A NATIONAL EPIDEMIC

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## TABLE OF CONTENTS

- About the Authors ............................................. 3
- Purpose and Goals ............................................. 3
- Instructional Objectives ....................................... 3
- Introduction ....................................................... 3
- Assessing the Abdominal Quadrants ................. 3
- Inspecting the Abdomen ......................................... 3
- Figure 1: Nine Abdominal Regions .................... 4
- Auscultating Bowel Sounds .................................. 4
- Percussing the Abdomen ....................................... 4
- Figure 2: Percussing the Abdomen ....................... 5
- Palpating the Abdomen ......................................... 5
- Assessment of the Acute Abdomen ..................... 5
- The Patient’s Description of Pain ....................... 5
- Figure 3: Estimating the Size of the Liver ......... 6
- Key Observations ................................................ 6
- Withholding Pain Medications ......................... 6
- Figure 4: Some Causes of Acute Abdominal Pain... 7
- When Minutes Count ......................................... 7
- The Causes of Acute Abdomen ............................. 7
- Gastrointestinal Bleeding ..................................... 7
- Figure 5: Key Assessment Signs ......................... 8
- Figure 6: Evaluating Orthostatic Vital Signs .... 9
- Figure 7: Estimating Blood Loss ......................... 10
- Figure 8: The Four Stages of Hemorrhage ........ 11
- Figure 9: Lab Values That Signal a GI Bleed .... 12
- Figure 10: A Closer Look at Blood Products, Colloids, and Crystalloids ................................. 13
- Figure 11: Massive Transfusions: Recognizing the Hazards ............................................. 14
- Bleeding Esophageal Varices ............................. 15
- Acute Pancreatitis .............................................. 16
- Appendicitis ...................................................... 16
- Figure 12: Reviewing Esophageal Tubes ...... 17
- Acute Mesenteric Ischemia ................................ 18
- Abdominal Aortic Aneurysm (AAA) .................. 18
- Case Study: AAA Rupture .................................. 19
- Abdominal Trauma ............................................. 19
- Assessment ....................................................... 19
- Diagnostic Tests ............................................... 21
- Intervention ...................................................... 22
- Evaluation ......................................................... 22
- Case Study: Abdominal Trauma ....................... 22
- Figure 13: Diagnostic Peritoneal Lavage ....... 23
- Conclusion ......................................................... 23
- Inside Tract Resource List .................................. 23
- Figure 14: Procedures Used to Diagnose Abdominal Trauma ............................................. 24
- Skills Assessment ............................................... 25
- Figure 15: Guide to Abdominal Trauma ....... 26
- References and Suggested Readings ............... 28
About the Authors

Shelda L. Hudson, RN, BSN, PHN completed her Baccalaureate Degree in Nursing and public health certificate at Azusa Pacific University. She is the Nurse Supervisor of the Instructional Systems Development section of the National Center of Continuing Education, Inc. In this capacity, she is responsible for directing the activities of this department; selecting qualified, credentialed authors for the courses offered by the National Center; and advising staff of required course design and criteria. Ms. Hudson has more than 20 years of extensive experience in publishing courses in continuing education for healthcare professionals with the National Center.

Cheryl Duksta, RN, ADN, M.Ed., is currently a critical care nurse in an intermediate care unit in Austin, Texas. She is an active member of the American Association of Critical-Care Nurses (AACN) Greater Austin chapter. A master's prepared teacher and former public school teacher, Ms. Duksta frequently serves as a continuing education facilitator. She has 15 years of experience in education and medical publishing, including writer and editor at the National Center of Continuing Education, Inc.

Purpose and Goals

Gastrointestinal (GI) emergencies can occur in a variety of situations. The goal of this course is to educate healthcare professionals regarding assessment of the abdomen, treatment methods, and care planning for patients with emergencies of the GI tract.

Instructional Objectives

At the completion of this course you will be able to:
1. Identify the nine regions of the abdomen and the underlying organs and structures.
2. List the standard assessment sequence to examine the abdomen.
3. Explain how to inspect, auscultate, percuss, and palpate the abdomen.
4. Describe two eponymous signs associated with injury to specific organs.
5. Differentiate the various four causes of acute abdominal pain.
6. Identify common causes of bleeding in GI emergencies.
7. Interpret various diagnostic studies used to confirm GI bleeding.
8. Compare pharmacological therapies used in the treatment of GI bleeding.
9. Summarize the complications of acute pancreatitis, appendicitis, and acute mesenteric ischemia.
10. Describe the symptoms associated with abdominal aortic aneurysm rupture.
11. Compare and contrast penetrating and blunt trauma.
12. Identify the procedures used to diagnose abdominal trauma.
13. Determine the treatment goals for patients with abdominal trauma.
14. Describe the procedure for peritoneal lavage.

Introduction

When patients suffer GI trauma, assessment doesn’t end in the emergency department. Complications can develop suddenly after patients are transferred to other units of the hospital. Determining the cause of a GI emergency can be puzzling. The signs and symptoms can be subtle and are often obscured by other life-threatening conditions or by drug or alcohol use. The nature or extent of the injury cannot be determined by any single test. To see the whole picture, the patient’s history, physical examination, lab reports, and test results must be evaluated.

Assessing the Abdominal Quadrants

Your assessment should include all regions of the abdomen. The abdomen is commonly divided into four quadrants, with the umbilicus as the center point. Sometimes the abdomen is divided into nine regions (see Figure 1).

To examine the abdomen, use the four standard assessment techniques of inspection, percussion, palpation, and auscultation but not in the normal sequence. Instead, inspect the abdomen first, then auscultate, percuss, and, finally, palpate. Because percussion and palpation can affect bowel motility, increasing the frequency of bowel sounds, perform those actions after inspection and auscultation.

Inspecting the Abdomen

How you position yourself during assessment of the abdomen can affect your observations. Standing at the foot of the bed for part of your inspection and then sitting to the patient’s side offer two vantage points that complement each other. For instance, sitting will allow you to better view the abdominal contour and any visible peristalsis. When you stand, you are at a better angle to evaluate abdominal symmetry.

To begin your inspection of the abdomen ask the patient to void and then lie supine with arms at each side. To help relax the abdominal muscles, place a small pillow under the patient’s head (or raise the head of the bed a little) and ask the patient to slightly flex his or her knees. At the same time, encourage the patient to take slow, deep breaths. Then
shine a flashlight across the patient’s abdomen. You can place the light either at the foot of the bed or to the right of the patient’s abdomen. Any changes in abdominal contour will cast a shadow.

Next, sit at the patient’s side so that your eyes are level with the patient’s abdomen. Inspect the patient’s skin for pigmentation changes, superficial veins, lesions, rashes, striae, and scars. Observe the size and shape of the abdomen. Note whether it is concave, flat, rounded, or distended and whether it appears symmetrical. Look for visible masses, pulsations, and peristalsis. Then assess the abdominal musculature and the condition of the umbilicus.

Tell the patient to take a deep breath and hold it. This will force the diaphragm downward, increase intraabdominal pressure, and reduce the size of the abdominal cavity. In many cases, you will be able to see hepatic and splenic masses more easily when a patient holds his or her breath.

Instruct the patient to raise his or her head to further assess the abdominal musculature. With the patient in this position, superficial abdominal wall masses, hernias, and muscle separations should be more apparent. After a complete inspection, move on to auscultation of bowel sounds.

**Auscultating Bowel Sounds**

When auscultating for bowel sounds, it doesn’t matter which quadrant you auscultate first, as long as you proceed systematically, in a clockwise fashion, and listen to all four quadrants. Many examiners like to follow the path of the large bowel: right lower quadrant (RLQ) to right upper quadrant (RUQ) to left upper quadrant (LUQ) and finally to left lower quadrant (LLQ).

To begin, warm the diaphragm of the stethoscope with your hands. A cold diaphragm can cause abdominal tenseness. Place the warmed diaphragm on the abdomen, in one of the quadrants. Hold the diaphragm lightly in place and listen for bowel sounds. Note the quality and frequency of the sounds.

Sometimes you may hear bowel sounds that are almost continuous. These hyperactive sounds indicate increased bowel motility, which may occur in patients with gastroenteritis or early intestinal obstruction. A prolonged gurgling sound, known as borborygmi, may result from increased motility and can be accompanied by diarrhea.

Sluggish bowel sounds (three or fewer per minute) indicate decreased motility. You might hear such decreased sounds in a patient with a late-stage bowel obstruction, paralytic ileus, or peritonitis.

If you don’t hear bowel sounds in one quadrant, on to the next quadrant, take your time, and listen carefully. Bowel sounds are described as absent if they are not heard for at least 5 minutes. Common causes of absent bowel sounds include complete obstruction, paralytic ileus, peritonitis, and gangrene.

Report any abnormal bowel sounds, particularly when they are accompanied by other signs and symptoms. Certain abnormal sounds indicate a life-threatening situation. For example, a patient who has hyperactive, high-pitched, tinkling bowel sounds that coincide with abdominal cramping may have an intestinal obstruction.

**Percussing the Abdomen**

By percussing the abdomen, you can gain information about a patient’s abdominal structures. Three types of percussion sounds help to determine the location of abdominal organs and structures. Dull percussion sounds, which are heard when percussing over dense abdominal organs, are short and high pitched. Dull sounds are heard over the liver in the RUQ, over the spleen just behind the left midaxillary line at the 10th rib, and over a distended bladder.

Percussing over an air-filled structure produces long, low-pitched, tympanic percussion sounds. These sounds occur over most of the abdomen because the stomach and bowel contain gas.

A flat percussion sound is almost silent, very short, and high pitched. This sound occurs when you percuss over muscle. Expect to hear flat percussion sounds over the epigastric area.

To percuss an abdomen, begin by performing light percussion over the entire abdomen, following the same sequence you used to auscultate. Note areas of dullness, tympany, and flatness, as well as any tenderness (see Figure 2).

Percussion is used to estimate the size of the liver. Start percussing on the right midclavicular line about two fingerbreadths below the nipple. Because this area is over lung tissue, a resonant percussion sound will be heard. As you move down the midclavicular line, the sound becomes dull, indicating the upper border of the liver. Usually, a change in sound from resonance to dullness occurs somewhere between the fifth and the seventh intercostal spaces. Mark the location using a water-soluble marker (see Figure 3).

To find the liver’s lower border, start percussing on the right midclavicular line about three fingerbreadths below the

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**Figure 1**

The nine regions of the abdomen are:

1. right hypochondriac
2. epigastric
3. left hypochondriac
4. right lumbar
5. umbilical
6. left lumbar
7. right inguinal
8. hypogastric
9. left inguinal

During assessment, the most frequently used regions are the *epigastric, umbilical,* and *hypogastric.*

**Figure 2**

By percussing the abdomen, you can gain information about a patient’s abdominal structures. Three types of percussion sounds help to determine the location of abdominal organs and structures. Dull percussion sounds, which are heard when percussing over dense abdominal organs, are short and high pitched. Dull sounds are heard over the liver in the RUQ, over the spleen just behind the left midaxillary line at the 10th rib, and over a distended bladder.

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To find the liver’s lower border, start percussing on the right midclavicular line about three fingerbreadths below the
When percussing your patient's abdomen, move your hands clockwise, starting from the right upper quadrant unless your patient is experiencing pain. If he is, identify in which quadrant the pain is occurring and percuss that quadrant last. Remember when tapping, to quickly move your right finger away so you don’t damp vibration.

