



Stomach Cancer

What is cancer?

The body is made up of trillions of living cells. Normal body cells grow, divide, and die in an orderly fashion. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries.

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 out-of-control growth of abnormal cells.

Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell.

Cells become cancer cells because of damage to DNA. DNA is in every cell and directs all its actions. In a normal cell, when DNA gets damaged the cell either repairs the damage or the cell dies. In cancer cells, the damaged DNA is not repaired, but the cell doesn't die like it should. Instead, this cell goes on making new cells that the body does not need. These new cells will all have the same damaged DNA as the first cell does.

People can inherit damaged DNA, but most DNA damage is caused by mistakes that happen while the normal cell is reproducing or by something in our environment. Sometimes the cause of the DNA damage is something obvious, like cigarette smoking. But often no clear cause is found.

In most cases the cancer cells form a tumor. Some cancers, like leukemia, rarely form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Cancer cells often travel to other parts of the body, where they begin to grow and form new tumors that replace normal tissue. This process is called metastasis. It happens when the cancer cells get into the bloodstream or lymph vessels of our body.

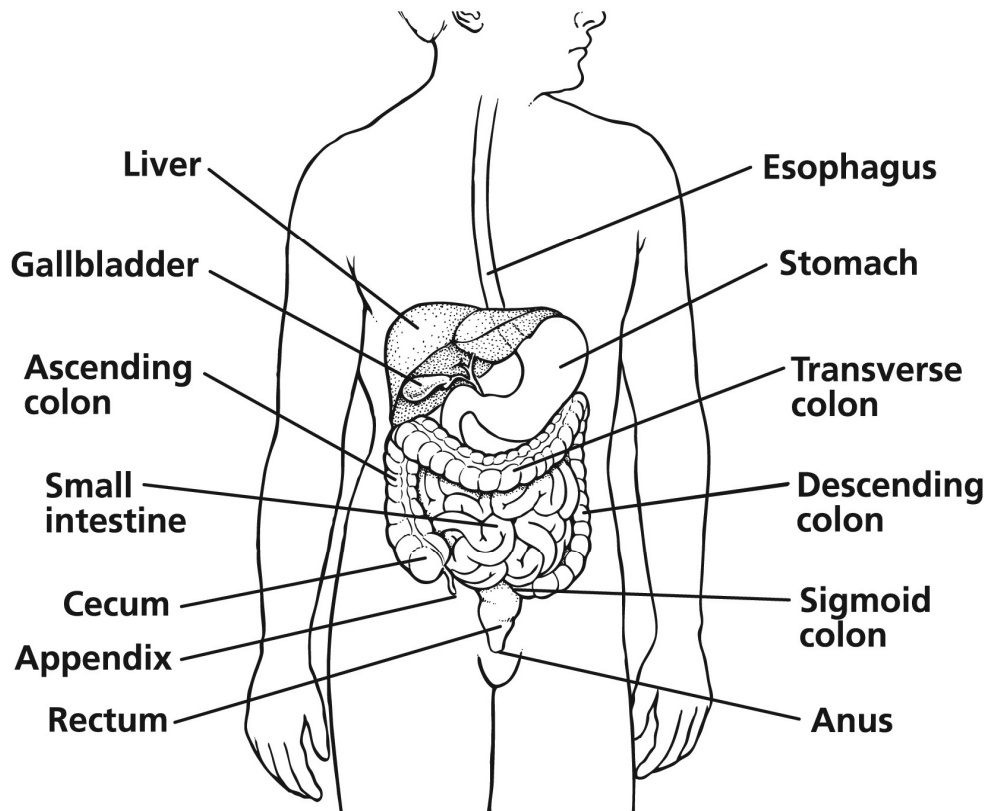
No matter where a cancer may spread, it is always named for the place where it started. For example, breast cancer that has spread to the liver is still called breast cancer, not liver cancer. Likewise, prostate cancer that has spread to the bone is metastatic prostate cancer, not bone cancer.

Different types of cancer can behave very differently. For example, lung cancer and breast cancer are very different diseases. They grow at different rates and respond to different treatments. That is why people with cancer need treatment that is aimed at their particular kind of cancer.

Not all tumors are cancerous. 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 cannot grow into (invade) other tissues. Because they can't invade, they also can't spread to other parts of the body (metastasize). These tumors are almost never life threatening.

What is stomach cancer?

Stomach cancer, also called *gastric cancer*, is a cancer that starts in the stomach.



