Pancreatic Cancer Overview

This overview is based on the more detailed information in our document *Pancreatic Cancer*.

What is cancer?

The body is made up of trillions of living cells. Normal body cells grow, divide to make new cells, and die in an orderly way. During the early years of a person's life when they are still growing, normal cells divide faster. Once the person becomes an adult, most cells divide only to replace worn-out, damaged, or dying cells.

Cancer begins when cells in a part of the body start to grow out of control. There are many kinds of cancer, but they all start because of this out-of-control growth of abnormal cells.

Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells keep on growing and form new cancer cells. In most cases the cancer cells form a tumor. Cancer cells can also grow into (invade) other tissues, something that normal cells can't do. Being able to grow out of control and invade other tissues are what makes a cell a cancer cell.

Sometimes cancer cells spread to other parts of the body. There they begin to grow and form new tumors. This process is called *metastasis*.

No matter where a cancer spreads, it is named (and treated) based on the place where it started. For instance, breast cancer that has spread to the liver is still breast cancer, not liver cancer. Likewise, prostate cancer that has spread to the bones is still prostate cancer, not bone cancer.

Different types of cancer can behave very differently. They grow at different rates and respond to different treatments. This is why people with cancer need treatment that is aimed at their own kind of cancer.

Not all tumors are cancer. Tumors that aren't cancer are called *benign*. Benign tumors can cause problems – they can grow very large and press on healthy organs and tissues.

But they can’t grow into other tissues. Because of this, they also can’t spread to other parts of the body (*metastasize*). These tumors are rarely life threatening.

What is pancreatic cancer?

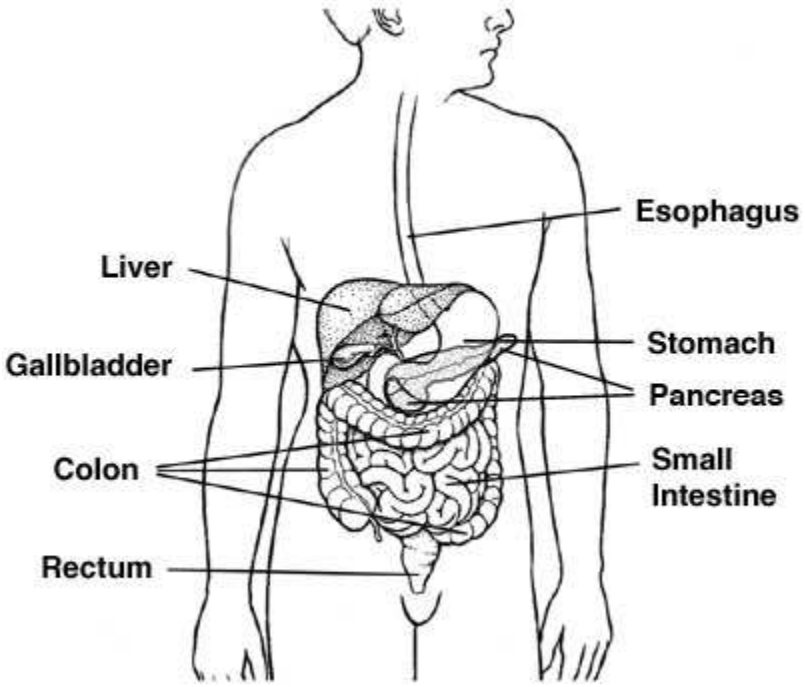
To understand pancreatic cancer, it helps to know about the pancreas and what it does.

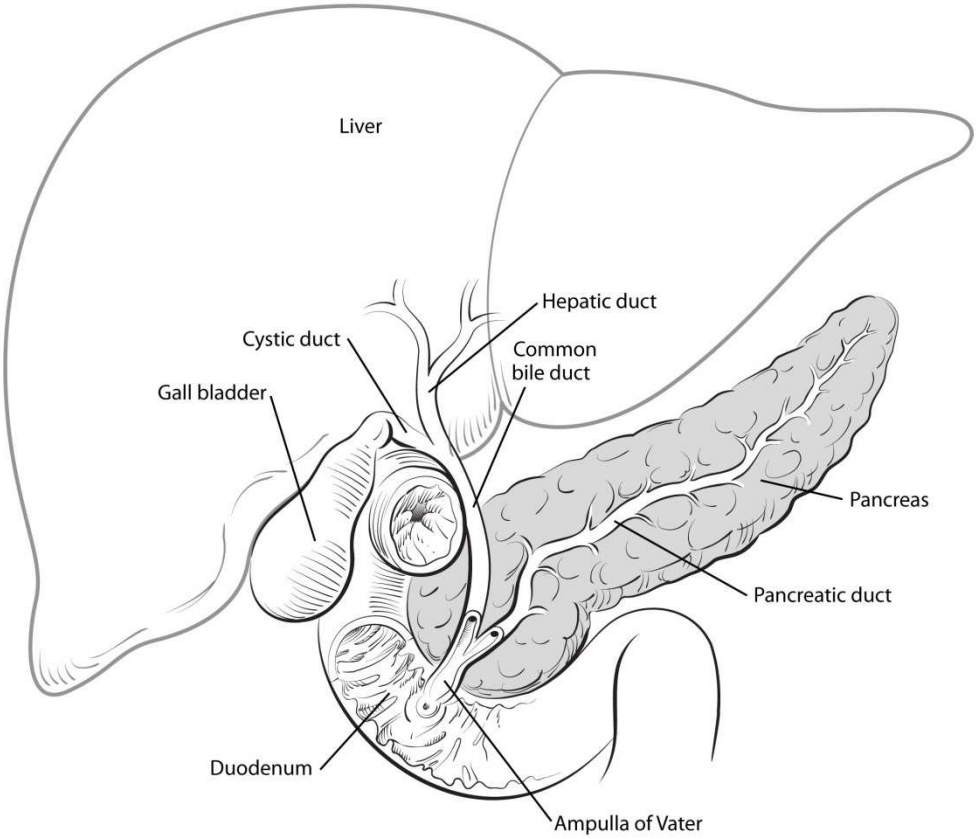
The normal pancreas

The pancreas is an organ deep in the body, behind the stomach. It is shaped a little like a fish. In adults it is about 6 inches long and less than 2 inches wide. It goes across the belly (abdomen).

The pancreas has 2 different kinds of glands.

- The *exocrine* glands make pancreatic “juice,” which goes into the intestines. This juice has enzymes that break down the foods you eat so the body can use them. Most of the cells in the pancreas are part of the *exocrine* system.
- A smaller number of cells in the pancreas are *endocrine* cells. These cells are in clusters called *islets*. They make hormones like insulin that help balance the amount of sugar in the blood.





Benign pancreatic tumors and precancers

Not all of the tumors in the pancreas are cancer. Some tumors are not cancer (they are benign), while others might become cancer over time if left untreated. (These are known as precancers.) Examples of these tumors include:

- Serous cystic neoplasms (SCNs)
- Mucinous cystic neoplasms (MCNs)
- Intraductal papillary mucinous neoplasms (IPMNs)

To learn more about these tumors, see our document *Pancreatic Cancer*.

Pancreatic cancers

Both the exocrine and endocrine cells of the pancreas can form cancers. But cancers formed by the exocrine cells are much more common. When someone says that they have pancreatic cancer, they usually mean an exocrine pancreatic cancer.

It is important to know whether a tumor is from the exocrine or endocrine part of the pancreas. These tumors have their own signs and symptoms, are found using different tests, are treated in different ways, and have different outlooks.

Exocrine tumors

Exocrine tumors are by far the most common type of pancreas cancer. Nearly all of these tumors are *adenocarcinomas* (cancers that start in gland cells).