Figure 2

Palpating the Abdomen

After percussing, use light palpation to relax the patient. Again, follow the sequence you established during auscultation. With your finger pads, press gently into the abdomen about 1 cm. Evaluate muscle tone and check for distention, tenderness, and gross abnormalities.

If you detect tenderness, assess for guarding (or muscle rigidity). Involuntary guarding may be associated with conditions such as acute appendicitis, acute cholecystitis, pelvic inflammatory disease, and ruptured ectopic pregnancy. Voluntary guarding, on the other hand, can result because the patient is anxious. To help a patient feel more relaxed, have the patient take deep breaths through the nose and then exhale through the mouth.

After you have used light palpation in all quadrants, examine each quadrant with deep palpation. Assess for deep tenderness and masses. If you find a mass, note its size, shape, consistency, texture, motility, and location. If you detect tenderness, note its location and whether the tenderness is diffuse or localized. Also, record if guarding occurs.

To palpate the liver, place your fingertips below the pen mark indicating the lower border. As you gently push in and up, ask the patient to take a deep breath. When the patient inhales, the edge of the liver should descend to meet your fingertips. Normally, it should feel smooth, firm, and sharp. A cirrhotic liver feels hard. If the liver feels hard and nodular, however, a malignancy may be present.

If you detect tenderness, check for rebound tenderness. Push your finger pads gently but deeply into the tender area and then quickly remove them. If the patient feels severe pain after you remove your fingers, the patient has rebound tenderness, a classic sign of peritoneal irritation. Remember, this maneuver can be extremely painful, so perform it at the end of the examination.

Note: If at any time you suspect appendicitis or abdominal aortic aneurysm, avoid deep palpation of the abdomen.

Assessment of the Acute Abdomen

Acute abdomen is medical shorthand for acute abdominal pain, usually accompanied by vomiting, constipation, and changes in genitourinary function. The word acute usually means a condition is brewing rapidly. For this reason, you may equate an acute abdomen with a surgical abdomen. The two terms are not interchangeable; surgery is not always a foregone conclusion, although a diagnostic laparoscopy and possibly an exploratory laparotomy may be performed in many cases. As a general rule, surgery is more likely when acute pain lasts more than 6 hours. Because elderly patients present more frequently than younger patients with operable diagnoses, surgery is more likely for patients older than 60 years.

Finding the underlying cause of an acute abdomen is not an easy matter because the pain may result from a number of causes, including intestinal obstruction or perforation, vascular abnormalities, bacterial and viral infections, inflammation, metabolic disorders, and poisoning (see Figure 4). No one test will clinch a particular diagnosis.

Interestingly, for many patients with acute abdominal pain their diagnosis changes during their hospitalization. For example, a patient admitted with a diagnosis of “rule out pancreatitis” may later be diagnosed with a common bile duct obstruction.

The Patient’s Description of Pain

The quality of the pain associated with an acute abdomen may range from vague to diffuse to immobilizing. Because many abdominal organs share the same nerve pathways, the source of the pain...
Key Observations

Keen observations skills are vital in assessing the acute abdomen. Watch your patient's behavior closely. You may notice some key diagnostic clues. For example, if your patient is tachypneic but not using his or her abdomen to breathe, the patient may have peritoneal irritation. The patient with this condition will often try to immobilize the abdomen and diaphragm to avoid pain. A patient with acute pancreatitis, on the other hand, may lean forward in an effort to relieve pain.

Perform the iliopsoas test and the obturator muscle test and observe your patient's response:

**Iliopsoas test.** With the patient lying supine in bed, place one hand on the patient's right hip and the other just below the right knee. Now ask the patient to raise the leg against your resistance. If this maneuver is painful for the patient, inflammation of the iliopsoas muscle in the groin may be present, which is strongly suggestive of appendicitis.

**Obturator muscle test.** With the patient lying supine, flex the hip and knee at right angles and rotate the leg both internally and externally. A positive test elicits hypogastric pain and may indicate a pelvic mass or appendicitis.

In addition to indicative patient behaviors, you may observe the following eponymous medical signs:

**Murphy's sign.** Ask the patient to take a deep breath while you palpate the right subcostal area, below the hepatic margin. As the patient's diaphragm descends during inspiration, the gallbladder, if distended, will touch your fingers. This contact will induce pain in the patient with cholecystitis. The patient may stop inhaling to guard against the pain. Murphy's sign is also known as the "sign of inspiratory arrest."

**Kehr's sign.** A positive Kehr's sign is a classic situation of referred pain. The patient will complain of pain in the left shoulder, which is caused by irritation of the diaphragm due to bleeding. This sign indicates a ruptured spleen.

**Grey Turner's sign.** This sign is indicative of blood collecting in the abdomen from retroperitoneal hemorrhage. To identify Grey Turner's, assess the patient's back. If the patient has a bluish discoloration in the flanks, a positive Grey Turner's sign is present.

**Cullen's sign.** Look for a bluish discoloration of the skin around the umbilicus, sometimes associated with intraperitoneal hemorrhage, especially following rupture of the fallopian tube in ectopic pregnancy. Cullen's sign may also indicate acute hemorrhagic pancreatitis (see Figure 5).

**Rovsing's sign.** This sign is based on the concept that changes in intraluminal pressure are transmitted through the large intestine when the ileocecal valve is competent. Apply pressure to the patient's left lower quadrant for 5 seconds, trapping air within the large bowel. This increases the pressure within the cecum and produces pain in the right lower quadrant if the appendix is inflamed.

To complete your assessment, observe the patient as you test for shifting dullness. This test can detect changes in the abdomen's contour when the patient moves from the supine to the lateral position. These changes occur if there is free fluid in the abdomen, such as with ascites.

To detect shifting dullness, percuss the abdomen with the patient lying supine. Start percussing along the midline of the abdomen, then move outward toward the flanks. Use a water-soluble pen to mark all areas of dull percussion with a B (to indicate that the patient was on his or her back). Dullness is usually heard over abdominal fluid or masses.

Now have the patient roll to the side. If free fluid is present in the abdomen, it will move to the dependent side. Percuss the abdomen again, marking dull areas with RS (right side) or LS (left side). To ensure consistent assessments among nurses, all nurses should use the same technique for marking shifting dullness.

### Withholding Pain Medications

In the past, nurses were discouraged from administering analgesics, anti-spasmodics, smooth muscle relaxants, and anticholinergics before a medical examination because these medications were thought to mask the patient's pain during physical exam, making it difficult to accurately diagnose a condition, which might delay surgery. This cardinal rule is no longer followed in many cases.
Recent studies show that analgesics do not compromise assessment but instead can enhance an assessment because they relax the patient and relieve anxiety, allowing for a more thorough exam. In addition, physicians rely on lab and radiologic studies for diagnosis in addition to observation. Therefore, patient comfort during the physical exam is allowed and encouraged.

Choice of analgesic depends on the patient’s age, symptoms, and possible diagnosis, but morphine and fentanyl are frequently prescribed. Any opiate analgesic can cause spasm of the sphincter of Oddi, but fentanyl is less likely than morphine to induce spasm and is more often the recommended analgesic for relief of acute abdomen.

**When Minutes Count**

Assessment of the patient with an acute abdomen is an active process, requiring constant, curious attention. A stable patient may rapidly deteriorate. Because of the time-critical nature of these injuries, effective communication is paramount. Reassess patients regularly and after a patient reports a change in symptoms and notify a physician of any changes that may signal a compromise in the patient's condition.

**The Causes of Acute Abdomen**

Many conditions can cause acute abdomen. This course focuses on the causes classified as GI emergencies, when quick thinking and early responses are necessary to prevent loss of life. The following sections describe the signs and symptoms of these conditions, their treatment, and the related nursing care.

**Gastrointestinal Bleeding**

GI bleeding most commonly comes from the upper GI tract (above the ligament of Treitz, at the duodenojejunal junction): mouth, esophagus, stomach, or duodenum. Common causes of upper GI bleeding include abdominal trauma, gastritis (a rare cause of massive bleeding), peptic ulcer (a common cause of massive bleeding), and esophageal varices (bleeding associated with significant
portal hypertension), which can result from liver disease.

The following conditions are less common causes of upper GI bleeding:

- **Mallory-Weiss syndrome** — a mucosal lining tear just below the esophagogastric junction, which usually occurs after violent or forceful vomiting
- **Boerhaave's syndrome** — esophageal perforation from esophageal dilation (expect a history of vomiting blood after a large meal
- **Osler-Weber-Rendu disease** (hereditary hemorrhagic telangiectasia) — chronic GI bleeding from dilated superficial capillaries and veins in the GI mucosa

GI bleeding may also occur from the lower GI tract (below the ligament of Treitz). Common causes of lower GI bleeding include diverticulosis (most common), inflammatory bowel disease (rarely causes massive bleeding), and hemorrhoids (usually cause mild, local bleeding). The following conditions are less common causes of lower GI bleeding:

- **Intussusception** — telescoping of a bowel segment into its communicating proximal segment; usually associated with the passage of currant jelly-like stools; usually occurs in children younger than 2 years of age
- **Colonic angiodysplasia** — arteriovenous malformations, typically in the ascending colon and usually occurring in elderly patients with a history of aortic valvular disease or previous GI bleeding
- **Bleeding diverticula** — small pouches that branch out from the intestinal wall that can become inflamed (diverticulitis) and perforate, causing massive bleeding
- **Rectal trauma** — rectal perforations that frequently cause acute rectal hemorrhage
- **Anal disorders** — conditions of the anus that typically cause less dramatic blood loss

If you suspect your patient has a GI bleed, perform a rapid assessment to...

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**Key Assessment Signs**

Bluish discoloration around the umbilicus (Cullen’s sign) or flank (Grey-Turner’s sign) indicates abdominal bleeding. With Cullen’s sign, suspect peritoneal bleeding from ruptured ectopic pregnancy or acute pancreatitis. Grey-Turner’s sign may reflect retroperitoneal bleeding from the pancreas, duodenum, kidneys, vena cava, or aorta.

**Figure 5**

Bluish discoloration around the umbilicus (Cullen’s sign) or flank (Grey-Turner’s sign) indicates abdominal bleeding. With Cullen’s sign, suspect peritoneal bleeding from ruptured ectopic pregnancy or acute pancreatitis. Grey-Turner’s sign may reflect retroperitoneal bleeding from the pancreas, duodenum, kidneys, vena cava, or aorta.
bleeding distal to the duodenum. Black combined with melena, usually indicate stools, formed from gross blood composed of primarily colonic bleeding. Maroon rectally—usually indicates lower GI hematochezia or maroon or black stools. (Recall that passage of black and tarry, maroon, and passage of black and tarry stools also can test positive, indicating hemoglobin depletion; disseminated intravascular coagulation (DIC) from shock and clotting factor loss; peritonitis and sepsis from bowel rupture; and aspiration from massive upper GI bleeding.)

Keep in mind that for life-threatening bleeding, you may need to intervene as you perform your assessment.