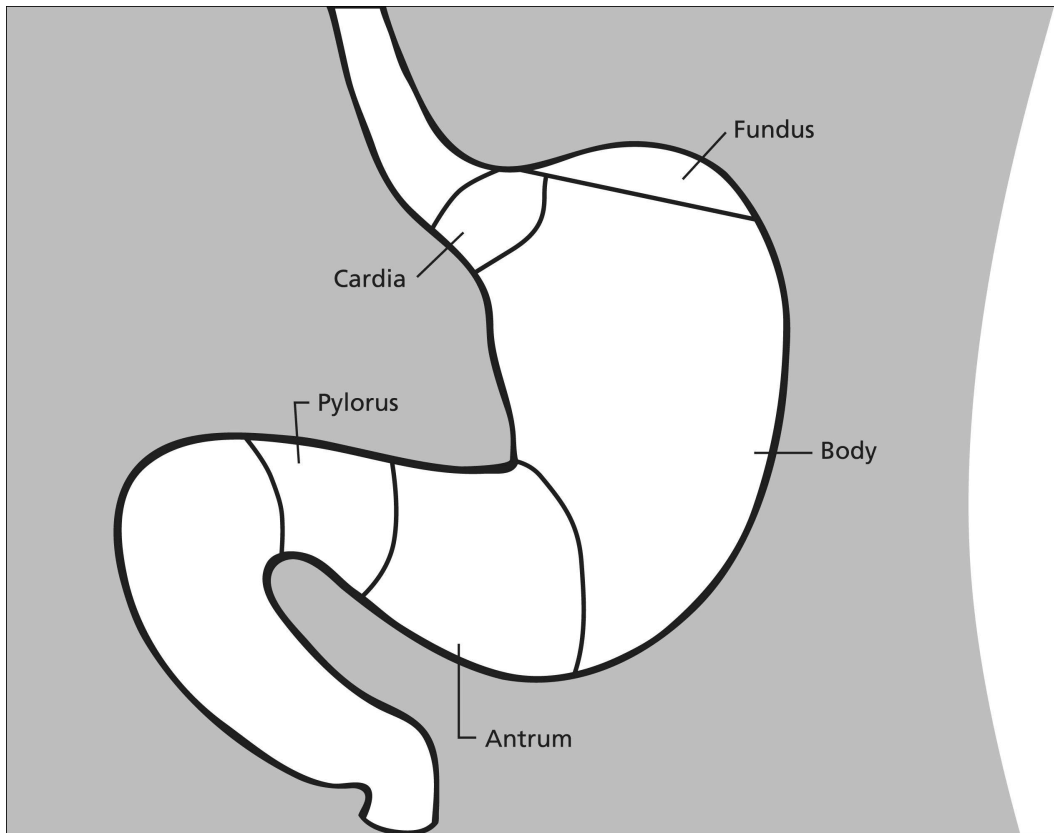
After food is chewed and swallowed, it enters the esophagus, a tube that carries food through the neck and chest to the stomach. The esophagus joins the stomach at the *gastroesophageal junction*, which is located just beneath the diaphragm (the breathing muscle under the lungs). The stomach is a sac-like organ that holds food and starts to digest it by secreting gastric juice. The food and gastric juice are mixed and then emptied into the first part of the small intestine called the *duodenum*.

Some people use the word *stomach* to refer to the area of the body between the chest and the pelvic area. The medical term for this area is the *abdomen*. For instance, some people with pain in this area would say they have a "stomach ache," when in fact the pain could be coming from the appendix, small intestine, colon (large intestine), or other organs in the area. Doctors would refer to this symptom as *abdominal pain*, because the stomach is only one of many organs in the abdomen in which cancers may start.

Stomach cancer should not be confused with other cancers that can occur in the abdomen, like cancer of the colon (large intestine), liver, pancreas, or small intestine because these cancers may have different symptoms, a different outlook, and different treatments.

Parts of the stomach

The stomach has 5 parts:



- **Cardia:** The upper portion (closest to the esophagus)

- **Fundus:** Located next to the cardia. Some cells in these areas of the stomach make acid and pepsin (a digestive enzyme), the parts of the gastric juice that help digest food.
- **Body (corpus):** The area between the upper and lower parts of stomach
- **Antrum:** The lower portion (closest to the intestine), where the food is mixed with gastric juice
- **Pylorus:** Acts as a valve to control emptying of the stomach contents into the small intestine.

The first 3 parts of the stomach (cardia, fundus, and body) are sometimes called the *proximal stomach*, and the lower 2 parts (antrum and pylorus) are called the *distal stomach*.