A special type of cancer (called *ampullary cancer*) starts where the bile duct (from the liver) and the pancreatic duct empty into the small intestine (called the *ampulla of Vater* – see the drawing above). This type of cancer often causes symptoms while it is still small, so it is usually found at an earlier stage than most pancreatic cancers. Finding it early means that the chances of successful treatment are better.

Endocrine tumors

Tumors of the endocrine pancreas are much less common. They are known as *islet cell tumors* or *neuroendocrine tumors*. There are many types, including:

- Gastrinomas
- Insulinomas
- Glucagonomas
- Somatostatinomas
- VIPomas
- PPomas

Most of these tumors are not cancer (benign), but there are a few that are cancer. The outlook for these tumors is usually better than that of pancreatic exocrine cancers.

The information here refers only to exocrine cancer and ampullary cancer. Please see our document *Pancreatic Cancer* to learn more about neuroendocrine tumors of the pancreas.

How many people get pancreatic cancer?

The American Cancer Society's estimates for pancreatic cancer in the United States for 2015 are:

- About 48,960 new cases of pancreatic cancer
- About 40,560 deaths from pancreatic cancer

Rates of pancreatic cancer have been fairly stable over the past several years.

The lifetime risk of having pancreatic cancer is about 1 in 67. A person's risk may be changed by certain risk factors (listed in the section "What are the risk factors for pancreatic cancer?").

What are the risk factors for pancreatic cancer?

We still do not know exactly what causes most cases of pancreatic cancer. But some risk factors have been linked to the disease. A risk factor is something that affects a person's chance of getting a disease such as cancer. Some risk factors, like smoking, can be changed. Others, like a person's age or race, can't be changed.

Recent research has shown that some of these risk factors affect the DNA of cells in the pancreas, which can lead to abnormal cell growth and may cause tumors to form. DNA is the substance in each cell that carries our genes — the instructions for how our cells work.

But having a risk factor, or even several risk factors, does not mean that you will get the disease. And some people who get the disease have few or no known risk factors.

Risk factors that can be changed

Tobacco use: The risk of getting cancer of the pancreas is about twice as high in smokers compared to those who never smoked. Cigar and pipe smoking also increase risk, as does the use of smokeless tobacco products.

Being overweight or obese: Overweight and obese people are more likely to get pancreatic cancer. Having extra weight around the waistline may be a risk factor even in people who are not very overweight.

Work exposure: Heavy exposure at work to certain pesticides, dyes, and chemicals may increase the risk of getting cancer of the pancreas.

Risk factors that can't be changed

Age: The risk of this cancer goes up as people age. Almost all patients are older than 45, and about 2 in 3 are at least 65 years old. The average age at the time the cancer is found is 71.

Gender: Men are more likely to get this cancer than women. This may be due, at least in part, to higher tobacco use in men.

Race: African Americans are more likely to have this cancer than are whites.

Family history: Cancer of the pancreas seems to run in some families. In some of these families, the high risk is due to a gene change (see below). In other families, the gene causing the higher risk is not known.

Gene changes: Inherited gene changes (mutations) can be passed from parent to child. These changed genes may cause as many as 1 in 10 pancreatic cancers and can cause other problems, too. Some of the genes that cause these problems can be recognized by genetic testing.

Diabetes: Pancreatic cancer is more common in people with this disease. Most of the risk is found in people with type 2 diabetes. The reason for this is not known. In some patients, the cancer seems to have caused the diabetes (not the other way around).

Chronic pancreatitis: Long-term inflammation of the pancreas is linked with a higher risk of pancreatic cancer. Still, most people with this condition do not get pancreatic cancer. A small number of cases of chronic pancreatitis appear to be due to a gene mutation (defect). People with this form of chronic pancreatitis seem to have a high lifetime risk of pancreatic cancer.

Cirrhosis of the liver: Cirrhosis is a scarring of the liver. It happens in people with liver damage from things like hepatitis and heavy alcohol use. People with cirrhosis seem to have an increased risk of pancreatic cancer.

Stomach problems: Having too much stomach acid or having bacteria called *H. pylori* in the stomach may increase the risk of pancreatic cancer.

Factors with unclear effect on risk

Diet: Some studies have linked pancreatic cancer with eating a lot of red meat, pork, and processed meat (such as sausage and bacon). Others have found that eating a lot of fruits and vegetables may help lower the risk. But not all studies have found these links.

Not being active: Some research has suggested that lack of physical activity might increase pancreatic cancer risk. But not all studies have found this.

Coffee: Some older studies suggested that drinking coffee might increase the risk of pancreatic cancer, but more recent studies have not found this.

Alcohol: Some studies have shown a link between heavy alcohol use and pancreatic cancer. This link is still not clear, but heavy alcohol use can lead to chronic pancreatitis and cirrhosis, which are known to increase pancreatic cancer risk.

Can pancreatic cancer be prevented?

There is no sure way to prevent cancer of the pancreas at this time. But there are some ways you might be able to lower your risk.

For now, the best advice is to avoid smoking, the major risk factor that you can change. Tobacco use also increases the risk of many other cancers. If you smoke and want help quitting, please talk to your doctor or call the American Cancer Society at 1-800-227-2345.

Getting to and staying at a healthy weight might also help lower your risk. The effects of getting being active and eating well are not as clear, but both of these can help you stay at a healthy weight. The American Cancer Society recommends choosing foods and beverages in amounts that help achieve and maintain a healthy weight. Eat a healthy diet, with an emphasis on plant foods. This includes at least 2½ cups of vegetables and fruits every day. Choose whole-grain breads, pastas, and cereals instead of refined grains, and eating fish, poultry, or beans instead of processed meat and red meat.

The full guidelines can be found in the *American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention.*

How is pancreatic cancer found?

It is hard to find pancreatic cancer early. Because the pancreas is deep inside the body, the doctor can’t see or feel tumors during a routine physical exam. By the time a person has symptoms, the cancer has usually spread to other organs.

Screening tests are used to look for cancer in people who have no symptoms. But there are no blood tests or other tests that can easily find pancreatic cancer early in people without symptoms. Blood levels of tumor markers such as CA 19-9 and CEA may be higher than normal in people with pancreatic cancer, but the cancer is usually advanced by the time the levels become high, so these are not useful as screening tests.

Tests for certain gene defects can be done in people with a strong family history of the disease (or a family history of certain other cancers). Genetic tests can sometimes help find people who have a higher risk for this cancer. The American Cancer Society strongly recommends that anyone thinking about genetic testing talk with a genetic counselor, nurse, or doctor who can explain the about the test before they proceed with testing. It’s

important to understand what the tests can and can't tell you and what any results would mean, and to carefully weigh the benefits and risks of testing before these tests are done. To learn more, see our document *Genetic Testing: What You Need to Know*.

For people in families at high risk of pancreatic cancer, newer tests for detecting early pancreatic cancer may help. For example, doctors are looking at whether a test called *endoscopic ultrasound* might be useful to check people with a high risk.

Signs and symptoms of pancreatic cancer

Having one or more of the signs and symptoms below does not mean you have pancreatic cancer. In fact, many of these symptoms are more likely to be caused by something else. Still, if you have any of these, it's important to have them checked by a doctor so that the cause can be found and treated, if needed.

Early pancreatic cancers often don't cause any signs or symptoms. By the time they do cause symptoms, they have often already grown through the pancreas or spread beyond it.

Jaundice and related symptoms: A yellowing of the eyes and skin is called jaundice. It is caused by a build-up of a substance (*bilirubin*) that is made in the liver. Most people with pancreatic cancer (and just about all people with ampullary cancer) have jaundice. The same problem that causes the skin to turn yellow can also cause other symptoms, such as dark-colored urine and itchy skin.

While jaundice can be a sign of cancer, more often it is caused by something else.

Belly or back pain: Pain in the belly area (abdomen) or in the back is a very common sign of advanced pancreatic cancer. Again, such pain is often caused by something else.

