discomfort, that cannot be explained by structural or biochemical abnormalities, for at least 3 months, with onset at least 6 months previously associated with 2 or more of the following:

1. improvement with defecation
2. onset is associated with a change in the frequency of stool
3. onset is associated with a change in the consistency of stool (loose, watery, or pellet-like)

Other associated symptoms to support a diagnosis may include:

- ≤ 3 stools per week
- ≥ 3 stools per day)
- lumpy/hard stool
- loose watery stools
- straining to pass stool
- urgency
- sensation of incomplete bowel movement
- passing mucus
- bloating

CAUSES

- Largely unknown

Predisposing Factors

- Possible genetic predisposition
- Past bowel disturbance (laxative abuse, food sensitivity, antibiotics, infection)
- Emotional stress
- History of physical or sexual abuse

HISTORY

- Usually begins before age 40
- More common in women
- Symptoms vague and long term
- Chronic condition with remissions and exacerbations
- Various combinations of constipation, diarrhea, abdominal pain and gas
- Constipation or diarrhea may be the dominant pattern
- Diffuse lower-abdominal pain or discomfort
- Pain of variable intensity; may persist for hours or days
- Looser, more frequent bowel movements may occur with onset of pain
- Pain exacerbated by meals, bowel movements or stress
- Pain relieved by defecation
- No interference with daily activities
- White mucus frequently present
- Bloating and flatulence
- Symptoms not associated with irritable syndrome that require further investigation include:
 - fever, weight loss or malaise
 - nocturnal pain and diarrhea
 - rectal bleeding or blood in stool
- Associated symptoms may include:
 - upper abdominal symptoms of dyspepsia, nausea, belching
 - dysmenorrhea
 - dyspareunia
 - sexual function difficulties
 - urinary symptoms including frequency and urgency

The history for irritable bowel syndrome requires a careful correlation of the timing of symptoms and the relationship with food intake and dietary content.

PHYSICAL FINDINGS

- Client may appear quite well or in mild distress
- Abdomen may be distended
- Bowel sounds may be increased or decreased
- Colon may be tender and “rope-like”
- Compression of colon may reproduce symptoms

DIFFERENTIAL DIAGNOSIS

- Constipation
- Uncomplicated diverticular disease
- Gastroenteritis
- Food intolerance
- Inflammatory bowel disease
- Drug-induced diarrhea or constipation
- Biliary colic

COMPLICATIONS

- Chronic abdominal symptoms
- Analgesic dependence or abuse
- Absenteeism from work with flare-ups of pain

DIAGNOSTIC TESTS

- Test stool for occult blood
- Sample stool for culture and sensitivity
- Measure hemoglobin level
- Perform urinalysis

MANAGEMENT**Goals of Treatment**

- Relieve symptoms
- Establish regular bowel habits
- Identify or modify precipitating stresses

Nonpharmacologic Interventions**Client Education**

- Recommend dietary modifications (for example, regular meals, gradual increase of fibre)
- For clients with constipation-related symptoms of IBS, increase in fibre content of diet (for example, raw bran, brown bread, popcorn, All-Bran, Puffed Wheat or Shredded Wheat cereal); when raw (miller’s) bran is used, start with a small amount and increase gradually to ¼ to ½ cup daily to avoid bloating and flatulence
- Recommend avoidance of foods that are known to cause symptoms (these vary from person to person)

- Recommend that client consume an adequate amount of fluid when using bulking agents
- Recommend elimination of nicotine and codeine-containing drugs
- Teach relaxation techniques and emphasize the importance of exercise to help with stress-induced symptoms
- Assist client to identify specific stress factors that exacerbate symptoms
- Assist client to gain insight into identifiable emotional factors
- Offer understanding and support, as this is an incompletely and poorly understood syndrome

Pharmacologic Interventions

The evidence regarding the benefits of fibre for IBS is limited, with greater benefit observed in constipation dominant IBS.¹¹⁶ Nonetheless, a trial of a stool-bulking agent may be helpful in some clients:

psyllium (Metamucil), 1–2 tsp (5–10 mL) orally two or three times daily with 8 oz (250 mL) fluid

The patient can obtain Metamucil with a prescription through an NIHB pharmacy provider.

May need to slowly increase the amount of fibre over several days to avoid worsening symptoms.¹¹⁶

Monitoring and Follow-Up

- Follow up in 1–2 weeks
- Review effects of dietary changes on symptoms
- If on additional dietary fiber, adjust the dose depending on response
- Use less fibre temporarily if gas and bloating are prominent
- Use more fibre if there has been little clinical response

Referral

Refer to a physician if symptoms or signs of organic disease are present or if symptoms do not improve with management. This can be a difficult condition to manage. Most patients have chronic symptoms that flare up periodically.

PEPTIC ULCER DISEASE (PUD)^{117,118,119,120,121,122,123}

An ulceration of the mucous membrane of the upper digestive tract. Usually refers to a duodenal or gastric ulcer.

CAUSES

The two most common causes of PUD are bacterial infection with *Helicobacter pylori* (HP) and use of nonsteroidal anti-inflammatory drugs (NSAIDs). The use of NSAIDs in the presence of HP infection may increase the risk of developing PUD. Other less common causes of PUD include other medications (for example, corticosteroids, bisphosphonates, potassium chloride), gastric surgery (gastric bypass) inflammatory diseases (Crohn's disease, sarcoidosis) and hypersecretion states (gastrinoma).

Risk Factors

- Medications such as NSAIDs, corticosteroids
- Severe physiological stress (illness, surgery)
- Chronic gastritis
- Chronic lung or kidney disease
- Smoking
- Genetic factors

HISTORY

- Symptoms may be vague or absent, classical or atypical (some people with a duodenal ulcer have no symptoms, whereas some with ulcer-like symptoms have no ulcer)
- Chronic benign disease with recurrent exacerbations and remissions (typical with duodenal ulcers)
- Symptoms usually occur in epigastrium near midline between xiphoid and umbilicus or in right upper quadrant and may radiate to the back
- Discomfort is typically described as burning, gnawing, hunger-like
- May also describe vague or cramp-like sensation or have heartburn
- Symptoms have variable intensity, from mild to moderate to severe
- Duodenal ulcer symptoms typically begin 2–5 hours after meals, when stomach becomes empty
- Gastric ulcer symptoms tend to occur soon after meals
- Night waking with symptoms is common due to high acid output from circadian rhythms (usually between 11:00 p.m. and 2:00 a.m.)
- Relieved by food, milk or antacids (less effective with gastric ulcers)

- Nausea may be present
- Melena or hematemesis indicates complications
- Assess use of alcohol, acetylsalicylic acid (ASA), NSAIDs, corticosteroids
- The natural history of a benign ulcer is that two-thirds will recur in the first year after treatment

PHYSICAL FINDINGS

Epigastric tenderness (mild-moderate). The acutely tender, rigid or distended abdomen may signal perforated ulcer.

DIFFERENTIAL DIAGNOSIS

- Gastritis
- Esophagitis
- Biliary colic
- GERD
- Irritable bowel syndrome
- Neoplasm
- Diverticulitis
- Pancreatitis
- Ischemic bowel disease
- Medications (NSAIDs, colchicine, corticosteroids, antibiotics, niacin, gemfibrozil, potassium supplements, digoxin, iron)

COMPLICATIONS

- Iron deficiency anemia (from chronic blood loss)
- Severe pain
- Sudden hemorrhage, which can lead to hypotension
- Perforation
- Peritonitis
- Obstruction of the gastric outlet

DIAGNOSTIC TESTS

- Test stool for occult blood
- Measure hemoglobin level
- Urinalysis
- Diagnostic testing to confirm presence of *H. pylori* (must be ordered by a physician)

MANAGEMENT

Goals of Treatment

- Relieve pain
- Reduce stomach acid
- Promote healing
- Eradication of *H. pylori* (if presence confirmed)
- Prevent complications

Appropriate Consultation

Suspected PUD requires consultation to initiate treatment and/or diagnostic testing.

Urgent consultation is appropriate for the following alarm symptoms:

- Unintentional weight loss
- Pain radiating to back, neck, jaws, left arm or shoulder
- Difficult or painful swallowing
- Protracted vomiting
- Anemia
- Active gastrointestinal bleeding (black stools, hematemesis) (*see “Gastrointestinal Bleeding (Upper and Lower)” in the section “Emergencies of the Gastrointestinal System”*)
- Stool positive for occult blood

Nonpharmacologic Interventions**Client Education**

- Explain the nature of the disease and the expected outcome
- Counsel client about appropriate use of medications (dose, frequency, purpose and importance of compliance)
- Recommend:
 - Small, frequent meals that are lightly spiced or not spiced at all
 - Avoidance of all foods known to increase pain (for example, large fatty meals)

- Minimizing caffeinated and highly acidic beverages (tea, coffee, colas, orange juice)
- Avoidance of alcohol
- Avoidance of causative medications (NSAIDs, colchicine, corticosteroids, antibiotics, niacin, gemfibrozil, potassium supplements, digoxin, iron)
- Smoking cessation
- Teach client the signs of complications that should be followed up immediately

Pharmacologic Interventions

Proton pump inhibitors such as Losec are the treatment of choice for symptomatic relief. They must be ordered by a physician.

