Assessment and Management of Patients with Biliary Disorders

**LEARNING OBJECTIVES**

On completion of this chapter, the learner will be able to:

1. Compare approaches to management of cholelithiasis.
2. Use the nursing process as a framework for care of patients with cholelithiasis and those undergoing laparoscopic or open cholecystectomy.
3. Differentiate between acute and chronic pancreatitis.
4. Use the nursing process as a framework for care of patients with acute pancreatitis.
5. Describe the nutritional and metabolic effects of surgical treatment of tumors of the pancreas.
Disorders of the biliary tract and pancreas are common and include gallbladder stones and pancreatic dysfunction. An understanding of the structure and function of the biliary tract and pancreas is essential, along with an understanding of the close link of biliary tract disorders with liver disease. Patients with acute or chronic biliary tract or pancreatic disease require care from nurses knowledgeable about the diagnostic procedures and interventions that are used in the management of gallbladder and pancreatic disorders.

Anatomic and Physiologic Overview

ANATOMY OF THE GALLBLADDER

The gallbladder, a pear-shaped, hollow, saclike organ, 7.5 to 10 cm (3 to 4 in) long, lies in a shallow depression on the inferior surface of the liver, to which it is attached by loose connective tissue. The capacity of the gallbladder is 30 to 50 mL of bile. Its wall is composed largely of smooth muscle. The gallbladder is connected to the common bile duct by the cystic duct (Fig. 40-1).

FUNCTION OF THE GALLBLADDER

The gallbladder functions as a storage depot for bile. Between meals, when the sphincter of Oddi is closed, bile produced by the hepatocytes enters the gallbladder. During storage, a large portion of the water in bile is absorbed through the walls of the gallbladder. So that gallbladder bile is five to ten times more concentrated than originally secreted by the liver. When food enters the duodenum, the gallbladder contracts and the sphincter of Oddi (located at the junction where the common bile duct enters the duodenum) relaxes. Relaxation of the sphincter of Oddi allows the bile to enter the intestine. This response is mediated by secretion of the hormone cholecystokinin—pancreozymin (CCK-PZ) from the intestinal wall. Bile is composed of water and electrolytes (sodium, potassium, calcium, chloride, and bicarbonate) and significant amounts of lecithin, fatty acids, cholesterol, bilirubin, and bile salts. The bile salts, together with cholesterol, assist in emulsification of fats in the distal ileum. They then are reabsorbed into the portal blood for return to the liver and again excreted into the bile. This pathway from hepatocytes to bile to intestine and back to the hepatocytes is called the enterohepatic circulation. Because of the enterohepatic circulation, only a small fraction of the bile salts that enter the intestine are excreted in the feces. This decreases the need for active synthesis of bile salts by the liver cells.

If the flow of bile is impeded (ie, with gallstones in the bile ducts), bilirubin, a pigment derived from the breakdown of red blood cells, does not enter the intestine. As a result, bilirubin levels in the blood increase. This results, in turn, in increased renal excretion of urobilinogen, which results from conversion of bilirubin in the small intestine and decreased excretion in the stool. These changes produce many of the signs and symptoms seen in gallbladder disorders.

THE PANCREAS

The pancreas, located in the upper abdomen, has endocrine as well as exocrine functions (see Fig. 40-1). The secretion of pancreatic enzymes into the gastrointestinal tract through the pancreatic duct represents its exocrine function. The secretion of insulin, glucagon, and somatostatin directly into the bloodstream represents its endocrine function.

Exocrine Pancreas

The secretions of the exocrine portion of the pancreas are collected in the pancreatic duct, which joins the common bile duct and enters the duodenum at the ampulla of Vater. Surrounding the ampulla is the sphincter of Oddi, which partially controls the rate at which secretions from the pancreas and the gallbladder enter the duodenum.

The secretions of the exocrine pancreas are digestive enzymes high in protein content and an electrolyte-rich fluid. The secretions are very alkaline because of their high concentration of sodium bicarbonate and are capable of neutralizing the highly acid gastric juice that enters the duodenum. The enzyme secretions include amylase, which aids in the digestion of carbohydrates; trypsin, which aids in the digestion of proteins; and lipase, which aids in the digestion of fats. Other enzymes that promote the breakdown of more complex foodstuffs are also secreted.

GLOSSARY

amy lase: pancreatic enzyme; aids in the digestion of carbohydrates
cholecystitis: inflammation of the gallbladder
cholecystokinin–pancreozymin (CCK-PZ): hormone; major stimulus for digestive enzyme secretion; stimulates contraction of the gallbladder
cholecystectomy: removal of the gallbladder
cholecystojejunostomy: anastomosis of the jejunum to the gallbladder to divert bile flow
cholecystostomy: opening and drainage of the gallbladder
choledocholithiasis: stones in the common duct
choledochostomy: opening into the common duct
cholelithiasis: calculi in the gallbladder
dissolution therapy: use of medications to break up/dissolve gallstones
endocrine: secreting internally; hormonal secretion of a ductless gland
endoscopic retrograde cholangiopancreatography (ERCP): an endoscopic procedure using fiberoptic technology to visualize the biliary system
exocrine: secreting externally; hormonal secretion from excretory ducts
laparoscopic cholecystectomy: removal of gallbladder through endoscopic procedure
lipase: pancreatic enzyme; aids in the digestion of fats
lithotripsy: disintegration of gallstones by shock waves
pancreaticojejunostomy: joining of the pancreatic duct to the jejunum by side-to-side anastomosis; allows drainage of the pancreatic secretions into the jejunum
pancreatitis: inflammation of the pancreas; may be acute or chronic
secretin: hormone responsible for stimulating secretion of pancreatic juice; also used as an aid in diagnosing pancreatic exocrine disease and in obtaining desquamated pancreatic cells for cytologic examination
steatorrhea: frothy, foul-smelling stools with a high fat content; results from impaired digestion of proteins and fats due to a lack of pancreatic juice in the intestine
trypsin: pancreatic enzyme; aids in digestion of proteins
Zollinger-Ellison tumor: hypersecretion of gastric acid that produces peptic ulcers as a result of a non-beta cell tumor of the pancreatic islets
Hormones originating in the gastrointestinal tract stimulate the secretion of these exocrine pancreatic juices. **Secretin** is the major stimulus for increased bicarbonate secretion from the pancreas, and the major stimulus for digestive enzyme secretion is the hormone CCK-PZ. The vagus nerve also influences exocrine pancreatic secretion.

**Endocrine Pancreas**

The islets of Langerhans, the endocrine part of the pancreas, are collections of cells embedded in the pancreatic tissue. They are composed of alpha, beta, and delta cells. The hormone produced by the beta cells is called insulin; the alpha cells secrete glucagon and the delta cells secrete somatostatin.

**INSULIN**

A major action of insulin is to lower blood glucose by permitting entry of the glucose into the cells of the liver, muscle, and other tissues, where it is either stored as glycogen or used for energy. Insulin also promotes the storage of fat in adipose tissue and the synthesis of proteins in various body tissues. In the absence of insulin, glucose cannot enter the cells and is excreted in the urine. This condition, called diabetes mellitus, can be diagnosed by high levels of glucose in the blood. In diabetes mellitus, stored fats and protein are used for energy instead of glucose, with consequent loss of body mass. (Diabetes mellitus is discussed in detail in Chap. 41.) The level of glucose in the blood normally regulates the rate of insulin secretion from the pancreas.

**GLUCAGON**

The effect of glucagon (opposite to that of insulin) is chiefly to raise the blood glucose by converting glycogen to glucose in the liver. Glucagon is secreted by the pancreas in response to a decrease in the level of blood glucose.

**SOMATOSTATIN**

Somatostatin exerts a hypoglycemic effect by interfering with release of growth hormone from the pituitary and glucagon from the pancreas, both of which tend to raise blood glucose levels.

**Endocrine Control of Carbohydrate Metabolism**

Glucose for body energy needs is derived by metabolism of ingested carbohydrates and also from proteins by the process of gluconeogenesis. Glucose can be stored temporarily in the liver, muscles, and other tissues in the form of glycogen. The endocrine system controls the level of blood glucose by regulating the rate at which glucose is synthesized, stored, and moved to and from the bloodstream. Through the action of hormones, blood glucose is normally maintained at about 100 mg/dL (5.5 mmol/L). Insulin is the primary hormone that lowers the blood glucose level. Hormones that raise the blood glucose level are glucagon, epinephrine, adrenocorticosteroids, growth hormone, and thyroid hormone.

The endocrine and exocrine functions of the pancreas are interrelated. The major exocrine function is to facilitate digestion through secretion of enzymes into the proximal duodenum. Secretin and CCK-PZ are hormones from the gastrointestinal tract that aid in the digestion of food substances by controlling the secretions of the pancreas. Neural factors also influence pancreatic enzyme secretion. Considerable dysfunction of the pancreas must occur before enzyme secretion decreases and protein and fat digestion becomes impaired. Pancreatic enzyme secretion is normally 1,500 to 2,500 mL/day.
Gerontologic Considerations

There is little change in the size of the pancreas with age. There is, however, an increase in fibrous material and some fatty deposition in the normal pancreas in patients older than 70 years of age. Some localized arteriosclerotic changes occur with age. There is also a decreased rate of pancreatic secretion (decreased lipase, amylase, and trypsin) and bicarbonate output in older patients. Some impairment of normal fat absorption occurs with increasing age, possibly because of delayed gastric emptying and pancreatic insufficiency. Decreased calcium absorption may also occur. These changes require care in interpreting diagnostic tests in the normal elderly person and in providing dietary counseling.

Disorders of the Gallbladder

Several disorders affect the biliary system and interfere with normal drainage of bile into the duodenum. These disorders include inflammation of the biliary system and carcinoma that obstructs the biliary tree. Gallbladder disease with gallstones is the most common disorder of the biliary system. Although not all occurrences of gallbladder inflammation (cholecystitis) are related to gallstones (cholelithiasis), more than 90% of patients with acute cholecystitis have gallstones. Most of the 15 million Americans with gallstones have no pain, however, and are unaware of the presence of stones. For a guide to the terminology associated with biliary disorders and procedures, see Chart 40-1.

CHOLECYSTITIS

Acute inflammation (cholecystitis) of the gallbladder causes pain, tenderness, and rigidity of the upper right abdomen that may radiate to the midsternal area or right shoulder and is associated with nausea, vomiting, and the usual signs of an acute inflammation. An empyema of the gallbladder develops if the gallbladder becomes filled with purulent fluid.

Calculous cholecystitis is the cause of more than 90% of cases of acute cholecystitis (Ahmed, Cheung & Keefe, 2000). In calculous cholecystitis, a gallbladder stone obstructs bile outflow. Bile remaining in the gallbladder initiates a chemical reaction; autolysis and edema occur; and the blood vessels in the gallbladder are compressed, compromising its vascular supply. Gangrene of the gallbladder with perforation may result. Bacteria play a minor role in acute cholecystitis; however, secondary infection of bile with Escherichia coli, Klebsiella species, and other enteric organisms occurs in about 60% of patients (Schwartz, 1999).

Acalculous cholecystitis describes acute gallbladder inflammation in the absence of obstruction by gallstones. Acalculous cholecystitis occurs after major surgical procedures, severe trauma, or burns. Other factors associated with this type of cholecystitis include torsion, cystic duct obstruction, primary bacterial infections of the gallbladder, and multiple blood transfusions. It is speculated that acalculous cholecystitis results from alterations in fluids and electrolytes and in regional blood flow in the visceral circulation. Bile stasis (lack of gallbladder contraction) and increased viscosity of the bile are also thought to play a role. The occurrence of acalculous cholecystitis with major surgical procedures or trauma makes its diagnosis difficult.

CHOLELITHIASIS

Calculi, or gallstones, usually form in the gallbladder from the solid constituents of bile; they vary greatly in size, shape, and composition (Fig. 40-2). They are uncommon in children and young adults but become increasingly prevalent after 40 years of age. The incidence of cholelithiasis increases thereafter to such an extent that up to 50% of those over the age of 70 and over 50% of those over 80 will develop stones in the bile tract (Borzellino, deManzoni & Ricci, 1999). Chart 40-2 identifies common risk factors.

Pathophysiology

There are two major types of gallstones: those composed predominantly of pigment and those composed primarily of cholesterol. Pigment stones probably form when unconjugated pigments in the bile precipitate to form stones; these stones account for about one third of cases in the United States (Donovan, 1999). The risk of developing such stones is increased in patients with cirrhosis, hemolysis, and infections of the biliary tract. Pigment stones cannot be dissolved and must be removed surgically.

Cholesterol stones account for most of the remaining cases of gallbladder disease in the United States. Cholesterol, a normal constituent of bile, is insoluble in water. Its solubility depends on bile acids and lecithin (phospholipids) in bile. In gallstone-prone patients, there is decreased bile acid synthesis and increased cholesterol synthesis in the liver, resulting in bile supersaturated with cholesterol, which precipitates out of the bile to form stones. The cholesterol-saturated bile predisposes to the formation of gallstones and acts as an irritant, producing inflammatory changes in the gallbladder.

Four times more women than men develop cholesterol stones and gallbladder disease; the women are usually older than 40, multiparous, and obese. The incidence of stone formation rises in users of oral contraceptives, estrogen, and clofibrate; these substances are known to increase biliary cholesterol saturation. The incidence of stone formation increases with age as a result of increased hepatic secretion of cholesterol and decreased bile acid synthesis. In addition, there is an increased risk because of malabsorption of bile salts in patients with gastrointestinal disease or...
Clinical Manifestations

Gallstones may be silent, producing no pain and only mild gastrointestinal symptoms. Such stones may be detected incidentally during surgery or evaluation for unrelated problems.

The patient with gallbladder disease from gallstones may develop two types of symptoms: those due to disease of the gallbladder itself and those due to obstruction of the bile passages by a gallstone. The symptoms may be acute or chronic. Epigastric distress, such as fullness, abdominal distention, and vague pain in the right upper quadrant of the abdomen, may occur. This distress may follow a meal rich in fried or fatty foods.

