**PANCREATITIS**

**INTRODUCTION**

Pancreatitis is an inflammatory process of the pancreas; it can be acute or chronic. Acute pancreatitis develops and resolves quickly, although in some cases it can be recurrent and/or lead to chronic pancreatitis. Chronic pancreatitis develops slowly, worsens over time, and can cause serious complications. Alcohol abuse is the most common cause of acute and chronic pancreatitis. The other causes of the disease include: gallstones, toxic/metabolic issues, genetic, autoimmune, idiopathic, obstruction, and recurrent pancreatitis itself, and other sources. Most of these – except for gallstones and idiopathic pancreatitis – are very uncommon.

Treatment for acute pancreatitis is essentially symptomatic and supportive. Occasionally, surgical and/or endoscopic treatment is needed. Chronic pancreatitis is also treated with much the same symptomatic/supportive care, but surgical and endoscopic treatments are also available.

**OBJECTIVES**

When the student has finished this module, she/he will be able to:

1. Identify the correct definition of pancreatitis.
2. Identify the differences between acute and chronic pancreatitis.
3. Identify four causes of acute pancreatitis.
4. Identify the two most common causes of acute pancreatitis.
5. Identify two relatively uncommon causes of acute pancreatitis.
6. Identify three common signs and symptoms of acute pancreatitis.
7. Identify a laboratory result that is used to confirm the diagnosis of acute pancreatitis.
8. Identify two serious complications of acute pancreatitis.
9. Identify four causes of chronic pancreatitis.
10. Identify the two most common causes of chronic pancreatitis.
11. Identify three signs and symptoms of chronic pancreatitis.
12. Identify two complications of chronic pancreatitis.
13. Identify three critical areas in the treatment of acute pancreatitis.
14. Identify three medical management techniques used to treat chronic pancreatitis.
15. Identify the two basic goals of surgical treatment of chronic pancreatitis.

**THE PANCREAS**

The pancreas is located partly in the left side of the abdomen and partly in the epigastric area. The pancreas is both an endocrine gland (releasing its secretions directly into the bloodstream) and an exocrine gland (releasing its secretions into a duct that leads to the external environment which in this case is the gut).

**Learning Break:** Because the pancreas is not encapsulated, inflammation of the pancreas can easily spread.
The pancreas produces digestive enzymes such as trypsin (which breaks down amino acids), lipase (which breaks down fats), and amylase (which breaks down carbohydrates and glycogen). These enzymes move through the pancreatic duct and into the duodenum. The pancreas also produces insulin, glucagon, and somatostatin. Insulin is produced in the β cells of the Islets of Langerhan. Insulin has many functions, but perhaps its most important is to function as a transport molecule that allows for entry of glucose into the cells. Glucagon, in contrast, causes serum glucose to rise by stimulating the conversion and release of liver glycogen. Somatostatin is a hormone that regulates the release of growth hormone and thyroid-stimulating hormone.

**Learning Break:** Inflammation and damage to the pancreas affects digestive function and insulin function, causing malabsorption, various gastrointestinal signs/symptoms, and diabetes mellitus.

**EPIDEMIOLOGY**

The exact incidence of pancreatitis is not known. Acute pancreatitis has been estimated to result in approximately 3000,000 hospital admissions and 3200 deaths each year and to affect 4.8 to 24.2 patients per 100,000.¹ The statistics for chronic pancreatitis are less abundant and less clear. Estimates of its incidence based on hospital discharge data indicate that approximately 87,000 cases occur each year.² The disease appears to affect African-Americans more frequently than Caucasians, and it is almost twice as common among men.³ Chronic pancreatitis occurs most frequently between ages 40 to 60.⁴ The incidence of chronic pancreatitis, worldwide, appears to be growing,⁵ and some authorities believe that the cause(s) of chronic pancreatitis are slowly and subtly shifting.⁶

**PATHOPHYSIOLOGY**

Both acute pancreatitis and chronic pancreatitis are caused by inflammation. However, acute pancreatitis is caused by an acute inflammation, the clinical presentation is different than that of chronic pancreatitis, and the disease most often – for the most part – resolves. Chronic pancreatitis is caused by a chronic inflammation, this inflammation is irreversible, and the clinical course and clinical presentation are different than that of acute pancreatitis.⁷ There are several theories about the pathogenesis and progression of the inflammation that causes pancreatitis, but the exact cause is not known.