Anyone testing positive for *H. pylori* in the setting of peptic ulcer will need to undergo triple-drug therapy for eradication, as ordered by a physician.

Monitoring and Follow-Up

Follow up in 2 weeks to assess response to therapy. Follow up again in 4–6 weeks. Discontinue medications if symptoms have resolved. Post-treatment testing for eradication of *H. pylori* must occur 4–6 weeks after discontinuation of all *H. pylori* eradication regimens.

Referral

Refer to a physician if there is no improvement with treatment or if there are alarm symptoms, including:

- New GI symptoms in clients > 40 years
- Persistent postprandial or nocturnal pain

EMERGENCIES OF THE GASTROINTESTINAL SYSTEM

ABDOMINAL PAIN (ACUTE)^{124,125}

Pain caused by a wide variety of more and less serious conditions. The location of the pain, including its origin and pattern of radiation, time of onset, nature and associated symptoms, will frequently help in making the diagnosis.

CAUSES

Some of the more common causes of acute abdominal pain in adults are:

- Appendicitis

- Gynecologic problems (Mittelschmerz [pain at the midpoint of menstrual cycle, presumably related to ovulation], dysmenorrhea, pelvic inflammatory disease)
- Pyelonephritis
- Peptic ulcer
- Dyspepsia
- Urinary tract infection
- Functional cause
- Gastroenteritis
- Gallbladder disease

HISTORY**Associated Symptoms**

- Unintended weight loss may indicate malignancy or malabsorption
- Vomiting may be associated with acute appendicitis, bowel obstruction or volvulus
- Diarrhea may suggest inflammatory bowel disease or malabsorption
- Constipation may indicate cancer or obstipation
- Melena or blood per rectum indicates gastrointestinal (GI) bleeding, which may be associated with peptic ulcer disease, esophageal varices, colon cancer or inflammatory bowel disease
- Jaundice may suggest liver disease, hepatic/pancreatic carcinoma, hemolysis, sickle cell anemia (G6PD [glucose-6-phosphate dehydrogenase] deficiency), choledocholithiasis
- Renal problems often present with abdominal pain; consider urolithiasis, urinary tract infection (dysuria, frequency, urgency, hematuria or testicular torsion)
- Pelvic/suprapubic symptoms and/or vaginal discharge may be associated with ectopic pregnancy, pelvic inflammatory disease, ovarian torsion or ruptured ovarian cyst

Medical History

- Other major illnesses
- Prior surgery
- Prior studies performed for evaluation of abdominal problems
- Family history of similar complaints
- Medications, especially digoxin, theophylline, corticosteroids, tetracycline (for peptic ulcer disease), analgesics, antipyretics, antiemetics, barbiturates, diuretics, bisphosphonates (for osteoporosis)
- Sexual activity, menstrual history, birth control use, history of sexually transmitted disease, vaginal discharge, spotting or bleeding

PHYSICAL EXAMINATION**Vital Signs**

- Signs of shock, infection (elevated temperature)
- Signs of dehydration, with dry mucous membranes and decreased skin turgor

Abdominal Examination**Inspection**

Check contour (distention), symmetry, location of most severe pain, hernia, scars.

Auscultation

- High-pitched bowel sounds suggest obstructive process
- Absent bowel sounds suggest ileus or obstruction

Palpation and Percussion

- Muscle rigidity (voluntary or involuntary)
- Localized tenderness, masses, pulsation, hernias, peritoneal irritation (cough or jumping may also elicit “rebound”)
- Involuntary guarding
- Obturator sign (pain on internal rotation of hip with knee and hip bent)
- Psoas sign (pain when straight leg is raised against resistance above the knee)
- Murphy’s sign (right upper quadrant pain when breathing in and pressing over the liver)
- Liver dimension and spleen dimension
- Tenderness of costovertebral angle
- Pelvic exam in women
- Rectal exam to rule out GI bleeding, prostatitis, etc. (rectal examination should be used to add to the entire clinical picture)
- Absence of rectal tenderness does not preclude or confirm diagnosis of appendicitis

Diagnostic Tests (If Available)

- Hemoglobin
- White blood cell (WBC) count
- Urinalysis
- Pregnancy test for all reproductive-age females, unless status is post-hysterectomy
- Chest x-ray (if available) to rule out pneumonia
- Stool for occult blood

DIFFERENTIAL DIAGNOSIS

See Table 4, *Differential Diagnosis of Abdominal Pain*.

Table 4 – Differential Diagnosis of Abdominal Pain

Diagnosis	Usual Location of Pain	Comments
Hepatitis, subphrenic abscess, hepatic abscess, neoplasm	RUQ; may radiate to right shoulder	Elevated liver enzymes, jaundice
Cholecystitis, cholelithiasis, cholangitis	RUQ, mid-epigastric region; radiates to back and right scapula	Sudden onset with associated nausea and/or vomiting; elderly may have minimal or no associated pain; fever with cholangitis
Pancreatitis, neoplasm	Mid-epigastric region; radiates to back	May have signs of peritonitis, nausea and vomiting, increased pain with any oral intake with pancreatitis
Duodenal ulcer or gastric ulcer	Mid-epigastric region, LUQ; radiation to back if posterior ulcer; peritoneal signs with perforation	Elderly may have minimal or no associated pain; overt GI bleeding or hemodynamic instability with perforation
Gastroenteritis	Generalized, may radiate	Crampy, nausea, vomiting and/or diarrhea
Constipation, obstipation, bowel obstruction; ileus	Generalized, may radiate	Abdominal distention, hyper-resonance, altered bowel function
Splenic hematoma or enlargement, rupture, infarct	LUQ	Hypotension and peritonitis if ruptured
Aortic aneurysm	Epigastric, periumbilical, especially into back flanks; may present as epigastric or back pain, flank or hip pain	May be colicky; hypotension if ruptured
Appendicitis	Early: periumbilical; late: RLQ	May present with peritoneal signs, especially in elderly people
Crohn's disease or ulcerative colitis; ischemic colitis	RLQ, LLQ or generalized	Bloody diarrhea with ulcerative colitis, cramps, elevated sedimentation rate, platelets with Crohn's/ulcerative colitis. Sudden pain that resolves and followed by bloody diarrhea with ischemic colitis
Mesenteric adenitis, ischemia	RLQ with adenitis, epigastric, periumbilical or generalized with ischemia	Adenitis causes pain secondary to enlarged mesenteric nodes from streptococcal pharyngitis; pain out of proportion to physical examination (may be changes in pulse and blood pressure), may have vomiting or diarrhea with ischemia
Spontaneous bacterial peritonitis	Generalized, with peritoneal signs	Usually in alcoholic people, people with indwelling catheters and those on dialysis
Diverticulitis	Generally LLQ, but may be suprapubic, RLQ or generalized	Clinical diagnosis (pain + diarrhea, vomiting, fever)
Meckel's diverticulum	Below or to left of umbilicus	May be recurrent; presents with rectal bleeding or intestinal obstruction
Urolithiasis, nephrolithiasis, pyelonephritis	Either flank; may radiate to labia or testicles	Intravenous pyelogram for lithiasis; aching, constant pain, nitrites, blood and/or leukocytes in urine with pyelonephritis
Cystitis	Suprapubic	Urinalysis may show blood and leukocytes
Gynecologic disease, including ovarian cyst, neoplasm or torsion, ectopic pregnancy, Mittelschmerz, PID	Pain in pelvis, either adnexal area; radiation to groin; may also radiate to right shoulder if free intraperitoneal bleeding	Pregnancy test, cervical/vaginal cultures, ultrasonography to rule out ectopic pregnancy and assess ovaries
Metabolic disease such as diabetic ketoacidosis, Addison's disease	Pain may be diffuse; may have guarding	Associated with nausea, vomiting and elevated blood sugars

Table 4 – Differential Diagnosis of Abdominal Pain

Diagnosis	Usual Location of Pain	Comments
Pneumonia, subphrenic abscess, pulmonary embolism, pneumothorax	RUQ. LUQ	Cough, shortness of breath, +/-chest pain; nausea/vomiting and fever may also be present
Cardiac ischemia, infarction, pericarditis, cardiac hepatopathy	May present as epigastric pain; RUQ with cardiac hepatopathy	ECG to rule out cardiac disease, especially if risk factors present; may be confused with esophageal reflux; signs of congestive heart failure with congestive hepatopathy

RUQ = right upper quadrant, LUQ = left upper quadrant, RLQ = right lower quadrant, LLQ = left lower quadrant, PID = pelvic inflammatory disease, ECG = electrocardiogram.