Cancers starting in different sections of the stomach may cause different symptoms and tend to have different outcomes. The cancer's location can also affect the treatment options. Cancers that start at the gastroesophageal junction are staged and treated the same as cancers of the esophagus. A cancer that started in the cardia of the stomach but then grew into the gastroesophageal junction is also staged and treated like a cancer of the esophagus.

The stomach has 2 curves, which form its upper and lower borders. They are called the *lesser curve* and *greater curve*, respectively. Other organs next to the stomach include the colon, liver, spleen, small intestine, and pancreas.

The stomach wall has 5 layers. As a cancer grows deeper into them, the prognosis (outlook) is not as good. The innermost layer is the *mucosa*. This is where stomach acid and digestive enzymes are made, and where most stomach cancers start. Under this is a supporting layer called the *submucosa*. This is surrounded by the *muscularis propria*, a layer of muscle that moves and mixes the stomach contents. The outer 2 layers, the *subserosa* and the *outermost serosa*, act as wrapping layers for the stomach.

Development of stomach cancer

Stomach cancers tend to develop slowly over many years. Before a true cancer develops, pre-cancerous changes often occur in the lining of the stomach. These early changes rarely cause symptoms and therefore often go undetected.

Stomach cancers can spread (metastasize) in different ways. They can grow through the wall of the stomach and invade nearby organs. They can also spread to the lymph vessels and nearby lymph nodes. Lymph nodes are bean-sized structures that help fight infections. The stomach has a very rich network of lymph vessels and nodes. If cancer spreads to the lymph nodes, the patient's outlook is not as good. As the stomach cancer becomes more advanced, it can travel through the bloodstream and spread to organs such as the liver, lungs, and bones.

Types of stomach cancers

Adenocarcinoma

About 90% to 95% of cancerous (malignant) tumors of the stomach are adenocarcinomas. The term *stomach cancer*, or *gastric cancer*, almost always refers to adenocarcinoma. This cancer develops from the cells that form the innermost lining of the stomach (known as the *mucosa*).

Lymphoma

These are cancers of the immune system tissue that are sometimes found in the wall of the stomach. They account for about 4% of stomach cancers. Prognosis and treatment depend on the type of lymphoma present. For more detailed information, see our document, *Non-Hodgkin Lymphoma*.

Gastrointestinal stromal tumor

These are rare tumors that seem to start in cells in the wall of the stomach called *interstitial cells of Cajal*. Some are non-cancerous (benign); others are cancerous. Although these tumors can be found anywhere in the digestive tract, most (about 60% to 70%) occur in the stomach. For more information, see our document, *Gastrointestinal Stromal Tumor (GIST)*.

Carcinoid tumor

These are tumors that start in hormone-making cells of the stomach. Most of these tumors do not spread to other organs. About 3% of stomach cancers are carcinoid tumors. These tumors are discussed in more detail in our separate document, *Gastrointestinal Carcinoid Tumors*.

The information in the remainder of this document refers only to adenocarcinoma of the stomach.

What are the key statistics about stomach cancer?

The American Cancer Society's most recent estimates for stomach cancer in the United States are for 2012:

- About 21,320 cases of stomach cancer will be diagnosed (13,020 in men and 8,300 in women)
- About 10,540 people will die from this type of cancer (6,190 men and 4,350 women)

This is a disease that mostly affects older people. The average age of people diagnosed is 70. Almost two thirds of people with stomach cancer are 65 or older. The risk of a person developing stomach cancer in their lifetime is about 1 in 114, but it is slightly higher in men than in women.

Stomach cancer is much more common in other parts of the world, particularly in less developed countries. It is a leading cause of cancer-related deaths in the world.

Until the late 1930s, stomach cancer was the leading cause of cancer death in the United States. Now, stomach cancer is well down on this list. The reasons for this decline are not completely known, but may be linked to increased use of refrigeration for food storage. This made fresh fruits and vegetables more available and decreased the use of salted and smoked foods. Some doctors think the decline may also be linked to the frequent use of antibiotics to treat infections. Antibiotics can kill the bacteria called *Helicobacter pylori* (*H pylori*), which may be a major cause of stomach cancer.

For information on survival rates for stomach cancer, see the section, “How is stomach cancer staged?”

What are the risk factors for stomach cancer?

A risk factor is anything that affects your chance of getting a disease such as cancer. Different cancers have different risk factors. Some risk factors, like smoking, can be changed. Others, like a person's age or family history, can't be changed.