PAIN AND BILIARY COLIC

If a gallstone obstructs the cystic duct, the gallbladder becomes distended, inflamed, and eventually infected (acute cholecystitis). The patient develops a fever and may have a palpable abdominal mass. The patient may have biliary colic with excruciating upper right abdominal pain that radiates to the back or right shoulder, is usually associated with nausea and vomiting, and is noticeable several hours after a heavy meal. The patient moves about restlessly, unable to find a comfortable position. In some patients the pain is constant rather than colicky.

Such a bout of biliary colic is caused by contraction of the gallbladder, which cannot release bile because of obstruction by the stone. When distended, the fundus of the gallbladder comes in contact with the abdominal wall in the region of the right ninth and tenth costal cartilages. This produces marked tenderness in the right upper quadrant on deep inspiration and prevents full inspiratory excursion.

The pain of acute cholecystitis may be so severe that analgesics are required. Morphine is thought to increase spasm of the sphincter of Oddi and may be avoided in many cases in favor of meperidine (Porth, 2002). This is controversial because morphine is the preferred analgesic agent for management of acute pain, and meperidine has metabolites toxic to the CNS.

If the gallstone is dislodged and no longer obstructs the cystic duct, the gallbladder drains and the inflammatory process subsides after a relatively short time. If the gallstone continues to obstruct the duct, abscess, necrosis, and perforation with generalized peritonitis may result.

JAUNDICE

Jaundice occurs in a few patients with gallbladder disease and usually occurs with obstruction of the common bile duct. The bile, which is no longer carried to the duodenum, is absorbed.
by the blood and gives the skin and mucous membrane a yellow color. This is frequently accompanied by marked itching of the skin.

**CHANGES IN URINE AND STOOL COLOR**
The excretion of the bile pigments by the kidneys gives the urine a very dark color. The feces, no longer colored with bile pigments, are grayish, like putty, and usually described as clay-colored.

**VITAMIN DEFICIENCY**
Obstruction of bile flow also interferes with absorption of the fat-soluble vitamins A, D, E, and K. Therefore, the patient may exhibit deficiencies (eg, bleeding caused by vitamin K deficiency, which interferes with normal blood clotting) of these vitamins if biliary obstruction has been prolonged.

**Assessment and Diagnostic Findings**

**ABDOMINAL X-RAY**
An abdominal x-ray may be obtained if gallbladder disease is suggested to exclude other causes of symptoms. However, only 15% to 20% of gallstones are calcified sufficiently to be visible on such x-ray studies.

**ULTRASONOGRAPHY**
Ultrasoundography has replaced oral cholecystography as the diagnostic procedure of choice because it is rapid and accurate and can be used in patients with liver dysfunction and jaundice. It does not expose patients to ionizing radiation. The procedure is most accurate if the patient fasts overnight so that the gallbladder is distended. The use of ultrasound is based on reflected sound waves. Ultrasoundography can detect calculi in the gallbladder or a dilated common bile duct. It is reported to detect gallstones with 95% accuracy.

**RADIONUCLIDE IMAGING OR CHOLESCINTIGRAPHY**
Cholescintigraphy is used successfully in the diagnosis of acute cholecystitis. In this procedure, a radioactive agent is administered intravenously. It is taken up by the hepatocytes and excreted rapidly through the biliary tract. The biliary tract is then scanned, and images of the gallbladder and biliary tract are obtained. This test is more expensive than ultrasonography, takes longer to perform, exposes the patient to radiation, and cannot detect gallstones. Its use may be limited to cases in which ultrasonography is not conclusive.

**CHOLECYSTOGRAPHY**
Although it has been replaced by ultrasonography as the test of choice, cholecystography is still used if ultrasonic equipment is not available or if the ultrasound results are inconclusive. Oral cholangiography may be performed to detect gallstones and to assess the ability of the gallbladder to fill, concentrate its contents, contract, and empty. An iodide-containing contrast agent excreted by the liver and concentrated in the gallbladder is administered to the patient. The normal gallbladder fills with this radiopaque substance. If gallstones are present, they appear as shadows on the x-ray film.

Contrast agents include iopanoic acid (Telepaque), iotidamide meglumine (Cholografin), and sodium ipodate (Oragrafin). These agents are administered orally 10 to 12 hours before the x-ray study. To prevent contraction and emptying of the gallbladder, the patient is permitted nothing by mouth after the contrast agent is administered.

The patient is asked about allergies to iodine or seafood. If no allergy is identified, the patient receives the oral form of the contrast agent the evening before the x-rays are obtained. An x-ray of the right upper abdomen is obtained. If the gallbladder is found to fill and empty normally and to contain no stones, gallbladder disease is ruled out. If gallbladder disease is present, the gallbladder may not be visualized because of obstruction by gallstones. A repeat of the oral cholecystogram with a second dose of the contrast agent may be necessary if the gallbladder is not visualized on the first attempt.

Cholecystography in the obviously jaundiced patient is not useful because the liver cannot excrete the radiopaque dye into the gallbladder in the presence of jaundice. Oral cholecystography is likely to continue to be used as part of the evaluation of the few patients who have been treated with gallstone dissolution therapy or lithotripsy.

**ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY**
Endoscopic retrograde cholangiopancreatography (ERCP) permits direct visualization of structures that could once be seen only during laparotomy. The examination of the hepatobiliary system is carried out via a side-viewing flexible fiberoptic endoscope inserted into the esophagus to the descending duodenum (Fig. 40-3). Multiple position changes are required during the procedure, beginning in the left semiprone position to pass the endoscope.

Fluoroscopy and multiple x-rays are used during ERCP to evaluate the presence and location of ductal stones. Careful insertion of a catheter through the endoscope into the common bile duct is the most important step in sphincterotomy (division of the muscles of the biliary sphincter) for gallstone extraction via this technique. This is described later in the chapter.

**Nursing Implications.** The procedure requires a cooperative patient to permit insertion of the endoscope without damage to the gastrointestinal tract structures, including the biliary tree. Before
the procedure, the patient is given an explanation of the procedure and his or her role in it. The patient takes nothing by mouth for several hours before the procedure. Moderate sedation is used with this procedure, so the sedated patient must be monitored closely. Most endoscopists use a combination of an opioid and a benzodiazepine. Medications such as glucagon or anticholinergics may also be necessary to eliminate duodenal peristalsis to make cannulation easier. The nurse observes closely for signs of respiratory and central nervous system depression, hypotension, oversedation, and vomiting (if glucagon is given). During ERCP, the nurse monitors intravenous fluids, administers medications, and positions the patient.

After the procedure, the nurse monitors the patient’s condition, observing vital signs and monitoring for signs of perforation or infection. The nurse also monitors the patient side effects of any medications received during the procedure and for return of the gag and cough reflexes after the use of local anesthetics.

**PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY**

Percutaneous transhepatic cholangiography involves the injection of dye directly into the biliary tract. Because of the relatively large concentration of dye that is introduced into the biliary system, all components of the system, including the hepatic ducts within the liver, the entire length of the common bile duct, the cystic duct, and the gallbladder, are outlined clearly.

This procedure can be carried out even in the presence of liver dysfunction and jaundice. It is useful for distinguishing jaundice caused by liver disease (hepatocellular jaundice) from that caused by biliary obstruction, for investigating the gastrointestinal symptoms of a patient whose gallbladder has been removed, for locating stones within the bile ducts, and for diagnosing cancer involving the biliary system.

This sterile procedure is performed under moderate sedation on a patient who has been fasting; the patient receives local anesthesia and intravenous sedation. Coagulation parameters and platelet count should be normal to minimize the risk for bleeding. Broad-spectrum antibiotics are administered during the procedure due to the high prevalence of bacterial colonization from obstructed biliary systems. After infiltration with a local anesthetic agent, a flexible needle is inserted into the liver from the right side in the midclavicular line immediately beneath the right costal margin. Successful entry of a duct is noted when bile is aspirated or upon the injection of a contrast agent. Ultrasound guidance can be used for duct puncture. Bile is aspirated and samples are sent for bacteriology and cytology. A water-soluble contrast agent is injected to fill the biliary system. The fluoroscopy table is tilted and the patient repositioned to allow x-rays to be taken in multiple projections. Delayed x-ray views can identify abnormalities of more distant ducts and determine the length of a stricture or multiple strictures. Before the needle is removed, as much dye and bile as possible are aspirated to forestall subsequent leakage into the needle tract and eventually into the peritoneal cavity, thus minimizing the risk of bile peritonitis.

Table 40-1 identifies various procedures and their diagnostic uses.

**NURSING ALERT** Although the complication rate after this procedure is low, the nurse must closely observe the patient for symptoms of bleeding, peritonitis, and septicemia. The nurse should immediately report pain and indicators of these complications. Antibiotic agents are often prescribed to minimize the risk of sepsis and septic shock.

**Medical Management**

The major objectives of medical therapy are to reduce the incidence of acute episodes of gallbladder pain and cholecystitis by supportive and dietary management and, if possible, to remove the cause of cholecystitis by pharmacologic therapy, endoscopic procedures, or surgical intervention.

Although nonsurgical approaches have the advantage of eliminating risks associated with surgery, they are associated with persistent symptoms or recurrent stone formation. Most of the nonsurgical approaches, including lithotripsy and dissolution of gallstones, provide only temporary solutions to the problems associated with gallstones. They are therefore rarely used in the United States. In some instances, other treatment approaches may be indicated; these are described below.

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**Table 40-1 • Studies Used in the Diagnosis of Biliary Tract and Pancreatic Disease**

<table>
<thead>
<tr>
<th>STUDIES</th>
<th>DIAGNOSTIC USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholecystogram, cholangiogram</td>
<td>To visualize gallbladder and bile duct</td>
</tr>
<tr>
<td>Celiac axis arteriography</td>
<td>To visualize liver and pancreas</td>
</tr>
<tr>
<td>Laparoscopy</td>
<td>To visualize anterior surface of liver, gallbladder, and mesentery through a trocar</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>To show size of abdominal organs and presence of masses</td>
</tr>
<tr>
<td>Magnetic resonance imaging (MRI)</td>
<td>To detect neoplasms; diagnose cysts, abscess, and hematomas</td>
</tr>
<tr>
<td>Endoscopic retrograde cholangiopancreatography (ERCP)</td>
<td>To visualize biliary structures and pancreas via endoscopy</td>
</tr>
<tr>
<td>Serum alkaline phosphatase</td>
<td>In absence of bone disease, to measure of biliary tract obstruction</td>
</tr>
<tr>
<td>GGT, GGTP, LDH</td>
<td>Markers for biliary stasis; also elevated in alcohol abuse</td>
</tr>
<tr>
<td>Cholesterol levels</td>
<td>Elevated in biliary obstruction; decreased in parenchymal liver disease</td>
</tr>
</tbody>
</table>
Removal of the gallbladder (cholecystectomy) through traditional surgical approaches was considered the standard approach to management for more than 100 years. However, dramatic changes have occurred in the surgical management of gallbladder disease. There is now widespread use of laparoscopic cholecystectomy (removal of the gallbladder through a small incision through the umbilicus). As a result, surgical risks have decreased, along with the length of hospital stay and the long recovery period associated with the standard surgical cholecystectomy.

**NUTRITIONAL AND SUPPORTIVE THERAPY**

Approximately 80% of the patients with acute gallbladder inflammation achieve remission with rest, intravenous fluids, nasogastric suction, analgesia, and antibiotic agents. Unless the patient’s condition deteriorates, surgical intervention is delayed until the acute symptoms subside and a complete evaluation can be carried out.

The diet immediately after an episode is usually limited to low-fat liquids. The patient can stir powdered supplements high in protein and carbohydrate into skim milk. Cooked fruits, rice or tapioca, lean meats, mashed potatoes, non–gas-forming vegetables, bread, coffee, or tea may be added as tolerated. The patient should avoid eggs, cream, pork, fried foods, cheese and rich dressings, gas-forming vegetables, and alcohol. It is important to remind the patient that fatty foods may bring on an episode. Dietary management may be the major mode of therapy in patients who have had only dietary intolerance to fatty foods and vague gastrointestinal symptoms (Dudek, 2001).

**PHARMACOLOGIC THERAPY**

Ursodeoxycholic acid (UDCA) and chenodeoxycholic acid (chenodiol or CDCA) have been used to dissolve small, radiolucent gallstones composed primarily of cholesterol. UDCA has fewer side effects than chenodiol and can be administered in smaller doses to achieve the same effect. It acts by inhibiting the synthesis and secretion of cholesterol, thereby desaturating bile. Existing stones can be reduced in size, small ones dissolved, and new stones prevented from forming. Six to 12 months of therapy are required in many patients to dissolve stones, and monitoring of the patient is required during this time. The effective dose of medication depends on body weight. This method of treatment is generally indicated for patients who refuse surgery or for whom surgery is considered too risky.

Patients with significant, frequent symptoms, cystic duct occlusion, or pigment stones are not candidates for this therapy. Symptomatic patients with acceptable operative risk are more appropriate for laparoscopic or open cholecystectomy.

**NONSURGICAL REMOVAL OF GALLSTONES**

**Dissolving Gallstones.** Several methods have been used to dissolve gallstones by infusion of a solvent (mono-octanoin or methyl tertiary butyl ether [MTBE]) into the gallbladder. The solvent can be infused through the following routes: a tube or catheter inserted percutaneously directly into the gallbladder; a tube or drain inserted through a T-tube tract to dissolve stones not removed at the time of surgery; an ERCP endoscope; or a transnasal biliary catheter.

In the last procedure, the catheter is introduced through the mouth and inserted into the common bile duct. The upper end of the tube is then rerouted from the mouth to the nose and left in place. This enables the patient to eat and drink normally while passage of stones is monitored or chemical solvents are infused to dissolve the stones. This method of dissolution of stones is not widely used in patients with gallstone disease.

**Stone Removal by Instrumentation.** Several nonsurgical methods are used to remove stones that were not removed at the time of cholecystectomy or have become lodged in the common bile duct (Fig. 40-4A, B). A catheter and instrument with a basket attached are threaded through the T-tube tract or fistula formed at the time of T-tube insertion; the basket is used to retrieve and remove the stones lodged in the common bile duct.