MANAGEMENT

Initial Decision

Decide whether to manage in the community, consult a physician or arrange for medical evacuation.

Appropriate Consultation

Consult a physician if the diagnosis is unclear and the presentation appears serious or medical evacuation is required.

Adjuvant Therapy

- Start intravenous (IV) therapy with normal saline; decide on expected fluid losses and current level of hydration
- Hydrate according to physician orders
- Insert nasogastric tube if upon consultation a physician supports its use for vomiting, bleeding or suspected bowel obstruction
- Foley catheter

Nonpharmacologic Interventions

- Nothing by mouth until diagnosis is clear

Pharmacologic Interventions

Although classic surgical teaching has been that medication for pain may confuse the diagnosis of abdominal pain in the emergency setting, this is not supported by the literature. Opioid analgesics can increase client comfort and do not mask clinical findings or delay diagnosis.¹²⁶ Unless the diagnosis is clear, do not administer any analgesia until you have consulted a physician.

Choice of medication will depend on the presentation and the severity of the pain as described and rated by the client.

Monitoring and Follow-Up

- Monitor pain, airway, breathing, circulation (ABC), vital signs and any associated fluid losses closely
- Serial exams over a few hours may clarify the diagnosis

Referral

Medevac for evaluation if diagnosis is uncertain and the client's condition warrants urgent evaluation.

APPENDICITIS^{127,128,129}

Inflammation of the appendix.

CAUSES

Obstruction of the opening of the appendix by stool, edema from inflammatory bowel disease or parasites traps intestinal bacteria that multiply and cause infection.

HISTORY

The following outlines the classic pattern for acute appendicitis; however, the client may complain of various forms of abdominal, rectal and back pain depending on the location of the appendix. Duration of symptoms is usually less than 48 hours; however, elderly patients commonly have a longer pain history and up to 2% of patients report pain and other abdominal symptoms extending to two weeks or greater.

- Review:
 - history immediately prior to the onset of pain (include nonpain symptoms in recent past)
 - symptoms of the attack and local signs
 - order of the occurrence of the symptoms
 - date of the last normal menstrual period, any menstrual irregularity and recent sexual history for women

- Vague, diffuse periumbilical or epigastric pain
- Pain shifts within hours to right lower quadrant
- Anorexia
- Nausea
- Vomiting usually occurs a few hours after onset of pain, but may not be present
- Low-grade fever may be present
- Urinary frequency, dysuria, pyuria and hematuria or acute urinary retention may develop due to proximity of the inflamed appendix to the bladder
- Diarrhea or constipation occurs in up to 18% of patients due to bowel irritation

PHYSICAL FINDINGS

Appendicitis is known as the “great mimic.” The actual signs and symptoms depend on the location of the appendix within the abdomen. Presentation is variable, depending on whether the client presents early or late in the evolution of the disease process.

- Temperature may be mildly elevated
- Heart rate elevated (may be normal in early stage)
- Variable level of distress
- Client holds abdomen, walks slowly and slightly bent over, lies with knees bent
- Bowel sounds variable: hyperactive to normal in early stages; reduced to absent in later stage
- Localized tenderness in right lower quadrant (tenderness may migrate from left to right lower quadrant)
- Muscle guarding in right lower quadrant (peritoneal irritation)
- Rebound tenderness may be present
- Rectal exam: tenderness may be present in right lower quadrant if tip of appendix is near the rectum
- Pain in right lower quadrant with:
 - flexion of the right hip against resistance just above the knee (psoas sign)
 - right hip and knee flexed and internally rotated (obturator sign)
 - left lower quadrant palpation for rebound tenderness (Rovsing’s sign)
 - voluntary cough (cough sign)
- Diffuse tenderness may be present with late presentation (more common in the elderly)

DIFFERENTIAL DIAGNOSIS

- Abdominal abscess
- Gastroenteritis/Enterocolitis
- Diverticulitis
- Pancreatitis
- Biliary colic
- Cholecystitis
- Peptic ulcer disease
- Small bowel obstruction
- Crohn’s disease
- Mittelschmerz (ruptured follicular cyst)
- Ectopic pregnancy
- Pelvic inflammatory disease
- Twisted ovarian cyst
- Pyelonephritis
- Renal colic
- Mesenteric adenitis

COMPLICATIONS

- Abscess
- Localized peritonitis
- Perforation
- Generalized peritonitis
- Sepsis

DIAGNOSTIC TESTS

- Perform WBC count, if possible
- Perform urinalysis
- Urine HCG in women of childbearing age (if no hysterectomy)
- CBC

MANAGEMENT

Goals of Treatment

- Maintain hydration
- Prevent complications
- Manage pain

Appropriate Consultation

Consult a physician as soon as possible.

Adjuvant Therapy

- Start IV therapy with normal saline to keep vein open
- Adjust IV rate according to age and state of hydration, and in consultation with a physician
- Insert nasogastric tube if upon consultation a physician supports its use if abdominal distention is present

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth

Pharmacologic Interventions

Although classic surgical teaching has been that medication for pain may confuse the diagnosis of abdominal pain in the emergency setting, this is not supported by the literature. Opioid analgesics can increase client comfort and do not mask clinical findings or delay diagnosis.¹²⁶ Unless the diagnosis is clear, do not administer any analgesia until you have consulted a physician.

Analgesia:

morphine 5–10 mg IM or SC every 3–4 hours
or 2.5–5 mg IV slow push q3–4h prn

Antiemetic:

dimenhydramine 50 mg IM or IV slow push q4–6h
(not to exceed 400 mg/day)

If transfer is delayed, discuss starting IV antibiotics with a physician:

cefazolin (Ancef), 1 g IV q8h

and

metronidazole (Flagyl), 500 mg IV q12h

Monitoring and Follow-Up

Monitor vital signs and general condition frequently.

Referral

Medevac as soon as possible; surgical consult is required.

GASTROINTESTINAL BLEEDING (UPPER AND LOWER)^{130,131,132,133,134,135,136}

Bleeding from the gastrointestinal tract (GI). Sudden, rapid loss of blood from the gastrointestinal tract can cause hemodynamic instability and be life threatening. GI bleeding is a complication of an existing condition or disease process.

CAUSES

See Table 5, “Causes of Gastrointestinal Bleeding.”

Table 5 – Causes of Gastrointestinal Bleeding

Category	Upper GI Bleeding	Lower GI Bleeding
Inflammatory	Peptic ulcer disease	Diverticulitis
	Erosive gastritis	Ulcerative or Crohn’s colitis
	Erosive esophagitis	Enterocolitis
	Stress ulcer	Radiation colitis
Anatomical	Mallory-Weiss tear*	Ischemic colitis
	Meckel’s diverticulum	Anal fissure*
		Diverticulosis
Vascular	Esophageal, gastric, duodenal varices	Hemorrhoids*
	Angiodysplasia, telangiectasia	Angiodysplasia, telangiectasia
		Mesenteric ischemia
Tumour	Benign/malignant	Malignant or benign polyps
Systemic	Blood dyscrasias	Blood dyscrasias

*Rarely causes significant blood loss unless patient is anticoagulated or has a blood dyscrasia

HISTORY**Upper Gastrointestinal Bleeding**

- Focused inquiry of possible GI symptoms or disease:
 - nonsteroidal anti-inflammatory drug use
 - peptic ulcer disease
 - liver disease
 - alcohol use
 - gastroesophageal reflux disease
 - upper abdominal pain
 - early satiety
 - unintended weight loss
 - difficult or painful swallowing
 - chronology of symptoms
 - timing of bleeding
 - estimated amount of blood loss
- Hematemesis (vomiting of bright red blood or coffee-ground emesis)
- Melena (black, tarry stools)
- Hematochezia (passage of bright red blood from rectum with severe upper gastrointestinal bleeding)
- Sudden weakness or fainting
- Cramping abdominal pain relieved by vomiting or stooling
- There may be minimal or no pain in the elderly

Lower Gastrointestinal Bleeding

- Focused inquiry of possible GI symptoms or disease:
 - diverticular disease
 - inflammatory bowel disease
 - painful passage of stool (fissure, hemorrhoids)
 - history of polyps
 - personal or family history of bowel cancer
 - estimated amount of blood loss
 - chronology of symptoms
 - timing of bleeding
 - symptoms of recent fatigue, fever, myalgia (suggests inflammatory bowel disease, infectious cause)
 - changes in stool diameter
 - history of abdominal or pelvic radiation therapy
- Hematochezia
- Sudden weakness or fainting
- May have painless bleeding or cramping abdominal pain relieved by stooling