**ACUTE PANCREATITIS: THE CAUSES**

Acute pancreatitis is caused by alcohol abuse, gallstones (these account for approximately 80% of all cases),⁸ trauma to the pancreas, congenital anatomical abnormalities, medications, toxins, medical procedures, infections, hypercalcemia, and hypertriglyceridemia.⁹

- Alcohol abuse: There is a strong relationship between alcohol abuse and acute pancreatitis. Alcohol abuse is the second-most common cause of acute
pancreatitis, and accounts for approximately 36% of all cases. However, only a small percentage of people (approximately 2%-3%) who are heavy drinkers develop pancreatitis. The mechanism or mechanisms by which alcohol abuse causes acute pancreatitis are not known. It may be that alcohol sensitizes the pancreas making it more susceptible to injury. It is also possible that alcohol abuse alone cannot cause acute pancreatitis; co-factors such as genetic susceptibility, cigarette smoking, a high-lipid diet, and infections may be needed to initiate the inflammatory process. Together, these may cause oxidative stress that damages the pancreas.

Learning Break: There is some evidence that acute pancreatitis caused by alcohol abuse initiates chronic lesions in the pancreas, and patients with this disease are at a relatively higher risk for developing chronic pancreatitis.

- Gallstones: Gallstones are the most common cause of acute pancreatitis. Gallstones account for approximately 50% of all cases of acute pancreatitis. Biliary pancreatitis appears to be related to the size of the gallstones and gender: men who have gallstones develop acute pancreatitis more often than women who have gallstones. No one is sure why gallstones cause pancreatitis; a likely suspect is the reflux of infected bile into the pancreas that is caused by duct obstruction by a gallstone. This would cause inflammation and obstruction of the pancreatic duct which in turn would cause more inflammation and “auto-digestion” of the pancreas by pancreatic enzymes.

- Hypercalcemia: Hypercalcemia caused by primary hyperparathyroidism is a very rare cause of pancreatitis. There are other causes of hypercalcemia that have been associated with acute pancreatitis, e.g., milk-alkali syndrome, but these are not often seen. It is not clear why an elevated serum calcium level can, at times, cause acute pancreatitis. It may be that excess calcium is deposited in the pancreatic duct and creates an obstruction or the excess calcium may stimulate the release of pancreatic enzymes and cause auto-digestion.

- Hypertriglyceridemia: Hypertriglyceridemia is another rare cause of acute pancreatitis; it accounts for approximately 1% - 4% of all cases. Acute pancreatitis usually occurs only after the serum triglycerides have reached at least 1000 mg/dL.

- Drug-induced pancreatitis: Drug-induced pancreatitis is unusual; the incidence has been estimated to be 1% - 4% of all cases of the disease. There are dozens of drugs that have been implicated as causative agents for pancreatitis: methyldopa, sulfonamides, tetracycline, furosemide, corticosteroids, octreotide, and estrogens have all been mentioned and there are many others. However, many of these cases appear to be anecdotal and idiosyncratic, and the association between drug and disease not firmly established. Valproic acid is a commonly prescribed drug and it is often mentioned as a possible cause of drug-induced pancreatitis, and children seem to be especially at risk. However, there is still controversy over
whether or valproic acid actually causes pancreatitis and how commonly this occurs and why it occurs.26

- Post-ERCP acute pancreatitis: Endoscopic retrograde cholangiopancreatography (ECRP) is an endoscopic and fluoroscopic procedure that is used diagnostically and therapeutically for diseases of the biliary and pancreatic systems. Approximately 5% of patients who have had ECRP will develop acute pancreatitis after the procedure.27

- Infections: Infections are an unusual cause of acute pancreatitis, accounting for approximately 1% or less of all cases.28 Epstein-Barr virus, coxsackie virus, measles, echovirus, and varicella zoster have all been associated with acute pancreatitis.29

- Trauma: Trauma is an infrequent (approximately 5%) cause of acute pancreatitis.30

- Anatomical abnormalities: Pancreas divisum is a common congenital abnormality of the pancreatic duct. It is a rare cause of acute pancreatitis.31