As your patient’s condition permits, gather pertinent medical history and obtain data about their symptoms. Most patients with GI bleeding report weakness, easy fatigue, and abdominal discomfort. These symptoms may have been present days, weeks, or months before the patient seeks medical attention. Ask the patient about recent abdominal pain and tenderness (suggesting gastritis or a peptic ulcer); severe retching just before bleeding onset (suggesting Mallory-Weiss syndrome); or a sudden fullness in the throat followed by a gushing of blood (suggesting esophageal varices). Ask about recent dysphagia, heartburn, unexplained weight loss, hematemesis; and passage of black and tarry, maroon, or bright red stools. Inquire about a history of blood disorders; peptic ulcer; previous GI bleeding and its treatment; liver disease; gastric, abdominal, or vascular surgery; possible rectal trauma; or recent abdominal trauma. Determine the use, frequency, and dosage of any medications the patient is taking, particularly salicylate compounds, nonsteroidal anti-inflammatory agents (NSAIDS), anticoagulants, steroids, and antacids. Also determine the patient’s alcohol intake.

To help uncover the cause of bleeding and the patient’s response to it. Hematomas and petechiae suggest a blood disorder. Palmar erythema, spider angioma, jaundice, hepatomegaly, ascites, and caput medusae may indicate liver disease. Telangiectasia of the skin, lips, and buccal mucosa suggest Osler-Weber-Rendu-Telangiectasia syndrome. These symptoms and physical signs may indicate lower GI bleeding from intestinal aneurysm. Hyperperistalsis usually indicates severe GI bleeding (intestinal blood acts as a potent laxative).

Obtain a set of vital signs. Acute, significant blood loss is often accompanied by increased heart rate and hypotension. Also, check for orthostatic or postural changes in blood pressure and pulse, which help indicate the degree of acute blood loss. For example, a drop in systolic blood pressure 20 mmHg and an increased heart rate of 20 beats per minute when a patient moves from supine to standing reflect a blood volume loss of approximately 20%. The greater the positional change in blood pressure and pulse, the greater the volume loss. (See Figure 6 for instructions on how to obtain and document orthostatic vital signs.)

If the patient is not in shock or exsanguinating, quickly determine the site of the bleed (if it’s not evident):

- **Upper GI bleed.** Symptoms include hematemesis or melena. Hematemesis—blood in vomitus or gastric aspirate—may be bright red (indicating fresh bleeding) or the color of coffee grounds (indicating older blood decomposed by gastric hydrochloric acid). Hematemesis almost always reflects upper GI bleeding. All vomitus and gastric aspirate should be tested to confirm the presence of blood. (Remember, however, that traumatic insertion of a nasogastric, or NG, tube may cause the patient to swallow blood, leading to a false-positive guaiac test.) Melena—liquid, tarry, foul-smelling black stools—usually reflects upper GI bleeding. The result of blood degradation, melena typically indicates blood loss of at least 500 ml in a 24-hour period. (Stools may also appear grossly bloody with a quick, massive blood loss, reflecting short transit time through the bowel.)

- **Lower GI bleed.** Symptoms include hematochezia or maroon or black stools. Hematochezia—bright red blood passed rectally—usually indicates lower GI (primarily colonic) bleeding. Maroon stools, formed from gross blood combined with melena, usually indicate bleeding distal to the duodenum. Black stools, also known as pseudomelena, may indicate lower GI bleeding from a condition that diminishes intestinal motility, such as obstructive cancer. (Remember that certain medicines, supplements, and foods can cause maroon or black stools, including iron and bismuth preparations as well as spinach, beets, and licorice.) Suspicious stool should be sent to the lab for a guaiac test. If a patient presents with symptoms of GI bleed but has brown stools plan to have stool collected for a guaiac test because brown stools also can test positive, indicating slight, intermittent, or chronic bleeding. (See Figures 7 & 8 for symptoms of mild to severe blood loss.)

Complications of GI bleeding may include anemia from blood loss; hypovolemic shock from severe volume depletion; exsanguination from rapid, massive intravascular blood loss; myocardial or cerebral infarction from acute hemoglobin depletion; disseminated intravascular coagulation (DIC) from shock and clotting factor loss; peritonitis and sepsis from bowel rupture; and aspiration from massive upper GI bleeding.

Consider a decrease in systolic pressure of 20 mmHg or more, or a pulse rate increase of 10 beats per minute or more, as positive for hypovolemia and possible impending hypovolemic shock. Dizziness, light-headedness, or vision disturbances (e.g., blurred vision) that occur when your patient changes position may also indicate orthostatic hypotension.
## Estimating Blood Loss

<table>
<thead>
<tr>
<th>Blood Loss Severity</th>
<th>Estimated Blood Loss</th>
<th>Signs and Symptoms</th>
<th>Physiologic Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mild blood loss</strong></td>
<td>&lt;20% (&lt;1,000 ml) volume depletion</td>
<td>Mild to severe orthostatic hypotension; normal blood pressure; cool, pale, diaphoretic skin (patient feels cold); normal capillary refill time; collapsed neck veins; slight anxiety; concentrated, scanty urine.</td>
<td>Peripheral vasoconstriction and decreased perfusion to least vital peripheral organs (skin, muscle, fat, bone). Increased circulating catecholamines.</td>
</tr>
<tr>
<td>Systolic blood pressure:</td>
<td>&gt;90 mmHg.</td>
<td>Pulse rate: &lt;110 beats/minute</td>
<td></td>
</tr>
<tr>
<td><strong>Moderate blood loss</strong></td>
<td>20% to 40% (1,000 to 2,000 ml) volume depletion</td>
<td>Hypotension (as much as 50 mmHg systolic blood pressure decrease); supine hypotension; rapid, bounding pulse at rest; pale mottled, cold, clammy skin; sluggish capillary refill time (&gt;2 seconds); increased respirations; patient feels thirsty; restlessness; increasing anxiety; early mental status changes; oliguria progressing to anuria.</td>
<td>Decreased perfusion to kidneys, liver and GI tract. Metabolic acidosis and hypoxemia.</td>
</tr>
<tr>
<td>Systolic blood pressure:</td>
<td>70 to 90 mmHg.</td>
<td>Pulse rate: 10 to 130 beats/minute</td>
<td></td>
</tr>
<tr>
<td><strong>Severe blood loss</strong></td>
<td>&gt;40% (&gt;2,000 ml) volume depletion</td>
<td>Severe supine hypotension (&lt;80 mm Hg, palpable to unobtainable); rapid, thready pulse (supine); cold, dusky, gray skin; glassy eyes; prolonged capillary refill time; rapid, deep respirations; agitation; confusion progressing to coma; anuria.</td>
<td>Decreased perfusion to heart and brain. Severe metabolic acidosis, respiratory acidosis, and hypoxemia.</td>
</tr>
<tr>
<td>Systolic blood pressure:</td>
<td>&lt;70 mmHg.</td>
<td>Pulse rate: &gt;130 beats/minute</td>
<td></td>
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</table>

**Figure 7**
### The Four Stages of Hemorrhage

<table>
<thead>
<tr>
<th>STAGE 1</th>
<th>STAGE 2</th>
<th>STAGE 3</th>
<th>STAGE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>up to 15% blood loss</strong></td>
<td><strong>up to 30% blood loss</strong></td>
<td><strong>up to 40% blood loss</strong></td>
<td><strong>&gt; 40% blood loss</strong></td>
</tr>
</tbody>
</table>

#### How the Body Responds

- **STAGE 1**
  - Baroreceptors detect decreased venous return and cardiac output, triggering stronger sympathetic responses.
  - Vasoconstriction continues to maintain adequate blood pressure, but with some difficulty now.
  - Blood flow is shunted to vital organs, with decreased flow to intestines, kidneys, and skin.

- **STAGE 2**
  - Patient becomes lethargic, drowsy or stuporous.
  - Signs of shock become more pronounced. Blood pressure continues to fall, pulse pressure continues to narrow, although if diastolic pressure “drops out,” pulse pressure may actually widen.
  - ABG analysis reveals metabolic acidosis and respiratory alkalosis.
  - Capillary refill is very delayed (>3 seconds).

- **STAGE 3**
  - Patient becomes more confused, restless, and anxious.
  - Classic signs of hypovolemic shock appear—tachycardia, decreased blood pressure, tachypnea, and cool, clammy extremities.
  - Capillary refill is delayed (>2 seconds).
  - Urine output continues to decrease.

- **STAGE 4**
  - Patient becomes more confused, restless, and anxious.
  - Classic signs of hypovolemic shock appear—tachycardia, decreased blood pressure, tachypnea, and cool, clammy extremities.
  - Capillary refill is delayed (>2 seconds).
  - Urine output continues to decrease.

#### Effect on Patient

- **STAGE 1**
  - Patient remains alert.
  - Blood pressure stays within normal limits.
  - Pulse stays within normal limits or increases slightly; pulse quality remains strong.
  - Respiratory rate and depth, skin color and temperature, and urine output all remain normal.
  - Capillary refill remains normal (<2 seconds).

- **STAGE 2**
  - Patient may become confused and restless. Skin turns pale, cool, and dry because of shunting of blood to vital organs. Urine output decreases for same reason. (Because other signs and symptoms are vague at this stage, decreased urine output may be the first sign of hypovolemia.)
  - Systolic pressure starts to fall.
  - Diastolic may rise or fall. It’s more likely to rise (due to vasoconstriction) or stay the same in otherwise healthy patients with no underlying cardiovascular problems.
  - Pulse pressure (difference between systolic and diastolic pressures) narrows.
  - Sympathetic responses also cause tachycardia. Pulse quality weakens.
  - Respiratory rate increases due to sympathetic stimulation.
  - Capillary refill remains normal.

- **STAGE 3**
  - Patient becomes more confused, restless, and anxious.
  - Classic signs of hypovolemic shock appear—tachycardia, decreased blood pressure, tachypnea, and cool, clammy extremities.
  - Capillary refill is delayed (>2 seconds).
  - Urine output continues to decrease.

- **STAGE 4**

#### Notes

*The average adult has 5 liters of circulating blood; 15% is 750 ml (or about 3 cups). With internal bleeding, 750 ml will occupy enough space in a limb to cause swelling and pain. With bleeding into the peritoneal cavity, however, the blood will spread throughout the cavity, causing little, if any, initial discomfort.*
pale, cool, clammy skin; decreased capillary refill time; and tachycardia.

Various diagnostic tests may confirm GI bleeding and help determine its site and cause. The physician may order the following studies:

- **Complete blood count (CBC) with differential**—Results may show an elevated white blood cell count, reflecting the body’s response to injury. Hemoglobin and hematocrit values remain unchanged initially or become falsely elevated from the body’s attempt to compensate for blood loss. Remember, however, that hemoglobin and hematocrit values do not accurately reflect early blood loss. Hemoglobin and hematocrit values change at a rate that varies with extracellular fluid diffusion into the vascular space and with the amount of IV fluids given. Because equilibrium takes 2 to 18 hours, early hematocrit values may not adequately reflect severity of fluid loss. Once the patient receives sufficient IV fluids to correct orthostatic hypotension, hemoglobin and hematocrit values reflect blood loss more accurately. A 4% drop in hematocrit reflects the loss of 1 unit of blood (See Figure 9).
- **Emesis, gastric aspirates, and stool tests**—Gross blood may appear in emesis; occult blood may be revealed by a guaiac test; nasogastric lavage removes the contents of the stomach so it can be examined for blood.