Considerations in the Elderly

- Have fewer symptoms prior to bleeding (for example, abdominal pain, symptoms of dyspepsia)
- Peptic ulcer disease most common cause of upper gastrointestinal bleeding due to:
 - higher rate of aspirin and NSAID use
 - higher rate of *Helicobacter pylori* infection
- Higher rate of anticoagulant use, increasing risk of blood loss
- More comorbid conditions (for example, vascular disease, respiratory disease)
- Greater risk of cancer
- Higher rate of diverticular lower gastrointestinal bleeding
- Higher rate of complications and mortality
- Greater risk of myocardial infarction due to higher rate of cardiovascular disease

PHYSICAL FINDINGS

- Significant gastrointestinal bleeding may cause hemodynamic compromise including:
 - increased heart rate
 - weak pulse
 - respirations rapid
 - blood pressure low-normal or decreased
 - postural blood pressure drop
 - restlessness, confusion
- Client pale and anxious
- Client weak and sweaty
- Bright red blood in vomit
- Black tarry stool
- Maroon, bright red blood or clots in stool
- Bowel sounds initially hyperactive due to blood in bowel
- Bowel sounds may become reduced or absent
- Mild-to-severe tenderness may be present

DIFFERENTIAL DIAGNOSIS**Upper Gastrointestinal Bleeding**

- Peptic ulcer
- Varices
- Erosive gastritis
- Erosive esophagitis
- Meckel's diverticulum

Lower Gastrointestinal Bleeding

- Diverticular disease
- Inflammatory bowel disease
- Colon cancer
- Mesenteric ischemia

COMPLICATIONS

- Hypotension
- Shock
- Myocardial infarction (in clients with underlying cardiac disease)
- Death

DIAGNOSTIC TESTS

- Measure hemoglobin
- Test stool for occult blood
- Check stool for gross blood
- ECG in elderly patients to assess for myocardial infarction
- *H. pylori* blood antibody test

MANAGEMENT**Goals of Treatment**

- Replace circulating blood volume

Appropriate Consultation

Consult a physician as soon as possible after client is stable.

Adjuvant Therapy

- Oxygen 6–10 L/min or more prn; keep oxygen saturation greater than 95%
- Large-bore IV (16- to 18-gauge) with normal saline
- Start a second IV line for volume replacement if there are signs of hypovolemia (see “Shock” in the section “General Emergency Situations” in the chapter “General Emergencies and Major Trauma”)
- Adjust IV rate according to estimated volume depletion, pulse rate, blood pressure, postural blood pressure drop and age
- Insert nasogastric tube if upon consultation a physician supports its use to empty the stomach for upper GI bleeding
- Insert urinary catheter; monitor hourly urinary output

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth

Pharmacologic Interventions

pantoprazole (Panto IV), 80 mg bolus over 30 minutes then pantoprazole (Pantoloc) 8 mg/hour IV¹³¹

Monitoring and Follow-Up

Monitor ABC, vital signs and general condition closely, as active re-bleeding can occur.

Referral

Medevac as soon as possible.

OBSTRUCTION OF THE SMALL OR LARGE BOWEL ^{137,138,139,140,141}

Blockage of small or large bowel (partial or complete, mechanical or paralytic).

CAUSES

- Small bowel: adhesions (75%), hernia, cancer, Crohn’s disease (strictures)
- Large bowel: cancer (60%), volvulus (5%), diverticulitis (20%), fecal impaction

HISTORY

- Pain
- Anorexia
- Nausea
- Vomiting
- Inability to pass stool or gas
- Abdominal distention
- Other symptoms, depending upon underlying disease process

The exact symptoms of obstruction depend on the location and severity of the obstruction. The higher the level of obstruction, the more acute and rapid the onset of symptoms.

Small-Bowel Obstruction

- Pain moderate to severe
- Intermittent waves of pain (every 4–5 minutes)
- Relative comfort between waves of pain
- Constant severe pain if bowel strangulation (up to 40% of cases of small-bowel obstruction)

- Vomiting frequent, violent, bilious when obstruction is high
- Vomiting feculent when obstruction is lower
- Abdominal distention; prominent when obstruction is low
- Reduced rectal gas and stool passage
- Weakness

Large-Bowel Obstruction

- Pain moderately severe (generally less acute than in small-bowel obstruction)
- Colicky
- Distention present, occurs early, may be severe
- Vomiting usually late and infrequent, may be feculent
- Reduced or absent rectal gas and stool
- Sudden onset of severe pain is a classic manifestation of volvulus
- Change in size of stool indicative of possible cancer, increased risk if weight loss

Paralytic Ileus

- Obstruction of the bowel due to paralysis of the muscle of the bowel wall, caused by generalized peritonitis, any acute inflammation of the abdomen, severe chest injury, any acute illness, or as a post-operative complication
- Major symptom is distention, resulting in moderate discomfort
- Pain may be absent, but cramping possible
- Frequent vomiting or regurgitation of gastric contents
- “Silent” distended abdomen on examination

PHYSICAL FINDINGS

- Heart rate normal or increased
- Respiration normal or increased
- Blood pressure normal or low
- Postural blood pressure drop may be present
- Fever, tachycardia and peritoneal signs suggest possible intestinal ischemia from strangulation
- Client appears mildly to severely ill
- Client doubles over with waves of pain in small-bowel obstruction
- Client pale, sweaty, anxious
- Various degrees of abdominal distention
- Hernia may be visible
- Contractions of bowel wall (peristalsis) may be seen
- Bowel sounds increased in early stages

- Peristaltic rushes, high-pitched tinkling sounds present
- Later, bowel sounds are diminished or absent
- Tenderness due to distention may be present
- Tender localized hernia or mass (abscess, tumour, volvulus)
- Rebound tenderness and rigidity present if perforation, peritonitis or strangulation have occurred
- Presence of surgical scars
- Tympany to hyperresonance with percussion (due to air-filled bowel loops)
- Rectal exam: blood or stool may be present, rectum may be empty, mass may be palpable if rectal cancer
- Examine all hernial orifices, including both femoral rings

DIFFERENTIAL DIAGNOSIS

- Gastroenteritis/Enteritis
- Cholecystitis
- Constipation/Obstipation
- Diverticular disease
- Appendicitis
- Inflammatory bowel disease with distention
- Perforated ulcer
- Pancreatitis
- Mesenteric ischemia
- Ovarian distortion, pelvic inflammatory disease, ectopic pregnancy

COMPLICATIONS

- Perforation
- Intra-abdominal abscess
- Strangulated segment of bowel
- Sepsis
- Hypotension, shock
- Death

DIAGNOSTIC TESTS

- Test stool for occult blood
- Perform urinalysis
- Measure hemoglobin (optional; may help with diagnosis and treatment)
- WBC if available (increased)

MANAGEMENT**Goals of Treatment**

- Relieve distention
- Maintain hydration
- Prevent complications

Appropriate Consultation

Consult physician as soon as possible.

Adjuvant Therapy

- Start a large-bore IV (16- or 18-gauge) with normal saline; replace volume deficits
- Adjust IV rate according to pulse, postural blood pressure drop, blood pressure, state of hydration, age, pre-existing medical problems (*see “Shock” in the section “General Emergency Situations” in the chapter “General Emergencies and Major Trauma”*)
- Aim for pulse < 100 bpm, systolic blood pressure > 100 mm Hg
- Insert nasogastric tube if upon consultation a physician supports its use. Attach to low suction or to straight drainage
- Insert urinary catheter; measure hourly urinary output

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth

Pharmacologic Interventions

Analgesia if required:

morphine 5–10 mg IM or SC q3–4h or 2.5–5 mg IV slow push q3–4h prn

Antiemetic if required:

dimenhydramine 50 mg IM or IV slow push q4–6h (not to exceed 400 mg/day)

If transfer is delayed, discuss starting IV antibiotics with a physician:

cefazolin (Ancef), 1 g IV q8h

and

metronidazole (Flagyl), 500 mg IV q12h

Monitoring and Follow-Up

Monitor ABC, vital signs, urinary output and general condition frequently.

Referral

Medevac as soon as possible.

PANCREATITIS (ACUTE)^{142,143,144,145,146,147}

Inflammation of the pancreas.

- Mild pancreatitis, 80% of cases, usually resolves in 5–7 days with symptomatic management and treatment of physiologic causes (for example, gallstones)
- Severe necrotizing pancreatitis causes significant morbidity and is associated with death rate of up to 30%. Early identification and management is essential for these cases

CAUSES

The most common causes of pancreatitis are gallstones (35–40%) and alcohol use (35%).