Weight loss: Losing weight (without trying) over a number of months is very common in patients with this cancer. They may also feel very tired and not feel like eating.

Digestive problems: If the cancer blocks the release of the pancreatic juice into the intestine, a person may not be able to digest fatty foods. Stools might be pale, bulky, greasy, and float in the toilet. Other problems may include nausea, vomiting, and pain that gets worse after eating.

Swollen gallbladder: The doctor may find that the gallbladder is enlarged. The doctor can sometimes feel this and see it on imaging tests (described below).

Blood clots: Sometimes blood clots form in a vein of the leg, leading to pain, swelling, and warmth in the leg. These clots can sometimes travel to the lungs and cause breathing problems and chest pain. But having a blood clot does not usually mean that you have cancer. Most blood clots are caused by other things.

Fatty tissue changes: Another clue that there may be pancreatic cancer is an uneven texture of the fatty tissue under the skin. This is caused by the release of the pancreatic enzymes that digest fat.

Diabetes: This cancer can cause problems with blood sugar. Sometimes (but not often) it can cause diabetes. Symptoms can include feeling thirsty and hungry, and having to urinate often.

Tests to find pancreatic cancer

If you have one or more of the signs and symptoms described above, certain exams and tests may be done to find out whether they are caused by pancreatic cancer or by something else.

History and physical exam

First the doctor will ask about your symptoms, overall health, and family history. The doctor will then do a physical exam, focusing mostly on the belly (abdomen). Sometimes this type of cancer causes the gallbladder or liver to swell, so the doctor will check these. The skin and the white part of the eyes will be checked for yellow color (jaundice).

If the results of the exam aren't normal, your doctor will order tests to help find the problem. You might also be referred to a gastroenterologist (a doctor who treats digestive system diseases) for further tests and treatment.

Imaging tests

Imaging tests make pictures of the inside of the body. They can be done to look for cancer, to see how far cancer has spread, or to help show if cancer treatment is working.

CT scan (computed tomography)

This test uses x-rays to create detailed pictures of the inside of the body. CT scans are useful in finding pancreatic cancer and in seeing how far it has spread. This can help show if surgery might be a good treatment option. CT scans can also be used to help guide a biopsy needle into the place that might be cancer (see below for more about biopsy).

A CT scanner has been described as a large donut, with a narrow table that slides in the middle "hole." You will need to lie still on the table while the scan is being done. CT scans take longer than regular x-rays, and you might feel a bit confined by the ring while the pictures are being taken.

Before the test, you might be asked to drink 1 to 2 pints of a liquid called *oral contrast*. This helps outline your insides so that certain areas are not mistaken for tumors. You

might also have an IV line through which a different kind of contrast dye (IV contrast) is put in. This helps better outline structures such as blood vessels in your body.

The dye can cause some flushing (redness and warm feeling). Some people are allergic to the dye and get hives or, rarely, have more serious reactions like trouble breathing and low blood pressure. Be sure to tell the doctor if you have any allergies or have ever had a reaction to any contrast material used for x-rays.

MRI (magnetic resonance imaging)

MRI scans use radio waves and strong magnets instead of x-rays to take pictures. Sometimes a contrast dye might be used, just as with CT scans. MRI scans are helpful in looking at the brain and spinal cord. MRI scans take longer than CT scans — often up to an hour. Also, you have to lie inside a narrow tube, which can upset some people. Special, “open” MRI machines can help with this if needed. The machine also makes loud thumping and clicking noises. Some places will give you headphones with music to block it out.

Most doctors prefer CT scans to look at the pancreas, but an MRI may sometimes give more information.

Special types of MRI scans can also be used in people who might have pancreatic cancer:

- **MR cholangiopancreatography (MRCP)** can be used to look at the pancreatic and bile ducts (the small tubes within and just outside the pancreas).
- **MR angiography (MRA)** can help show if the cancer has grown into nearby blood vessels.

Ultrasound

These tests use sound waves to make pictures of the inside of the body.

Abdominal ultrasound: For an ultrasound of the belly, a wand-shaped probe called a *transducer* is moved around over the skin. If it’s not clear what might be causing a person’s belly symptoms, an ultrasound might be the first test done because it is easy to do and it doesn’t expose a person to radiation. But if signs and symptoms are more likely to be caused by pancreatic cancer, a CT scan is often done instead.

Ultrasound is also used to look at the liver, so it is often done if someone has symptoms (like jaundice) that point to a liver problem.

Endoscopic ultrasound (EUS): This test is often the best way to look at pancreatic cancer. For this test, the wand (probe) is on the end of a long tube (called an endoscope) that is placed through the mouth or nose into the stomach. The probe can be pointed toward the pancreas. This gives a very good picture and is better than CT scans for spotting small tumors. Patients are given medicine to make them sleepy (sedated) for this type of ultrasound.

Cholangiopancreatography

These tests are used to look at the pancreatic and bile ducts to see if they are blocked, narrowed, or dilated. These tests can help show if someone might have a pancreatic tumor that is blocking a duct. They can also be used to help plan surgery.

Endoscopic retrograde cholangiopancreatography (ERCP): For this test, patients are given medicine to make them sleepy (sedated). Then a thin, flexible tube is passed down the throat, all the way into the small intestine. A small amount of contrast dye is then pushed through the tube into the ducts, which outlines them on x-rays. The doctor can also put a small brush through the tube to remove cells to look at under a microscope to see whether they look like cancer. ERCP can also be used to place a small tube (stent) into the bile duct to keep it open if a nearby tumor is pressing on it.

Magnetic resonance cholangiopancreatography (MRCP): This test uses an MRI machine to look at the pancreatic and bile ducts. It is non-invasive, unlike ERCP, so doctors often use MRCP if the purpose of the test is just to look at the pancreatic and bile ducts. But this test can't be used to get biopsy samples of tumors or to place stents in ducts.

Percutaneous transhepatic cholangiography (PTC): In this test, the doctor puts a thin, hollow needle through the skin of the belly and into a bile duct within the liver. A contrast dye is then injected through the needle, and x-rays are taken as it passes through the bile and pancreatic ducts. As with ERCP, this test can also be used to take fluid or tissue samples or to place a stent into a duct to help keep it open. Because it is more invasive (and might cause more pain), PTC is not usually used unless ERCP has already been tried or can't be done for some reason.

PET scan (positron emission tomography)

For a PET scan, a radioactive sugar called FDG is put into a vein in your arm. Because cancer cells are very active, they take in large amounts of the sugar. A special camera is then used to show the areas of radioactivity in the body. A PET scan can be more helpful than many x-rays because it scans the whole body. This test is useful to see whether the cancer has spread to the lymph nodes or to other places.

PET/CT scan: This test combines the 2 types of scans to even better pinpoint the tumor.

Angiography

This is an x-ray test that uses a dye to look at blood vessels. It can show whether blood flow in an area is blocked or slowed by a tumor. It can also show if there are any abnormal blood vessels. The results help the doctors decide whether the cancer can be removed and helps them plan the surgery.

X-ray angiography can be uncomfortable because the doctor who does it has to put a small tube (called a catheter) into the artery leading to the pancreas. Usually the catheter

is put into an artery in the inner thigh and threaded up to the pancreas. Medicine is used to numb the area before putting in the catheter. Then the dye is quickly put in to outline all the vessels while the x-rays are being taken.

Angiography can also be done with a CT scanner (CT angiography) or an MRI scanner (MR angiography). These techniques are now used more often because they can show the blood vessels in or near the pancreas without the need for a catheter in the artery. You might still need an IV line so that a contrast dye can be injected into the blood during the test.

Blood tests

Certain blood tests can be used to help find pancreatic cancer or to help decide on treatment options.

Jaundice (yellowing of the skin and eyes) is often one of the first signs of pancreatic cancer, but it can have many causes other than cancer. Doctors often get blood tests to assess liver function in people with jaundice to help determine its cause.