A second procedure involves the use of the ERCP endoscope (see Fig. 40-4C). After the endoscope is inserted, a cutting instrument is passed through the endoscope into the ampulla of Vater of the common bile duct. It may be used to cut the submucosal fibers, or papilla, of the sphincter of Oddi, enlarging the opening, which may allow the lodged stones to pass spontaneously into the duodenum. Another instrument with a small basket or balloon at its tip may be inserted through the endoscope to retrieve the stones (see Fig. 40-4D–F). Although complications after this procedure are rare, the patient must be observed closely for bleeding, perforation, and the development of pancreatitis or sepsis.

The ERCP procedure is particularly useful in the diagnosis and treatment of patients who have symptoms after biliary tract surgery, for patients with intact gallbladders, and for patients in whom surgery is particularly hazardous.

**Extracorporeal Shock-Wave Lithotripsy.** Extracorporeal shock-wave therapy (lithotripsy or ESWL) has been used for nonsurgical fragmentation of gallstones. The word lithotripsy is derived from lithos, meaning stone, and tripsis, meaning rubbing or friction. This noninvasive procedure uses repeated shock waves directed at the gallstones in the gallbladder or common bile duct to fragment the stones. The energy is transmitted to the body through a fluid-filled bag, or it may be transmitted while the patient is immersed in a water bath. The converging shock waves are directed to the stones to be fragmented.

After the stones are gradually broken up, the stone fragments pass from the gallbladder or common bile duct spontaneously, are removed by endoscopy, or are dissolved with oral bile acid or solvents. Because the procedure requires no incision and no hospitalization, patients are usually treated as outpatients, but several sessions are generally necessary.

The advent of laparoscopic cholecystectomy has reduced the use of this method to treat gallbladder stones. It is used in some centers for a small percentage of suitable patients (those with common bile duct stones who may not be surgical candidates), sometimes in combination with dissolution therapy.

**Intracorporeal Lithotripsy.** Stones in the gallbladder or common bile duct may be fragmented by means of laser pulse technology. A laser pulse is directed under fluoroscopic guidance with the use of devices that can distinguish between stones and tissue. The laser pulse produces rapid expansion and disintegration of plasma on the stone surface, resulting in a mechanical shock wave. Electrohydraulic lithotripsy uses a probe with two electrodes that deliver electric sparks in rapid pulses, creating expansion of the liquid environment surrounding the gallstones. This results in pressure waves that cause stones to fragment. This technique can be employed percutaneously with the use of a basket or balloon catheter system or by direct visualization through an endoscope. Repeated procedures may be necessary due to stone size, local anatomy, bleeding, or technical difficulty. A nasobiliary tube can be inserted to allow for biliary decompression and prevent stone impaction in the common bile duct. This approach allows time for improvement in the patient’s clinical condition until gallstones are cleared endoscopically, percutaneously, or surgically.
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SURGICAL MANAGEMENT
Surgical treatment of gallbladder disease and gallstones is carried out to relieve persistent symptoms, to remove the cause of biliary colic, and to treat acute cholecystitis. Surgery may be delayed until the patient’s symptoms have subsided or may be performed as an emergency procedure if the patient’s condition necessitates it.

Preoperative Measures. A chest x-ray, electrocardiogram, and liver function tests may be performed in addition to x-ray studies of the gallbladder. Vitamin K may be administered if the prothrombin level is low. Blood component therapy may be administered before surgery. Nutritional requirements are considered; if the nutritional status is suboptimal, it may be necessary to provide intravenous glucose with protein hydrolysate supplements to aid wound healing and help prevent liver damage.

Preparation for gallbladder surgery is similar to that for any upper abdominal laparotomy or laparoscopy. Instructions and explanations are given before surgery with regard to turning and deep breathing. Pneumonia and atelectasis are possible postoperative complications that can be avoided by deep-breathing exercises and frequent turning. The patient should be informed that drainage tubes and a nasogastric tube and suction may be required during the immediate postoperative period if an open cholecystectomy is performed.

Laparoscopic Cholecystectomy. Laparoscopic cholecystectomy (Fig. 40-5) has dramatically changed the approach to the management of cholecystitis. It has become the new standard for therapy of symptomatic gallstones. Approximately 700,000 patients in the United States require surgery each year for removal of the gallbladder, and 80% to 90% of them are candidates for laparoscopic cholecystectomy (Bornman & Beckingham, 2001). If the common bile duct is thought to be obstructed by a gallstone, an ERCP with sphincterotomy may be performed to explore the duct before laparoscopy.

Before the procedure, the patient is informed that an open abdominal procedure may be necessary, and general anesthesia is administered. Laparoscopic cholecystectomy is performed through a small incision or puncture made through the abdominal wall in the umbilicus. The abdominal cavity is insufflated with carbon dioxide (pneumoperitoneum) to assist in inserting the laparoscope and to aid the surgeon in visualizing the abdominal structures. The fiberoptic scope is inserted through the small umbilical incision. Several additional punctures or small incisions are made in the abdominal wall to introduce other surgical instruments into the operative field. The surgeon visualizes the biliary system through the laparoscope; a camera attached to the scope permits a view of the intra-abdominal field to be transmitted to a television monitor. After the cystic duct is dissected, the common bile duct is imaged by ultrasound or cholangiography to evaluate the anatomy and identify stones. The cystic artery is dissected free and clipped. The gallbladder is separated away from the hepatic bed and dissected. The gallbladder is then removed from the abdominal cavity after bile and small stones are aspirated. Stone forceps also can be used to remove or crush larger stones.

The advantage of the laparoscopic procedure is that the patient does not experience the paralytic ileus that occurs with open abdominal surgery and has less postoperative abdominal pain. The patient is often discharged from the hospital on the day of surgery or within a day or two and can resume full activity and employment within a week of the surgery.

Conversion to a traditional abdominal surgical procedure may be necessary if problems are encountered during the laparoscopic procedure; this occurs in 2% to 8% of reported surgical cases.
Conversion is required more often, approximately 20% of the time, in those with acute cholecystitis (Lai et al., 1998). Careful screening of patients and identification of those at low risk for complications limits the frequency of conversion to an open abdominal procedure. With wider use of laparoscopic procedures, however, there may be an increase in the number of such conversions. The most serious complication after laparoscopic cholecystectomy is a bile duct injury.

Because of the short hospital stay, it is important to provide written as well as verbal instructions about managing postoperative pain and reporting signs and symptoms of intra-abdominal complications, including loss of appetite, vomiting, pain, distention of the abdomen, and temperature elevation. Although recovery from laparoscopic cholecystectomy is rapid, patients are drowsy afterward. The nurse must ensure that the patient has assistance at home during the first 24 to 48 hours. If pain occurs in the right shoulder or scapular area (from migration of the CO₂ used to insufflate the abdominal cavity during the procedure), the nurse may recommend use of a heating pad for 15 to 20 minutes hourly, walking, and sitting up when in bed.

**Cholecystectomy.** In this procedure, the gallbladder is removed through an abdominal incision (usually right subcostal) after the cystic duct and artery are ligated. The procedure is performed for acute and chronic cholecystitis. In some patients a drain may be placed close to the gallbladder bed and brought out through a puncture wound if there is a bile leak. The drain type is chosen based on the physician’s preference. A small leak should close spontaneously in a few days with the drain preventing accumulation of bile. Usually only a small amount of serosanguinous fluid will drain in the initial 24 hours after surgery, and then the drain will be removed.

The drain is usually maintained if there is excess oozing or bile leakage. Use of a T-tube inserted into the common bile duct during the open procedure is now uncommon; it is used only in the setting of a complication (ie, retained common bile duct stone). Bile duct injury is a serious complication of this procedure but occurs less frequently than with the laparoscopic approach. Once one of the most common surgical procedures in the United States, this procedure has largely been replaced by laparoscopic cholecystectomy.

**Mini-cholecystectomy.** Mini-cholecystectomy is a surgical procedure in which the gallbladder is removed through a small incision. If needed, the surgical incision is extended to remove large gallbladder stones. Drains may or may not be used. The cost savings resulting from the shorter hospital stay have been identified as a major reason for pursuing this type of procedure. Debate exists about this procedure because it limits exposure to all the involved biliary structures.

**Choledochostomy.** Choledochostomy involves an incision into the common duct, usually for removal of stones. After the stones have been evacuated, a tube usually is inserted into the duct for drainage of bile until edema subsides. This tube is connected to gravity drainage tubing. The gallbladder also contains stones, and as a rule a cholecystectomy is performed at the same time.

**Surgical Cholecystostomy.** Cholecystostomy is performed when the patient’s condition prevents more extensive surgery or when an acute inflammatory reaction is severe. The gallbladder is surgically opened, the stones and the bile or the purulent drainage are removed, and a drainage tube is secured with a purse-string suture. The drainage tube is connected to a drainage system to
prevent bile from leaking around the tube or escaping into the peritoneal cavity. After recovery from the acute episode, the patient may return for cholecystectomy. Despite its lower risk, surgical cholecystostomy has a high mortality rate (reported as high as 20% to 30%) because of the underlying disease process.

**Percutaneous Cholecystostomy.** Percutaneous cholecystostomy has been used in the treatment and diagnosis of acute cholecystitis in patients who are poor risks for any surgical procedure or for general anesthesia. These may include patients with sepsis or severe cardiac, renal, pulmonary, or liver failure. Under local anesthesia, a fine needle is inserted through the abdominal wall and liver edge into the gallbladder under the guidance of ultrasonography or computed tomography. Bile is aspirated to ensure adequate placement of the needle, and a catheter is inserted into the gallbladder to decompress the biliary tract. Almost immediate relief of pain and resolution of signs and symptoms of sepsis and cholecystitis have been reported with this procedure. Antibiotic agents are administered before, during, and after the procedure.

**Gerontologic Considerations**

Surgical intervention for disease of the biliary tract is the most common operative procedure performed in the elderly. Cholesterol saturation of bile increases with age due to increased hepatic secretion of cholesterol and decreased bile acid synthesis.

Although the incidence of gallstones increases with age, the elderly patient may not exhibit the typical picture of fever, pain, chills, and jaundice. Symptoms of biliary tract disease in the elderly may be accompanied or preceded by those of septic shock, which include oliguria, hypotension, changes in mental status, tachycardia, and tachypnea.

Although surgery in the elderly presents a risk because of preexisting associated diseases, the mortality rate from serious complications from biliary tract disease itself is also high. The risk of death and complications is increased in the elderly patient who undergoes emergency surgery for life-threatening disease of the biliary tract. Despite chronic illness in many elderly patients, elective cholecystectomy is usually well tolerated and can be carried out with low risk if expert assessment and care are provided before, during, and after the surgical procedure.

Because of recent changes in the health care system, there has been a decrease in the number of elective surgical procedures performed, including cholecystectomies. As a result, patients requiring the procedure are seen in the later stages of disease. Simultaneously, patients undergoing surgery are increasingly older than 60 years of age and have complicated acute cholecystitis. The higher risk of complications and shorter hospital stays make it essential that older patients and their family members receive specific information about signs and symptoms of complications and measures to prevent them.

**NURSING PROCESS: THE PATIENT UNDERGOING SURGERY FOR GALBLADDER DISEASE**

**Assessment**

The patient who is to undergo surgical treatment of gallbladder disease is often admitted to the hospital or same-day surgery unit on the morning of surgery. Preadmission testing is often completed a week or more before admission; at that time, the nurse instructs the patient about the need to avoid smoking to enhance pulmonary recovery postoperatively and to avoid respiratory complications. It also is important to instruct the patient to avoid the use of aspirin and other agents (over-the-counter medications and herbal remedies) that can alter coagulation and other biochemical processes.

Assessment should focus on the patient’s respiratory status. If a traditional surgical approach is planned, the high abdominal incision required during surgery may interfere with full respiratory excursion. The nurse notes a history of smoking, previous respiratory problems, shallow respirations, a persistent or ineffective cough, and the presence of adventitious breath sounds. Nutritional status is evaluated through a dietary history and general examination performed at the time of preadmission testing. The nurse also reviews previously obtained laboratory results to obtain information about the patient’s nutritional status.

**Diagnosis**

**NURSING DIAGNOSES**

Based on all the assessment data, the major postoperative nursing diagnoses for the patient undergoing surgery for gallbladder disease may include the following:

- Acute pain and discomfort related to surgical incision
- Impaired gas exchange related to the high abdominal surgical incision (if traditional surgical cholecystectomy is performed)
- Impaired skin integrity related to altered biliary drainage after surgical intervention (if a T-tube is inserted because of retained stones in the common bile duct or another drainage device is employed)
- Imbalanced nutrition, less than body requirements, related to inadequate bile secretion
- Deficient knowledge about self-care activities related to incision care, dietary modifications (if needed), medications, reportable signs or symptoms (eg, fever, bleeding, vomiting)

**COLLABORATIVE PROBLEMS/POTENTIAL COMPLICATIONS**

Based on assessment data, potential complications may include:

- Bleeding
- Gastrointestinal symptoms (may be related to biliary leak)

**Planning and Goals**

The goals for the patient include relief of pain, adequate ventilation, intact skin and improved biliary drainage, optimal nutritional intake, absence of complications, and understanding of self-care routines.

**Postoperative Nursing Interventions**

After recovery from anesthesia, the nurse places the patient in the low Fowler’s position. Intravenous fluids may be given, and nasogastric suction (a nasogastric tube was probably inserted immediately before surgery for a nonlaparoscopic procedure) may be instituted to relieve abdominal distention. Water and other fluids are given in about 24 hours, and a soft diet is started when bowel sounds return.

**RELIEVING PAIN**

The location of the subcostal incision in nonlaparoscopic gallbladder surgery is likely to cause the patient to avoid turning and moving, to splint the affected site, and to take shallow breaths to prevent pain. Because full aeration of the lungs and gradually increased activity are necessary to prevent postoperative complica-
tions, the nurse should administer analgesic agents as prescribed to relieve the pain and to promote well-being in addition to helping the patient turn, cough, breathe deeply, and ambulate as indicated. Use of a pillow or binder over the incision may reduce pain during these maneuvers.