- Gallstones (including biliary sludge and microlithiasis)
- Alcohol (excessive or chronic alcohol abuse, recent alcohol binge)
- Medications (for example, azathioprine, L-asparaginase, furosemide, thiazides, estrogens, tamoxifen, valproic acid, didanosine, pentamidine, metronidazole, tetracycline, sulfasalazine, 5-ASA, sulindac, salicylates, calcium)
- Abnormality of the biliary tract (duodenal obstruction, biliary stricture, tumours)
- Acute viral, bacterial or parasitic infection (mumps, coxsackie, hepatitis B, CMV, varicella-zoster, HSV, HIV, mycoplasma, legionella, leptospira, salmonella, aspergillus, toxoplasma, cryptosporidium, ascaris)
- Biliary procedures or abdominal surgery (for example, ERCP)
- Trauma
- Autoimmune diseases (for example, lupus, inflammatory bowel disease)
- Hyperlipidemia: triglycerides > 11.3 mmol/L
- Hypercalcemia
- Idiopathic
- Genetic disorders
- Ischemic injury (from vasculitis, embolism, severe hypotension)

HISTORY

- A focused history is important to establishing pancreatitis as the cause of abdominal pain including:
 - biliary disease or gallstones
 - alcohol use (onset of symptoms often 1–3 days after binges)
 - current or recent use of prescription/nonprescription medications or herbal, alternative or traditional products
 - autoimmune disorders
 - family history of pancreatic disease (especially in young patients with no alcohol history)
 - ERCP or other abdominal procedures
- Upper abdominal pain, most commonly in the epigastrium, but may also be right or left upper quadrant
- Rapid onset of pain that reaches maximum intensity within 20 minutes
- Pain steady and penetrating in nature
- May have band-like pain radiating through to the back (occurs in 1/2 of patients)
- Pain is relieved by sitting up and leaning forward, aggravated by lying down
- Nausea and vomiting
- Diarrheal symptoms may occur
- Abdominal distention (due to ileus, fluid collecting in abdomen from pancreatic weeping)
- Shortness of breath (due to diaphragm irritation or pleural effusion)
- Jaundice (due to biliary obstruction)
- Weak, light-headed (may be significant if hemodynamically unstable)

PHYSICAL FINDINGS

Physical findings reflect the severity of the attack. More severe disease is indicated by signs of shock.

- Temperature elevated (76% of patients)
- Heart rate elevated (65% of patients)
- Blood pressure may be low (if in shock) or high (related to pain)
- Postural blood pressure drop may be present
- Client anxious, in acute distress
- Distress increased when lying down
- Abdomen distention (65% of patients)
- Bowel sounds reduced to absent (paralytic ileus)
- Respiratory findings may be present: basal crackles, left-sided atelectasis, pleural effusion (10% of patients)

- Tender epigastrium with muscle guarding and rigidity (may have less epigastric tenderness than expected given severity of pain)
- Jaundice (28% of patients)
- Severe cases may have bluish discoloration of the flanks (Grey Turner's sign) and periumbilicus (Cullen's sign) due to retroperitoneal bleeding from the injured pancreas

DIFFERENTIAL DIAGNOSIS

- Peptic ulcer disease
- Severe gastritis
- Acute cholecystitis, cholangitis
- Lower lobe pneumonia
- Intestinal obstruction
- Aortic aneurysm
- Perforated viscus
- Pancreatic neoplasm

COMPLICATIONS

- Hypotension
- Shock
- Paralytic ileus
- Thrombocytopenia
- Sepsis
- Hyperglycemia
- Adult respiratory distress syndrome
- Death

DIAGNOSTIC TESTS

- Measure blood glucose level (may be elevated)
- Perform urinalysis
- Perform WBC count (if possible)

MANAGEMENT**Goals of Treatment**

- Relieve symptoms
- Maintain hydration
- Prevent complications

Appropriate Consultation

Consult a physician to establish diagnosis and treatment plan.

Adjuvant Therapy

- Start a large-bore IV (16- or 18-gauge) with normal saline; replace volume deficits (may require significant fluid resuscitation) (*see “Shock” in the section “General Emergency Situations” in the chapter “General Emergencies and Major Trauma”*)
- Adjust rate according to pulse, postural blood pressure drop, systolic blood pressure
- Aim for pulse < 100 bpm, systolic blood pressure > 100 mm Hg
- Insert nasogastric tube if upon consultation a physician supports its use
- Insert a urinary catheter
- Oxygen to maintain saturation of 95% (except with severe COPD)

Nonpharmacologic Interventions

- Bed rest
- Nothing by mouth

Pharmacologic Interventions

Analgesia:

morphine 5–10 mg IM or SC q3-4h or 2.5–5 mg IV slow push q3-4h prn

or

hyoscine butylbromide (Buscopan), 10–20 mg IV/IM q6-8h prn

Antiemetics:

dimenhydrinate (Gravol), 50 mg IM q4-6h prn (maximum dose 400 mg in 24 hours)

Monitoring and Follow-Up

- Measure hourly urinary output; adjust IV rate to maintain urine output at 0.5–1 mL/kg in adults¹⁴⁸
- Stabilize blood pressure and pulse
- Monitor blood glucose (hyperglycemia is common)
- Monitor pulse and blood pressure frequently until the client’s condition stabilizes – *watch for shock*
- Monitor oxygenation
- Observe for alcohol withdrawal if a recent binge is a known cause of pancreatitis

Referral

Medevac as soon as possible.

SOURCES

Internet addresses are valid as of February 2012.

BOOKS AND MONOGRAPHS

Bickley LS. *Bates’ guide to physical examination and history taking*. 7th ed. Baltimore, MD: Lippincott Williams & Wilkins; 1999.

Cash JC, Glass CA. *Family practice guidelines*. Philadelphia, PA: Lippincott Williams & Wilkins; 1999.

Enkin M, Nelison J, Keirse MJ, et al. *A guide to effective care in pregnancy and childbirth*. 3rd ed. New York: Oxford University Press; 2000.

Fischbach FT. *A manual of laboratory and diagnostic tests*. 6th ed. Lippincott; 2000.

Gilbert DN, Sande MA, Moellering RC. *The Sanford guide to antimicrobial therapy*. 32nd ed. Portland, OR: Antimicrobial Therapy; 2002.

Gray J (Editor-in-chief). *Therapeutic choices*. 5th ed. Ottawa, ON: Canadian Pharmacists Association; 2007.

Jamison J. *Differential diagnosis for primary practice*. London, UK: Churchill Livingstone; 1999.

Karch AM. *Lippincott’s 2002 nursing drug guide*. Philadelphia, PA: Lippincott; 2002.

Pagna K, Pagna T. *Diagnostic testing and nursing implications*. 5th ed. St. Louis, MO: Mosby; 1999.

Pilla NJ, Rosser WW, Pennie RA, et al. *Anti-infective guidelines for community acquired infections*. Toronto, ON: MUMS Guidelines Clearing House; 2001.

Prateek L, Waddell A. *Toronto notes: MCCQE 2003 review notes*. 19th ed. Toronto, ON: University of Toronto, Faculty of Medicine; 2003.

Ratcliffe S, Baxley EG, Byrd JE, et al (Editors). *Family practice obstetrics*. 2nd ed. Salt Lake City, UT: Hanley and Belfus; 2001.

Robinson DL, Kidd P, Rogers KM. *Primary care across the lifespan*. St. Louis, MO: Mosby; 2000.

Rubin RH, Voss C, Derksen DJ. *Medicine: A primary care approach*. Philadelphia, PA: W.B. Saunders Company; 1996.

Tierney LM Jr., McPhee SJ, Papadakis MA. *Current medical diagnosis and treatment*. 40th ed. New York, NY: Lange Medical Books, McGraw-Hill; 2001.

Toth PP, Jothivijayarani A (Editors). *University of Iowa family practice handbook*. 3rd ed. St. Louis, MO: Mosby; 1997.

Uphold CR, Graham MV. *Clinical guidelines in family practice*. 4th ed. Gainesville, FL: Barmarrae Books; 2003.

CD-ROMS

Briggs GG, Freeman RK, Yaffe SJ. (Editors). *Drugs in pregnancy and lactation. A reference guide to fetal and neonatal risk*. 5th ed. Lippincott, Williams and Wilkins; 1999.

Braunwald E, Fauci AS, Kasper DL, et al. *Harrison's principles of internal medicine*. 15th ed. CD-ROM version 1.0. McGraw-Hill; 2001.

Fitzpatrick, TB, Allen R, Johnson K, et al. *Color atlas and synopsis of clinical dermatology*. 4th ed. McGraw-Hill; 2001.

Tintinalli JE, Stapczynski JS, Kelen GD, (Editors). *Emergency medicine plus*. CD-ROM version 2.0. New York: NY: McGraw-Hill Professional; 2001.

JOURNAL ARTICLES

Al Garf A. Differential diagnosis of lower abdominal pain in the female patient. *Update Primary Health Care Journal* 1988;3(1):6-8.