High blood levels of the tumor markers CA 19-9 and CEA (carcinoembryonic antigen) may point to exocrine pancreatic cancer, but these tests aren't always accurate.

Other blood tests can help tell about a person's general health (such as kidney and bone marrow function). These tests can also help the doctor decide if a patient will be able to go through the stress of a major operation.

Biopsy

Other tests might strongly suggest a person has pancreatic cancer, but usually the only way to be sure is to remove a small sample of tumor and look at it under the microscope. This is called a *biopsy*. Biopsies can be done in different ways:

Percutaneous (through the skin) biopsy: The doctor inserts a thin, hollow needle through the skin and into the pancreas to remove a small piece of a tumor. This is known as a *fine needle aspiration* (FNA). The doctor guides the needle into place using images from ultrasound or CT scans.

Endoscopic biopsy: The doctor passes an endoscope (a thin, flexible, tube with a small video camera on the end) down the throat and into the small intestine near the pancreas. A small brush or hollow needle is then use to remove cells from the bile or pancreatic ducts. You will be sedated (made sleepy) for these tests, but general anesthesia (being put into a deep sleep) is not usually needed.

Surgical biopsy: The most common way to do a surgical biopsy is to use *laparoscopy* (sometimes called *keyhole surgery*). You will be sedated or asleep for this procedure. The surgeon makes small incisions (cuts) in the abdomen and inserts small telescope-like

instruments. The surgeon can look at the pancreas and other organs for tumors and take biopsy samples of abnormal areas. Surgical biopsies are now done less often than in the past.

Some people might not need a biopsy

Rarely, the doctor might not do a biopsy on someone who has a tumor in the pancreas if imaging tests show the tumor is very likely to be cancer and if it looks like surgery can remove all of it. Instead, the doctor will go straight to surgery, at which time the tumor cells can be looked at to confirm the diagnosis. If during surgery the doctor finds that the cancer has spread too far to be removed completely, only a sample of the cancer will be removed to confirm the diagnosis, and the rest of the planned operation will be stopped.

See our document *Testing Biopsy and Cytology Specimens for Cancer* to learn more about different types of biopsies, how the samples are tested in the lab, and what the results will tell you.

Staging for pancreatic cancer

The stage of a cancer is a standard way for doctors to sum up how far the cancer has spread. This is very important because your treatment and outlook depend on the stage of your cancer. The tests described in the section “How is pancreatic cancer found?” are used to decide the stage of the cancer.

The most common staging system for pancreatic cancer is the AJCC staging system, also known as the TNM system. It uses 3 key pieces of information:

- **T** describes the size of the main **tumor** and if it has grown into nearby structures.
- **N** describes spread to nearby lymph **nodes**.
- **M** tells whether the cancer has spread (**metastasized**) to other parts of the body.

The T, N, and M categories are combined to get an overall stage, using 0 and the Roman numerals I through IV (1-4). The lower the number, the less the cancer has spread. A higher number, such as stage IV (4), means a more advanced cancer.

If you have pancreatic cancer, ask your doctor to explain its stage in a way that you understand. This can help you take a more active role in making informed decisions about your treatment.

Other factors

Although not part of the AJCC staging system, some other factors are also important. The *grade* of the cancer (whether the cells look more or less normal under the microscope) is

sometimes listed on a scale from G1 to G3 (or G4), with G1 cancers looking the most like normal cells and having the best outlook.

If you have surgery, the *extent of the resection* — whether or not all of the tumor is removed — is also important with regard to outlook. This is sometimes listed on a scale from R0 (where all of tumor that can be seen has been removed) to R2 (where some tumor could not be removed).

Resectable versus unresectable pancreatic cancer

The AJCC staging system provides a detailed summary of how far the cancer has spread. But for treatment purposes, doctors often use a simpler staging system which divides cancers into groups based on whether or not it is likely they can be removed (resected) by surgery. These groups are listed below.

Resectable: The cancer is only (or mostly) in the pancreas and the doctors think all of it can be removed.

Borderline resectable: The cancer has just reached nearby blood vessels, but the doctors feel it might still be removed completely with surgery.

Locally advanced (unresectable): The cancer has not spread to distant organs, but the doctor still can't remove all of the cancer. Surgery would be done only to relieve symptoms or other problems.

Metastatic: The cancer has spread to distant organs. Surgery would be done only to relieve symptoms or other problems.

How is pancreatic cancer treated?

This information represents the views of the doctors and nurses serving on the American Cancer Society's Cancer Information Database Editorial Board. These views are based on their interpretation of studies published in medical journals, as well as their own professional experience.

The treatment information in this document is not official policy of the Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor.

Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

About treatment

After the cancer is found and staged, your cancer care team will discuss treatment options with you. Take time to think about your choices. Weigh the benefits of each option against the possible risks and side effects. In choosing a treatment plan, some of the main factors to think about are whether or not the cancer can be removed (resected) with surgery and your overall health.

The main types of treatment for pancreatic cancer are:

- Surgery
- Ablative techniques
- Radiation therapy
- Chemotherapy and other drugs

Some of these treatments may be combined. Pain control is also an important part of treatment for many patients

Doctors on your cancer treatment team might include:

- A surgeon: a doctor who uses surgery to treat cancers or other problems
- An endocrinologist: a doctor who treats diseases in glands that make hormones
- A radiation oncologist: a doctor who uses radiation to treat cancer
- A medical oncologist: a doctor who uses chemotherapy and other medicines to treat cancer

Many other experts may be involved in your care as well; these could include physician assistants (PA), nurse practitioners (NPs), nurses, psychologists, social workers, nutritionists, and others. See *Health Professionals Associated With Cancer Care* for more on this.

Discuss all of your treatment options, including their goals and possible side effects, with your doctors to help make the decision that best fits your needs. Ask questions if there is anything you're not sure about. You can find some good questions to ask in the section "What are some questions I can ask my doctor about pancreatic cancer?"

Surgery for pancreatic cancer

There are 2 types of surgery used for cancer of the pancreas:

- *Potentially curative surgery* is used when tests suggest that all of the cancer can be removed.
- *Palliative surgery* may be done if tests show that the tumor is too widespread to be removed completely. This surgery is done to relieve symptoms or to prevent certain problems like blockage of the bile ducts or the intestine by the cancer. But it is not meant to try to cure the cancer.

Studies have shown that removing only part of the cancer does not help patients live longer, so potentially curative surgery is only done if the surgeon thinks all of the cancer can be removed. This is one of the hardest operations a surgeon can do. It is also one of hardest for patients to have. It can cause serious problems and can take many weeks to recover from. Patients need to weigh the pros and cons of such surgery carefully.

Surgery to try to cure the cancer (potentially curative surgery)

Fewer than 1 in 5 pancreatic cancers look to be only in the pancreas when they are found. Even then, not all of these cancers turn out to be truly resectable once the surgery is started. Sometimes it becomes clear during the operation that the cancer has grown too far to be removed completely. If this happens, the operation might be stopped, or the surgeon might continue with a smaller operation with a goal of relieving or preventing symptoms (see “Palliative surgery” below). This is because the planned operation would be very unlikely to cure the cancer and could still lead to major side effects. It would also lengthen the recovery time, which could delay other treatments.

The type of surgery most often done if it looks like the cancer can be cured is called the *Whipple procedure.* It is the most common type of surgery for cancer of the pancreas. In this surgery, parts of the pancreas are removed along with parts of the small intestine, the gallbladder, part of the bile duct, nearby lymph nodes, and sometimes part of the stomach. This is a very complex operation. It is best done by a surgeon who has done it many times in a hospital that does at least 15 to 20 Whipple procedures per year. This surgery is a major operation that carries a fairly high risk of complications that may be fatal.