But risk factors don't tell us everything. Having a risk factor, or even several risk factors, does not mean that you will get the disease. And many people who get the disease may not have had any known risk factors.

Scientists have found several risk factors that make a person more likely to get stomach cancer. Some of these can be controlled, but others cannot.

Helicobacter pylori infection

Infection with *Helicobacter pylori* (*H pylori*) bacteria seems to be a major cause of stomach cancer, especially cancers in the lower (distal) part of the stomach. Long-term infection of the stomach with this germ may lead to inflammation (chronic atrophic gastritis) and pre-cancerous changes of the inner lining of the stomach. Patients with stomach cancer have a higher rate of *H pylori* infection than people without this cancer. *H pylori* infection is also linked to some types of lymphoma of the stomach. Even so, most people who carry this germ in their stomachs never develop cancer.

Stomach lymphoma

People who have been treated for a certain type of lymphoma of the stomach known as *mucosa-associated lymphoid tissue (MALT) lymphoma* have an increased risk of getting

carcinoma of the stomach. That is probably because MALT lymphoma of the stomach is caused by infection with *H pylori* bacteria.

Gender

Stomach cancer is more common in men than in women.

Aging

There is a sharp increase in stomach cancer after the age of 50. Most people are diagnosed with stomach cancer when they are between their late 60s and 80s.

Ethnicity

In the United States, stomach cancer is more common in Hispanic Americans and African Americans than in non-Hispanic whites. It is most common in Asian/Pacific Islanders.

Geography

Where you live may be important. Stomach cancer is more common in Japan, China, Southern and Eastern Europe, and South and Central America. This disease is less common in Northern and Western Africa, South Central Asia, and North America.

Diet

An increased risk of stomach cancer is seen in people with diets that have large amounts of smoked foods, salted fish and meat, and pickled vegetables. Nitrates and nitrites are substances commonly found in cured meats. They can be converted by certain bacteria, such as *H pylori*, into compounds that have caused stomach cancer in animals.

On the other hand, eating fresh fruits and vegetables that contain antioxidant vitamins (such as A and C) appears to lower the risk of stomach cancer.

Tobacco use

Smoking increases stomach cancer risk, particularly for cancers of the upper portion of the stomach closest to the esophagus. The rate of stomach cancer is about doubled in smokers.

Obesity

Being very overweight or obese is a possible cause of cancers of the cardia (the upper part of the stomach nearest the esophagus), but the strength of this link is not yet clear.

Previous stomach surgery

Stomach cancers are more likely to develop in people who have had part of their stomach removed to treat non-cancerous diseases such as ulcers. This may be because it allows more nitrite-producing bacteria to be present. Also, acid production goes down after ulcer surgery, and there may be reflux (backup) of bile from the small intestine into the stomach. The risk continues to increase for as long as 15 to 20 years after surgery.

Pernicious anemia

Certain cells in the stomach lining normally make a substance called *intrinsic factor (IF)* that we need to absorb vitamin B12 from foods. People without enough IF may end up with a vitamin B12 deficiency, which affects the body's ability to make new red blood cells. This condition is called pernicious anemia. Along with anemia (low red blood cell counts), there is an increased risk of stomach cancer for patients with this disease.

Menetrier disease (hypertrophic gastropathy)

This is a condition in which excess growth of the stomach lining forms large folds in the lining and leads to low levels of stomach acid. Because this disease is very rare, it is not known exactly how much this increases the risk of stomach cancer.

Type A blood

Blood type groups refer to certain substances that are normally present on the surface of red blood cells and some other types of cells. These groups are important in matching blood for transfusions. For unknown reasons, people with type A blood have a higher risk of getting stomach cancer.

Inherited cancer syndromes

Some inherited conditions may raise a person's risk of stomach cancer.

Hereditary diffuse gastric cancer: This is an inherited syndrome that greatly increases the risk of developing stomach cancer. This condition is quite rare, but the lifetime stomach cancer risk among affected people is about 70% to 80%. Women with this syndrome also have an increased risk of getting a certain type of breast cancer. This condition is caused by mutations (defects) in the gene E-cadherin (*CDH1*). Some cancer centers can test for these genetic mutations.

Hereditary non-polyposis colorectal cancer: HNPCC, also known as *Lynch syndrome* is an inherited genetic disorder that causes an increased risk of colon cancer. People with this syndrome have an increased risk of getting stomach cancer as well. In most cases, this disorder is caused by a defect in either the gene *MLH1* or the gene *MSH2*, but at least 5 other genes can cause HNPCC: *MLH3*, *MSH6*, *TGBR2*, *PMS1*, and *PMS2*.