IMPROVING RESPIRATORY STATUS
Patients undergoing biliary tract surgery are especially prone to pulmonary complications, as are all patients with upper abdominal incisions. Thus, the nurse reminds patients to take deep breaths and cough every hour to expand the lungs fully and prevent atelectasis. The early and consistent use of incentive spirometry also helps improve respiratory function. Early ambulation prevents pulmonary complications as well as other complications, such as thrombophlebitis. Pulmonary complications are more likely to occur in the elderly and in obese patients.

PROMOTING SKIN CARE AND BILIARY DRAINAGE
In patients who have undergone a cholecystostomy or choledochostomy, the drainage tubes must be connected immediately to a drainage receptacle. The nurse should fasten tubing to the dressings or to the patient’s gown, with enough leeway for the patient to move without dislodging or kinking it. Because a drainage system remains attached when the patient is ambulating, the drainage bag may be placed in a bathrobe pocket or fastened so that it is below the waist or common duct level. If a Penrose drain is used, the nurse changes the dressings as required.

After these surgical procedures, the patient is observed for indications of infection, leakage of bile into the peritoneal cavity, and obstruction of bile drainage. If bile is not draining properly, an obstruction is probably causing bile to be forced back into the liver and bloodstream. Because jaundice may result, the nurse should be particularly observant of the color of the sclerae. The nurse should also note and report right upper quadrant abdominal pain, nausea and vomiting, bile drainage around any drainage tube, clay-colored stools, and a change in vital signs.

Bile may continue to drain from the drainage tract in considerable quantities for a time, necessitating frequent changes of the outer dressings and protection of the skin from irritation because bile is corrosive to the skin.

To prevent total loss of bile, the physician may want the drainage tube or collection receptacle elevated above the level of the abdomen so that the bile drains externally only if pressure develops in the duct system. Every 24 hours, the nurse measures the bile collected and records the amount, color, and character of the drainage. After several days of drainage, the tube may be clamped for an hour before and after each meal to deliver bile to the duodenum to aid in digestion. Within 7 to 14 days, the drainage tube is removed. The patient who goes home with a drainage tube in place requires instruction and reassurance about its function and care of the tube.

In all patients with biliary drainage, the nurse observes the stools daily and notes their color. Specimens of both urine and stool may be sent to the laboratory for examination for bile pigment is disappearing from the blood and is draining again into the duodenum. Maintaining a careful record of fluid intake and output is important.

IMPROVING NUTRITIONAL STATUS
The nurse encourages the patient to eat a diet low in fats and high in carbohydrates and proteins immediately after surgery. At the time of hospital discharge, there are usually no special dietary instructions other than to maintain a nutritious diet and avoid excessive fats. Fat restriction usually is lifted in 4 to 6 weeks when the biliary ducts dilate to accommodate the volume of bile once held by the gallbladder and when the ampulla of Vater again functions effectively. After this, when the patient eats fat, adequate bile will be released into the digestive tract to emulsify the fats and allow their digestion. This is in contrast to before surgery, when fats may not be digested completely or adequately, and flatulence may occur. However, one purpose of gallbladder surgery is to allow a normal diet.

MONITORING AND MANAGING POTENTIAL COMPLICATIONS
Bleeding may occur as a result of inadvertent puncture or nicking of a major blood vessel. Postoperatively, the nurse closely monitors vital signs and inspects the surgical incisions and drains, if in place, for evidence of bleeding. The nurse also periodically assesses the patient for increased tenderness and rigidity of the abdomen. If these signs and symptoms occur, they are reported to the surgeon. The nurse instructs the patient and family to report to the surgeon any change in the color of stools because this may indicate complications. Gastrointestinal symptoms, although not common, may occur with manipulation of the intestines during surgery.

After laparoscopic cholecystectomy, the nurse assesses the patient for loss of appetite, vomiting, pain, distention of the abdomen, and temperature elevation. These may indicate infection or disruption of the gastrointestinal tract and should be reported to the surgeon promptly. Because the patient is discharged soon after laparoscopic surgery, the patient and family are instructed verbally and in writing about the importance of reporting these symptoms promptly.

PROMOTING HOME AND COMMUNITY-BASED CARE
Teaching Patients Self-Care
The nurse instructs the patient about the medications that are prescribed (vitamins, anticholinergics, and antispasmodics) and their actions. It also is important to inform the patient and family about symptoms that should be reported to the physician, including jaundice, dark urine, pale-colored stools, pruritus, or signs of inflammation and infection, such as pain or fever.

Some patients report one to three bowel movements a day. This is the result of a continual trickle of bile through the common duct junction after cholecystectomy. Usually, such frequency diminishes over a period of a few weeks to several months.

If a patient is discharged from the hospital with a drainage tube still in place, the patient and family may need instructions about its management. The nurse instructs them in proper care of the drainage tube and the importance of reporting to the physician promptly any changes in the amount or characteristics of drainage. Assistance in securing the appropriate dressings will reduce the patient’s anxiety about going home with the drain or tube still in place. (See Chart 40-3 for more details.)

Continuing Care
With sufficient support at home, most patients recover quickly from cholecystectomy. However, elderly or frail patients and those who live alone may require a referral for home care. During home visits, the nurse assesses the patient’s physical status, especially wound healing, and progress toward recovery. Assessing the patient for adequacy of pain relief and pulmonary exercises also is important. If the patient has a drainage system in place, the nurse assesses it for patency and appropriate management by the patient and family. Assessing for signs of infection and teaching the patient about...
resuming activity

- Begin light exercise (walking) immediately.
- Take a shower or bath after 1 or 2 days.
- Drive a car after 3 or 4 days.
- Avoid lifting objects exceeding 5 pounds after surgery, usually for 1 week.
- Resume sexual activity when desired.

Caring for the Wound

- Check puncture site daily for signs of infection.
- Wash puncture site with mild soap and water.
- Allow special adhesive strips on the puncture site to fall off. Do not pull them off.

Resuming Eating

- Resume your normal diet.
- If you had fat intolerance before surgery, gradually add fat back into your diet in small increments.

Managing Pain

- You may experience pain or discomfort in your right shoulder from the gas used to inflate your abdominal area during surgery. Sitting upright in bed or a chair or walking may ease the discomfort.

Managing Follow-Up Care

- Make an appointment with your surgeon for 7 to 10 days after discharge.
- Call your surgeon if you experience any signs or symptoms of infection at or around the puncture site: redness, tenderness, swelling, heat, or drainage.
- Call your surgeon if you experience a fever of 37.7°C (100°F) or more for 2 consecutive days.
- Call your surgeon if you develop nausea, vomiting, or abdominal pain.

The signs and symptoms of infection are also important nursing interventions. The patient’s understanding of the therapeutic regimen (medications, gradual return to normal activities) is assessed, and previous teaching is reinforced. The nurse emphasizes the importance of keeping follow-up appointments and reminds the patient and family of the importance of participating in health promotion activities and recommended health screening.

### Evaluation

**EXPECTED PATIENT OUTCOMES**

Expected patient outcomes may include:

1. Reports decrease in pain
   a. Splints abdominal incision to decrease pain
   b. Avoids foods that cause pain
   c. Uses postoperative analgesia as prescribed
2. Demonstrates appropriate respiratory function
   a. Achieves full respiratory excursion, with deep inspiration and expiration
   b. Coughs effectively, using pillow to splint abdominal incision
   c. Uses postoperative analgesia as prescribed
   d. Exercises as prescribed (eg, turns, ambulates)
3. Exhibits normal skin integrity around biliary drainage site (if applicable)
   a. Is free of fever, abdominal pain, change in vital signs, or bile, foul-smelling drainage, or pus around drainage tube
   b. Demonstrates proper management of drainage tube (if applicable)
   c. Identifies signs and symptoms of biliary obstruction to be noted and reported
   d. Has serum bilirubin level within normal range
4. Obtains relief of dietary intolerance
   a. Maintains adequate dietary intake and avoids foods that cause gastrointestinal symptoms
   b. Reports decreased or absent nausea, vomiting, diarrhea, flatulence, and abdominal discomfort
5. Absence of complications
   a. Has normal vital signs (blood pressure, pulse, respiratory rate and pattern, and temperature)
   b. Reports absence of bleeding from gastrointestinal tract, biliary drainage tube/catheter (if present) and no evidence of bleeding in stool
   c. Reports return of appetite and no evidence of vomiting, abdominal distention, and pain
   d. Lists symptoms that should be reported to surgeon promptly and demonstrates an understanding of self-care, including wound care

### Disorders of the Pancreas

**Pancreatitis** (inflammation of the pancreas) is a serious disorder. The most basic classification system used to describe or categorize the various stages and forms of pancreatitis divides the disorder into acute or chronic forms. Acute pancreatitis can be a medical emergency associated with a high risk for life-threatening complications and mortality, whereas chronic pancreatitis often goes undetected until 80% to 90% of the exocrine and endocrine tissue is destroyed. Acute pancreatitis does not usually lead to chronic pancreatitis unless complications develop. However, chronic pancreatitis can be characterized by acute episodes. Typically, patients are men 40 to 45 years of age with a history of alcoholism or women 50 to 55 years of age with a history of biliary disease (Hale et al., 2000).

Although the mechanisms causing pancreatic inflammation are unknown, pancreatitis is commonly described as autodigestion of the pancreas. Generally, it is believed that the pancreatic duct becomes obstructed, accompanied by hypersecretion of the exocrine enzymes of the pancreas. These enzymes enter the bile duct, where they are activated and, together with bile, back up (reflux) into the pancreatic duct, causing pancreatitis.

### ACUTE PANCREATITIS

Acute pancreatitis ranges from a mild, self-limiting disorder to a severe, rapidly fatal disease that does not respond to any treatment. Mild acute pancreatitis is characterized by edema and inflammation confined to the pancreas. Minimal organ dysfunction is present, and return to normal usually occurs within 6 months. Although this is considered the milder form of pancreatitis, the
patient is acutely ill and at risk for hypovolemic shock, fluid and electrolyte disturbances, and sepsis. A more widespread and complete enzymatic digestion of the gland characterizes severe acute pancreatitis. The tissue becomes necrotic, and the damage extends into the retroperitoneal tissues. Local complications consist of pancreatic cysts or abscesses and acute fluid collections in or near the pancreas. Systemic complications, such as acute respiratory distress syndrome, shock, disseminated intravascular coagulopathy, and pleural effusion, can increase the mortality rate to 50% or higher (Aronson, 1999).

Gerontologic Considerations

Acute pancreatitis affects people of all ages, but the mortality rate associated with acute pancreatitis increases with advancing age. In addition, the pattern of complications changes with age. Younger patients tend to develop local complications; the incidence of multiple organ failure increases with age, possibly as a result of progressive decreases in physiologic function of major organs with increasing age. Close monitoring of major organ function (ie, lungs, kidneys) is essential, and aggressive treatment is necessary to reduce mortality from acute pancreatitis in the elderly.

Pathophysiology

Self-digestion of the pancreas by its own proteolytic enzymes, principally trypsin, causes acute pancreatitis. Eighty percent of patients with acute pancreatitis have biliary tract disease; however, only 5% of patients with gallstones develop pancreatitis. Gallstones enter the common bile duct and lodge at the ampulla of Vater, obstructing the flow of pancreatic juice or causing a reflux of bile from the common bile duct into the pancreatic duct, thus activating the powerful enzymes within the pancreas. Normally, these remain in an inactive form until the pancreatic secretions reach the lumen of the duodenum. Activation of the enzymes can lead to vasodilation, increased vascular permeability, necrosis, erosion, and hemorrhage (Quillen, 2001).

Long-term use of alcohol is commonly associated with acute episodes of pancreatitis, but the patient usually has had undiagnosed chronic pancreatitis before the first episode of acute pancreatitis occurs. Other less common causes of pancreatitis include bacterial or viral infection, with pancreatitis a complication of mumps virus. Spasm and edema of the ampulla of Vater, resulting from duodenitis, can probably produce pancreatitis. Blunt abdominal trauma, peptic ulcer disease, ischemic vascular disease, hyperlipidemia, hypercalcemia, and the use of corticosteroids, thiazide diuretics, and oral contraceptives also have been associated with an increased incidence of pancreatitis. Acute pancreatitis may follow surgery on or near the pancreas or after instrumentation of the pancreatic duct. Acute idiopathic pancreatitis accounts for up to 20% of the cases of acute pancreatitis (Hale, Moseley & Warner, 2000). In addition, there is a small incidence of hereditary pancreatitis.

The mortality rate of patients with acute pancreatitis is high (10%) because of shock, anoxia, hypotension, or fluid and electrolyte imbalances. Attacks of acute pancreatitis may result in complete recovery, may recur without permanent damage, or may progress to chronic pancreatitis. The patient admitted to the hospital with a diagnosis of pancreatitis is acutely ill and needs expert nursing and medical care.

Severity and mortality predictions of acute alcoholic pancreatitis are generally assessed using Ranson’s criteria (Tierney, McPhee & Papadakis, 2001). The Acute Physiology and Chronic Health Evaluation (APACHE) grading system may also be used. Predictors of the severity of pancreatitis and its prognosis are listed in Chart 40-4.

Clinical Manifestations

Severe abdominal pain is the major symptom of pancreatitis that causes the patient to seek medical care. Abdominal pain and tenderness and back pain result from irritation and edema of the inflamed pancreas that stimulate the nerve endings. Increased tension on the pancreatic capsule and obstruction of the pancreatic ducts also contribute to the pain. Typically, the pain occurs in the midepigastrium. Pain is frequently acute in onset, occurring 24 to 48 hours after a very heavy meal or alcohol ingestion, and it may be diffuse and difficult to localize. It is generally more severe after meals and is unrelieved by antacids. Pain may be accompanied by abdominal distention; a poorly defined, palpable abdominal mass; and decreased peristalsis. Pain caused by pancreatitis is accompanied frequently by vomiting that does not relieve the pain or nausea.

The patient appears acutely ill. Abdominal guarding is present. A rigid or board-like abdomen may develop and is generally an ominous sign; the abdomen may remain soft in the absence of peritonitis. Echymosis (bruising) in the flank or around the umbilicus may indicate severe pancreatitis. Nausea and vomiting are common in acute pancreatitis. The emesis is usually gastric in origin but may also be bile-stained. Fever, jaundice, mental confusion, and agitation also may occur.