Surgery to remove just part of the pancreas may be an option for a few patients with pancreatic cancer. For more information, see “Surgery for pancreatic cancer” in our document *Pancreatic Cancer*.

Palliative surgery

Because pancreatic cancer can progress quickly, most doctors do not advise major surgery to relieve symptoms. Sometimes surgery may be tried in the hope of curing the patient, but during the operation the surgeon discovers this is not possible. In this case, the surgeon may continue the operation as a palliative procedure to relieve or prevent symptoms.

For example, surgery can be used to relieve blockage of the bile duct. When this duct is blocked, it can cause pain, problems with digestion, jaundice, and other symptoms. There are 2 main options to relieve a bile duct blockage.

Stent placement: The most common way to treat bile duct blockage does not involve actual surgery. Instead, small tubes (usually made of metal) called *stents* are placed inside the duct to keep it open. The doctor puts the stents in using a thin, flexible tube called an *endoscope* that is passed down the throat, often during an ERCP (see "How is pancreatic cancer found?").

Over time the stents might get clogged and need to be replaced. Bigger stents can be used to keep the small intestine open, too.

Bypass surgery: In people who are healthy enough, another option is surgery to re-route the flow of bile from the common bile duct into the small intestine, avoiding the pancreas. This often requires a large cut (incision), from which it can take weeks to recover. But sometimes it can be done through a few small cuts in the belly using special long surgical tools. (This is known as *laparoscopic* or *keyhole surgery*.)

Having a stent placed is often easier and people recover faster, which is why this is done more often than bypass surgery. But surgery can have some advantages, such as:

- It can often give longer-lasting relief than a stent, which might need to be cleaned out or replaced.
- It might be an option if a stent can't be placed for some reason.
- During surgery, the surgeon can cut the nerves leading to the pancreas or inject them with alcohol to relieve pain caused by the cancer.

Sometimes during this surgery, the end of the stomach is disconnected from the first part of the small intestine and attached to it farther down. (This is known as a *gastric bypass*.) This can help avoid problems later on because the cancer can often grow and block the first part of the intestine.

For more about surgery as a treatment for cancer, see our document *Understanding Cancer Surgery: A Guide for Patients and Families*.

Ablation or embolization for pancreatic cancer

These treatments destroy tumors, rather than removing them with surgery. They can sometimes be used to help treat cancer that has spread, especially to the liver. But these treatments are very unlikely to cure cancers on their own. They are more likely to be used to help prevent or relieve symptoms, and are often used along with other types of treatment.

These treatments typically do not require a hospital stay. Side effects can include pain, infections, and bleeding inside the body, but serious side effects are not common.

Ablation techniques

These treatments destroy tumors, usually with extreme heat or cold.

Radiofrequency ablation (RFA): In RFA, a probe (like a needle) is put into the tumor. An electric current is then passed through the tip of the probe, which heats the tumor and destroys the cancer cells.

Microwave thermotherapy: This approach is much like RFA except that microwaves are used to heat and destroy the cancer.

Cryosurgery (cryoablation): In cryosurgery, a probe is put right into the tumor to freeze the tissue with liquid nitrogen or liquid carbon dioxide. The area being frozen is destroyed.

Embolization

During embolization, the doctor injects substances into an artery to try to block the blood flow to cancer cells, causing them to die. This can sometimes be used for tumors that are too large to be treated with ablation. There are 3 main types of embolization:

Arterial embolization: In this procedure a catheter (a thin, flexible tube) is put into an artery through a small cut in the inner thigh and moved up into the artery feeding the tumor. Small particles are then injected into the artery to plug it up.

Chemoembolization: This approach combines embolization with chemotherapy. Most often, this is done by injecting tiny beads that give off a chemo drug. It can also be done by giving chemo through the catheter directly into the artery, then plugging up the artery.

Radioembolization: This technique combines embolization with radiation therapy. This is often done by injecting small radioactive beads (called *microspheres*) into the artery.

Radiation therapy for pancreatic cancer

Radiation therapy is treatment with high energy rays (like x-rays) to kill cancer cells or shrink tumors. Having radiation is much like getting a regular x-ray, but the radiation is stronger. The treatment is not painful. Each treatment lasts only a few minutes, although the setup time – getting you into place for treatment – usually takes longer. Treatment is usually given 5 times a week for several weeks or months.

Sometimes the radiation is given before surgery, sometimes after. Radiation (along with chemotherapy) can also be used for patients whose tumors are too widespread to be removed by surgery. It can also be used to help relieve symptoms such as pain in people with advanced cancers.

Side effects of radiation therapy could include skin changes that look like sunburn, upset stomach, loose bowels, poor appetite, weight loss, or tiredness. Radiation can also lower blood counts and can increase the risk of serious infection.

Often side effects go away over time after treatment ends. Talk with your doctor if you have side effects because there are ways to relieve them.

Learn more about radiation therapy in the “Radiation Therapy” section of our website or in our document *Understanding Radiation Therapy: A Guide for Patients and Families.*

Chemotherapy for pancreatic cancer

Chemotherapy (chemo) is the use of drugs to kill cancer cells. Usually the drugs are given into a vein or are taken as a pill. Once the drugs enter the bloodstream, they go throughout the body. This makes chemo useful for cancer that has spread beyond the place where it started.

Chemo may be used at any stage of pancreatic cancer:

- In people who are going to have surgery, chemo (sometimes with radiation) may be given to shrink the tumor ahead of time. This is known as *neoadjuvant* treatment.
- Chemo can also be used after surgery to try to kill any cancer cells that may have been left behind. This type of treatment is called *adjuvant* treatment. When used this way, chemo is often given with radiation.
- Chemo can also be used for people with advanced cancer.

Doctors give chemo in cycles, with each period of treatment followed by time to allow the body to recover. Each chemo cycle typically lasts for a few weeks.

Chemo can cause side effects. These side effects will depend on the type of drugs given, the amount taken, and how long treatment lasts.

Common short-term side effects might include:

- Nausea and vomiting
- Loss of appetite
- Hair loss
- Mouth sores
- Diarrhea or constipation

Because chemo can damage the bone marrow (where new blood cells are made) blood cell counts might become low. This can result in:

- Increased risk of infection (from a shortage of white blood cells)
- Bleeding or bruising after minor cuts (from a shortage of platelets)
- Tiredness (fatigue) (from too few red blood cells)

Some chemo drugs can also cause other side effects. For example, some drugs can damage nerves. This can lead to problems with numbness, tingling, or pain in the hands and feet.

Most side effects go away once treatment is over. Talk with your doctor or nurse about side effects, as there are often ways to help.

For more about chemo, please see the Chemotherapy section of our website, or our document *A Guide to Chemotherapy*.

Targeted therapy for pancreatic cancer

Newer drugs that target certain parts of cancer cells are now being studied. These drugs work in a different way from regular chemotherapy (chemo) drugs. Sometimes they work when standard chemo drugs don't, and they often have different side effects.

Erlotinib (Tarceva®) is a drug that has helped some patients with advanced pancreatic cancer. It is taken as a pill. When combined with the chemo drug gemcitabine (Gemzar®) it has been shown to be slightly better than gemcitabine alone. Common side effects of this drug can include an acne-like rash, diarrhea, loss of appetite, and feeling tired.

Pain control for pancreatic cancer

Pain can be a real problem for patients with this cancer. But pain can often be relieved with medicines or, sometimes, with surgery or other treatments. Tell your doctor or nurse about any pain you have.

Pain medicines

For most patients, treatment with strong medicines can help control the pain. Pain is easier to treat if the treatment is started when you first have it. You should not be afraid to use the pain medicines offered. Pain medicines work best when they are taken on a regular schedule, not just when the pain gets bad. There are long-acting forms of morphine and other drugs that only need to be taken once or twice a day.