Chiba N, Lahaie R, Fedorak RN, et al. Helicobacter pylori and peptic ulcer disease. Current evidence for management strategies. *Can Fam Physician* 1998;44:1481-88.

Hunt R, Thomson A. Canadian helicobacter pylori consensus conference. *Can J Gastroenterol* 1998;12(1):31-41.

Kelkar PS, Li JT. Cephalosporin allergy. *N Engl J Med* 2001;345(11):804-09.

Paterson WG, Thompson WG, Vanner SJ, et al. Recommendations for the management of irritable bowel syndrome in family practice *CMAJ* 1999;161(2):154-60. Available at: <http://www.cmaj.ca/content/161/2/154.full>

Suerbaum S, Michetti P. Helicobacter pylori infection. *N Engl J Med* 2002;347(15):1175-86. Available at: <http://www.ti.ubc.ca/pages/letter2.html>

Therapeutics Initiative. Definitive treatment of peptic ulcer disease by eradication of *Helicobacter pylori* (*H. pylori*). *Therapeutics Letter* 1994;2.

END NOTES

- 1 Canadian Cancer Society. *Early detection for Prostate Cancer 2008*. Available at: http://www.cancer.ca/canada-wide/Prevention/Getting%20checked/Prostate%20cancer%20NEW.aspx?sc_lang=en
- 2 American Gastroenterological Association medical position statement: Diagnosis and care of patients with anal fissure. *Gastroenterology* 2003;124:233-4.
- 3 Breen E, Bleday R. (2007). *Anal fissures*. UpToDate Online. Available by subscription: www.uptodate.com
- 4 Penner RM, Majumdar SR. (2007, October). *Approach to minimal bright red bleeding per rectum*. UpToDate Online. Available by subscription: www.uptodate.com
- 5 Wald A. (2007). *Etiology and evaluation of chronic constipation in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 6 Wald A. (2007). *Treatment of chronic constipation in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 7 Mauk KL. *Preventing constipation in older adults*. *Nursing* 2005;35:6. Available at: www.nursing2005.com
- 8 Frizelle F, Barclay M. *Constipation in adults*. *Clinical Evidence* 2005;14:557-66. London, UK: BMJ Publishing Group Ltd.
- 9 Bazain Group. *Constipation in adults*. *Clinical Evidence* 2004;11:571-82. London, UK: BMJ Publishing Group Ltd.
- 10 Kenny KA, Skelly JA. Dietary fiber for constipation in older adults: A systematic review. *Clinical Effectiveness in Nursing* 2001;5:120-8.
- 11 Hurdon V, Voila R, Schroder C. How useful is docusate in patients at risk for constipation? A systematic review of the evidence in the chronically ill. *J Pain Symptom Managem* 2000 Feb;19(2):130-6. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/10699540>
- 12 American Gastroenterology Association. (2000, May). *AGA technical review on constipation*. Available at: <http://download.journals.elsevierhealth.com/pdfs/journals/0016-5085/PIIS0016508500700242.pdf>

- 13 Rumkumar D, Rao SS. Efficacy and safety of traditional medical therapies for chronic constipation: systematic review. *Am J Gastroenterol* 2005;100(4):936-71.
- 14 American Gastroenterological Association medical position statement: Guidelines on constipation. *Gastroenterology* 2000;119:1761-78.
- 15 Paré P, Bridges R, Champion MC, Gangula SC, Gray JR, Irvine EM, et al. Recommendations on chronic constipation (including constipation associated with irritable bowel syndrome) treatment. *Can J Gastroenterol* 2007;Apr 21 Supplement B:3B-22B.
- 16 Hsieh C. Treatment of constipation in older adults. *Am Family Physician* 2005;Dec, 72, 11:2277-83.
- 17 Longstreth GW, Thompson WG, Chey WD, Houghtong LA, Mearin F, Spiller RC. Functional bowel disorders. *Gastroenterology* 2006;130:1480-91.
- 18 Hohanson FF. *Review of the treatment options for chronic constipation*. Medscape General Medicine 2007. Available at: http://www.medscape.com/viewarticle/550956_1
- 19 Wald A. (2009, May). *Etiology and evaluation of chronic constipation in adults*. UpToDate Online 17.2. Available by subscription: www.uptodate.com
- 20 Stanton B, Evans JB, Batra B. (2006). *Oral rehydration therapy*. UpToDate Online. Available by subscription: www.uptodate.com
- 21 Post TW, Rose BD. (2008). *Clinical manifestations and diagnosis of volume depletion in adults*. UpToDate Online.
- 22 Post TW, Rose BD. (2004). *Dehydration is not synonymous with hypovolemia*. UpToDate Online. Available by subscription: www.uptodate.com
- 23 Rose BD, Mandel J. (2008). *Treatment of severe hypovolemia or hypovolemic shock in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 24 American Medical Directors Association. *Dehydration and fluid maintenance*. Columbia, MD: American Medical Directors Association (AMDA); 2001.
- 25 Menten JC. *Hydration management*. Iowa City, IA: University of Iowa Gerontological Nursing Interventions Research Center, Research Dissemination Core; 1998.
- 26 Faes MC, Spigt MG, Rikkert MGMO. *Dehydration in geriatrics*. Medscape.
- 27 Irvin DJ, White M. (2004, May 28). *The importance of accurately assessing orthostatic hypotension*. Medscape Nurses. Available at: www.medscape.com/viewarticle/474822
- 28 Stanton B, Evans JB, Batra B. (2009, May). *Oral rehydration therapy*. UpToDate Online. Available by subscription: www.uptodate.com
- 29 Rose BD. (2009, May). *Maintenance and replacement fluid therapy in adults*. UpToDate 17.2. Available by subscription: www.uptodate.com
- 30 Goldin BR, Borbach SL. *Clinical indications for probiotics: An overview*. *Clinical Infectious Diseases* 2008;46:S96-100.
- 31 Reid G, Anukam K, Koyama T. Probiotic products in Canada with clinical evidence: What can gastroenterologists recommend. *Can J Gastroenterol* 2008;22(2):169-75.
- 32 Pham M, Lemberg DA, Day ASP. *Probiotics: Sorting the evidence from the myths*. *MJA* 2008;133:304-08.
- 33 Quigley EMM. What is the evidence for the use of probiotics in functional disorders? *Current Gastroenterology Reports* 2008;10:379-84.
- 34 Doron SI, Hibberd PL, Gorbach SL. Probiotics for prevention of antibiotic-associated diarrhea. *J Clin Gastroenterol* 2008;42 (Suppl 2):S58-63.
- 35 Hatakka K, Saxelin M. Probiotics in intestinal and non-intestinal infectious disease: Clinical evidence. *Curr Pharm Des* 2008;14(14):1351-67.
- 36 Balfour Sartor R. (2008). *Probiotics for gastrointestinal disease*. UpToDate Online. Available by subscription: www.uptodate.com
- 37 Mueller-Lissner S, Tytgat GN, Paulo LG, Qudley EM, et al. Placebo- and paracetamol-controlled study on the efficacy and tolerability of hyoscine butylbromide in the treatment of patients with recurrent crampy abdominal pain. *Aliment Pharmacol Ther* 2006;23(12):1741-8.
- 38 Tytgat GN. Hyoscine butylbromide: A review of its use in the treatment of abdominal cramping and pain. *Drugs* 2007;67(9):1343-57.
- 39 Bonis PAL, LaMont JT. *Approach to the patient with chronic diarrhea*. Stanton B, Evans JB, Batra B. Oral rehydration therapy. UpToDate. 2008. Available by subscription: www.uptodate.com
- 40 Diagnosis and management of foodborne illnesses: a primer for physicians and other health care professionals. *MMWR* Apr 16 2004;53(RR04):1-33. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5304a1.htm>
- 41 Floch MH, Walker AW, Guandalini S, Hibberd P, et al. Recommendations for probiotic use – 2008. *J Clin Gastroenterol* 2008;42 (Suppl 2):S104-8.
- 42 Wanke CA. (2007). *Diarrheagenic Escherichia coli*. UpToDate Online. Available by subscription: www.uptodate.com