Hypotension is typical and reflects hypovolemia and shock caused by the loss of large amounts of protein-rich fluid into the tissues and peritoneal cavity. The patient may develop tachycardia, cyanosis, and cold, clammy skin in addition to hypotension. Acute renal failure is common.

Respiratory distress and hypoxia are common, and the patient may develop diffuse pulmonary infiltrates, dyspnea, tachypnea, and abnormal blood gas values. Myocardial depression, hyperglycemia, and disseminated intravascular coagulopathy (DIC) may also occur with acute pancreatitis.

### Chart 40-4 Criteria for Predicting Severity of Pancreatitis*

<table>
<thead>
<tr>
<th>Criteria on Admission to Hospital</th>
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<tbody>
<tr>
<td>Age &gt;55 years</td>
</tr>
<tr>
<td>WBC &gt;16,000 mm³</td>
</tr>
<tr>
<td>Serum glucose &gt;200 mg/dL (&gt;11.1 mmol/L)</td>
</tr>
<tr>
<td>Serum LDH &gt;350 IU/L (&gt;350 U/L)</td>
</tr>
<tr>
<td>AST &gt;250 U/mL (120 U/L)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria Within 48 Hours of Hospital Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall in hematocrit &gt;10% (&gt;0.10)</td>
</tr>
<tr>
<td>BUN increase &gt;5 mg/dL (&gt;1.7 mmol/L)</td>
</tr>
<tr>
<td>Serum calcium &lt;8 mg/dL (&lt;2.0 mmol/L)</td>
</tr>
<tr>
<td>Base deficit &gt;4 mEq/L (&gt;4 mmol/L)</td>
</tr>
<tr>
<td>Fluid retention or sequestration &gt;6 L</td>
</tr>
<tr>
<td>PO₂ &lt;60 mm Hg</td>
</tr>
</tbody>
</table>

*Note: The more risk factors a patient has, the greater the severity and the greater the likelihood of a complicated course or death.

Two or fewer signs: 1% mortality; 3 or 4 signs: 15% mortality; 5 or 6 signs: 40% mortality; >6 signs: 100% mortality.
Assessment and Diagnostic Findings

The diagnosis of acute pancreatitis is based on a history of abdominal pain, the presence of known risk factors, physical examination findings, and diagnostic findings. Serum amylase and lipase levels are used in making the diagnosis of acute pancreatitis. In 90% of the cases, serum amylase and lipase levels usually rise in excess of three times their normal upper limit within 24 hours (Tierney, McPhee & Papadakis, 2001). Serum amylase usually returns to normal within 48 to 72 hours. Serum lipase levels may remain elevated for 7 to 14 days (Braunwald et al., 2001). Urinary amylase levels also become elevated and remain elevated longer than serum amylase levels. The white blood cell count is usually elevated; hypocalcemia is present in many patients and correlates well with the severity of pancreatitis. Transient hyperglycemia and glucosuria and elevated serum bilirubin levels occur in some patients with acute pancreatitis.

X-ray studies of the abdomen and chest may be obtained to differentiate pancreatitis from other disorders that may cause similar symptoms and to detect pleural effusions. Ultrasound and contrast-enhanced computed tomography scans are used to identify an increase in the diameter of the pancreas and to detect pancreatic cysts, abscesses, or pseudocysts.

Hematocrit and hemoglobin levels are used to monitor the patient for bleeding. Peritoneal fluid, obtained through paracentesis or peritoneal lavage, may contain increased levels of pancreatic enzymes. The stools of patients with pancreatic disease are often bulky, pale, and foul-smelling. Fat content of stools varies between 50% and 90% in pancreatic disease; normally, the fat content is 20%. ERCP is rarely used in the diagnostic evaluation of acute pancreatitis because the patient is acutely ill; however, it may be valuable in the treatment of gallstone pancreatitis.

Medical Management

Management of the patient with acute pancreatitis is directed toward relieving symptoms and preventing or treating complications. All oral intake is withheld to inhibit pancreatic stimulation and secretion of pancreatic enzymes. Parenteral nutrition is usually an important part of therapy, particularly in debilitated patients, because of the extreme metabolic stress associated with acute pancreatitis (Dejong, Greve & Soeters, 2001). Nasogastric suction may be used to relieve nausea and vomiting, to decrease painful abdominal distention and paralytic ileus, and to remove hydrochloric acid so that it does not enter the duodenum and stimulate the pancreas. Histamine-2 (H₂) antagonists (eg, cimetidine [Tagamet] and ranitidine [Zantac]) may be prescribed to decrease pancreatic activity by inhibiting HCl secretion.

PAIN MANAGEMENT

Adequate pain medication is essential during the course of acute pancreatitis to provide sufficient pain relief and minimize restlessness, which may stimulate pancreatic secretion further. Morphine and morphine derivatives are often avoided because it has been thought that they cause spasm of the sphincter of Oddi; meperidine (Demerol) is often prescribed because it is less likely to cause spasm of the sphincter (Porth, 2002). Antiemetic agents may be prescribed to prevent vomiting.

INTENSIVE CARE

Correction of fluid and blood loss and low albumin levels is necessary to maintain fluid volume and prevent renal failure. The patient is usually acutely ill and is monitored in the intensive care unit, where hemodynamic monitoring and arterial blood gas monitoring are initiated. Antibiotic agents may be prescribed if infection is present; insulin may be required if significant hyperglycemia occurs.

RESPIRATORY CARE

Aggressive respiratory care is indicated because of the high risk for elevation of the diaphragm, pulmonary infiltrates and effusion, and atelectasis. Hypoxemia occurs in a significant number of patients with acute pancreatitis even with normal x-ray findings. Respiratory care may range from close monitoring of arterial blood gases to use of humidified oxygen to intubation and mechanical ventilation (see Chap. 25 for further discussion).

BILIARY DRAINAGE

Placement of biliary drains (for external drainage) and stents (indwelling tubes) in the pancreatic duct through endoscopy has been performed to reestablish drainage of the pancreas. This has resulted in decreased pain and increased weight gain.

SURGICAL INTERVENTION

Although often risky because the acutely ill patient is a poor surgical risk, surgery may be performed to assist in the diagnosis of pancreatitis (diagnostic laparotomy), to establish pancreatic drainage, or to resect or debride a necrotic pancreas. The patient who undergoes pancreatic surgery may have multiple drains in place postoperatively as well as a surgical incision that is left open for irrigation and repacking every 2 to 3 days to remove necrotic debris (Fig. 40-6).
**POSTACUTE MANAGEMENT**
Antacids may be used when acute pancreatitis begins to resolve. Oral feedings low in fat and protein are initiated gradually. Caffeine and alcohol are eliminated from the diet. If the episode of pancreatitis occurred during treatment with thiazide diuretics, corticosteroids, or oral contraceptives, these medications are discontinued. Follow-up of the patient may include ultrasound, x-ray studies, or ERCP to determine whether the pancreatitis is resolving and to assess for abscesses and pseudocysts. ERCP may also be used to identify the cause of acute pancreatitis if it is in question and for endoscopic sphincterotomy and removal of gallstones from the common bile duct.

**NURSING PROCESS:**  
**THE PATIENT WITH ACUTE PANCREATITIS**

**Assessment**
The health history focuses on the presence and character of the abdominal pain and discomfort. The nurse assesses the presence of pain, its location, its relationship to eating and to alcohol consumption, and the effectiveness of pain relief measures. It also is important to assess the patient’s nutritional and fluid status and history of gallbladder attacks and alcohol use. A history of gastrointestinal problems, including nausea, vomiting, diarrhea, and passage of fatty stools, is elicited. The nurse assesses the abdomen for pain, tenderness, guarding, and bowel sounds, noting the presence of a board-like or soft abdomen. It also is important to assess respiratory status, respiratory rate and pattern, and breath sounds. Normal and adventitious breath sounds and abnormal findings on chest percussion, including dullness at the bases of the lungs and abnormal tactile fremitus, are documented. The nurse assesses the emotional and psychological status of the patient and family and their coping, because they are often anxious about the severity of the symptoms and the acuity of illness.

**Diagnosis**

**NURSING DIAGNOSES**  
Based on all the assessment data, the major nursing diagnoses of the patient with acute pancreatitis include the following:

- Acute pain related to inflammation, edema, distention of the pancreas, and peritoneal irritation
- Ineffective breathing pattern related to severe pain, pulmonary infiltrates, pleural effusion, atelectasis, and elevated diaphragm
- Imbalanced nutrition, less than body requirements, related to reduced food intake and increased metabolic demands
- Impaired skin integrity related to poor nutritional status, bed rest, and multiple drains and surgical wound

**COLLABORATIVE PROBLEMS/POtENTIAL COMPLICATIONS**  
Based on assessment data, potential complications that may occur include the following:

- Fluid and electrolyte disturbances
- Necrosis of the pancreas
- Shock and multiple organ dysfunction

**Planning and Goals**
The major goals for the patient include relief of pain and discomfort, improved respiratory function, improved nutritional status, maintenance of skin integrity, and absence of complications.

**Nursing Interventions**

**RELIEVING PAIN AND DISCOMFORT**  
Because the pathologic process responsible for pain is autodigestion of the pancreas, the objectives of therapy are to relieve pain and decrease secretion of the enzymes of the pancreas. The pain of acute pancreatitis is often very severe, necessitating the liberal use of analgesic agents. Meperidine (Demerol) is the medication of choice; morphine sulfate is avoided because it causes spasm of the sphincter of Oddi (Porth, 2002). Oral feedings are withheld to decrease the formation and secretion of secretin. The patient is maintained on parenteral fluids and electrolytes to restore and maintain fluid balance. Nasogastric suction is used to remove gastric secretions and to relieve abdominal distention. The nurse provides frequent oral hygiene and care to decrease discomfort from the nasogastric tube and relieve dryness of the mouth.

The acutely ill patient is maintained on bed rest to decrease the metabolic rate and reduce the secretion of pancreatic and gastric enzymes. If the patient experiences increasing severity of pain, the nurse reports this to the physician because the patient may be experiencing hemorrhage of the pancreas, or the dose of analgesic may be inadequate.

The patient with acute pancreatitis often has a clouded sensorium because of severe pain, fluid and electrolyte disturbances, and hypoxia. Therefore, the nurse provides frequent and repeated but simple explanations about the need for withholding fluid intake and about maintenance of gastric suction and bed rest.

**IMPROVING BREATHING PATTERN**
The nurse maintains the patient in a semi-Fowler’s position to decrease pressure on the diaphragm by a distended abdomen and to increase respiratory expansion. Frequent changes of position are necessary to prevent atelectasis and pooling of respiratory secretions. Pulmonary assessment and monitoring of pulse oximetry or arterial blood gases are essential to detect changes in respiratory status so that early treatment can be initiated. The nurse instructs the patient in techniques of coughing and deep breathing to improve respiratory function and encourages and assists the patient to cough and deep breathe every 2 hours.

**IMPROVING NUTRITIONAL STATUS**
The patient with acute pancreatitis is not permitted food and oral fluid intake; however, it is important to assess the patient’s nutritional status and to note factors that alter the patient’s nutritional requirements (eg, temperature elevation, surgery, drainage). Laboratory test results and daily weights are useful in monitoring the nutritional status.

Parenteral nutrition may be prescribed. In addition to administering parenteral nutrition, the nurse monitors serum glucose levels every 4 to 6 hours. As the acute symptoms subside, the nurse gradually reintroduces oral feedings. Between acute attacks, the patient receives a diet high in carbohydrates and low in fat and proteins. The patient should avoid heavy meals and alcoholic beverages.

**IMPROVING SKIN INTEGRITY**
The patient is at risk for skin breakdown because of poor nutritional status, enforced bed rest, and restlessness, which may result in pressure ulcers and breaks in tissue integrity. In addition, the patient who has undergone surgery, has had multiple drains inserted, or has an open surgical incision is at risk for skin breakdown and infection. The nurse carefully assesses the wound,
drainage sites, and skin for signs of infection, inflammation, and breakdown. The nurse carries out wound care as prescribed and takes precautions to protect intact skin from contact with drainage. Consultation with an enterostomal therapist is often helpful in identifying appropriate skin care devices and protocols. It is important to turn the patient every 2 hours; use of specialty beds may be indicated to prevent skin breakdown.

**MONITORING AND MANAGING POTENTIAL COMPLICATIONS**

Fluid and electrolyte disturbances are common complications because of nausea, vomiting, movement of fluid from the vascular compartment to the peritoneal cavity, diaphoresis, fever, and the use of gastric suction. The nurse assesses the patient’s fluid and electrolyte status by noting skin turgor and moistness of mucous membranes. The nurse weighs the patient daily and carefully measures fluid intake and output, including urine output, nasogastric secretions, and diarrhea. In addition, it is important to assess the patient for other factors that may affect fluid and electrolyte status, including increased body temperature and wound drainage. The nurse assesses the patient for ascites and measures abdominal girth daily if ascites is suspected.

Intravenous fluids are administered and may be accompanied by infusion of blood, blood products, and albumin to maintain the blood volume and to prevent or treat hypovolemic shock. It is important to keep emergency medications readily available because of the risk of circulatory collapse and shock. The nurse promptly reports decreased blood pressure and reduced urine output because they may indicate hypovolemia and shock or renal failure. Low serum calcium and magnesium levels may occur and require prompt treatment.

Pancreatic necrosis is a major cause of morbidity and mortality in patients with acute pancreatitis. The patient who develops necrosis is at risk for hemorrhage, septic shock, and multiple organ failure. The patient may undergo diagnostic procedures to confirm pancreatic necrosis; surgical debridement or insertion of multiple drains may be performed. The patient with pancreatic necrosis is usually critically ill and requires expert medical and nursing management, including hemodynamic monitoring in the intensive care unit.

In addition to carefully monitoring vital signs and other signs and symptoms, the nurse is responsible for administering prescribed fluids, medications, and blood products; assisting with supportive management, such as use of a ventilator; preventing additional complications; and attending to the patient’s physical and psychological care.