These are among the most common causes of acute pancreatitis, but there are certainly more. Cigarette smoking may be a risk factor for developing acute pancreatitis. Tumors of the pancreas or the pancreatic duct, postoperative pancreatitis, autoimmune pancreatitis, hereditary pancreatitis, cystic fibrosis, pancreatic cancer, idiopathic cases, and infestation with ascaris (a parasitic worm that can cause duct obstruction) have also been identified as possible, albeit relatively rare, causes of acute pancreatitis.32,33

**SIGNS AND SYMPTOMS OF ACUTE PANCREATITIS**

Acute pancreatitis typically manifests with acute abdominal pain, nausea, vomiting, fever, and tachycardia.34 The abdominal pain is usually located in the upper abdomen and occurs suddenly and without warning signs or symptoms. The white blood cell count is often elevated, the serum calcium is low, and the serum glucose is high. The diagnosis is confirmed if the serum amylase and/or lipase are elevated threefold or higher.35

**CLINICAL COURSE AND PROGNOSIS OF ACUTE PANCREATITIS**

For most patients acute pancreatitis is a relatively benign disease. Many patients have one or two episodes and recover, but approximately 25% of all patients with the disease have recurrent pancreatitis.36 Acute pancreatitis can also progress to chronic pancreatitis. People who chronically abuse alcohol or smoke cigarettes and have acute pancreatitis will often develop the chronic disease.37

However, although most cases of acute pancreatitis are mild, some patients do develop severe acute pancreatitis (SAP). Approximately 20% of all patients admitted to a hospital with acute pancreatitis have SAP.38 Mild cases of acute pancreatitis are associated with a mortality rate of approximately < 5%, but SAP is associated with a mortality rate of up to
Severe acute pancreatitis can cause shock, renal failure, bleeding, sepsis, and multi-system organ failure. Death is usually caused by infected pancreatic necrosis.

Learning Break: Pancreatic necrosis is not one of the more common complications of the disease, but infection of the necrotic pancreas is common, it is very serious, and carries a high risk of morbidity and mortality.

It is difficult to predict which patients with mild acute pancreatitis will develop SAP and none of the predictive criteria that have been developed have been proven to have good negative predictive power, but suboptimal positive predictive power. Some of the criteria that have been used to predict progression to SAP and mortality have included patients who: are over the age of 70, who have a body mass index (BMI) >30; develop any significant organ failure (e.g., renal failure, shock); are hemoconcentrated (hematocrit > 44%); have elevated serum transaminases, serum glucose, and/or white blood cell count.

CHRONIC PANCREATITIS: THE CAUSES

There are six major etiologies for chronic pancreatitis: Toxic/metabolic, idiopathic, genetic, autoimmune, recurrent and severe acute pancreatitis, and obstruction. Collectively these are called the TIGAR-O classification system.

- Toxic/metabolic: Toxic/metabolic causes of chronic pancreatitis include chronic alcohol abuse, cigarette smoking, medications, hypercalcemia, and hyperlipidemia. Chronic alcohol abuse is the most common cause of chronic pancreatitis; it accounts for approximately 70%-80% of all cases. Cigarette smoking is also considered to be a significant cause of and/or contributing factor to, the development of chronic pancreatitis.

Learning Break: There is some evidence that obesity might increase the risk of developing chronic pancreatitis if the patient also chronically abuses alcohol.

- Idiopathic: Idiopathic pancreatitis is relatively common. Approximately 25%-30% of all cases of chronic pancreatitis are considered to be idiopathic in etiology.

- Genetic: Genetic factors almost certainly do not act alone to cause chronic pancreatitis, but they increase the susceptibility of the pancreas to stressors such as cigarette smoking, drugs, elevated lipids, alcohol, etc. For example, these genetic factors (or some of them) affect the control of the secretion of pancreatic enzymes precursors such as trypsinogen and increased levels of these can cause damage to the pancreas.

- Autoimmune: This is an uncommon cause of chronic pancreatitis. It accounts for approximately 1% - 11% or less of all cases.
• Recurrent pancreatitis: As mentioned earlier, approximately 25% of all patients with acute pancreatitis will develop chronic pancreatitis.