### Lab Values That Signal a GI Bleed

<table>
<thead>
<tr>
<th>Lab value</th>
<th>Normal readings</th>
<th>Interpreting abnormal levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood urea nitrogen (BVN)</td>
<td>8--20 mg/dl</td>
<td>Increases signal upper GI bleeding, rarely lower GI bleeding.</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>Male: 45%-52%</td>
<td>Low levels indicate blood loss, but hematocrit may remain normal for 24 hrs after massive bleed.</td>
</tr>
<tr>
<td></td>
<td>Female: 37%-58%</td>
<td></td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>Male: 13.5--18.2 g/dl</td>
<td>A drop indicates hemorrhage, but levels may be normal immediately after a massive bleed.</td>
</tr>
<tr>
<td></td>
<td>Female: 12.0--16.0 g/dl</td>
<td></td>
</tr>
<tr>
<td>Mean corpuscular volume</td>
<td>82--98 cubic microns</td>
<td>A decrease indicates chronic blood loss, but normal levels are common during acute bleeding.</td>
</tr>
<tr>
<td>Partial thromboplastin time (PTT)</td>
<td>30--45 seconds</td>
<td>Prolonged times are expected in hemophilia A and B and other disorders that cause bleeding, including vitamin K deficiency and alcoholic cirrhosis.</td>
</tr>
<tr>
<td>Platelet count</td>
<td>150,000--350,000/mm³</td>
<td>Decreased levels can contribute to GI bleeding.</td>
</tr>
<tr>
<td>Prothrombin time (PT)</td>
<td>11--12.5 seconds</td>
<td>Time is prolonged in conditions that cause bleeding, including vitamin K deficiency and alcoholic cirrhosis.</td>
</tr>
<tr>
<td>Red blood cell (RBC) count</td>
<td>Male: 4.6--6.2 x 10⁹/mcl</td>
<td>RBCs decrease after blood loss but may be normal during acute bleeding or dehydration.</td>
</tr>
<tr>
<td></td>
<td>Female: 4.2--5.4 x 10⁹/mcl</td>
<td></td>
</tr>
<tr>
<td>PRODUCT BEING INFUSED</td>
<td>DESCRIPTION</td>
<td>POINTS TO REMEMBER</td>
</tr>
<tr>
<td>-----------------------</td>
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<td>--------------------</td>
</tr>
</tbody>
</table>
| **Whole Blood**       | *Blood product:* Contains normal components of whole blood; 1 unit equals 500 ml. | • Restores blood volume and oxygen carrying capacity of blood.  
• Administer over 2–4 hr.  
• Takes 12–24 hr. for hemoglobin and hematocrit to equilibrate.  
• Watch for transfusion reaction and fluid overload. |
| **Packed RBCs**        | *Blood product:* Contains RBCs and 20% plasma (but no clotting factors and less sodium and potassium than whole blood); 1 unit equals 250–300 ml. | • Restores oxygen-carrying capacity of blood while minimizing risk of fluid overload.  
• Administer at a slower rate than whole blood.  
• Watch for transfusion reaction. |
| **Fresh frozen plasma**| *Blood product:* Contains liquid portion of whole blood separated from cells, then frozen; one unit equals 200–250 ml. | • Rich in clotting factors but contains no platelets.  
• Expands circulating fluid volume.  
• Laboratory should allow 20 minutes to thaw.  
• Use within 24 hours of thawing.  
• Administer 1 unit over 1 hour. |
| **Plasma Protein Fraction (Plasmanate)** | *Blood product/colloid:* Contains 5% plasma protein fraction solution but no clotting factors; one unit can range from 50 to 500 ml. | • Allows plasma replacement without type and crossmatch testing.  
• Infuse no faster than 10 ml/minute. (Hypotension may occur if infused too rapidly.)  
• Watch for hypersensitivity reaction and fluid overload.  
• Hyperventilation and headaches may occur.  
• Expensive treatment. |
| **Serum albumin**      | *Blood product/colloid:* Contains albumin from plasma (main proteins found in blood); available in 5% and 25% solutions. | • 5% albumin is equal to plasma oncotic pressure; 25% albumin draws volume into vascular space.  
• Infuse slowly. Start infusion with 25 g and repeat after 15–20 minutes prn (without exceeding 250 g in 48 hr).  
• Watch for fluid overload, hypersensitivity reaction, and bleeding.  
• Expensive treatment. |
| **Lactated Ringer’s solution** | *Crystalloid:* Contains sodium, chloride, potassium, calcium, and lactate, closely approximating normal electrolyte contents. | • Tailor dosage to meet needs of individual patient, depending on volume loss.  
• Can infuse rapidly (and while patient’s blood is being typed and cross matched).  
• Inexpensive and readily available; also, carries no risk of hypersensitivity reaction.  
• Watch for fluid overload. |
| **Normal saline solution** | *Crystalloid:* Contains 0.9% sodium chloride. | • Same as for lactated Ringer’s, but watch for electrolyte disturbances and potassium loss. |
Massive Transfusions: Recognizing the Hazards

A massive transfusion—replacement of more than 50% of a patient’s blood volume in 1 hour—can save your patient’s life during a serious GI bleed. However, massive transfusions pose their own risks. Citrate phosphate–dextrose, a preservative added to whole blood, reduces the oxygen-carrying capacity of blood, which adversely affects the patient’s oxygenation. Also, stored blood undergoes various metabolic changes that may lead to complications.

During massive transfusions, provide supplemental oxygen, as ordered, to your patient and monitor carefully for the following complications:

- Hyperkalemia (stored blood has a high potassium content)
- Hypocalcemia (stored blood lacks ionized calcium)
- Acid-base imbalance (stored blood acidifies gradually)
- Ammonia intoxication (stored blood has an increased ammonia level)
- Citrate intoxication (stored blood contains citrate, which binds to serum calcium)
- Coagulation disturbances (stored blood may have low levels of platelets and other clotting factors)
- Bacterial and viral infections (stored blood may come from infected donors)
- Circulatory overload from excessive volume replacement
- Hypothermia from rapid infusion of cold blood

Figure 11

Radiographs—Films taken with the patient in high Fowler’s position (if the patient’s hemodynamic status permits) may show free air beneath the diaphragm, suggesting perforation.

- Endoscopy—The most common method of determining the source of GI bleeding, this exam is also called esophagogastroduodenoscopy (EGD) when the endoscope is inserted through the mouth to examine the esophagus, stomach, or duodenum for upper GI bleeding. When the endoscope is inserted into the colon, the procedure is called a colonoscopy, which is the preferred examination to evaluate a lower GI bleed. Other diagnostic endoscopic exams to evaluate the source of lower GI bleeding include sigmoidoscopy, an examination of the rectum, and anoscopy, an exam of the anus. Active bleeding can obstruct the view during these exams; therefore, the physician may defer endoscopy until the patient’s bowel can be cleansed. In some cases, the physician may order endoscopy with injection of a sclerosing agent to help treat bleeding.

- Angiography—The physician may order this test (usually performed through the superior mesenteric artery) to help determine the sites of an upper or lower GI bleed. Angiography may also be used to provide injection access for a vasoconstrictive agent (e.g., vasopressin), an autologous clot, or Gelfoam, all of which help control bleeding. Computed tomographic angiography (CTA) and magnetic resonance angiography (MRA) are becoming increasingly popular as diagnostic tools for in-hospital patients with suspected GI bleeding.

- Technetium-99m red blood cell scan—This radionuclide scan assists in detecting the location of slow bleeds.

- ECG—Some patients with GI bleeding may suffer silent MI, so prepare the patient for a 12-lead ECG as ordered.

Treatment goals for the patient with active GI bleeding include obvious measures—stabilizing the patient, stopping the bleeding, and beginning appropriate therapy to prevent further bleeding. Many patients stop bleeding spontaneously. Those who don’t may need invasive (and not always effective) procedures. Many patients have recurrent—and sometimes fatal—bleeding during the first few days after hospitalization.

Expect to start interventions during your initial assessment. Focus on maintaining the ABCs: airway (keep clear and open), breathing (maintain oxygenation), and circulation (maintain adequate fluid volume). Obtain vascular access with two large-bore IV catheters or a central line. Patients at high risk of fluid overload or pulmonary edema may need a pulmonary artery catheter to monitor hemodynamic stability during resuscitation.

As ordered, administer crystalloids and colloids. Crystalloids, such as normal saline solution or lactated Ringer’s solution, help maintain intravascular volume. These fluids may be ordered as a rapid bolus of 1 to 2 liters. During the infusion, draw blood and send it to the lab for a type and cross-match, in preparation for a blood transfusion.

Whole blood; packed red blood cells (RBCs); blood products, such as fresh-frozen plasma (FFP), platelets, and albumin; and synthetic solutions, such as hetastarch and dextran, are colloids. The patient’s condition dictates the type of colloid the physician orders. For example, high-risk patients (e.g., those with coronary artery disease) with an active bleed may receive packed RBCs; those with an active bleed and a prolonged INR may receive packed RBCs and FFP; and those who are actively bleeding and have a low platelet count may receive packed RBCs and platelets. A patient with a coagulation disturbance should receive 1 unit of FFP for every 4 units of packed RBCs administered (see Figure 10 for more detailed information on fluids). Administration of warmed blood products helps to prevent hypothermia, a frequent complication of hemorrhagic shock.

Check hematocrit and hemoglobin values to assess the effectiveness of fluid resuscitation. A hematocrit of 30% and a hemoglobin of 10 g serve as reasonable goals for most patients. As a rule of thumb, remember that 1 unit of packed RBCs increases hematocrit by approximately 4% and hemoglobin by approximately 1 g. Assess the patient frequently for signs and symptoms of electrolyte disturbances and other complications related to massive transfusion (see Figure 11).

The physician may order insertion of an indwelling (Foley) catheter to monitor urine output and assess circulatory sta-
Drug therapy — The doctor may order vasoconstrictors. Vasoconstrictors, such as norepinephrine (Levophed) and vasopressin (Pitressin), help control both upper and lower GI bleeding. Norepinephrine increases systemic vascular resistance, shunting blood away from the periphery to the more vital organs, such as the brain and heart. Administer norepinephrine after fluid resuscitation has been made since increasing vascular resistance in a hypovolemic patient will have little effect on the patient's blood pressure. A loading dose of 8–12 mcg/min, followed by a maintenance dose of 2–4 mcg/min may be ordered; titrate the dose to desired effect. Monitor vital signs closely during administration because norepinephrine can cause renal damage due to prolonged hypertension.

Vasopressin, a naturally occurring antidiuretic hormone, is commonly ordered to manage hypotension secondary to GI bleeding. Administer vasopressin at a rate of 0.2 to 0.4 unit/minute, titrating to a maximum dose of 0.9 unit/minute. For intra-arterial infusion (usually through the superior mesenteric artery), the initial dose of vasopressin is 0.2 unit/minute, with a maximum rate of 0.6 unit/minute for persistent bleeding. Because vasopressin can cause soft-tissue necrosis if it infiltrates subcutaneously, the preferred administration route is through a central line.

Monitor your patient carefully during vasopressin infusion. Frequently assess vital signs and place the patient on a cardiac monitor. Vasopressin’s most common adverse effects include pallor, colicky abdominal pain, diarrhea, hypotension, peripheral vasoconstriction, increased arterial pressure, decreased cardiac output, angina, and dysrhythmias (especially bradycardia). Also stay alert for infarction of infused GI areas.

Always use an infusion pump to administer vasopressin, and never stop a vasopressin infusion abruptly. Wean your patient off the drug gradually once bleeding stops. Don’t give vasopressin to a patient with cardiovascular disease because it causes peripheral and coronary arterial vasoconstriction, possible precipitating cardiac dysrhythmias.