Shock and multiple organ failure may occur with acute pancreatitis. Hypovolemic shock may occur as a result of hypovolemia and sequestration of fluid in the peritoneal cavity. Hemorrhagic shock may occur with hemorrhagic pancreatitis. Septic shock may occur with bacterial infection of the pancreas. Cardiac dysfunction may occur as a result of fluid and electrolyte disturbances, acid–base imbalances, and release of toxic substances into the circulation.

The nurse closely monitors the patient for early signs of neurologic, cardiovascular, renal, and respiratory dysfunction. The nurse must be prepared to respond quickly to rapid changes in the patient’s status, treatments, and therapies. In addition, it is important to inform the family about the status and progress of the patient and allow them to spend time with the patient. (Management of the patient in shock is discussed in detail in Chap. 15.)

**PROMOTING HOME AND COMMUNITY-BASED CARE**

**Teaching Patients Self-Care**

The patient who has survived an episode of acute pancreatitis has been acutely ill. A prolonged period is needed to regain strength and return to previous level of activity. The patient is often still weak and debilitated weeks or months after an acute episode of pancreatitis. Because of the severity of the acute illness, the patient may not recall many of the explanations and instructions given during the acute phase, so these often need to be repeated and reinforced. The nurse instructs the patient about the factors implicated in the onset of acute pancreatitis and about the need to avoid high-fat foods, heavy meals, and alcohol. It is important to give the patient and family verbal and written instructions about signs and symptoms of acute pancreatitis and possible complications that should be reported promptly to the physician.

If acute pancreatitis is a result of biliary tract disease, such as gallstones and gallbladder disease, additional explanations are needed about required dietary modifications. If the pancreatitis is a result of alcohol abuse, the nurse reminds the patient of the importance of eliminating all alcohol.

**Continuing Care**

A referral for home care often is indicated; this enables the nurse to assess the patient’s physical and psychological status and adherence to the therapeutic regimen. The nurse also assesses the home situation and reinforces instructions about fluid and nutritional intake and avoidance of alcohol.

When the acute attack has subsided, some patients may be inclined to return to their previous drinking habits. The nurse provides specific information about resources and support groups that may be of assistance in avoiding alcohol in the future. Referral to Alcoholics Anonymous or other appropriate support groups is essential. A summary of nursing management of the patient with acute pancreatitis is provided in the Plan of Nursing Care.

**Evaluation**

**EXPECTED PATIENT OUTCOMES**

Expected patient outcomes may include:

1. Reports relief of pain and discomfort
   a. Uses analgesics and anticholinergics as prescribed, without overuse
   b. Maintains bed rest as prescribed
   c. Avoids alcohol to decrease abdominal pain
2. Experiences improved respiratory function
   a. Changes position in bed frequently
   b. Coughs and takes deep breaths at least every hour
   c. Demonstrates normal respiratory rate and pattern, full lung expansion, normal breath sounds
   d. Demonstrates normal body temperature and absence of respiratory infection
3. Achieves nutritional and fluid and electrolyte balance
   a. Reports decrease in number of episodes of diarrhea
   b. Identifies and consumes high-carbohydrate, low-protein foods
   c. Explains rationale for eliminating alcohol intake
   d. Maintains adequate fluid intake within prescribed guidelines
   e. Exhibits adequate urine output
### Nursing Interventions, Rationale, Expected Outcomes

**Nursing Diagnosis:** Acute pain and discomfort related to edema, distention of the pancreas, and peritoneal irritation

**Goal:** Relief of pain and discomfort

<table>
<thead>
<tr>
<th>Nursing Interventions</th>
<th>Rationale</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Administer meperidine (Demerol) frequently, as prescribed, to achieve level of pain acceptable to patient based on patient’s level of pain and discomfort.</td>
<td>1. Meperidine acts by depressing the central nervous system and thereby increasing the patient’s pain threshold. Morphine is avoided because it produces spasm of the sphincter of Oddi.</td>
<td>• Reports relief of pain&lt;br&gt;• Moves and turns without increasing pain and discomfort&lt;br&gt;• Rests comfortably and sleeps for increasing periods&lt;br&gt;• Reports less frequent episodes of pain, discomfort, and cramping&lt;br&gt;• Experiences enhanced pain relief&lt;br&gt;• Reports increased feelings of well-being and security with the health care team</td>
</tr>
<tr>
<td>2. Using a pain scale, assess pain level before and after administration of analgesic.</td>
<td>2. Assessment and control of pain are important because restlessness increases body metabolism, which stimulates the secretion of pancreatic and gastric enzymes.</td>
<td></td>
</tr>
<tr>
<td>3. Report unrelieved pain or increasing intensity of pain.</td>
<td>3. Pain may increase pancreatic enzymes and may also indicate pancreatic hemorrhage.</td>
<td></td>
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<tr>
<td>4. Assist the patient to assume positions of comfort; turn and reposition every 2 hours.</td>
<td>4. Frequent turning relieves pressure and assists in preventing pulmonary and vascular complications.</td>
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</tr>
<tr>
<td>5. Use nonpharmacologic interventions for relieving pain (eg, relaxation, focused breathing, diversion).</td>
<td>5. Use of nonpharmacologic methods will enhance the effects of analgesics. Gate control theory states that cutaneous stimulation closes the pain pathways.</td>
<td></td>
</tr>
<tr>
<td>6. Listen to patient’s expression of pain experience.</td>
<td>6. Demonstration of caring can help to decrease anxiety.</td>
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</table>

**Goal:** Relief of pain related to stimulation of the pancreas

<table>
<thead>
<tr>
<th>Nursing Interventions</th>
<th>Rationale</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Administer anticholinergic medications as prescribed.</td>
<td>1. Anticholinergic medications reduce gastric and pancreatic secretion.</td>
<td>• Reports relief of pain, discomfort, and abdominal cramping&lt;br&gt;• Consumes no fluid and food during acute phase&lt;br&gt;• Maintains bed rest&lt;br&gt;• Identifies rationale for fluid and dietary restrictions and use of nasogastric drainage&lt;br&gt;• Cooperates with insertion of nasogastric tube and suction</td>
</tr>
<tr>
<td>2. Withhold oral intake.</td>
<td>2. Pancreatic secretion is increased by food and fluid intake.</td>
<td></td>
</tr>
<tr>
<td>3. Maintain the patient on bed rest.</td>
<td>3. Bed rest decreases body metabolism and thus reduces pancreatic and gastric secretions.</td>
<td></td>
</tr>
<tr>
<td>4. Maintain continuous nasogastric drainage.</td>
<td>4. Nasogastric suction removes gastric contents and prevents gastric secretions from entering the duodenum and stimulating the secretin mechanism. Decompression of the intestines (if intestinal intubation is used) also assists in relieving respiratory distress.</td>
<td></td>
</tr>
<tr>
<td>a. Measure gastric secretions at specified intervals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Observe and record color and viscosity of gastric secretions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Ensure that the nasogastric tube is patent to permit free drainage.</td>
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<td></td>
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</tbody>
</table>

**Nursing Diagnosis:** Discomfort related to nasogastric tube

**Goal:** Relief of discomfort associated with nasogastric intubation

<table>
<thead>
<tr>
<th>Nursing Interventions</th>
<th>Rationale</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use water-soluble lubricant around external nares.</td>
<td>1. Prevents irritation of nares</td>
<td>• Exhibits intact skin and tissue of nares at site of nasogastric tube insertion&lt;br&gt;• Reports no pain or irritation of nares or oropharynx&lt;br&gt;• Exhibits moist, clean mucous membranes of mouth and nasopharynx&lt;br&gt;• States that thirst is relieved by oral hygiene&lt;br&gt;• Identifies rationale for nasogastric tube and suction</td>
</tr>
<tr>
<td>2. Turn patient at intervals; avoid pressure or tension on nasogastric tube.</td>
<td>2. Relieves pressure of tube on esophageal and gastric mucosa</td>
<td></td>
</tr>
<tr>
<td>3. Provide oral hygiene and gargling solutions without alcohol.</td>
<td>3. Relieves dryness and irritation of oropharynx</td>
<td></td>
</tr>
<tr>
<td>4. Explain rationale for use of nasogastric drainage.</td>
<td>4. Assists patient to cooperate with the drainage, nasogastric tube, and suction.</td>
<td></td>
</tr>
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</table>

(continued)
## Plan of Nursing Care

### Care of the Patient With Acute Pancreatitis (Continued)

<table>
<thead>
<tr>
<th>Nursing Interventions</th>
<th>Rationale</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nursing Diagnosis:</strong> Imbalanced nutrition: less than body requirements related to inadequate dietary intake, impaired pancreatic secretions, increased nutritional needs secondary to acute illness, and increased body temperature</td>
<td>1. Alteration in pancreatic secretions interferes with normal digestive processes. Acute illness, infection, and fever increase metabolic needs.</td>
<td>• Maintains normal body weight</td>
</tr>
<tr>
<td><strong>Goal:</strong> Improvement in nutritional status</td>
<td>2. Impairment of endocrine function of the pancreas leads to increased serum glucose levels.</td>
<td>• Demonstrates no additional weight loss</td>
</tr>
<tr>
<td>1. Assess current nutritional status and increased metabolic requirements.</td>
<td>3. Parenteral administration of fluids, electrolytes, and nutrients is essential to provide fluids, calories, electrolytes, and nutrients when oral intake is prohibited.</td>
<td>• Maintains normal serum glucose levels</td>
</tr>
<tr>
<td>2. Monitor serum glucose levels and administer insulin as prescribed.</td>
<td>4. These foods increase caloric intake without stimulating pancreatic secretions beyond the ability of the pancreas to respond.</td>
<td>• Reports decreasing episodes of vomiting and diarrhea</td>
</tr>
<tr>
<td>3. Administer intravenous fluid and electrolytes and parenteral nutrition as prescribed.</td>
<td>5. Alcohol intake produces further damage to pancreas and precipitates attacks of acute pancreatitis.</td>
<td>• Reports return of normal stool characteristics and bowel pattern</td>
</tr>
<tr>
<td>4. Provide high-carbohydrate, low-protein, low-fat diet when tolerated.</td>
<td>6. Coffee and spicy foods increase pancreatic and gastric secretions.</td>
<td>• Consumes foods high in carbohydrate, low in fat and protein</td>
</tr>
<tr>
<td>5. Instruct patient to eliminate alcohol and refer to Alcoholics Anonymous if indicated.</td>
<td>7. This provides a baseline and a means to measure desirable weight.</td>
<td>• Explains rationale for high-carbohydrate, low-fat, low-protein diet</td>
</tr>
<tr>
<td>6. Counsel patient to avoid excessive use of coffee and spicy foods.</td>
<td></td>
<td>• Eliminates alcohol from diet</td>
</tr>
<tr>
<td>7. Monitor daily weights.</td>
<td></td>
<td>• Explains rationale for limiting coffee intake and avoiding spicy foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Participates in Alcoholics Anonymous or other counseling approach</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Returns to and maintains desirable weight</td>
</tr>
</tbody>
</table>

### Nursing Diagnosis: Ineffective breathing pattern related to splinting from severe pain, pulmonary infiltrates, pleural effusion, and atelectasis

| Goal: Improvement in respiratory function | 1. Acute pancreatitis produces retroperitoneal edema, elevation of the diaphragm, pleural effusion, and inadequate lung ventilation. Intra-abdominal infection and labored breathing increase the body’s metabolic demands, which further decreases pulmonary reserve and leads to respiratory failure. | • Demonstrates normal respiratory rate and pattern and full lung expansion  |
|                                          | 2. Decreases pressure on diaphragm and allows greater lung expansion. | • Demonstrates normal breath sounds and absence of adventitious breath sounds  |
|                                          | 3. Taking deep breaths and coughing will clear the airways and reduce atelectasis. | • Demonstrates normal arterial blood gases and pulse oximetry  |
|                                          | 4. Changing position frequently assists aeration and drainage of all lobes of the lungs. | • Maintains semi-Fowler’s position when in bed  |
|                                          | 5. Pancreatitis produces a severe peritoneal and retroperitoneal reaction that causes fever, tachycardia, and accelerated respirations. Placing the patient in an air-conditioned room and supporting the patient with oxygen therapy decrease the workload of the respiratory system and the tissue utilization of oxygen. Reduction of fever and pulse rate decreases the metabolic demands on the body. | • Changes position in bed frequently  |

(continued)
**CHRONIC PANCREATITIS**

Chronic pancreatitis is an inflammatory disorder characterized by progressive anatomic and functional destruction of the pancreas. As cells are replaced by fibrous tissue with repeated attacks of pancreatitis, pressure within the pancreas increases. The end result is mechanical obstruction of the pancreatic and common bile ducts and the duodenum. Additionally, there is atrophy of the epithelium of the ducts, inflammation, and destruction of the secreting cells of the pancreas.

Alcohol consumption in Western societies and malnutrition worldwide are the major causes of chronic pancreatitis. Excessive and prolonged consumption of alcohol accounts for approximately 70% of the cases (Clain & Pearson, 1999). The incidence of pancreatitis is 50 times greater in alcoholics than in the nondrinking population. Long-term alcohol consumption causes hypersecretion of protein in pancreatic secretions, resulting in protein plugs and calculi within the pancreatic ducts. Alcohol also has a direct toxic effect on the cells of the pancreas. Damage to these cells is more likely to occur and to be more severe in patients whose diets are poor in protein content and either very high or very low in fat.