Other treatments

There are other ways to relieve pain from pancreatic cancer, such as with endoscopy or surgery. For instance, cutting some of the nerves that carry pain sensations or injecting alcohol into these nerves can often provide relief. If you are having surgery for some reason, these nerves can often be cut or treated during the same operation. Or it can be done either by passing a needle through the skin or by using an endoscope (a long, flexible tube that is passed down the mouth and past the stomach).

Chemotherapy and/or radiation to the pancreas can also sometimes relieve pain by shrinking the size of the cancer.

For more information on pain and what can be done about it, see the "Cancer-related Pain" section of our website, or our document *Guide to Controlling Cancer Pain.*

Clinical trials for pancreatic cancer

You may have had to make a lot of decisions since you've been told you have pancreatic cancer. One of the most important decisions you will make is deciding which treatment is best for you. You may have heard about clinical trials being done for pancreatic cancer. Or maybe someone on your health care team has mentioned a clinical trial to you.

Clinical trials are carefully controlled research studies that are done with patients who volunteer for them. They are done to learn more about promising new treatments or procedures.

Clinical trials are one way to get state-of-the art cancer treatment. Sometimes they may be the only way to get some newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials matching service for a list of studies that meet your medical needs. You can reach this service at 1-800-303-5691 or on our website at www.cancer.org/clinicaltrials. You can also get a list of current clinical trials by calling the National Cancer Institute's Cancer Information Service at 1-800-4-CANCER (1-800-422-6237) or by visiting the NCI clinical trials website at www.cancer.gov/clinicaltrials.

You must meet certain requirements to take part in any clinical trial. If you do qualify for a clinical trial, you decide whether or not to enter (enroll in) it.

You can get a lot more information on clinical trials in our document *Clinical Trials: What You Need to Know*.

Complementary and alternative therapies for pancreatic cancer

When you have pancreatic cancer you are likely to hear about ways to treat your cancer or relieve symptoms that your doctor hasn't mentioned. Everyone from friends and family to social media groups and websites might offer ideas for what might help you. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

What are complementary and alternative therapies?

It can be confusing because not everyone uses these terms the same way, and they are used to refer to many different methods. We use *complementary* to refer to treatments that are used *along with* your regular medical care. *Alternative* treatments are used *instead of* a doctor's medical treatment.

Complementary methods: Most complementary treatment methods are not offered as cures for cancer. Mainly, they are used to help you feel better. Some examples of methods that are used along with regular treatment are meditation to reduce stress, acupuncture to help relieve pain, or peppermint tea to relieve nausea. Some complementary methods are known to help, while others have not been tested. Some have been proven not to be helpful, and a few are even harmful.

Alternative treatments: Alternative treatments may be offered as cancer cures. These treatments have not been proven safe and effective in clinical trials. Some of these methods may be harmful, or have life-threatening side effects. But the biggest danger in most cases is that you might lose the chance to be helped by standard medical treatment. Delaying or interrupting your medical treatments might give the cancer more time to grow and make it less likely that treatment will help.

Finding out more

It's easy to see why people with cancer think about alternative methods. You want to do all you can to fight the cancer, and the idea of a treatment with few or no side effects sounds great. Sometimes medical treatments like chemotherapy can be hard to take, or they may no longer be working. But the truth is that most alternative methods have not been tested and proven to work in treating cancer.

As you think about your options, here are 3 important steps you can take:

- Look for “red flags” that suggest fraud. Does the method promise to cure all or most cancers? Are you told not to have regular medical treatments? Is the treatment a “secret” that requires you to visit certain providers or travel to another country?
- Talk to your doctor or nurse about any method you are thinking of using.
- Contact us at 1-800-227-2345 or read our document *Complementary and Alternative Methods and Cancer* to learn more. You can also find out about the specific methods you are looking at by calling us or visiting the “Complementary and Alternative Medicine” section of our website

The choice is yours

Decisions about how to treat or manage your cancer are always yours to make. If you want to use a non-standard treatment, learn all you can about the method and talk to your doctor about it. With good information and the support of your health care team, you may be able to safely use the methods that can help you while avoiding those that could be harmful.

What are some questions I can ask my doctor about pancreatic cancer?

As you cope with cancer and its treatment, you need to have honest, open talks with your doctor. Feel free to ask any question, no matter how small it might seem. Here are some questions you might want to ask. Be sure to add your own questions as you think of them.

- Would you please write down the exact kind of cancer I have?
- Has my cancer spread beyond the pancreas?
- What is the stage of my cancer?
- Can the cancer be removed (resected) with surgery?
- Do I need other tests before we can decide on treatment?
- Do I need to see other kinds of doctors?
- How much experience do you have treating this type of cancer?
- Should I get a second opinion? Can you recommend a doctor or cancer center?
- What are my treatment choices?
- What do you recommend and why?

- What is the goal of the treatment?
- How is treatment likely to help me?
- What risks or side effects might I expect? How long are they likely to last?
- Will treatment affect how I eat?
- How would treatment affect my daily life?
- Should I think about taking part in a clinical trial?
- How soon do I need to start treatment?
- What should I do to be ready for treatment?
- How long will treatment last? What will it be like? Where will it be done?
- What would my options be if the treatment doesn't work or if the cancer comes back?
- Where can I find more information and support?

Keep in mind that doctors are not the only ones who can give you information. Other health care professionals, such as nurses and social workers, may have the answers to some of your questions. For more about speaking with your health care team, see our document *Talking With Your Doctor*.

Moving on after treatment for pancreatic cancer

For some people with pancreatic cancer, treatment can remove or destroy the cancer. Completing treatment can be both stressful and exciting. You will be relieved to finish treatment, yet it is hard not to worry about cancer coming back. (When cancer returns, it is called *recurrence*.) This is a very common concern among those who have had cancer.

It may take a while before your fears lessen. But it may help to know that many cancer survivors have learned to live with this uncertainty and are living full lives. Our document *Living With Uncertainty: The Fear of Cancer Recurrence* gives more detailed information on this.

For most people with pancreatic cancer, the cancer never goes away completely. These people may get regular treatments with chemotherapy, radiation, or other treatments to help keep the cancer under control and relieve symptoms from it. Learning to live with cancer that does not go away can be hard and very stressful. It has its own type of uncertainty. Our document *When Cancer Doesn't Go Away*, talks more about this.

Follow-up care

If you have finished treatment, your doctors will still want to watch you closely. During follow-up visits with your doctors, they will ask about symptoms, do physical exams, and may order blood tests or imaging tests (like CT scans or MRIs). Follow-up is needed to watch for treatment side effects and to check for cancer that has come back or spread. Ask what kind of follow-up schedule you can expect.

Almost any cancer treatment can have side effects. Some may last for a few weeks or months, but others might last the rest of your life. Tell your cancer care team about any symptoms or side effects so they can help you manage them. Use this time to ask your health care team questions and discuss any concerns you might have.

It's also important to keep health insurance. Tests and doctor visits cost a lot, and even though no one wants to think of their cancer coming back, this could happen.

If cancer does come back, treatment will depend on where the cancer is, what treatments you've had before, and your health. Our document *When Your Cancer Comes Back: Cancer Recurrence* can help you manage and cope with this phase of your treatment.

Help with nutrition and pain

Often people with cancer of the pancreas don't feel like eating. They may lose weight and feel weak. These symptoms may be caused by treatment or by the cancer itself. A team of doctors and nutritionists can work with you to help you maintain your weight and nutrition. Many patients need to take pancreatic enzymes in pill form to help digest food. For people with serious nutrition problems, the doctor might need to put a feeding tube into the stomach. This is usually temporary. For more information and nutrition tips for during and after cancer treatment, see our document *Nutrition for the Person With Cancer During Treatment: A Guide for Patients and Families*.