- 43 LaMont JT. (2008). *Clinical manifestations and diagnosis of clostridium difficile infection*. UpToDate Online.
- 44 Blacklow NR. (2007). *Prevention and treatment of viral gastroenteritis in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 45 Leder K, Weller PF. (2008). *Cryptosporidiosis*. UpToDate Online. 2008. Available by subscription: www.uptodate.com
- 46 Weller PF, Leder K. (2006). *Isospora infections*. UpToDate Online. Available by subscription: www.uptodate.com
- 47 Marcos LA, DuPont HL. Advances in defining etiology and new therapeutic approaches in acute diarrhea. *J Infection* 2007 55, p 385-93
- 48 Leder K, Weller PF. *Microsporidiosis*. UpToDate. 2007. Available by subscription: www.uptodate.com
- 49 Weller PF, Leder K. (2006). *Cyclospora infections*. UpToDate Online. Available by subscription: <http://www.uptodate.com>
- 50 Wanke CA. (2006). *Approach to the adult in the United States and other developed countries, with acute diarrhea*. UpToDate Online. Available by subscription: <http://www.uptodate.com>
- 51 Agha R, Goldberg MB. (2007). *Clinical manifestations and diagnosis of Shigella infection in adults*. UpToDate Online. Available by subscription: <http://www.uptodate.com>
- 52 Allos BM. (2007). *Clinical features and treatment of Campylobacter infection*. UpToDate. Available by subscription: www.uptodate.com
- 53 Wanke CA. (2010, May). *Epidemiology and causes of acute diarrhea in developing countries*. UpToDate.
- 54 Bonis PAL, LaMont JT. *Approach to the adult with chronic diarrhea in developing countries. Table 1 on Etiology of chronic diarrhea*.
- 55 Uphold CR, Graham MV. *Clinical guidelines in family practice*. 4th ed. Gainesville, FL: Barmarrae Books; 2003.
- 56 Stanton B, Evans JB, Batra B. (2009, May). *Oral rehydration therapy*. UpToDate Online. Available by subscription: www.uptodate.com
- 57 Young-Fadok T, Pemberton JH. (2007, November). *Epidemiology and pathophysiology of colonic diverticular disease*. Up To Date Online. Available by subscription: www.uptodate.com
- 58 Young-Fadok T, Pemberton JH. (2008, June). *Clinical manifestations and diagnosis of colonic diverticular disease*. Up To Date Online. Available by subscription: www.uptodate.com
- 59 Young-Fadok T, Pemberton JH. (2008, March). *Colonic diverticular bleeding*. Up To Date Online Available by subscription: www.uptodate.com
- 60 Young-Fadok T, Pemberton JH. (2008, September). *Treatment of acute diverticulitis*. Up To Date Online. Available by subscription: www.uptodate.com
- 61 Blondel-Hill E, Fryter S. *Bugs and drugs*. Edmonton, AB: Capital Health; 2006.
- 62 Ozick L, Clark OC. (2006, April). *Diverticulosis, Small intestine*. eMedicine. Available at: <http://emedicine.medscape.com/article/185356-overview>
- 63 Kazzi AA, Kazzi ZN. (2006, June). *Diverticular disease*. eMedicine. Available at: <http://emedicine.medscape.com/article/774922-overview>
- 64 Nguyen NCT, Chudasama YN, Dea SK, Cooperman A. *Diverticulitis*. eMedicine. June 2008. Available at: <http://emedicine.medscape.com/article/173388-overview>
- 65 British Society of Gastroenterology. *Dyspepsia management guidelines, 2002*. Available at: http://www.bsg.org.uk/pdf_word_docs/dyspepsia.doc
- 66 Talley NJ, Vakil N and the Practice Parameters Committee of the American College of Gastroenterology. Guidelines for the management of dyspepsia. *Am J Gastroenterol* 2005;100:2324-37. Available at: <http://www.acg.gi.org/physicians/guidelines/dyspepsia.pdf>
- 67 Zakko SF. (2008, January). *Uncomplicated gallstone disease*. UpToDate Online. Available by subscription: www.uptodate.com
- 68 Gilroy RK, Mukherjee S, Botha JF. (2008, July). *Biliary colic*. eMedicine. Available at: <http://www.emedicine.com/med/TOPIC224.HTM>
- 69 Zakko SF. (2008, January). *Clinical features and diagnosis of acute cholecystitis*. UpToDate Online. Available by subscription: www.uptodate.com
- 70 Zakko SF, Afdhal NH. (2008, April). *Treatment of acute cholecystitis*. UpToDate Online. Available by subscription: www.uptodate.com
- 71 Afdal NH. (2007, May). *Epidemiology of and risk factors for gallstones*. UpToDate Online. Available by subscription: www.uptodate.com
- 72 Afdal NH. (2007, August). *Acute cholangitis*. UpToDate Online.
- 73 Heuman DM, Mihas AA, Allen J, Cuschieri A. (2006, August). *Cholelithiasis*. Available at: <http://www.emedicine.com/med/topic836.htm>
- 74 Rosh AJ, Manko JA, Santen S. (2006, June). *Cholangitis*. eMedicine. Available at: <http://www.emedicine.com/emerg/TOPIC96.HTM>

- 75 Ahmed A, Cheung RC, Keeffe EB. Management of gallstones and their complications. *Am Fam Physician* 2000;61:1673-80.
- 76 Dula DJ, Anderson R, Wood GC. A prospective study comparing i.m. ketorolac with i.m. meperidine in the treatment of acute biliary colic. *J Emerg Med* 2001;20(2):121-24.
- 77 Gladden D, Migala DF, Beverly CS, Wolff J. (2008, August). *Cholecystitis*. eMedicine. Available at: <http://www.emedicine.com/med/TOPIC346.HTM>
- 78 Zakko SF, et al. (2010, January). *Treatment of acute cholecystitis*. UpToDate Online. Available by subscription: www.uptodate.com
- 79 Manterola C, Astudillo P, Losada H, Pineda V, et al. (2007). Analgesia in patients with acute abdominal pain. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: CD005660. DOI: 10.1002/14651858.CD005660.pub2. Available at: <http://www.cochrane.org/reviews/en/ab005660.html>
- 80 Toward Optimized Practice: Clinical Practice Guidelines. (2007). *Treatment of gastroesophageal reflux disease (GERD) in adults*. Alberta Medical Association. Available at: <http://www.topalbertadoctors.org/cpgs/gerd.html>
- 81 Xu X, Li Aho-shen, Zou D, Xu G, et al. Role of duodenogastroesophageal reflux in the pathogenesis of esophageal mucosal injury and gastroesophageal reflux symptoms. *Can J Gastroenterol* 2006;20(2):91-4.
- 82 Spechler SJ. (2007, November). *Epidemiology, clinical manifestations and diagnosis of Barrett's esophagus*. UpToDate Online.
- 83 Galmiche JP, Clouse RE, Balint A, Cook IJ, et al. Functional esophageal disorders. *Gastroenterology* 2006;130:1459-65.
- 84 American Gastroenterological Association. American Gastroenterological Association medical position statement: Evaluation of dyspepsia. *Gastroenterology* 2005;129:1753-55.
- 85 Tack J, Talley NJ, Camilleri M, Holtmann G, et al. Functional gastroduodenal disorders. *Gastroenterology* 2006;130:1466-79.
- 86 DaCosta L. Value of a therapeutic trial to diagnose gastroesophageal reflux disease: Step up versus step down therapy. *Can J Gastroenterol* 1997;11 (Suppl B):78B-81B.
- 87 Armstrong D, Marshall J, Chiba N, Enns R, et al. Canadian Consensus Conference on the management of gastroesophageal reflux disease in adults: Update 2004. *Can J Gastroenterol* 2005;19(1):15-35.
- 88 Longstreth GF. (2008, June). *Functional dyspepsia*. UpToDate Online. Available by subscription: www.uptodate.com
- 89 Kahrilas PJ. (2008, February). *Clinical manifestations and diagnosis of gastroesophageal reflux in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 90 Longstreth GF. (2008, April). *Approach to the patient with dyspepsia*. UpToDate Online. Available by subscription: www.uptodate.com
- 91 Kahrilas PJ. (2008, February). *Medical management of gastroesophageal disease reflux in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 92 American Gastroenterological Association technical review on the diagnosis and treatment of hemorrhoids. *Gastroenterology* 2004;126:1463-73.
- 93 Cataldo P. (2005). *Hemorrhoids*. American Society of Colorectal Surgeons. Available at: http://www.fascrs.org/physicians/education/core_subjects/2005/hemorrhoids/
- 94 Bleday B, Breen E. (2008). *Treatment of hemorrhoids*. UpToDate Online. Available by subscription: www.uptodate.com
- 95 Bleday B, Breen E. (2008). *Clinical features of hemorrhoids*. UpToDate Online. Available by subscription: www.uptodate.com
- 96 Acheson, AG, Scholefield JH. Management of hemorrhoids. *BMJ* 2008;336:380-3.
- 97 American Gastroenterological Association medical position statement: Diagnosis and treatment of hemorrhoids. *Gastroenterology* 2004;126:1461-62.
- 98 Brooks DC. (2007, October). *Abdominal wall hernias*. UpToDate Online. Available by subscription: www.uptodate.com
- 99 Brooks DC. (2008, May). *Classification and diagnosis of groin hernias*. UpToDate Online. Available by subscription: www.uptodate.com
- 100 Brooks DC. (2007, October). *Treatment of groin hernias*. UpToDate Online. Available by subscription: www.uptodate.com
- 101 Golladay ES, McCrudden KW. (2008, June). *Abdominal hernias*. (link to: Available at: <http://www.emedicine.com/med/TOPIC2703.HTM>)
- 102 Amerson JR. Clinical methods: *The history, physical and laboratory examinations*. Third edition. Walker HK, Hall WD, Hurst JW (Editors). Butterworths. Available at: <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=cm&part=A3091>