**Clinical Manifestations**

Chronic pancreatitis is characterized by recurring attacks of severe upper abdominal and back pain, accompanied by vomiting. Attacks are often so painful that opioids, even in large doses, do

<table>
<thead>
<tr>
<th>Collaborative Problem: Fluid and electrolyte disturbances, hypovolemia, shock</th>
<th>Rationale</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assess fluid and electrolyte status (skin turgor, mucous membranes, urine output, vital signs, hemodynamic parameters).</td>
<td>1. The amount and type of fluid and electrolyte replacement are determined by the status of the blood pressure, the laboratory evaluations of serum electrolyte and blood urea nitrogen levels, the urinary volume, and the assessment of the patient's condition.</td>
<td>Exhibits moist mucous membranes and normal skin turgor</td>
</tr>
<tr>
<td>2. Assess sources of fluid and electrolyte loss (vomiting, diarrhea, nasogastric drainage, excessive diaphoresis).</td>
<td>2. Electrolyte losses occur from nasogastric suctioning, severe diaphoresis, emesis, and as a result of the patient’s being in a fasting state.</td>
<td>Exhibits normal arterial pressures and blood gases</td>
</tr>
<tr>
<td>3. Combat shock if present.</td>
<td>3. Extensive acute pancreatitis may cause peripheral vascular collapse and shock. Blood and plasma may be lost into the abdominal cavity, and, therefore, there is a decreased blood and plasma volume. The toxins from the bacteria of a necrotic pancreas may cause shock.</td>
<td>Exhibits normal electrolyte levels</td>
</tr>
<tr>
<td>a. Administer corticosteroids as prescribed if patient does not respond to conventional treatment.</td>
<td>4. Patients with hemorrhagic pancreatitis lose large amounts of blood and plasma, which decreases effective circulation and blood volume.</td>
<td>Exhibits no signs or symptoms of calcium deficit (eg, tetany, carpopedal spasm)</td>
</tr>
<tr>
<td>b. Evaluate the amount of urinary output. Attempt to maintain this at 50 mL/h.</td>
<td>5. Replacement with blood, plasma or albumin assists in ensuring effective circulating blood volume.</td>
<td>Exhibits no additional losses of fluids and electrolytes through vomiting, diarrhea, or diaphoresis</td>
</tr>
<tr>
<td>4. Administer blood products, fluids, and electrolytes (sodium, potassium, chloride) as prescribed.</td>
<td>6. Calcium may be prescribed to prevent or treat tetany.</td>
<td>Reports stabilization of weight</td>
</tr>
<tr>
<td>5. Administer plasma, albumin, and blood products as prescribed.</td>
<td>7. During acute pancreatitis, plasma may be lost into the abdominal cavity, which diminishes the blood volume.</td>
<td>Demonstrates no increase in abdominal girth</td>
</tr>
<tr>
<td>6. Keep a supply of intravenous calcium gluconate readily available.</td>
<td>8. All body systems may fail if pancreatitis is severe and treatment is ineffective.</td>
<td>Demonstrates no fluid wave on palpation of the abdomen</td>
</tr>
<tr>
<td>a. Measure abdominal girth daily.</td>
<td>a. Skin is without breakdown or infection</td>
<td>• Exhibits normal blood pressure without evidence of postural (orthostatic) hypotension</td>
</tr>
<tr>
<td>b. Weigh patient daily.</td>
<td>b. Drainage is contained adequately</td>
<td>• Exhibits normal electrolyte levels</td>
</tr>
<tr>
<td>c. Palpate abdomen for fluid wave.</td>
<td>c. Palpate abdomen for fluid wave.</td>
<td>• Exhibits no fluid wave on palpation of the abdomen</td>
</tr>
<tr>
<td>8. Monitor for manifestations of multiple organ failure: neurologic, cardiovascular, renal, and respiratory dysfunction.</td>
<td>8.</td>
<td>• Exhibits normal arteriolar pressures and blood gases</td>
</tr>
<tr>
<td>9. All body systems may fail if pancreatitis is severe and treatment is ineffective.</td>
<td>9.</td>
<td>• Exhibits normal electrolyte levels</td>
</tr>
</tbody>
</table>

**Plan of Nursing Care**

Care of the Patient With Acute Pancreatitis (Continued)

<table>
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<tr>
<th>Nursing Interventions</th>
<th>Rationale</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1.</td>
<td>Exhibits moist mucous membranes and normal skin turgor</td>
</tr>
<tr>
<td>2.</td>
<td>2.</td>
<td>Exhibits normal blood pressure without evidence of postural (orthostatic) hypotension</td>
</tr>
<tr>
<td>3.</td>
<td>3.</td>
<td>Exhibits normal electrolyte levels</td>
</tr>
<tr>
<td>4.</td>
<td>4.</td>
<td>Exhibits no signs or symptoms of calcium deficit (eg, tetany, carpopedal spasm)</td>
</tr>
<tr>
<td>5.</td>
<td>5.</td>
<td>Exhibits no additional losses of fluids and electrolytes through vomiting, diarrhea, or diaphoresis</td>
</tr>
<tr>
<td>6.</td>
<td>6.</td>
<td>Reports stabilization of weight</td>
</tr>
<tr>
<td>7.</td>
<td>7.</td>
<td>Demonstrates no increase in abdominal girth</td>
</tr>
<tr>
<td>8.</td>
<td>8.</td>
<td>Demonstrates no fluid wave on palpation of the abdomen</td>
</tr>
<tr>
<td>9.</td>
<td>9.</td>
<td>Demonstrates stable organ function without manifestations of failure</td>
</tr>
</tbody>
</table>
not provide relief. As the disease progresses, recurring attacks of pain are more severe, more frequent, and of longer duration. Some patients experience continuous severe pain; others have a dull, nagging constant pain. The risk of dependence on opioids is increased in pancreatitis because of the chronic nature and severity of the pain.

Weight loss is a major problem in chronic pancreatitis: more than 75% of patients experience significant weight loss, usually caused by decreased dietary intake secondary to anorexia or fear that eating will precipitate another attack. Malabsorption occurs late in the disease, when as little as 10% of pancreatic function remains. As a result, digestion, especially of proteins and fats, is impaired. The stools become frequent, frothy, and foul-smelling because of impaired fat digestion, which results in stools with a high fat content. This is referred to as steatorrhea. As the disease progresses, calcification of the gland may occur, and calcium stones may form within the ducts.

**Assessment and Diagnostic Findings**

ERCP is the most useful study in the diagnosis of chronic pancreatitis. It provides detail about the anatomy of the pancreas and the pancreatic and biliary ducts. It is also helpful in obtaining tissue for analysis and differentiating pancreatitis from other conditions, such as carcinoma. Various imaging procedures, including magnetic resonance imaging, computed tomography, and ultrasound, have been useful in the diagnostic evaluation of patients with suspected pancreatic disorders. Computed tomography scanning or ultrasound is helpful to detect pancreatic cysts.

A glucose tolerance test evaluates pancreatic islet cell function, information necessary for making decisions about surgical resection of the pancreas. An abnormal glucose tolerance test indicative of diabetes may be present. In contrast to the patient with acute pancreatitis, serum amylase levels and the white blood cell count may not be elevated significantly.

**Medical Management**

The management of chronic pancreatitis depends on its probable cause in each patient. Treatment is directed toward preventing and managing acute attacks, relieving pain and discomfort, and managing exocrine and endocrine insufficiency of pancreatitis.

**NONSURGICAL MANAGEMENT**

Nonsurgical approaches may be indicated for the patient who refuses surgery, who is a poor surgical risk, or whose disease and symptoms do not warrant surgical intervention. Endoscopy to remove pancreatic duct stones and stent strictures may be effective in selected patients to manage pain and relieve obstruction. However, such therapy is available only in special centers and is suitable for few patients (Bornman & Beckham, 2001).

Management of abdominal pain and discomfort is similar to that of acute pancreatitis; however, the focus is usually on the use of nonopioid methods to manage pain. Persistent, unrelied pain is often the most difficult aspect of management (Bornman & Beckham, 2001). The physician, nurse, and dietician emphasize to the patient and family the importance of avoiding alcohol and other foods that the patient has found tend to produce abdominal pain and discomfort. The fact that no other treatment is likely to relieve pain if the patient continues to consume alcohol is stressed to the patient.

Diabetes mellitus resulting from dysfunction of the pancreatic islet cells is treated with diet, insulin, or oral antidiabetic agents. The hazard of severe hypoglycemia with alcohol use is stressed to the patient and family. Pancreatic enzyme replacement is indicated in the patient with malabsorption and steatorrhea (Trolli, Conwell & Zuccaro, 2001).

**SURGICAL MANAGEMENT**

Surgery is generally carried out to relieve abdominal pain and discomfort, restore drainage of pancreatic secretions, and reduce the frequency of acute attacks of pancreatitis. The surgery performed depends on the anatomic and functional abnormalities of the pancreas, including the location of disease within the pancreas, diabetes, exocrine insufficiency, biliary stenosis, and pseudocysts of the pancreas. Other factors taken into consideration in determining whether surgery is to be performed and what procedure is indicated include the patient’s continued use of alcohol and the likelihood that the patient will be able to manage the endocrine or exocrine changes that are expected after surgery.

Pancreaticoduodenectomy (also referred to as Roux-en-Y) with a side-to-side anastomosis or joining of the pancreatic duct to the jejunum allows drainage of the pancreatic secretions into the jejunum. Pain relief occurs by 6 months in more than 80% of the patients who undergo this procedure, but pain returns in a substantial number of patients as the disease itself progresses (Tierney et al., 2001).

Other surgical procedures may be performed for different degrees and types of disease, ranging from revision of the sphincter of the ampulla of Vater, to internal drainage of a pancreatic cyst into the stomach (see Pancreatic Cyst discussion), to insertion of a stent, to wide resection or removal of the pancreas. A Whipple resection (pancreaticoduodenectomy) has been carried out to relieve the pain of chronic pancreatitis.

Autotransplantation or implantation of the patient’s pancreatic islet cells has been attempted to preserve the endocrine function of the pancreas in patients who have undergone total pancreatectomy. Testing and refinement of this procedure continue in an effort to improve outcomes.

When chronic pancreatitis develops as a result of gallbladder disease, the obstruction is treated by surgery to explore the common duct and remove the stones; usually, the gallbladder is removed at the same time. In addition, an attempt is made to improve the drainage of the common bile duct and the pancreatic duct by dividing the sphincter of Oddi, a muscle that is located at the ampulla of Vater (this surgical procedure is known as a sphincterotomy). A T-tube usually is placed in the common bile duct, requiring a drainage system to collect the bile postoperatively. Nursing care after such surgery is similar to that indicated after other biliary tract surgery.

Patients who undergo surgery for chronic pancreatitis may experience weight gain and improved nutritional status; this may result from reduction in pain associated with eating rather than from correction of malabsorption. However, morbidity and mortality after these surgical procedures are high because of the poor physical condition of the patient before surgery and the concomitant occurrence of cirrhosis. Even after undergoing these surgical procedures, the patient is likely to continue to have pain and impaired digestion secondary to pancreatitis unless alcohol is avoided completely.

**PANCREATIC CYSTS**

As a result of the local necrosis that occurs at the time of acute pancreatitis, collections of fluid may form in the vicinity of the pancreas. These become walled off by fibrous tissue and are called...
pancreatic pseudocysts. They are the most common type of pancreatic cysts. Less common cysts occur as a result of congenital anomalies or are secondary to chronic pancreatitis or trauma to the pancreas.

Diagnosis of pancreatic cysts and pseudocysts is made by ultrasound, computed tomography, and ERCP. ERCP may be used to define the anatomy of the pancreas and evaluate the patency of pancreatic drainage. Pancreatic pseudocysts may be of considerable size. Because of their location behind the posterior peritoneum, when they enlarge they impinge on and displace the stomach or the colon, which are adjacent. Eventually, through pressure or secondary infection, they produce symptoms and require drainage.

Drainage into the gastrointestinal tract or through the skin and abdominal wall may be established. In the latter instance, the drainage is likely to be profuse and destructive to tissue because of the enzyme contents. Hence, steps must be taken to protect the skin near the drainage site from excoriation. Ointments protect the skin if they are applied before excoriation takes place. Another method involves the constant aspiration of digestive secretions from the drainage tract by means of a suction apparatus, so that skin contact with the digestive enzymes is avoided. This method requires expert nursing attention to ensure that the suction tube does not become dislodged and suction is not interrupted. Consultation with an enterostomal therapist is indicated to identify appropriate strategies to maintain drainage and protect the skin.

**CANCER OF THE PANCREAS**

The incidence of pancreatic cancer has decreased slightly over the past 25 years in non-Caucasian men. It is the fifth leading cause of cancer deaths in the United States and occurs most frequently in the fifth to seventh decades of life (American Cancer Society, 2002). Cigarette smoking, exposure to industrial chemicals or toxins in the environment, and a diet high in fat, meat, or both are associated with pancreatic cancer, although their role is not completely clear. The risk for pancreatic cancer increases as the extent of cigarette smoking increases. Diabetes mellitus, chronic pancreatitis, and hereditary pancreatitis are also associated with pancreatic cancer. The pancreas can also be the site of metastasis from other tumors.

Cancer may arise in any portion of the pancreas (in the head, the body, or the tail); clinical manifestations vary depending on the location of the lesion and whether functioning, insulin-secreting pancreatic islet cells are involved. Approximately 75% of pancreatic cancers originate in the head of the pancreas and give rise to a distinctive clinical picture. Functioning islet cell tumors, whether benign (adenoma) or malignant (carcinoma), are responsible for the syndrome of hyperinsulinism. With these exceptions, the symptoms are nonspecific, and patients usually do not seek medical attention until late in the disease; 80% to 85% of patients have advanced, unresectable tumor when first detected. In fact, pancreatic carcinoma has only a 2% to 5% survival rate at 5 years regardless of the stage of disease at diagnosis or treatment (Tierney et al., 2001).

**Clinical Manifestations**

Pain, jaundice, or both are present in more than 90% of patients and, along with weight loss, are considered classic signs of pancreatic carcinoma. However, they often do not appear until the disease is far advanced. Other signs include rapid, profound, and progressive weight loss as well as vague upper or midabdominal pain or discomfort that is unrelated to any gastrointestinal function and is often difficult to describe. Such discomfort radiates as a boring pain in the midback and is unrelated to posture or activity. It is often progressive and severe, requiring the use of opioids. It is often more severe at night. Relief may be obtained by sitting up and leaning forward, or accentuated when lying supine.

Malignant cells from pancreatic cancer are often shed into the peritoneal cavity, increasing the likelihood of metastasis. The formation of ascites is common. An important sign, when present, is the onset of symptoms of insulin deficiency: glucosuria, hyperglycemia, and abnormal glucose tolerance. Thus, diabetes may be an early sign of carcinoma of the pancreas. Meals often aggravate epigastric pain, which usually occurs before the appearance of jaundice and pruritus.