There are many ways to control pain caused by pancreatic cancer. If you have pain, tell your cancer care team right away, so they can help you manage it. For more, see our document *Guide to Controlling Cancer Pain*.

Seeing a new doctor

At some point after your cancer is found and treated, you may find yourself in the office of a new doctor who doesn't know anything about your cancer. It's important that you can to give your new doctor the details of your diagnosis and treatment. Gathering these details during and soon after treatment may be easier than trying to get them at some point in the future. Make sure you have this information handy (and always keep copies for yourself):

- A copy of your pathology report from any biopsy or surgery

- Copies of imaging tests (CT or MRI scans, etc.), which can usually be stored digitally (on a DVD, etc.)
- If you had surgery, a copy of your operative report
- If you stayed in the hospital, a copy of the discharge summary that the doctor wrote when you were sent home
- If you had radiation treatment, a summary of the type and dose of radiation and when and where it was given
- If you had chemotherapy, targeted therapies, or other drug treatments, a list of your drugs, drug doses, and when you took them
- The contact information of the doctors who treated your cancer

Lifestyle changes after pancreatic cancer

You can't change the fact that you have had cancer. What you can change is how you live the rest of your life — making choices to help you stay healthy and feel as well as you can. This can be a time to look at your life in new ways. Maybe you're thinking about how to improve your health over the long term. Some people even start during cancer treatment.

Make healthier choices

For many people, finding out they have cancer helps them focus on their health in ways they may not have thought much about in the past. Are there things you could do that might make you healthier? Maybe you could try to eat better or get more exercise. Maybe you could cut down on alcohol, or give up tobacco. Even things like keeping your stress level under control may help. Now is a good time to think about making changes that can have positive effects for the rest of your life. You will feel better and you will also be healthier.

You can start by working on those things that worry you most. Get help with those that are harder for you. For instance, if you are thinking about quitting smoking and need help, call the American Cancer Society at 1-800-227-2345.

Eating better

Eating right can be hard for anyone, but it can get even tougher during and after cancer treatment. This is especially true for cancers of the pancreas. The cancer or its treatment may affect your appetite or alter how you digest foods. Nausea can be a problem. You may lose weight when you don't want to. All of these things can be very frustrating.

If treatment causes weight changes or eating problems, do the best you can and keep in mind that these problems can get better over time. You may find it helps to eat small portions every 2 to 3 hours until you feel better. You may also want to ask your cancer team about seeing a dietitian, an expert in nutrition who can give you ideas on how to deal with these treatment side effects.

One of the best things you can do after cancer treatment is to start healthy eating habits. You may be surprised at the long-term benefits of some simple changes, like increasing the variety of healthy foods you eat. Getting to and staying at a healthy weight, eating a healthy diet, and limiting your alcohol intake may lower your risk for a number of types of cancer, as well as having many other health benefits.

To learn more, see our document *Nutrition and Physical Activity During and After Cancer Treatment: Answers to Common Questions*.

Rest, fatigue, and exercise

Feeling tired (fatigue) is a very common problem during and after cancer treatment. This is not a normal type of tiredness but a bone-weary exhaustion that often doesn't get better with rest. For some people, fatigue lasts a long time after treatment and can keep them from staying active. But exercise can actually help reduce fatigue and the sense of depression that sometimes comes with feeling so tired.

If you are very tired, though, you will need to balance activity with rest. It is OK to rest when you need to. To learn more about fatigue, please see our document *Fatigue in People With Cancer.*

If you were very ill or weren't able to do much during treatment, it's normal that your fitness, staying power, and muscle strength declined. You need to find an exercise plan that fits your own needs. If you haven't exercised in a few years, you will have to start slowly — maybe just by taking short walks. Talk with your health care team before starting. Get their input on your exercise plans. Then try to get an exercise buddy so that you're not doing it alone.

Exercise can improve your physical and emotional health.

- It improves your heart fitness.
- It can help you get to and stay at a healthy weight.
- It makes your muscles stronger.
- It reduces fatigue and helps you have more energy
- It can help lower anxiety and depression.
- It can make you feel happier.

- It helps you feel better about yourself

Long term, we know that getting regular physical activity can help lower the risk of some cancers, as well as having other health benefits.

Can I lower my risk of the cancer progressing or coming back?

Most people want to know if they can do things to lower their risk of their cancer progressing or coming back. Unfortunately, for most cancers there isn't much solid evidence to guide people. This doesn't mean that nothing will help – it's just that for the most part this is an area that hasn't been well studied.

Not enough is known about pancreatic cancer to say for sure if there are things you can do that will be helpful. Tobacco use has clearly been linked to pancreas cancer, so not smoking may help reduce your risk. We don't know for sure if this will help, but we do know that it can help improve your appetite and overall health. It can also reduce the chance of developing other types of cancer. If you want to quit smoking and need help, call your American Cancer Society at 1-800-227-2345, or read our *Guide to Quitting Smoking*.

Other healthy behaviors such as eating well, being active, and staying at a healthy weight may help as well, but no one knows for sure. But we do know that these types of changes can be good for your health in ways that can extend beyond your risk of cancer.

So far, no dietary supplements have been shown to clearly help lower the risk of pancreatic cancer growing or coming back. Again, this doesn't mean that none will help, but it's important to know that none have been proven to do so.

How might having pancreatic cancer affect your emotional health?

During and after treatment, you may be surprised by the flood of emotions you go through. This happens to a lot of people. You may find that you think about the effect of your cancer on things like your family, friends, and career. Money may be a concern as the medical bills pile up. Or you may take a new look at your relationships with those around you. This can be hard for some people.

This is a good time to look for emotional and social support. You need people you can turn to. Support can come in many forms: family, friends, cancer support groups, church or spiritual groups, online support communities, or private counselors.

The cancer journey can feel very lonely. You don't need to go it alone. Your friends and family may feel shut out if you decide not to include them. Let them in — and let in anyone else who you feel may help. If you aren't sure who can help, call your American Cancer Society at 1-800-227-2345 and we can put you in touch with a group or resource

that may work for you. You can also read our document *Distress in People with Cancer* or see the Emotional Side Effects section of our website for more information.

If treatment for pancreatic cancer stops working

When a person has had many different treatments and the cancer has not been cured, over time even newer treatments might no longer be helpful. At this time you may have to weigh the possible benefits of trying a new treatment against the downsides, like treatment side effects and clinic visits.

This is likely to be the hardest time in your battle with cancer — when you have tried everything within reason and it's just not working anymore. Your doctor might offer you new treatment, but you will need to talk about whether the treatment is likely to improve your health or change your outlook for survival.

No matter what you decide to do, it is important for you to feel as good as possible. Make sure you are asking for and getting treatment for pain, nausea, or any other problems you may have. This type of treatment is called *palliative treatment*. It helps relieve symptoms but is not meant to cure the cancer.

At some point you may want to think about hospice care. Most of the time, this is given at home. Your cancer may be causing symptoms or problems that need to be treated. Hospice focuses on your comfort. You should know that having hospice care doesn't mean you can't have treatment for the problems caused by your cancer or other health issues. It just means that the purpose of your care is to help you live life as fully as possible and to feel as well as you can. You can learn more about this in our document *Hospice Care*.

Staying hopeful is important, too. Your hope for a cure may not be as bright, but there is still hope for good times with family and friends – times that are filled with joy and meaning. Pausing at this time in your cancer treatment gives you a chance to focus on the most important things in your life. Now is the time to do some things you've always wanted to do and to stop doing the things you no longer want to do. Though the cancer may be beyond your control, there are still choices you can make.

You can learn more about the changes that occur when treatment stops working, and about planning ahead for yourself and your family, in our documents *Advance Directives* and *Nearing the End of Life*.

What's new in pancreatic cancer research?

Research into the causes and treatment of pancreatic cancer is going on in many medical centers around the world.