• Obstruction: Obstruction that causes chronic pancreatitis can caused by a congenital structural abnormality or blunt force trauma.\(^5\)

There are other causes of chronic pancreatitis: Groove pancreatitis (an obstructive form), tropical pancreatitis (associated with malnutrition), pancreatitis associated with cystic fibrosis, and ectopic pancreatic tissue.\(^5\) These are very uncommon.

**DIAGNOSING CHRONIC PANCREATITIS**

Chronic pancreatitis is diagnosed using the clinical history (e.g., signs and symptoms, risk factors such as the presence of gallstones or a history of chronic alcohol abuse), and diagnostic procedures such as CT scan, endoscopic ultrasonography, MRI, or ERCP. Magnetic resonance cholangiopancreatography is a non-invasive technique for imaging the pancreas that is as effective as ECRP, but safer.

**SIGNS AND SYMPTOMS OF CHRONIC PANCREATITIS**

Most patients with chronic pancreatitis have severe abdominal pain. These attacks are intermittent, unpredictable, and usually last several hours. Diarrhea and weight loss are also common. Because the pancreatic enzyme secretion is disrupted, steatorrhea, bloating, indigestion, and dyspepsia are common, as well.\(^5\)

**CLINICAL COURSE OF CHRONIC PANCREATITIS**

The inflammation that occurs in chronic pancreatitis is progressive and irreversible, and fibrosis of the pancreas is inevitable. The patient will suffer some degree, over time, of exocrine and endocrine dysfunction.\(^5\) The overall survival rate of patients with chronic pancreatitis at 10 years after diagnosis is 70% and 45% at 20 years; if the patient is diagnosed at a relatively older age, smokes, and/or drinks alcohol, the prognosis is worse.\(^5\)

There are multiple complications associated with chronic pancreatitis.

• Type 2 diabetes is possible; some sources indicate that chronic pancreatitis is a common cause of type 2 diabetes, but some do not.\(^5\)\(^6\)\(^7\)

• Pancreatic pseudocyst: A pancreatic pseudocyst is a collection of fluid surrounded by fibrous tissue. They are located in the body of the pancreas and connect to the pancreatic duct system. They are a common complication of the disease, and they occur in approximately 30% - 40% of all patients with chronic pancreatitis.\(^5\) Most pancreatic pseudocysts are caused by alcohol-related chronic pancreatitis. They usually respond to symptomatic/supportive care and the pseudocyst resolves, but infection, bleeding, fistulas, and obstruction are possible complications.\(^4\)
• Exocrine dysfunction: The production of the pancreatic enzymes that are needed for digestion can be significantly decreased without disrupting normal digestion. However, patients with chronic pancreatitis often suffer from exocrine dysfunction because of pancreatic insufficiency cause by the inflammation of the disease. The dysfunction manifests as steatorrhea (excretion of > 6 grams of fat in the feces each day), weight loss, vitamin A, D, E, and K deficiencies, bloating, weight loss, and anorexia.\textsuperscript{65} Fat absorption is particularly affected in chronic pancreatitis because lipase has a shorter half-life and is more rapidly degraded in the gut than the other pancreatic enzymes.

• Pancreatic cancer: The presence of chronic pancreatitis significantly increases an individual’s risk of developing pancreatic cancer by as much as 26-fold, and if the patient has hereditary pancreatitis, this risk is almost 50-fold.\textsuperscript{66} For most patients, although the risk of developing pancreatic cancer is much worse than that of the general population, it is still uncommon.\textsuperscript{67}

Other complications which can be seen but are uncommon include pancreatic-pleural fistulas, bile duct fistulas, pseudoaneurysm, common bile duct stenosis, and splenic and portal venous obstruction.\textsuperscript{68}

\textbf{TREATMENT OF ACUTE PANCREATITIS}

Acute pancreatitis is treated with symptomatic and supportive care. A useful acronym for remembering the therapeutic approach to treating acute pancreatitis is \textbf{PANCREAS}.\textsuperscript{69}

• Perfusion: The patient should receive fluid support that maintains urine output of 0.5 – 1.0 ml/kg per hour. \textbf{Fluid therapy is crucial for ensuring the patient health and reducing complications.} Patients with acute pancreatitis are often dehydrated and may not be able to tolerate oral intake; hypovolemia reduces microcirculation and can cause hemoconcentration, hypotension, decreased renal perfusion, and prerenal azotemia.\textsuperscript{70,71} The patient should receive supplemental oxygen, if needed, to ensure oxygen saturation > 95%.