In addition to maintaining adequate blood pressure, therapy should also focus on stopping the bleeding. Physicians may also order the following medications to meet this goal:

- Octreotide (Sandostatin), a protein similar to the hormone somatostatin, is effective in controlling bleeding esophageal varices. Octreotide is typically ordered as an initial bolus of 50 mcg IV, then continuous infusion of 50 mcg/hour for 2 to 5 days.

To reduce gastric acidity and aid healing in patients with peptic ulcers, pantoprazole (Protonix), a proton pump inhibitor, may be ordered. High-dose infusion of pantoprazole begins with a bolus of 80 mg IV, followed by a continuous IV infusion of 8 mg/hour for 72 hours. If H. pylori is the suspected cause of the ulcer, an antibiotic will be ordered.

Your patient may undergo gastric lavage in preparation for endoscopy. In this procedure, the physician inserts a large-bore NG or orogastric tube and instills saline solution or tap water through the tube until the aspirate is free of blood. Gastric lavage with iced solutions may lyse clots and reactivate bleeding; if lavage is used, room temperature solution is preferred.

Although most GI bleeding calls for medical management, the physician may consider surgery in these special situations:

- Bleeding recurs despite medical treatment
- Slow bleeding persists
- Shock cannot be controlled
- Acceptable blood pressure and hematocrit values cannot be maintained
- Bleeding stems from esophageal hemorrhage or hemorrhagic gastritis

The surgical procedure performed depends on the bleeding site and cause and may include gastrectomy, bowel resection, and hemorrhoidectomy.

Evaluate your patient frequently throughout treatment. To determine the patient’s status, ask yourself these questions:

- Can the patient maintain adequate tissue perfusion?
- Does the patient have a urine output of at least 30 ml/hour?
- Can the patient maintain a mean arterial blood pressure above 60 mmHg?

Bleeding Esophageal Varices

One of the most common problems nurses encounter is cirrhosis, a progressive liver disease that causes degeneration of hepatic cells and simultaneous growth of fibrotic tissue. Although cirrhosis itself is a chronic illness and not an emergent diagnosis, it is the most common cause of bleeding esophageal varices, a medical emergency.

Esophageal varices arise as cirrhosis progresses and the liver’s structure and vasculature are destroyed. Capillary branches of the portal vein and hepatic artery narrow, and pressure increases. The increased pressure creates resistance to blood flow, consequently increasing pressure in the portal vein, leading to portal hypertension.

Portal hypertension is a precursor to bleeding esophageal varices, which develop in the proximal stomach and distal esophagus. Esophageal varices are like fragile balloons: They are vulnerable to increased pressure in the portal vein and are susceptible to rupture, causing profuse bleeding into the GI tract. Massive hematemesis, melena, hypovolemia, and shock often result.

To manage an episode of acute bleeding from esophageal varices, the nurse should keep in mind the following goals: 1) replace fluid and blood through rapid fluid resuscitation, replacing clotting factors as needed, and 2) stop the bleeding, either through surgical intervention or medical management with vasoconstrictors. Several types of surgical intervention are available for bleeding varices:

Transjugular intrahepatic portosystemic shunts (TIPS) — This procedure helps to reduce portal hypertension by diverting blood flow from the portal vein to the hepatic vein. The procedure is performed by radiology under general or local anesthesia, with access usually obtained through the right jugular vein, although the left jugular vein can be used.
Acute Pancreatitis

Sudden inflammation of the pancreas, acute pancreatitis affects 100,000 people in the United States each year. Pancreatitis results from autodigestion of the pancreas, when digestive enzymes that normally are activated in the duodenum are activated early, in the pancreas itself, in effect causing the pancreas and surrounding tissues to consume themselves. Most people diagnosed with acute pancreatitis are diagnosed with mild, or interstitial, pancreatitis; about 20% of people suffer from the more severe form of pancreatitis, which can involve infection, necrosis of the pancreas, and organ failure.

Symptoms of acute pancreatitis include sudden, severe epigastric pain that may radiate to the back. Your patient may complain that the pain worsens when eating and when drinking alcoholic beverages. The pain is accompanied by nausea, vomiting, and anorexia, and your patient may also have a fever, tachycardia, and hypotension.

Your abdominal assessment may reveal hypoactive or absent bowel sounds, indicating paralytic ileus. If the patient has retroperitoneal hemorrhage, you may also notice Grey Turner’s or Culen’s sign.

The physician will order diagnostic labs and tests to confirm acute pancreatitis:

- Laboratory tests: A complete blood count (CBC), a complete metabolic panel, and serum amylase and lipase levels will be drawn. Elevated amylase and lipase are indicative of pancreatitis.
- X-rays: Often used as an initial diagnostic tool, plain films of the abdomen and chest may be taken to detect any complications of pancreatitis, including pleural effusions and ileus.
- Endoscopic ultrasound: The physician may order an ultrasound to detect gallstones, a potential cause of acute pancreatitis.
- Computed tomography (CT) scan: A CT scan can help the doctor identify and evaluate both mild and severe forms of acute pancreatitis.

• Endoscopic retrograde cholangiopancreatography (ERCP): This exam helps diagnose pancreatitis caused by gallstones and can help determine the cause of idiopathic pancreatitis.
• Magnetic resonance cholangiopancreatography (MRCP): A noninvasive alternative to ERCP, this procedures uses contrast dye to allow the physician to visualize the pancreas, gall bladder, and bile ducts. Treatment for interstitial pancreatitis includes analgesia and rest of the digestive system. Your patient will be kept NPO for up to 7 days, and intravenous fluids will be prescribed. Depending on the length of NPO status, the doctor may order a nasojejunal feeding tube, to provide nutritional support to the patient while avoiding pancreatic stimulation. As the patient’s pain subsides, the patient’s diet will be gradually advanced, beginning with foods high in carbohydrates and low in fats and protein.

If necrotizing pancreatitis is diagnosed, the patient will undergo emergent surgery to remove all necrotized and surrounding tissue.

Appendicitis

Inflammation and infection of the appendix, or appendicitis, is a leading cause of emergency surgery. The appendix, located in the right lower quadrant of the abdomen, can become obstructed and infected due to a number of causes, including inflammatory bowel disease, abdominal trauma, or enlarged lymph tissue. Left untreated, the infected appendix will burst, resulting in rapid onset of peritonitis.

Patients presenting with appendicitis complain of pain near the umbilicus that radiates to the RLQ. The pain typically has a sudden onset and worsens when the patients moves, coughs, or breathes deeply. The patient may also have nausea, vomiting, and fever. Physical examination of the patient reveals guarding, rebound tenderness, and several eponymous signs, including Rovsing’s sign and the obturator sign.

Diagnosis is often made after a medical history and physical examination are complete. If appendicitis is suspected, the doctor may perform emergent sur-
Be sure that you are familiar with the esophageal tubes described below.

Reviewing Esophageal Tubes

**Sengstaken–Blakemore tube**
3–lumen tube with gastric and esophageal balloons

**Lumen functions**
- gastric balloon inflation (about 200 to 250 cc air capacity)
- esophageal balloon inflation (about 30 to 45 mmHg pressure capacity)
- gastric aspiration

**Nursing considerations**
- Patient may need nasogastric tube to aspirate secretions that collect above esophageal balloon.
- Don’t keep esophageal balloon inflated more than 24 hr after bleeding stops. Then, as ordered, deflate balloon, release traction, and leave tube in place for another 24 to 36 hr. If gastric aspirate then appears clear, remove tube, as ordered.

**Minnesota tube**
4–lumen tube with gastric and esophageal balloons

**Lumen functions**
- gastric balloon inflation (about 450 to 500 cc air capacity) with adjacent gastric balloon pressure monitoring port
- esophageal balloon inflation with adjacent esophageal pressure monitoring port
- gastric aspiration
- esophageal aspiration

**Nursing considerations**
- Don’t keep esophageal balloon inflated more than 24 hr. Keep gastric balloon inflated for 24 hr after bleeding stops. Then, as ordered, deflate balloon, release traction, and leave tube in place for another 24 to 36 hr. If gastric aspirate then appears clear, remove tube, as ordered.

**Figure 12**
some patients, the abdomen may be diffuse abdominal pain. However, you are more likely to see nonspecific, abdomen caused by intestinal ischemia, flatulence, constipation, nausea, vomit lasting up to 90 minutes before subsiding, the patient presents with pain that starts severe abdominal pain, nausea, and vomit lasts up to 90 minutes before subsiding, which may result in the affected area and, in many cases, a colostomy. Patients with this serious problem show signs and symptoms of sepsis and impending shock. Diagnostic tests include a complete blood count, which may show an elevated white count; a computed tomography (CT) scan; and a magnetic resonance imaging (MRI) scan. In some cases, exploratory surgery may be performed to determine the extent of the gangrene.

**Acute Mesenteric Ischemia**

Acute mesenteric ischemia describes a group of processes that ultimately results in necrotic intestine if left untreated. The ischemia can be occlusive or non-occlusive in nature and is considered a vascular emergency. Arterial emboli account for 40–50% of the cases of acute mesenteric ischemia. Other causes include arterial thrombosis secondary to atherosclerotic disease, vasospasm, decreased cardiac output, intra-abdominal sepsis, and malignancy, among others.

The elderly are at greater risk for acute mesenteric ischemia from decreased tissue perfusion. A lifetime of atherosclerotic plaque formation is usually the underlying cause. In many cases, long-term use of anticoagulants and cardiac glycosides contributes to the development of intestinal ischemia: Anticoagulants may cause hematomas of the duodenum and jejunum; cardiac glycosides (e.g., digitalis) produce vasoconstriction in the peripheral mesenteric circulation.

The elderly are not the only population at high risk for acute mesenteric ischemia. For example, patients of any age with congestive heart failure or cardiac arrhythmias and those who smoke are in the high-risk category for occlusive ischemia as a result of a blood clot.

Symptoms of intestinal ischemia may develop suddenly, as in acute mesenteric ischemia, or gradually, as in chronic mesenteric ischemia. Symptoms of acute mesenteric ischemia include sudden, severe abdominal pain, nausea, and vomiting. In chronic mesenteric ischemia, the patient presents with pain that starts 15–60 minutes after ingesting food and lasts up to 90 minutes before subsiding, flatulence, constipation, nausea, vomiting, and weight loss.

In an elderly patient with an acute abdomen caused by intestinal ischemia, you are more likely to see nonspecific, diffuse abdominal pain. However, with some patients, the abdomen may become distended from gas trapped in the intestine, producing colicky, hypogastic cramps. The patient may not be able to pass the trapped gas rectally, so flatulence may be absent. You will also find constipation or watery diarrhea that eventually becomes bloody. Bits of necrotic material may appear in bloody stools. Tenesmus, a painfully urgent but ineffectual urge to urinate or defecate, may also be present.

A prolonged hemodynamic crisis can cause ischemic intestinal strictures or internal gangrene, requiring resection of the affected area and, in many cases, a colostomy. Patients with this serious problem may experience the sensation of impending doom similar to that seen in patients with an acute MI. In addition, pulsations distal to the ruptured portion of the aorta may be absent. Other systemic signs might include leukocytosis and fever.

In nonemergency cases, a variety of radiologic studies will be ordered to visualize the abdominal aorta when an AAA is suspected. Abdominal ultrasound is the screening tool of choice. A plain film x-ray may be taken and will show calcifications of the AAA and a widened aortic lumen. In addition, the doctor may order a CT and an MRI, with or without contrast, to accurately determine the size of the AAA. CT angiogram can provide similar information as an MRI and is the preferred diagnostic tool for patients with symptoms of AAA rupture.