Familial adenomatous polyposis (FAP): In FAP syndrome, patients get many polyps in the colon as well as in the stomach and intestines. People with this syndrome are at greatly increased risk of getting colorectal cancer and have a slightly increased risk of getting stomach cancer. It is caused by mutations in the gene *APC*.

BRCA1 and BRCA2: People who carry mutations of the inherited breast cancer genes *BRCA1* and *BRCA2* may also have a higher rate of stomach cancer.

A family history of stomach cancer

People with several first-degree relatives who have had stomach cancer are more likely to develop this disease. (First-degree relatives include parents, siblings, and children.)

Some types of stomach polyps

Polyps are non-cancerous growths on the lining of the stomach. Most types of polyps (such as hyperplastic polyps or inflammatory polyps) do not seem to increase a person's risk of stomach cancer, but adenomatous polyps -- also called *adenomas* -- can sometimes develop into cancer.

Epstein-Barr virus infection

This virus causes infectious mononucleosis (also called *mono*). Almost all adults have been infected with this virus at some time in their lives, usually as children or adolescents. It has been linked to some forms of lymphoma. Epstein-Barr virus is found in the cancer cells of about 5% to 10% of people with stomach cancer. These people tend to have a slower growing, less aggressive cancer with a lower tendency to spread. It isn't yet clear if this virus actually causes stomach cancer, just that the virus has been found in stomach cancer cells.

Certain occupations

Workers in the coal, metal, and rubber industries seem to have a higher risk of getting stomach cancer.

Immune deficiency

People with common variable immunodeficiency (CVID) have an increased risk of stomach cancer. The immune system of someone with CVID can't make enough antibodies in response to germs. People with CVID have frequent infections as well as other problems, including atrophic gastritis and pernicious anemia. They are also more likely to get gastric lymphoma and stomach cancer.

Do we know what causes stomach cancer?

There are many known risk factors for stomach cancer, but it is not known exactly how these factors cause cells of the stomach lining to become cancerous. This is the subject of ongoing research.

Several changes thought to be pre-cancerous can occur in the stomach lining. One of these is *atrophic gastritis*. In this condition, the normal glands of the stomach are either decreased or absent. There is also some degree of inflammation (the stomach cells are damaged by cells of the immune system). Atrophic gastritis is often due to *H pylori* infection. It is not known exactly why this condition progresses to cancer.

Another possible pre-cancerous change is *intestinal metaplasia*. In this, the normal lining of the stomach is replaced with cells that closely resemble the cells that usually line the intestine. People with this condition usually have chronic atrophic gastritis as well. How and why this change occurs and progresses to stomach cancer is not well understood. This might also be related to *H pylori* infection.

Recent research has provided clues on how some stomach cancers form. For instance, *H pylori* bacteria, particularly certain subtypes, can convert substances in some foods into chemicals that cause mutations (changes) in the DNA of the cells in the stomach lining. This may also explain why certain foods such as preserved meats increase a person's risk for stomach cancer. On the other hand, some of the foods that lower stomach cancer risk contain antioxidants, which can block substances that damage a cell's DNA.

During the past few years, scientists have made a lot of progress in understanding how certain changes in DNA can cause normal stomach cells to grow abnormally and form cancers. DNA is the chemical in each cell that carries our genes — the instructions for how our cells function. We look like our parents because they are the source of our DNA. But DNA affects more than how we look.

Some genes contain instructions for controlling when cells grow and divide. Certain genes that promote cell division are called *oncogenes*. Others that slow down cell division or cause cells to die at the right time are called *tumor suppressor genes*. Cancers can be caused by DNA changes that turn on oncogenes or turn off tumor suppressor genes.

There are also genes that make enzymes to repair the DNA when it develops abnormal changes. If these genes are lost or damaged, it can also lead to some cancers.

Inherited abnormalities of some of these types of genes (as explained in the section “What are the risk factors for stomach cancer?”) can increase a person's stomach cancer risk. But most of the genetic changes that lead to stomach cancer occur after birth. Inherited genetic changes account for only a small percentage of stomach cancers.

Can stomach cancer be prevented?

Even though we do not know the exact cause of stomach cancer, it is still possible to prevent many stomach cancers.

The dramatic decline of stomach cancer in the past several decades is thought to be a result of people reducing many of the known dietary risk factors. This includes greater use of refrigeration for food storage rather than preserving foods by salting, pickling, and smoking. To help reduce their risk, people should avoid diets that are high in smoked and pickled foods and salted meats and fish.