• Analgesia: \textbf{Pain control is a critical area in treating acute pancreatitis.} Pain is managed with parenteral narcotics, e.g., morphine, fentanyl, and hydromorphone. There is no evidence that one drug is more effective than another.\textsuperscript{72}

• Nutrition: \textbf{Nutrition is critical for ensuring patient health and good outcomes.} The patient has high metabolic needs and is often unable or unwilling to eat. Good nutrition lowers the risk of mortality.\textsuperscript{73} Oral, feedings, jejeunal tube feedings, or total parenteral nutrition may be used.

• Clinical: This refers to careful assessment and triage of all cases of acute pancreatitis. The goal is to identify patients who have a high risk for complication and/or death.
• **Radiology:** Imaging studies should be used to detect complications such as necrosis.

• **ECRP:** ECRP should be performed if it is suspected that the patient has cholangitis or obstruction.

• **Antibiotics:** Prophylactic antibiotics have been used in the past when the patient with acute pancreatitis had, or was suspected to have, pancreatic necrosis. The goal was to prevent infection and sepsis. However, this approach is no longer recommended. Several large studies found that morbidity and mortality rates were not improved by the use of prophylactic antibiotics.\(^{74,75}\) unless a needle biopsy and aspiration confirms the presence of an infection involving 30% or more of the pancreas.\(^ {76}\)

• **Surgery:** Surgery is indicated if the patient with acute pancreatitis has not responded to symptomatic, supportive care and conservative management.\(^ {77}\) Surgery is also indicated if the patient suffers from a perforation, hemorrhage, an infected, necrotic pancreas with sepsis, or biliary pancreatitis.\(^ {78}\)

**Learning Break:** Octreotide is a synthetic version of somatostatin. Somatostatin inhibits pancreatic exocrine secretion. Some physicians have used octreotide to treat patients with chronic pancreatitis; the rationale has been that inhibition of pancreatic enzyme secretion allows the inflamed pancreas to rest. Some clinical trials have shown octreotide to be useful, others have not. Currently there is no conclusive evidence that it provides any benefit to patients with chronic pancreatitis.\(^ {79}\)

### TREATMENT OF CHRONIC PANCREATITIS

Chronic pancreatitis can be treated with medical management or with surgery.

**Medical Treatment**

**Medical management** of chronic pancreatitis starts with lifestyle changes. The patient should be encouraged to stop drinking alcohol if this is appropriate and to stop smoking. Special diets – particularly low-fat diets and low-protein – may help decrease pain. Vitamin D supplements may be helpful to prevent osteopathy. Analgesics should be used to alleviate pain.

**Pancreatic enzyme replacement therapy** has long been used to provide symptomatic relief for patients with chronic pancreatitis who have with exocrine dysfunction and steatorrhea. It has been proven to improve malabsorption and decrease steatorrhea.\(^ {80}\) Pancrelipase is a commonly used pancreatic enzymes preparation. These are most often given as enteric-coated oral capsules.

**Learning Break:** Pancrelipase (Creon® is a common brand name) is a combination of amylase, lipase and protease. It is supplied as a capsule (there are varying strengths). The
dosing for adults is individualized and will depend on the patient’s symptoms and the amount of steatorrhea that is present. The drug is taken several times a day with meals or food. Bloating, abdominal pain, diarrhea, and constipation are common side effects.

Enzyme replacement therapy has also been used to try and treat the pain caused by chronic pancreatitis. This therapy has been less successful, and the available data gives conflicting result as to its effectiveness for treating pain.\(^{81,82}\)

**Celiac plexus blockade (CPB)** is another medical approach for treating chronic pancreatitis. This technique involves endoscopic, ultrasound-guided administration of a corticosteroid and a local anesthetic into the celiac plexus. This a group of nerves that innervates abdominal organs, blood vessels, etc. CPB is used after other medial management techniques have failed to treat pain experienced by patients with chronic pancreatitis. The nerve can also be destroyed by injecting an absolute alcohol; this process is called celiac plexus neurolysis. The techniques are usually done as out-patient procedures, they do not take long (approximately 30 minutes) and there are few complications.\(^{83}\) CPB appears to be effective for about 50% of patients with chronic pancreatitis, and the patients are pain-free for an average of three to six months.\(^{84,85}\)