**Assessment and Diagnostic Findings**

Magnetic resonance imaging and computed tomography are used to identify the presence of pancreatic tumors. ERCP is also used in the diagnosis of pancreatic carcinoma. Cells obtained during ERCP are sent to the laboratory for examination. Gastrointestinal x-ray findings may demonstrate deformities in adjacent viscera caused by the impinging pancreatic mass.

Percutaneous fine-needle aspiration biopsy of the pancreas is used to diagnose pancreatic tumors and confirm the diagnosis in patients whose tumors are not resectable, eliminating the stress and postoperative pain of ineffective surgery. In this procedure, a needle is inserted through the anterior abdominal wall into the pancreatic mass, guided by computed tomography, ultrasound, ERCP, or other imaging techniques. The aspirated material is examined for malignant cells. Although percutaneous biopsy is a valuable diagnostic tool, it has some potential drawbacks: a false-negative result if small tumors are missed and seeding of cancer cells along the needle track. Low-dose radiation to the site may be used before the biopsy to reduce the risk of seeding.

Percutaneous transhepatic cholangiography is another procedure that may be performed to identify obstructions of the biliary tract by a pancreatic tumor. Several tumor markers (e.g., CA 19-9, CEA, DU-PAN-2) may be used in the diagnostic workup, but they are nonspecific for pancreatic carcinoma. These tumor markers are useful as indicators of disease progression.

Angiography, computed tomography, and laparoscopy may be performed to determine whether the tumor can be removed surgically. Intraoperative ultrasonography has been used to determine if there is metastatic disease to other organs.

**Medical Management**

If the tumor is resectable and localized (typically tumors in the head of the pancreas), the surgical procedure to remove it is usually extensive (see Medical Management in Tumors of the Head of the Pancreas). However, definitive surgical treatment (i.e., total excision of the lesion) is often not possible because of the extensive growth when the tumor is finally diagnosed and because of the probable widespread metastases (especially to the liver, lungs, and bones). More often, treatment is limited to palliative measures.

Although pancreatic tumors may be resistant to standard radiation therapy, the patient may be treated with radiation and chemotherapy (fluorouracil and gemcitabine). If the patient undergoes surgery, intraoperative radiation therapy (IORT) may be used to deliver a high dose of radiation to the tumor with minimal injury to other tissues. IORT may also be helpful in relief of
pain. Interstitial implantation of radioactive sources has also been used, although the rate of complications is high. A large biliary stent inserted percutaneously or by endoscopy may be used to relieve jaundice.

**Nursing Management**

Pain management and attention to nutritional requirements are important nursing measures to improve the level of comfort. Skin care and nursing measures are directed toward relief of pain and discomfort associated with jaundice, anorexia, and profound weight loss. Specialty mattresses are beneficial and protect bony prominences from pressure. Pain associated with pancreatic cancer may be severe and may require liberal use of opioids; patient-controlled analgesia should be considered for the patient with severe, escalating pain.

Because of the poor prognosis and likelihood of short survival, end-of-life preferences are discussed and honored. If appropriate, the nurse refers the patient to hospice care. (See Chaps. 16 and 17, respectively, for discussion of care of the patient with cancer and end-of-life care.)

**PROMOTING HOME AND COMMUNITY-BASED CARE**

**Teaching Patients Self-Care.** The specific patient and family teaching indicated varies with the stage of disease and the treatment choices made by the patient. If the patient elects to receive chemotherapy, the nurse focuses teaching on prevention of side effects and complications of the agents used. If surgery is performed to relieve obstruction and establish biliary drainage, teaching addresses management of the drainage system and monitoring for complications. The nurse instructs the family about changes in the patient’s status that should be reported to the physician.

**Continuing Care.** A referral for home care is indicated to help the patient and family deal with the physical problems and discomforts associated with pancreatic cancer and the psychological impact of the disease. The home care nurse assesses the patient’s physical status, fluid and nutritional status, and skin integrity and the adequacy of pain management. The nurse teaches the patient and family strategies to prevent skin breakdown and relieve pain, pruritus, and anorexia. It is important to discuss and arrange palliative care (hospice services) in an effort to relieve patient discomfort, assist with care, and comply with the patient’s end-of-life decisions and wishes.

**TUMORS OF THE HEAD OF THE PANCREAS**

Sixty to eighty percent of pancreatic tumors occur in the head of the pancreas. Tumors in this region of the pancreas obstruct the common bile duct where the duct passes through the head of the pancreas to join the pancreatic duct and empty at the ampulla of Vater into the duodenum. The tumors producing the obstruction may arise from the pancreas, the common bile duct, or the ampulla of Vater.

**Clinical Manifestations**

The obstructed flow of bile produces jaundice, clay-colored stools, and dark urine. Malabsorption of nutrients and fat-soluble vitamins may result from obstruction by the tumor to entry of bile in the gastrointestinal tract. Abdominal discomfort or pain and pruritus may be noted, along with anorexia, weight loss, and malaise. If these signs and symptoms are present, cancer of the head of the pancreas is suspected.

The jaundice of this disease must be differentiated from that due to a biliary obstruction caused by a gallstone in the common duct, which is usually intermittent and appears typically in obese patients, most often women, who have had previous symptoms of gallbladder disease.

**Assessment and Diagnostic Findings**

Diagnostic studies may include duodenography, angiography by hepatic or celiac artery catheterization, pancreatic scanning, percutaneous transhepatic cholangiography, ERCP, and percutaneous needle biopsy of the pancreas. Results of a biopsy of the pancreas may aid in the diagnosis.

**Medical Management**

Before extensive surgery can be performed, a fairly long period of preparation is often necessary because the patient’s nutritional and physical condition is often quite compromised. Various liver and pancreatic function studies are performed. A diet high in protein along with pancreatic enzymes is often prescribed. Preoperative preparation includes adequate hydration, correction of prothrombin deficiency with vitamin K, and treatment of anemia to minimize postoperative complications. Parenteral nutrition and blood component therapy are frequently required.

A biliary-enteric shunt may be performed to relieve the jaundice and, perhaps, to provide time for a thorough diagnostic evaluation. Total pancreatectomy (removal of the pancreas) may be performed if there is no evidence of direct extension of the tumor to adjacent tissues or regional lymph nodes. A pancreaticoduodenectomy (Whipple’s procedure or resection) is used for potentially resectable cancer of the head of the pancreas (Fig. 40-7). This procedure involves removal of the gallbladder, distal portion of the stomach, duodenum, head of the pancreas, and common bile duct and anastomosis of the remaining pancreas and stomach to the jejunum (Stanford, 2001). The result is removal of the tumor, allowing flow of bile into the jejunum. When the tumor cannot be excised, the jaundice may be relieved by diverting the bile flow into the jejunum by anastomosing the jejunum to the gallbladder, a procedure known as cholecystojejunostomy.

The postoperative management of patients who have undergone a pancreatectomy or a pancreaticoduodenectomy is similar to the management of patients after extensive gastrointestinal and biliary surgery. The patient’s physical status is often less than optimal, increasing the risk for postoperative complications. Hemorrhage, vascular collapse, and hepatorenal failure remain the major complications of these extensive surgical procedures. The mortality rate after these procedures has improved because of advances in nutritional support and improved surgical techniques. A nasogastric tube and suction and parenteral nutrition allow the gastrointestinal tract to rest while promoting adequate nutrition.

**Nursing Management**

Preoperatively and postoperatively, nursing care is directed toward promoting patient comfort, preventing complications, and assisting the patient to return to and maintain as normal and comfortable a life as possible. The nurse closely monitors the patient in the intensive care unit after surgery; the patient will have...
multiple intravenous and arterial lines in place for fluid and blood replacement as well as for monitoring arterial pressures, and is on a mechanical ventilator in the immediate postoperative period. It is important to give careful attention to changes in vital signs, arterial blood gases and pressures, pulse oximetry, laboratory values, and urine output. The nurse must also consider the patient’s compromised nutritional status and risk for bleeding. Depending on the type of surgical procedure performed, malabsorption syndrome and diabetes mellitus are likely; the nurse must address these issues during acute and long-term patient care.

Although the patient’s physiologic status is the focus of the health care team in the immediate postoperative period, the patient’s psychological and emotional state must be considered, along with that of the family. The patient has undergone major and risky surgery and is critically ill; thus, anxiety and depression may affect recovery. The immediate and long-term outcome of this extensive surgical resection is uncertain, and the patient and family require emotional support and understanding in the critical and stressful preoperative and postoperative periods.

**PROMOTING HOME AND COMMUNITY-BASED CARE**

**Teaching Patients Self-Care.** The patient who has undergone this extensive surgery requires careful and thorough preparation for self-care at home. The nurse instructs the patient and family about the need for modifications in the diet because of malabsorption and hyperglycemia resulting from the surgery. It is important to instruct them about the continuing need for pancreatic enzyme replacement, a low-fat diet, and vitamin supplementation.

The nurse teaches the patient and family strategies to relieve pain and discomfort, along with strategies to manage drains, if present, and to care for the surgical incision. The patient and family members may require instruction about use of patient-controlled analgesia, parenteral nutrition, wound care, skin care, and management of drainage. It is important to describe, verbally and in writing, the signs and symptoms of complications, and to teach the patient and family about indicators of complications that should be reported promptly.

Discharge of the patient to a long-term care setting may be warranted after surgery as extensive as pancreatectomy or pancreaticoduodenectomy, particularly if the patient’s preoperative status was not optimal. Efforts are made to communicate to the long-term care staff about the teaching that has been provided so that instructions can be clarified and reinforced. During the recovery or long-term phase of care, the patient and family receive further instructions about care that they will carry out at home.

**Continuing Care.** A referral for home care may be indicated when the patient returns home. The home care nurse assesses the patient’s physical and psychological status and the ability of the patient and family to manage needed care. The home care nurse provides needed physical care and monitors the adequacy of pain management. In addition, it is important to assess the patient’s nutritional status and monitor the use of parenteral nutrition. The nurse discusses the use of hospice services with the patient and family and makes a referral if indicated.
PANCREATIC ISLET TUMORS

The pancreas contains the islets (islands) of Langerhans, small nests of cells that secrete directly into the bloodstream and therefore are part of the endocrine system. The hormone insulin is essential for the metabolism of glucose. Diabetes mellitus (see Chap. 41) is the result of deficient secretion of insulin.

At least two types of tumors of the pancreatic islet cells are known: those that secrete insulin (insulinoma) and those in which insulin secretion is not increased (“nonfunctioning” islet cell cancer). Insulinomas produce hypersecretion of insulin and cause an excessive rate of glucose metabolism. The resulting hypoglycemia may produce symptoms of weakness, mental confusion, and seizures. These symptoms may be relieved almost immediately by oral or intravenous administration of glucose. The 5-hour glucose tolerance test is helpful in diagnosing insulinoma and in distinguishing it from other causes of hypoglycemia.

Surgical Management

When a tumor of the islet cells has been diagnosed, surgical treatment with removal of the tumor usually is recommended. The tumors may be benign adenomas or they may be malignant. Complete removal usually results in almost immediate relief of symptoms. In some patients, symptoms may be produced by simple hypertrophy of this tissue rather than a tumor of the islet cells. In such cases, a partial pancreatectomy (removal of the tail and part of the body of the pancreas) is performed.

Nursing Management

In preparing the patient for surgery, the nurse must be alert for symptoms of hypoglycemia and be ready to administer glucose as prescribed if symptoms occur. Postoperatively, the nursing management is the same as that after other upper abdominal surgical procedures, with special emphasis on monitoring serum glucose levels. Patient teaching is determined by the extent of surgery and the alterations in pancreatic function that result.

HYPERINSULINISM

Hyperinsulinism results from overproduction of insulin by the pancreatic islets. Symptoms resemble those of excessive doses of insulin and are attributable to the same mechanism, an abnormal reduction in blood glucose levels. Clinically, it is characterized by episodes during which the patient experiences unusual hunger, nervousness, sweating, headache, and faintness; in severe cases, seizures and episodes of unconsciousness may occur. The findings at the time of surgery or at autopsy may indicate hyperplasia (overgrowth) of the islets of Langerhans or a benign or malignant tumor involving the islets and capable of producing large amounts of insulin (see preceding discussion). Occasionally, tumors of nonpancreatic origin produce an insulin-like material that can cause severe hypoglycemia that may be responsible for seizures coinciding with blood glucose levels too low to sustain normal brain function (ie, below 30 mg/dL, [1.6 mmol/L]).

All the symptoms that accompany spontaneous hypoglycemia are relieved by the oral or parenteral administration of glucose. Surgical removal of the hyperplastic or neoplastic tissue from the pancreas is the only successful method of treatment. About 15% of patients with spontaneous or functional hypoglycemia eventually develop diabetes mellitus.

ULCEROGENIC TUMORS

Some tumors of the islets of Langerhans are associated with hypersecretion of gastric acid that produces ulcers in the stomach, duodenum, and jejunum. The result is referred to as Zollinger-Ellison syndrome. The hypersecretion is so great that even after partial gastric resection, enough acid is produced to cause further ulceration. When a marked tendency to develop gastric and duodenal ulcers is noted, an ulcerogenic tumor of the islets of Langerhans is considered.

These tumors, which may be benign or malignant, are treated, when possible, by excision. Frequently, however, because of extension beyond the pancreas, removal is not possible. In many patients, a total gastrectomy may be necessary to reduce the secretion of gastric acid sufficiently to prevent further ulceration.

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**RESOURCES AND WEBSITES**

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700, Bethesda, MD 20814; (301) 654-2055; http://www.gastro.org.

National Digestive Diseases Information Clearing House, 2 Information 
Way, Bethesda, MD 20892-3570; (301) 654-3810; http://www.
niddk.nih.gov.

National Endocrine Society, 4350 East West Highway, Suite 500, 
Bethesda, MD 20814; (301) 941-0200; http://www.endo-society.org.

National Pancreas Foundation, P.O. Box 15333, Boston, MA 02215; 