Genetics and finding cancer early

Scientists are learning more about some of the changes in DNA that cause cells to become cancer. In some families an inherited risk increases the chance that members will have pancreatic cancer.

Researchers have learned that pancreatic cancer does not form suddenly. It develops over many years in a series of steps. In the early steps there are changes in a small number of genes, and the cells of the pancreas look almost normal. In later steps there are changes in more genes and the cells look more abnormal.

This information is being used to develop tests for finding acquired (not inherited) gene changes in pancreatic cancer pre-cancerous conditions

For now, imaging tests like endoscopic ultrasound, ERCP, and genetic tests for changes in certain genes are options for people with a strong family history of pancreatic cancer. But these tests are not helpful for people at normal risk who have no symptoms.

Treatment

The major focus of much research is on finding better treatments for pancreatic cancer.

Surgery

Surgery for pancreatic cancer is often a long and complex operation that can be hard both for the surgeon and the patient. A newer approach is to do the operation through a few small incisions in the belly instead of one large one. This is known as *laparoscopic* or *keyhole* surgery. People often recover from this type of surgery more quickly. But this is still a difficult operation. Surgeons are looking to see how it compares to standard surgery and which patients might be helped the most by it.

Radiation therapy

Some studies are looking at different ways to give radiation to treat pancreatic cancer. One example is intraoperative radiation therapy (IORT), in which a single large dose of radiation is given to the pancreas in the operating room at the time of surgery. Another is a special type of radiation called *proton beam radiation*.

Chemotherapy

Many clinical trials are testing new ways to combine chemo drugs. Other studies are testing the best ways to combine chemo with radiation or other treatments.

Targeted therapies

As researchers have learned more about what makes pancreatic cancer cells different from normal cells, they have developed newer drugs that should be able to attack only the cancer cells. These targeted therapies may prove to be useful along with, or instead of, current treatments. For the most part, they seem to have fewer side effects than the usual chemo drugs.

Growth factor inhibitors: Many types of cancer cells have certain molecules on their surface that help them to grow. These molecules are called *growth factor receptors*. Many drugs that target growth factor receptors are now being studied. One drug, erlotinib (Tarceva), is already approved for use.

Angiogenesis inhibitors: All cancers depend on the growth of new blood vessels (this is called *angiogenesis*) to nourish the cells. New drugs that can block this growth and thus starve the tumor are being studied in clinical trials.

Drugs that target the tumor stroma (supporting tissue): Chemo often does not work well for pancreatic cancer. This is partly because of the dense supportive tissue (stroma) in the tumor, which seems to help protect the cancer cells from the effects of chemo drugs. Researchers are now looking at drugs that attack the stroma to help break it down.

Immune therapy

Immune therapies attempt to boost a person's immune system to attack cancer cells. Some studies have shown promise for treating pancreatic cancer.

Monoclonal antibodies: These immune system proteins are designed to lock onto specific substances on cancer cells. Toxins or radioactive atoms can be attached to these antibodies, which bring them right to the cancer cells. The hope is that the antibodies will damage the cancer cells while leaving normal cells alone. These treatments are only being used in clinical trials at this time.

Cancer vaccines: Several types of vaccines for boosting the body's immune response to pancreatic cancer cells are being tested in clinical trials.

Drugs that target immune system checkpoints: The immune system normally keeps itself from attacking other normal cells in the body by using "checkpoints" – molecules on immune cells that need to be switched on (or off) to start an immune response. Cancer cells sometimes find ways to use these checkpoints to avoid being attacked by the immune system. Newer drugs that target these checkpoints have shown a lot of promise in treating some types of cancer, and are now being studied for pancreatic cancer.

Personalized treatments

Some drugs seem to work better if certain types of gene changes can be found in the patient's tumor. Finding markers that can predict how well a drug will work before it is given is an important area of research in pancreatic and other types of cancer.

More information about pancreatic cancer

American Cancer Society information

Here is more information you might find helpful. You also can order free copies of our documents from our toll-free number, 1-800-227-2345, or read them on our website.

Pancreatic Cancer Detailed Guide (also in Spanish)

Dealing with diagnosis and treatment

Health Professionals Associated With Cancer Care

Talking With Your Doctor (also in Spanish)

After Diagnosis: A Guide for Patients and Families (also in Spanish)

Coping With Cancer in Everyday Life (also in Spanish)

Nutrition for the Person With Cancer During Treatment: A Guide for Patients and Families (also in Spanish)

Living with cancer

Caring for the Patient With Cancer at Home: A Guide for Patients and Families (also in Spanish)

Distress in People With Cancer

Guide to Controlling Cancer Pain (also in Spanish)

Anxiety, Fear, and Depression

Living With Uncertainty: The Fear of Cancer Recurrence

When Your Cancer Comes Back: Cancer Recurrence

Family and caregiver concerns

Talking With Friends and Relatives About Your Cancer (also in Spanish)

Helping Children When A Family Member Has Cancer: Dealing With Diagnosis (also in Spanish)

What It Takes to Be a Caregiver

Insurance and financial issues

In Treatment: Financial Guidance for Cancer Survivors and Their Families (also in Spanish)

Health Insurance and Financial Assistance for the Cancer Patient (also in Spanish)

More on cancer treatments

Understanding Cancer Surgery: A Guide for Patients and Families (also in Spanish)

A Guide to Chemotherapy (also in Spanish)

Understanding Radiation Therapy: A Guide for Patients and Families (also in Spanish)

Targeted Therapy

Clinical Trials: What You Need to Know

Cancer treatment side effects

Nausea and Vomiting

Anemia in People With Cancer

Fatigue in People With Cancer

Peripheral Neuropathy Caused By Chemotherapy

When treatment isn’t working

When Cancer Doesn’t Go Away

Nearing the End of Life

Hospice Care

Your American Cancer Society also has books that you might find helpful. Call us at 1-800-227-2345 or visit our bookstore online at cancer.org/bookstore to find out about costs or to place an order.

National organizations and websites*

Along with the American Cancer Society, other sources of information and support include:

National Cancer Institute
Toll-free number: 1-800-4-CANCER (1-800-422-6237)
Website: www.cancer.gov

> Offers a wide variety of free, accurate, up-to-date information about cancer to patients, their families, and the general public; also can help people find clinical trials in their area

Pancreatic Cancer Action Network, Inc.
Toll-free number: 1-877-272-6226
Website: www.pancan.org

> Has a "Patient and Liaison Services" (PALS) program which offers information about pancreatic cancer, treatment options, diet and nutrition, specialists and clinical trials specific to pancreatic cancer, and more; also has the PALS Survivor and Caregiver Network through which newly-diagnosed people and families are matched with volunteer survivors and caregivers

Confronting Pancreatic Cancer (Pancreatica)
Website: www.pancreatica.org

> For practical, impartial, understandable information about pancreatic cancer; also has a free phone information and counseling line at 1-800-525-3777 and another free phone service that will put you in contact with a fellow survivor at 1-800-433-0464

Hirshberg Foundation for Pancreatic Cancer Research
Phone number: 1-310-473-5121
Website: www.pancreatic.org

> Provides a variety of types of information, resources, and support to pancreatic cancer patients and their families, including referrals for treatment facilities, second opinions, and doctors across the US

The Lustgarten Foundation for Pancreatic Cancer Research
Toll-free number: 1-866-789-1000
Website: www.lustgarten.org

> Offers a free patient handbook called "Understanding Pancreatic Cancer," newsletters, and a free quarterly "Ask an Expert" patient information series which includes updates on topics of interest to those with pancreatic cancer

**Inclusion on this list does not imply endorsement by the American Cancer Society.*

No matter who you are, we can help. Contact us anytime, day or night, for information and support. Call us at **1-800-227-2345.**

Last Medical Review: 8/1/2014
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For additional assistance please contact your American Cancer Society
1-800-227-2345 or www.cancer.org