Treatment options depend on the size of the aneurysm, which is determined by radiologic studies, and the patient’s symptoms. An asymptomatic patient with an AAA smaller than 5 or 6 cm in diameter and not growing will likely be followed as an outpatient. The risk of rupture in these cases is about 10%. However, if the diameter of the aneurysm is more than 7 cm, the risk of rupture can increase to 40%. In these cases, surgery may be recommended.

Two types of surgery are used to repair an abdominal aortic aneurysm: endovascular repair and open surgery. In endovascular repair, a stent is used to connect the lower and upper healthy legs and feet, with absent pedal pulses, may reflect distal vessel occlusion from embolization. Ecchymosis of the lower back or dependent body part should alert you to the possibility of a leaking AAA with subsequent pooling.

The three classic signs of a ruptured AAA are sudden intense, constant abdominal or back pain; a pulsating abdominal mass; and hypotension. The severe pain is due to the stretching and stripping of retroperitoneal tissues by free blood within the abdominal cavity. Signs of hemorrhagic shock usually quickly follow AAA rupture. However, some patients won’t show signs of shock immediately because the rupture may be temporarily walled off or tamponaded in the retroperitoneal space. Patients with ruptured AAA often appear restless, apprehensive, and anxious and may experience a sense of impending doom similar to that seen in patients with an acute MI. In addition, pulsations distal to the ruptured portion of the aorta may be absent. Other systemic signs might include leukocytosis and fever.
portions of the aorta. In open surgery, an incision is made on the abdomen, and the damaged portion of the aorta is replaced with a man made graft.

Surgery is risky and is generally recommended for symptomatic patients and those with aneurysms that are enlarging or more than 6 cm. Because of the inherent risks of surgery, individual risk factors must be considered before surgery is undertaken. The patient’s age and comorbid medical conditions must be taken into account. The 5-year survival rate after elective resection and grafting is 65%.

AAA rupture is a true life-threatening emergency. Nursing care focuses on immediate resuscitative measures, including airway management and fluid replacement, with a target systolic blood pressure of 50–70 mmHg, and preparation for surgery. The mortality rate for patients following repair of a ruptured AAA is greater than 40%; for patients who suffer a rupture outside of the hospital the mortality rate is much greater: 90%.

**Case Study: AAA Rupture**

Robert Sanders, age 66, presented to the emergency department with intermittent, gnawing abdominal pain. The location of the pain varied; sometimes it seemed to be at the back of his abdomen; other times it seemed to be substernal. The nurse’s abdominal assessment revealed a symmetrical abdomen with normal bowel sounds; however, the nurse auscultated a systolic bruit over the area of the abdominal aorta and refrained from percussing or palpating the abdomen. An electrocardiogram (ECG) showed a normal rhythm with heart rate within normal. The results of the nursing assessment were relayed to the emergency physician and an ultrasound was ordered.

While waiting for radiology, Mr. Sanders suddenly clutched his abdomen and screamed in pain. He sat straight up in bed, then fell back on his pillow. Vital signs included a systolic pressure of 38 and a heart rate of 124. Immediate resuscitative actions were taken, including replacement of fluids and blood products, and Mr. Sanders was taken to the operating room for emergent aortic repair. Unfortunately, despite the efforts of the healthcare team, Mr. Sanders did not survive.

**Abdominal Trauma**

Abdominal trauma accounts for approximately 10% of trauma-related deaths. Because the abdominal cavity contains structures of the genitourinary, hematopoietic, musculoskeletal, neurologic, reproductive, and vascular systems in addition to GI structures, abdominal trauma usually produces multisystemic injuries.

Motor vehicle accidents, violent assaults, reckless behavior, and contact sports most commonly cause abdominal trauma. The injury mechanism (penetrating, blunt, or both) helps determine the trauma’s extent and severity.

A penetration injury may be low velocity or high velocity. Low-velocity penetration damages tissues at the injury site, whereas high-velocity penetration damages tissues and organs surrounding the penetration path. The liver, spleen, and hollow organs (e.g., small intestine) most frequently suffer damage.

Penetrating trauma may result from stabbing, impalement, or missile injuries. Stabbings, which usually result in a low-velocity injury, frequently occur in the LUQ because most assailants use their right hand. The stab wound site usually indicates the organ involved; injury severity depends on the instrument’s width, shape, and length. Impalement, frequently the result of a fall from a significant height, results in an extremely dirty wound. This injury carries a higher mortality than stab wounds because of the resulting gross intra-abdominal contamination. The severity of a missile injury depends on the missile used (e.g., bullet vs. shrapnel), the degree of tissue penetration, and local dissipation of kinetic energy by the missile. A missile that ricochets off bone, causing intra-abdominal penetration, can worsen the injury. Fragments of bone or tissue may also penetrate abdominal organs.

Motor vehicle accidents with steering wheel and seat belt injuries are the most frequent forms of blunt injury to the abdomen, followed by falls and blows. The spleen, liver, diaphragm, and bowel are the most commonly injured organs. Mechanisms of blunt trauma injury include direct impact, rapid deceleration, rotary forces, and shearing forces.

Direct impact to the abdominal wall transfers energy to underlying organs. The impact’s force and duration, the patient’s body mass, and the surface area at the impact point determine injury severity. In a motor vehicle accident, for example, impact from a steering wheel, windshield, or instrument panel may cause injury. Contact sports also lead to direct-impact injuries.

Rapid deceleration injuries take place when a moving object suddenly stops, as in high-speed motor vehicle accidents and falls. The impact jars internal structures, which continue to move, tearing vessels and tissues from their attachment points. Duodenal and vascular ruptures frequently result from deceleration forces.

Rotary forces, such as those occurring in a fall from an incline or down stairs, result in tearing injuries as internal organs tumble within the abdomen.

Shearing forces frequently accompany crush injuries. These forces tear vessels from their attachment or fixation points, usually resulting in extensive soft-tissue damage and visceral rupture.

In addition to initial trauma, patients can suffer consequent complications of abdominal trauma:
- Hypovolemic shock from blood and fluid loss
- Exsanguination from shearing of major intra-abdominal vessels
- DIC from shock, clotting factor loss, or pregnancy
- Peritonitis or sepsis from bowel rupture or gross bacterial contamination

**Assessment**

If you know or suspect a patient has suffered abdominal trauma, assess the patient rapidly for life-threatening injuries. Usually, you have to take initial intervention measures as you gather historical information and perform a physical examination. Isolated organ injury occurs rarely; therefore, expect your patient to have multisystemic injuries that may threaten ABCs (airway, breathing, circulation). Focus your initial assessment on ensuring ABCs and determining whether the patient has an acute abdomen that requires immediate surgical exploration.
To evaluate and ensure a patent airway and adequate breathing, assess the patient’s respiratory status:

- Determine the patient’s respiratory rate, rhythm, and effort. Tachypnea and dyspnea may be associated with pain, anxiety, hypoxia, and pulmonary or diaphragm injury.
- Evaluate the presence and quality of breath sounds. Muffled or distant sounds may indicate hemithorax.
- Check for thoracic injury. Have the patient take a deep breath; if this does not cause discomfort, assume no thoracic injury. Pain, splinting, increased respiratory effort, and shallow respirations suggest rib fracture or diaphragm injury. Paradoxical chest wall movement indicates flail chest. Thoracic swelling and deformity suggest rib fracture; crepitus indicates lung puncture.
- To evaluate your patient’s circulation, take these actions:
  - Assess the patient’s pulses in both arms and both legs. Note pulse equality, character, and rate.
  - Check blood pressure in each arm and each leg. Compare readings between the right and left arms and, if possible, between the arms and the leg (or legs). Consider a 10–20 mmHg difference in systolic and diastolic pressure normal; a difference greater than 20 mmHg may mean aortic injury. Check for orthostatic pressure changes—an early sign of hypovolemia. Note pulse pressure, which may widen with severe head trauma and late shock. Narrowing pulse pressure accompanies early shock.
  - Auscultate heart sounds. Changes in normal heart sound quality and any extra heart sounds or murmurs may indicate valvular injury. Distant or muffled heart sounds may signal cardiac tamponade.
  - Assess capillary refill time to help determine peripheral perfusion.
  - Check mental status for adequate cerebral perfusion. Altered mental status without head trauma suggests hypoxia.

After assessing the ABCs, take the patient’s health history, quickly gathering standard information, such as medication use, allergies, and past medical history.

Then collect as much information as possible regarding the events leading to the injury. Try to determine the injury mechanism to help estimate the trauma’s extent and severity. With a motor vehicle accident victim, determine his position in the vehicle (e.g., the driver is likely to sustain major blunt chest and abdominal trauma from steering wheel impact). Find out the approximate speed of the involved vehicles and the direction and point of impact, such as head-on versus broadside (shearing forces accompany broadside impact). Determine if the patient was wearing a seatbelt. Also determine the patient’s position after impact, how the patient was extricated, and the elapsed time from injury to prehospital care and then to emergency department arrival. If the patient can’t answer these questions, ask available family members, friends, witnesses, or ambulance personnel.

If the patient has a penetrating wound, determine the object used. With a missile injury, find out the weapon type and the distance and angle from which it was fired. With a stab wound, find out if the assailant was a man or a woman (men are generally stronger than women and tend to stab upward and deeply, injuring major vessels and vital organs in the thoracoabdominal cavity). With impalement, determine if anyone removed or tried to remove the impaled object. With a fall, find out the distance the patient fell, the patient’s body position on impact, and the surface that broke the fall.

Ask your patient to describe the location, quality, severity, duration, and radiation of any pain. Also ask about associated symptoms. Keep in mind that abdominal trauma may produce serious injuries with insidious clinical manifestations.

While you gather the pertinent history, remove the patient’s clothing and roll the patient, using a logroll technique, to quickly assess for the presence and severity of wounds. Check both front and back surfaces for exit wounds, impaled objects, contusions, or hematomas.

Assess the patient’s nervous system and cervical spine, evaluating level of consciousness, pupil size and reaction to light, and motor and sensory function of the patient’s extremities. Always assume cervical spine injury with a suggestive injury mechanism. Maintain head and neck immobilization with a cervical collar until cervical spine x-rays rule out abnormalities. Take the patient’s temperature within the first hour after trauma, then hourly. Increasing temperature may indicate sepsis. Many patients brought to trauma centers are hypothermic, with temperatures lower in patients more severely injured and in patients who die. Yet temperature measurement, a simple and standard nursing procedure, is often ignored in trauma resuscitation.

Examine your patient’s abdomen thoroughly, using inspection, auscultation, percussion, and palpation. During inspection, note the patient’s chest wall integrity (the six lower ribs overlie the abdominal cavity) by observing chest wall movement during deep breathing. Keep in mind that women tend to use intercostal muscles to breathe, whereas men use the diaphragm. Suspect upper abdominal injury with halting, labored breathing. Note any masses, pulsations, abrasions, contusions, hematomas, bleeding, foreign objects, or protruding organs. If you see a wound, determine the type (bullet, stab, or puncture) and mark the area with a paper clip or radiology marker so it will appear on x-ray.

Match bullet holes with the reported number of shots fired (but don’t waste time trying to distinguish between entry and exit wounds). An odd number of holes implies an internally lodged foreign body, which must be found on x-ray to determine the injury path. Note any powder burns, which indicate the range from which the bullet was fired.