- 103 Wilhelm SM, Brubaker CM, Varcak EA, Kale-Pradhan PB. *Effectiveness of probiotics in the treatment of irritable bowel syndrome*. *Pharmacotherapy* 2008;28(4):496-505. Available at: <http://www.medscape.com/viewarticle/572709>
- 104 Reid G, Anukam K, Koyama T. Probiotic products in Canada with clinical evidence: What can gastroenterologists recommend. *Can J Gastroenterol* 2008;22(2):169-75.
- 105 Quigley EMM. What is the evidence for the use of probiotics in functional disorders? *Current Gastroenterology Reports* 2008;10:379-84.
- 106 Kajander K, Myllyluoma E, Rajulic-Stojanovic M, Kyronpalo S, et al. Clinical trial: Multispecies probiotic supplementation alleviates the symptoms of irritable bowel syndrome and stabilizes intestinal microbiota. *Alimentary Pharmacological Therapy* 2006;27(1):48-57. Available at: http://www.medscape.com/viewarticle/568552_print
- 107 Tack J, Fried M, Houghton LA, Spcak J, Fisher G. Systematic review: The efficacy of treatments for irritable bowel syndrome – A European perspective. *Alimentary Pharmacological Therapy* 2006;24(2):183-205. Available at: http://www.medscape.com/viewarticle/537719_print
- 108 Lehrer JK, Lichtenstein GR. (2008, September). Irritable bowel syndrome. eMedicine. Available at: <http://emedicine.com/met/TOPIC1190.HTM>
- 109 Tougas G. Irritable bowel syndrome: New approaches to its pharmacological management. *Can J Gastroenterol* 2001;15 Suppl B:12B-13B
- 110 Ford AC, Talley NJ, Spiegel BMR, Foxx-Orenstein AE, et al. Effect of fibre, antispasmodics, and peppermint oil in the treatment of irritable bowel syndrome: systematic review and meta-analysis. *BMJ* 2008;337:a2313. Available at: http://bmj.com/cgi/content/full/337/nov13_2/a2313
- 111 Wald A. (2008, May). *Treatment of irritable bowel syndrome*. UpToDate Online. Available by subscription: www.uptodate.com
- 112 Bernstein CN. Who gets irritable bowel syndrome and does seeing a gastroenterologist affect its course? *Can J Gastroenterol* 2001;15 (Suppl 8):5B-7B
- 113 Longstreth GF, Thompson WG, Chey WD, Houghton LA, et al. Functional bowel disorders. *Gastroenterology* 2006;130(5):1480-91.
- 114 Chun AB, Wald A. (2007, August). *Pathophysiology of irritable bowel syndrome*. UpToDate Online. Available by subscription: www.uptodate.com
- 115 Chun AB, Wald A. (2009, May). *Clinical manifestations and diagnosis of irritable bowel syndrome*. Up To Date Online. Available by subscription: www.uptodate.com
- 116 Thompson WG. (2009, November). *Irritable bowel syndrome*. www.e-therapeutics.ca
- 117 Soll AH. (2008, January). *Overview of peptic ulcer: Epidemiology and major causes*. UpToDate Online. Available by subscription: www.uptodate.com
- 118 Soll AH. (2006, February). *Clinical manifestations of peptic ulcer*. UpToDate Online. Available by subscription: www.uptodate.com
- 119 Soll AH. (2008, January). *Diagnosis of peptic ulcer*. UpToDate Online. Available by subscription: www.uptodate.com
- 120 Soll A H. (2008, May). *Complications of peptic ulcer*. UpToDate Online. Available by subscription: <http://www.uptodate.com>
- 121 Peura DA. (2007, July). *Management of duodenal ulcers in patients infected with Helicobacter pylori*. UpToDate Online. Available by subscription: www.uptodate.com
- 122 Toward Optimized Practice; Clinical Practice Guidelines. *Diagnosis and treatment of chronic undiagnosed dyspepsia in adults*. Alberta Medical Association, 2007. Available at: www.topalbertadoctors.org/download/353/dyspepsia_guidline.pdf
- 123 Scaccianoce G, Hassan C, Panarese A, Piglionica D, et al. Helicobacter pylori eradications with either seven-day or 10-day triple therapies, and with a 10 day sequential regimen. *Can J Gastroenterol* 2006;20(2):113-17.
- 124 Flasar MH, Goldberg E. (2006). Acute abdominal pain. *Med Clin North Am*;90:481-503.
- 125 Lyon C, Clark DC. (2006). *Diagnosis of acute abdominal pain in older patients*. Available at: <http://www.aafp.org/afp>
- 126 Manterola C, Astudillo P, Losada H, Pineda V, et al. (2007). Analgesia in patients with acute abdominal pain. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: CD005660. DOI: 10.1002/14651858.CD005660.pub2. Available at: <http://www.cochrane.org/reviews/en/ab005660.html>
- 127 Craig S. (2008, September). *Acute appendicitis*. eMedicine. Available at: <http://www.emedicine.com/emerg/TOPIC41.HTM>
- 128 Sanacroce L, Ochoa JB. (2008, August). *Appendicitis*. eMedicine. Available at: <http://www.emedicine.com/med/TOPIC3430.HTM>
- 129 Goldberg JE, Hodin RA. (2008, September). UpToDate Online. Available by subscription: www.uptodate.com

- 130 Jutabha R, Jensen DM. (2008, March). *Major causes of upper gastrointestinal bleeding in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 131 Jutabha R, Jensen DM. (2008, October). *Approach to the adult patient with upper gastrointestinal bleeding in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 132 Jutabha R, Jensen DM. (2006, October). *Etiology of lower gastrointestinal bleeding in adults*. UpToDate Online. Available by subscription: www.uptodate.com
- 133 Jutabha R, Jensen DM. (2008, September). *Approach to the adult patient with lower gastrointestinal bleeding in adults*. UpToDate Online. Available by subscription: <http://www.uptodate.com>
- 134 Chico GF, Manas KJ. (2008, November). *Lower gastrointestinal bleeding*. eMedicine. Available at: <http://www.emedicine.com/med/TOPIC3730.HTM>
- 135 Yachimski PS, Friedman LS. (2008, January). *Gastrointestinal bleeding in the elderly*. eMedicine. Available at: <http://www.medscape.com/viewprogram/8635>
- 136 Cerulli MA, Iqbal S. (2008, February). *Upper gastrointestinal bleeding*. eMedicine. Available at: <http://www.emedicine.com/med/TOPIC3565.HTM>
- 137 Quickel R, Hodin RA. (2008, October). *Clinical manifestations and diagnosis of small bowel obstruction*. UpToDate Online 16.3. Available by subscription: www.uptodate.com
- 138 Quickel R, Hodin RA. (2008, October). *Treatment of small bowel obstruction*. UpToDate Online 16.3.
- 139 Hopkins C. (2011, November) *Large bowel obstruction*. eMedicine. Available at: <http://emedicine.medscape.com/article/774045-overview>
- 140 Basson MD. (2008, July). *Colonic obstruction*. eMedicine. Available at: <http://www.emedicine.com/med/TOPIC415.HTM>
- 141 Nobie BA. (2007, September). *Small bowel obstruction*. eMedicine. Available at: <http://www.emedicine.com/emerg/TOPIC66HTM>
- 142 Barclay L, Lie D. (2008, June). *Recommendations issued for acute pancreatitis*. eMedicine.
- 143 Gardner TB. (2008, June). *Acute pancreatitis*. eMedicine. Available at: <http://www.emedicine.com/med/TOPIC1720.HTM>
- 144 Vege SS, Chari ST. (2008, May). *Etiology of acute pancreatitis*. UpToDate Online.
- 145 Vege SS, Chari ST. (2008, September). *Clinical manifestations and diagnosis of acute pancreatitis*. UpToDate Online. Available by subscription: <http://www.uptodate.com>
- 146 Vege SS, Chari ST. (2008, September). *Treatment of acute pancreatitis*. UpToDate Online. Available by subscription: www.uptodate.com
- 147 Khoury G. (2007, July). *Pancreatitis*. eMedicine. Available at: <http://www.emedicine.com/emerg/TOPIC354.HTM>
- 148 New South Wales (NSW) Health. *NSW rural adult emergency clinical guidelines*. 3rd ed. 2010 p. 112.