**Surgical Treatment**

There is a wide a variety of surgical procedures that be used to treat chronic pancreatitis. These can include endoscopic procedures and traditional surgery. Although both approaches can be useful, several studies have indicated that traditional surgery is more effective at relieving pain, provides longer-lasting pain relief, and improves quality of life to a greater degrees than endoscopic procedures.\(^{86,87}\) Endoscopic treatment, however, does have its place. For example patients with certain simple pancreatic strictures that obstruct flow are good candidates for endoscopic dilating and stenting, but patients with complex strictures and stones are better treated with surgery.\(^{88}\)

**Surgical procedures for chronic pancreatitis are designed to decompress the pancreas by drainage, to resect the pancreas** (if there is a tumor, duct anomalies, significant inflammation), or to do a combination of both.\(^{89}\) An example of drainage procedures is the lateral pancreaticojejunostomy (basically an anastomosis of the pancreatic duct and the jejunum); an example of a resection procedure is the partial pancreateoduodectomy (the head of the pancreas and part of the duodenum are excised); an example of a combination procedure is the Berger procedure (part of the pancreas is removed, but the duodenum is preserved and there is reconstruction to allow for pancreatic drainage).\(^{90,91}\)

**NURSING CARE OF THE PATIENT WITH PANCREATITIS**

Nursing care of the patient with pancreatitis should focus on these areas: evaluation and assessment for possible complications; pain control; elimination; fluid and electrolyte status; nutrition; patient education about lifestyle issues.

- Evaluation and assessment for possible complications: These would include infection, sepsis, diabetes, nausea and vomiting, and intractable pain.
• Pain control: This is a critical area to focus on. People with pancreatitis are often in severe pain and require narcotic analgesics. The nurse will need to understand the patient’s pain pattern, individual expression of pain, tolerance for pain, and response to analgesics. Serious side effects and dependency are possible, and the patient with chronic pancreatitis may need to use narcotic analgesics for many years, and needs education about these issues. This patient would need help, as do many people with chronic pain, in learning how to integrate the pain experience and its treatment into daily life.

• Elimination: Many patients with pancreatitis suffer from diarrhea and steatorrhea. Skin integrity and perineal comfort can be concerns as can maintaining adequate hydration.

• Fluid and electrolyte status: It is very important for patients with pancreatitis to be well hydrated. The RN must be well aware of this, monitor the patient’s fluid status closely, and educate the patient about the need for adequate fluid intake.

• Nutrition: The RN must closely monitor the patient’s nutrition status and educate the patient about the need for good nutrition.

• Lifestyle issues: Alcohol abuse, cigarette smoking, and (quite possibly because of the association with obesity and gallstones) obesity play a role in initiating, prolonging, and aggravation the process of pancreatitis. Part of the cure for the disease is lifestyle modification, and the RN needs to make sure that the patient for whom these lifestyle issues are contributing factors to the disease is aware of this. The RN must also be sure that the patient has the resources needed to make healthy choices and changes.
SUMMARY

- Pancreatitis is an inflammation of the pancreas.
- Pancreatitis can be acute or chronic.
- Most cases of acute pancreatitis resolve.
- Acute pancreatitis can cause residual scarring, some people have recurrent acute pancreatitis, and some develop chronic pancreatitis.
- Acute pancreatitis has many causes: by far the most common are alcohol abuse and gallstones.
- Acute pancreatitis can be complicated by necrosis and infection and severe acute pancreatitis (SAP).
- Chronic pancreatitis does not resolve; it gets progressively worse.
- The most common causes of chronic pancreatitis are alcohol abuse and idiopathic chronic pancreatitis.
- Chronic pancreatitis can be complicated by exocrine and endocrine dysfunction, necrosis and infection, and pancreatic cancer.
- Acute pancreatitis is treated with fluids, analgesics, and good nutrition.
- Acute pancreatitis with complications can be treated with surgery or endoscopic procedures.
- Chronic pancreatitis is treated medically with supportive care, enzyme therapy, analgesics, and occasionally celiac plexus blockade.
- Chronic pancreatitis is treated surgically by procedures for drainage and resection.
REFERENCES