During auscultation, listen for bowel sounds in all four quadrants. Listen for at least 2 minutes at each site to determine decreased or absent bowel sounds signaling an immobile bowel, peritonitis, or paralytic ileus. Stay alert for bruits, created by turbulent blood flow through a partially occluded vessel; venous hums (heard over the upper abdomen or liver), indicating portal or splenic vein thrombosis; and friction rubs (associated with respirations and heard over the spleen), signaling inflammation or splenic infarction.

During percussion, stay alert for decreased or absent liver dullness—signs of free air below the diaphragm (usually secondary to hollow visceral perforation). Increased tympany over the stomach associated with upper abdominal
Distension may indicate gastric dilation. Dullness in the flank region suggests retroperitoneal hematoma.

During palpation, assess the most painful area last. Perform gentle palpaton to assess local areas of increased tone that may signal underlying injury. Perform deep palpation to elicit guarding, tenderness, or rebound tenderness (indicating peritoneal irritation). Also compress the iliac crest to detect any pelvic injury. Assess the patient’s rectum. Fullness signals retroperitoneal hematoma, whereas tenderness indicates peritonitis. Blood on the examining glove suggests lower GI injury. Check the genitals. Urethral blood may mean urethral injury.

Keep in mind the hidden dangers related to splenic injury. The spleen is the most commonly injured organ during blunt abdominal trauma. Some protection is provided by the rib cage, but rib fractures pose a possible threat to additional injury. The spleen has an interesting ability for encapsulating blood. If the body suffers severe hemorrhage, the spleen can increase the blood volume from 350 ml to 550 ml in less than 60 seconds. This compensatory mechanism can delay overt signs and symptoms of rupture: The patient’s condition may not deteriorate for days after the initial trauma.

The spleen, part of the reticuloendothelial system, lies directly below the diaphragm, behind the stomach and above the left kidney. This friable organ measures about 5.5 inches long by 3 inches wide. A connective tissue capsule encloses it, dividing the organ into compartments. White pulp (lymphatic tissue masses) and red pulp (venous sinusoids) fill these compartments, supported by a spongy framework of reticular fibers (reticuloendothelial cells). The splenic artery supplies the spleen through arterioles that open into the red pulp. The splenic vein drains red pulp veins, eventually joining with the superior mesenteric vein to form the portal vein.

The spleen’s functions include blood filtration and hematopoiesis (blood cell production and destruction). It also acts as a blood reservoir and may play a role in the regulation of bone marrow production and the immune system (through antibody production).

A highly vascular organ, the spleen frequently suffers injury in abdominal trauma. Even minor trauma may result in avulsion or tearing; major trauma commonly causes splenic rupture with resulting hypovolemia. In children, sledding and bicycle accidents commonly lead to splenic rupture. Delayed rupture may also occur.

During your assessment, be astute to any of the following findings, which may indicate a serious, and perhaps life-threatening, situation:
- **Kehr’s sign**—referred pain at the tip of the left shoulder. What it suggests: ruptured spleen or diaphragmatic irritation from blood, bile, or fecal material
- **Bruit**—abnormal sound or murmur along middle or lower back. What it suggests: arterial injury, possibly of renal vascular network
- **Ballance’s sign**—fixed area of dullness on percussion of the LUQ. What it suggests: subcapsular or extracapsular hematoma of spleen
- **Cooperneal ecchymosis**—ecchymosis on the scrotum or labia. What it suggests: fractured pelvis

Remember to assess the patient with abdominal trauma continuously because changes may occur quickly.

### Diagnostic Tests

The physician may order the following studies for a patient with major abdominal trauma:

**Laboratory studies**—Expect to draw a CBC with differential; a basic metabolic panel, including serum sodium, potassium, chloride, and glucose, as well as BUN and creatinine; an alkaline phosphatase level and liver function studies; coagulation studies, including PT/INR and PTT; arterial blood gases (ABGs); and blood typing and cross-matching. With splenic rupture, lab values may reflect decreased hemoglobin and hematocrit levels and, if subcapsular hematomas have developed, an elevated WBC count. Obtain a urine specimen for gross and microscopic blood content and, if the patient has a crush injury or burns, pH, glucose, protein, ketone, bilirubin, and myoglobin levels. Stool and gastric contents should be tested for occult blood. The doctor may order a peritoneal fluid sample for red and white blood cell counts and amylase and alkaline phosphatase levels.

**Radiography**—An upright chest x-ray helps evaluate abdominal trauma by detecting intrathoracic injuries and free air below the diaphragm (indicating bowel perforation). Flat plate, upright, and lateral decubitus abdominal x-rays can detect free intraperitoneal air (signaling hollow visceral injury), intra-abdominal fluid, displaced adjacent viscera, and fluid accumulation between gas shadows of bowel loops (meaning solid visceral injury with secondary hemorrhage). Psoas muscle outline loss signals retroperitoneal bleeding. With splenic rupture, a flat plate abdominal x-ray may show a fading outline and a growing splenic shadow, both signs of hemorrhage into the peritoneum.

**IV venous pyelogram**—This radiologic test uses contrast to detect hematuria and renal trauma.

**Retrograde urethrography and cystography**—The physician may order a retrograde urethrogram in the case of urethral injury. If the physician suspects bladder injury, a cystogram will be ordered.

**Ultrasonography**—Because ultrasound beams can’t penetrate gas, this method has limited use in abdominal trauma. However, it may help distinguish subcapsular liver or spleen hematoma from free peritoneal blood or ascites.

**Computed tomography (CT) scan**—This diagnostic tool detects intra-abdominal or retroperitoneal blood and splenic or pancreatic injury. It also evaluates areas of vascular injury and nonperfusion.

**Diagnostic peritoneal tap and lavage (DPL)**—Peritoneal tap (paracentesis) and lavage help detect intra-abdominal bleeding. Although not used as frequently today as in the past, due to accessibility of less-invasive diagnostic tools, such as CT scan, paracentesis is a highly accurate test for intraperitoneal hemorrhage. It is important to remember that peritoneal tap can assess injury to peritoneal organs; however, it cannot detect injury to organs in the retroperitoneal space. Therefore, your patient can have a negative DPL but still have injury to the duodenum, kidneys, pancreas, aorta, or vena cava.

To perform a peritoneal tap using the closed technique, the doctor introduces a catheter into the patient’s peritoneal cavity (see Figure 13). The tap may be made in one or more abdominal quadrants; however, most doctors do a single tap in
the periumbilical area. Gross blood (10 ml upon initial aspiration), bile, urine, or fecal matter apparent in peritoneal cavity indicates bleeding, which warrants surgery.

If no gross blood or other material appears initially, the doctor may then perform peritoneal lavage (shown in the bottom left of Figure 13). This involves infusion of 1 L of warmed fluid (usually normal saline solution or lactated Ringer’s solution) into the peritoneal cavity. The patient may be gently rolled from side to side (unless the patient has skeletal injuries) or tilted slightly (if his vital signs permit) so fluid can reach all intra-abdominal areas and mix with any blood. (In some cases, the patient’s abdomen may be manipulated manually instead.) The fluid is then collected by gravity drainage into a collection container placed lower than the abdomen. Adequate fluid analysis requires at least 30% return of the infused fluid (about 350 ml). DPL is positive if fluid analysis reveals a white blood cell count greater than 500/mm³ or a red blood cell count greater than 100,000/mm³. With splenic bleeding, diagnostic peritoneal lavage will be positive, unless the bleeding is encapsulated.

Other abnormal findings include green (bile-stained) fluid, which may indicate bowel perforation; cloudy or turbid fluid, a possible sign of bowel infarction or peritonitis from bowel rupture; and milky (chyle-containing) fluid, which suggests small-intestine perforation. (Normal peritoneal fluid appears clear to pale yellow.)

Keep these points in mind if the doctor orders a peritoneal tap or lavage for your patient:
- Insert an NG tube before the procedure to decompress the stomach.
- Have the patient void before the procedure or insert an indwelling (Foley) catheter, as ordered.
- Maintain a sterile field and strict sterile technique during the procedure.
- To allow fluid to flow back into the container, make sure the IV tubing does not have a one-way valve.
- Apply an antibiotic ointment and sterile dressing after catheter removal, as ordered.
- After the procedure, observe for complications, such as bowel or bladder perforation and free air in the peritoneal cavity.

Other tests the doctor may order include magnetic resonance imaging (MRI), which detects small amounts of blood and fluid; angiography, which helps detect vascular injury; and culdocentesis, which can detect intraperitoneal bleeding in female patients. (See Figure 14 for an overview of diagnostic procedures for abdominal trauma.)

**Intervention**

Treatment goals for a patient with abdominal trauma include stabilizing the patient's condition and preventing complications. Focus on the ABCs: Ensure a patent airway by suctioning, inserting an artificial airway, or assisting with intubation as necessary. Administer oxygen, as ordered, to maintain adequate tissue oxygenation. Assess breath sounds and, as ordered, draw blood for ABGs to monitor respiratory status and prepare the patient for a chest x-ray. Measures used to maintain adequate circulation include:
- applying direct pressure over bleeding sites
- inserting large-bore IV lines
- administering fluids

If significant blood loss has occurred, expect fluid resuscitation. Usually, autotransfusion of blood is not ordered because this procedure carries a high contamination risk from hollow visceral perforation.

Monitor your patient’s blood pressure and pulse parameters and insert an indwelling catheter to help monitor fluid status. (Of course, don’t insert a Foley if you note bleeding from the urinary meatus.)

Depending on the patient’s condition, the doctor may order an NG tube to decompress the stomach and permit occult blood testing of gastric contents. Expect to administer broad-spectrum antibiotics (to help prevent sepsis) and tetanus prophylaxis.

Provide emotional and psychological support throughout your nursing care. Depending on the specific injuries suffered, organs damaged, and diagnostic test results, the patient may require immediate surgery. After the patient is stabilized, continuously assess for such complications as hypovolemic shock, peritonitis, sepsis, renal failure, myocardial infarction, and DIC. Also stay alert for delayed symptoms of abdominal trauma, such as in splenic rupture, which may not appear for a week after injury. In case of splenic rupture, the doctor may perform a splenectomy or splenorrhaphy (spleen repair). After spleen removal, the remaining reticuloendothelial tissue assumes the spleen’s reticuloendothelial functions. However, the patient may have a slight reduction in antibody formation.

**Evaluation**

Evaluation of a patient with abdominal trauma depends on the patient's response to therapy. Successful intervention will have the following outcomes:
- The patient maintains adequate cardiac output, tissue perfusion, and blood pressure.
- The patient's urine output is at least 30 ml/hour.
- The patient has improved or normal baseline mental status.

Proper evaluation will assist you in anticipating future care for your patient. A general guide to abdominal trauma is provided in Figure 15.

**Case Study: Abdominal Trauma**

Michael James, 20, was admitted to your unit at 3:30 p.m. Saturday for observation. During your admission assessment, you find out that Michael sustained a direct hit on the left side of his abdomen while playing football that morning. The blow caused Michael to lose consciousness for a few minutes. Otherwise, his medical history is unremarkable. A CT of Michael’s head taken in the emergency department was negative, and his vital signs have been within normal limits and stable. His only complaint of pain is an occasional pain in the left shoulder.

At 2:30 a.m. on Sunday, Michael is unable to sleep. The pain in his left shoulder and left upper quadrant is keeping him awake. You perform a quick, focused assessment, which reveals a soft abdomen, LUQ tenderness to palpation (though normal on percussion), a pulse of 90,
blood pressure of 100/70, a respiratory rate of 18, and warm, dry skin. You decide to keep Michael on q15-minute vitals and administer pain medications as ordered.

Thirty minutes later you return to find Michael restless and disoriented. He is moaning and holding his left side. His most recent blood pressure is 90/48, pulse is 120, and respirations are 22. He is cool and clammy, and his pulse is thread on palpation. Michael’s abdomen feels rigid on palpation; there is generalized abdominal tenderness with extreme rebound pain. All these symptoms suggest internal bleeding and possible peritonitis. You suspect that his intense left shoulder pain may be Kehr’s sign, indicating injury to the spleen. You page the on-call physician to notify him of the changes in Michael’s condition.

Conclusion

Nurses must be ever vigilant in monitoring patients who present with abdominal injury or illness to prevent progression of GI-associated conditions, which could lead to devastating results. Gastrointestinal trauma is a devastating event that affects all ages. It can be fatal, disabling, or disfiguring. Morbidity and mortality are directly related to the failure to treat injuries promptly.

Public awareness, education, and legislation can affect the trauma statistics of the future. Health professionals, including nurses, are working toward these goals, but government and community support are also needed. If 24% of trauma deaths can be prevented when appropriate medical and nursing care are provided within the first hour after injury, then health professionals and hospitals, as well as communities, are obligated to provide a system that makes appropriate care available.

Inside Tract Resource List

American College of Gastroenterology
www.acg-gi.org

International Foundation for Functional Gastrointestinal Disorders (IFFGD)
www.iffgd.org

American Liver Foundation
www.liverfoundation.org

National Digestive Diseases Information Clearinghouse
http://digestive.niddk.nih.gov

The World’s Healthiest Foods
www.whfoods.com

EndoNurse Magazine-Endoscopic Nursing
www.endonurse.com
### Procedures Used to Diagnose Abdominal Trauma

<table>
<thead>
<tr>
<th>Procedure</th>
<th>How it's Performed</th>
<th>Primary indication</th>
<th>Contraindications</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic peritoneal lavage (DPL)</td>
<td>Fluid is instilled in peritoneal space through a surgical opening. Lavage fluid is returned by catheter and analyzed for RBCs, WBCs, gram stain, and amylase.</td>
<td>Suspected intra-abdominal bleeding in hypotensive patient with blunt trauma, in stable patient with anterior stab wound, or in patients with head or spinal cord injuries prior to emergency surgery.</td>
<td>• Obvious need for abdominal surgery.</td>
<td>• Misses diaphragm and retroperitoneal injuries.</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>High-frequency sound waves are used to produce images of internal soft tissue structures.</td>
<td>Suspected intra-abdominal bleeding in hypotensive patients.</td>
<td>• Obvious need for abdominal surgery.</td>
<td>• May miss small amounts of fluid.</td>
</tr>
<tr>
<td>Computed tomography (CT)</td>
<td>Tissue densities and abnormalities in the abdomen are detected by cross-sectional x-ray. Contrast media may be used to enhance the film.</td>
<td>To define location and magnitude of intra-abdominal injuries in stable patient with blunt or penetrating trauma to the flank or back.</td>
<td>• Obvious need for abdominal surgery.</td>
<td>• Misses 20%--25% of hepatic and splenic injuries.</td>
</tr>
<tr>
<td>Angiography</td>
<td>An x-ray is taken of the blood vessels following an injection of a contrast dye into the femoral or brachial artery.</td>
<td>To define rate of hemorrhage from visceral injuries or localize and control pelvic arterial bleeding.</td>
<td>• Obvious need for abdominal surgery.</td>
<td>• Expensive Procedure.</td>
</tr>
<tr>
<td>Abdominal x-ray (flat plate of abdomen)</td>
<td>An x-ray is taken of the abdomen.</td>
<td>To detect presence of foreign bodies (e.g., bullets or knife-blades), free air, and skeletal landmarks in abdomen.</td>
<td>• Obvious need for abdominal surgery.</td>
<td>• Requires 30--40 min.</td>
</tr>
</tbody>
</table>

*Figure 14*
Instructions for Estimating Liver Size

1. Obtain permission from a patient or acquaintance to percuss the liver for size.

2. Start percussing on the right midclavicular line two fingerbreadths below the nipple line.

3. As you move down the midclavicular line, the sound will become dull. MARK THIS SPOT with a water-soluble marker.

4. To find the liver’s lower border, start percussing on the right midclavicular line about three fingers below the level of the umbilicus and move upward.

5. When the sound changes from tympany to dullness, MARK THIS SPOT with a water-soluble marker.

6. Measure the distance between the upper and lower borders in centimeters.

7. The size of this liver is ______________ cm.

8. The normal liver span on the midclavicular line is between ___________ and __________ cm.

9. Remember, proper percussion is not easy and requires lots of practice.
Guide to Abdominal Trauma

**LIVER**

*Most frequently injured abdominal organ*

*Possible causes:* Blunt or penetrating trauma to upper right or left quadrants and/or epigastric area; upper quadrant pain, tenderness, or rigidity; possibly referred pain to shoulder

*Possible associated injuries:* Diaphragm laceration, lower rib fractures, lacerated bowel

*Assessment findings:* History of trauma to right or left quadrants or epigastric area; upper quadrant pain, tenderness, or rigidity; possibly referred pain to shoulder

*Specific diagnostic tests:* Computed tomography (CT) scan, peritoneal tap, and lavage

*Intervention:*
- Ensure airway, breathing, and circulation (ABCs).
- Intervene for hypovolemic shock, if indicated.
- Prepare for surgery, if indicated.
- Enforce bed rest and observe closely if patient doesn’t undergo surgery.

**SPLEEN**

*Most frequently injured organ in left upper quadrant; usually ruptured*

*Possible causes:* Blunt or penetrating trauma (as from fall, high-impact motor vehicle accident, or direct impact resulting from contact sports)

*Possible associated injuries:* Lower left rib fractures, stomach compression, penetrating injuries to stomach, pancreas, and bowel

*Assessment findings:* History of trauma to left upper quadrant, left upper quadrant pain and rigidity, Kehr’s sign (referred pain to left shoulder)

*Specific diagnostic tests:* CT scan, arteriography, peritoneal tap, and lavage

*Intervention:*
- Ensure ABCs.
- Intervene for hypovolemic shock, if indicated.
- Prepare for surgery, if indicated.

**PANCREAS**

*Rarely injured; however, high-velocity blunt trauma may crush pancreas against spine*

*Possible causes:* Blunt trauma to epigastric area (as from fall, high-impact motor vehicle accident, or direct impact resulting from contact sports)

*Possible associated injuries:* Crushed duodenum

*Assessment findings:* History of blunt epigastric trauma, ecchymosis in epigastric region, nonspecific abdominal signs and symptoms (pain may occur immediately, decrease over the next 2 hours, then increase again)

*Specific diagnostic tests:* CT scan, serum amylase and lipase (elevated)

*Intervention:*
- Ensure ABCs.
- Intervene for hypovolemic shock, if indicated.
- Prepare for surgery, if indicated.
- Administer treatment for pancreatitis, if indicated.

**STOMACH & SMALL INTESTINE**

*Stomach injuries usually result from penetrating trauma; small intestine injuries usually result from direct impact that crushes intestine against spine*

*Possible causes:* Stomach---usually blunt trauma (as from stab or gunshot); small intestine---usually blunt trauma (as from kick or seatbelt injury)

*Possible associated injuries:* Pancreas, bile duct, liver, spleen, inferior vena cava injuries

*Assessment findings:* History of upper abdominal trauma: stomach---upper abdominal pain, decreased bowel sounds, evidence of peritoneal irritation. Small intestine—nonspecific abdominal signs and symptoms (may not appear until 12 to 18 hours after injury); ecchymosis in epigastric region; absent bowel sounds

*Specific diagnostic tests:* Upright abdominal x-ray (may show air), alkaline phosphatase (elevated), CT scan, contrast upper GI series

*Intervention:*
- Ensure ABCs.
- Intervene for hypovolemic shock, if indicated.
- Prepare for surgery, if indicated.
- Administer broad-spectrum antibiotics, as ordered.
- Decompress stomach.

**Figure 15**
Guide to Abdominal Trauma

<table>
<thead>
<tr>
<th>Organ System</th>
<th>Description</th>
<th>Possible Causes</th>
<th>Possible Associated Injuries</th>
<th>Assessment Findings</th>
<th>Specific Diagnostic Tests</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidneys &amp; Ureters</td>
<td>Usually suffer contusion or laceration</td>
<td>Kidneys: blunt trauma (as from motor vehicle accident, direct impact, or fall); ureters: penetrating trauma</td>
<td>Pelvic fractures, abdominal visceral injury</td>
<td>History of trauma to area; hematuria; costovertebral angle or flank pain; tenderness or rigidity; oliguria or anuria; local ecchymosis</td>
<td>IV pyelogram, renal arteriogram</td>
<td>Ensure ABCs. Intervene for hypovolemic shock, if indicated. Prepare for surgery, if indicated. Enforce bed rest and observe closely if patient doesn’t undergo surgery.</td>
</tr>
<tr>
<td>Colon &amp; Rectum</td>
<td>Usually injured by penetrating trauma</td>
<td>Colon: penetrating trauma to lower abdomen (as from motor vehicle accident); rectum: penetrating trauma</td>
<td>Pelvic fractures; subcutaneous emphysema; absent bowel sounds</td>
<td>History of penetrating trauma to lower abdomen; subcutaneous emphysema; absent bowel sounds</td>
<td>Peritoneal tap or lavage (positive for blood or bacteria); rectum: gross blood on examination</td>
<td>Ensure ABCs. Prepare for surgery, if indicated. Enforce bed rest and observe closely if patient doesn’t undergo surgery.</td>
</tr>
<tr>
<td>Bladder &amp; Urethra</td>
<td>Bladder frequently suffers perforation; urethra, transection</td>
<td>Blunt trauma (as from direct impact or falling astride object)</td>
<td>Pelvic fractures, perforated peritoneum</td>
<td>History of trauma to area; lower abdominal or suprapubic pain; inability to void despite a strong urge; hematuria; ecchymosis on lower abdomen or perineum</td>
<td>Pelvic x-rays, cystogram or urethrogram, IV pyelogram</td>
<td>Ensure ABCs. Intervene for hypovolemic shock, if indicated. Prepare for surgery, if indicated. Don’t catheterize if you note bleeding at urinary meatus (doctor may insert suprapubic catheter). Enforce bed rest and administer analgesics and sitz baths if patient doesn’t undergo surgery.</td>
</tr>
<tr>
<td>Vasculation</td>
<td>Intraabdominal vessels, such as abdominal aorta or inferior vena cava, may be injured</td>
<td>Blunt or penetrating trauma</td>
<td>Spinal cord injury, retroperitoneal hematoma, lacerated bowel</td>
<td>History of blunt or penetrating trauma to lower abdomen; abdominal tenderness or rigidity; evidence of hypovolemic shock (although retroperitoneal hemorrhage may not produce signs and symptoms of shock); Cullen’s or Grey Turner’s sign</td>
<td>Arteriogram</td>
<td>Ensure ABCs. Intervene for hypovolemic shock. Prepare for surgery.</td>
</tr>
</tbody>
</table>
References and Suggested Readings


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GI 911: Rapid Response to Acute Abdomen