A diet high in fresh fruits and vegetables can also lower stomach cancer risk. Citrus fruits (such as oranges, lemons, and grapefruit) may be especially helpful, but grapefruit and grapefruit juice can cause the blood levels of certain drugs you take to go up, so it's important to discuss this with your health care team before adding grapefruit to your diet. The American Cancer Society recommends that people eat a healthy diet, with an emphasis on plant foods. This includes eating at least 2½ cups of vegetables and fruits every day. Choosing whole-grain breads, pastas, and cereals instead of refined grains, and eating fish, poultry, or beans instead of processed meat and red meat may also help lower your risk of cancer.

Studies that have looked at using dietary supplements to lower stomach cancer risk have had mixed results so far. There is some evidence that combinations of antioxidant supplements (vitamins A, C, and E and the mineral selenium) may reduce the risk of stomach cancer in people with poor nutrition to begin with. But most studies looking at people who have good nutrition have not found any benefit to adding vitamin pills to their diet. Further research in this area is needed.

Although some small studies suggested that drinking tea, particularly green tea, may help protect against stomach cancer, most large studies have not found such a link.

Obesity may add to the risk of stomach cancer. The American Cancer Society recommends maintaining a healthy weight throughout life by balancing calorie intake with physical activity. Aside from possible effects on the risk of stomach cancer, losing weight may also have an effect on the risk of several other cancers and health problems related to obesity.

Tobacco use can increase the risk of cancers of the proximal stomach (the portion of the stomach closest to the esophagus). Tobacco use increases the risk for many types of cancer and is responsible for about one third of all cancer deaths in the United States. If you don't use tobacco, please don't start. If you already do and want help quitting, call your health care professional or the American Cancer Society.

It is not yet clear whether antibiotic treatment should be given to people whose stomach linings are chronically infected with the bacteria *H pylori* but who do not have any symptoms. This is a topic of current research. Some early studies have suggested that giving antibiotics to people with *H pylori* infection may lower the number of pre-cancerous lesions in the stomach and may reduce the risk of developing stomach cancer.

But not all studies have found this. More research is needed to be sure that this is a way to prevent stomach cancer in people with *H pylori* infection.

If your doctor thinks you might have *H pylori* infection, there are several ways of testing for this:

- The simplest way is a blood test that looks for antibodies to *H pylori*. Antibodies are proteins the body's immune system makes in response to an infection. A positive *H pylori* antibody test can mean either that an infection is present, or that there was an infection in the past that is now cleared.
- Another approach is to use endoscopy (see the section “How is stomach cancer diagnosed?”) to take a biopsy of the stomach lining. This sample can be used for chemical tests for this kind of bacteria. Doctors can also identify *H pylori* in biopsy samples viewed under a microscope. The biopsy sample can also be *cultured* (placed in a substance that promotes growth of *H pylori*).
- There is also a special breath test for the bacteria. First you drink a liquid containing urea. If *H pylori* is present, it will chemically change the urea. A sample of your breath is then tested to detect these chemical changes.

Using aspirin or other non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen or naproxen, seems to lower the risk of stomach cancer by at least 25%. These medicines can also lower the risk of developing colon polyps and colon cancer. But they can also cause serious (and even life-threatening) internal bleeding and other potential health risks in some people. Most doctors consider any reduced cancer risk an added benefit for patients who take these drugs for other reasons, such as to treat arthritis. But they do not routinely recommend NSAIDs specifically to prevent stomach cancer. Studies have not yet determined for which patients the benefits of lowering cancer risk would outweigh the risks of bleeding complications.

Avoiding risk factors when possible can lower a person's stomach cancer risk, but it cannot guarantee protection from this disease. Early detection may be the best way to improve the chance of successful treatment and reduce the number of deaths caused by the disease, particularly in countries where stomach cancer is common.

Only a small percentage of stomach cancers are caused by *hereditary diffuse gastric cancer syndrome*. It is very important to recognize it, however, because most people who inherit this condition eventually get stomach cancer, people with a strong family history of stomach cancer should find out if they might have it. If their family history suggests that they do, they can get genetic testing. If the result shows an abnormal form of the E-cadherin/CHD1 gene, many doctors will recommend they have their stomach removed before the cancer develops.

Can stomach cancer be found early?

Screening is the search for disease, such as cancer, in people without symptoms. In countries such as Japan, where stomach cancer is very common, mass screening of the population has helped find many cases at an early, curable stage. This may have reduced

the number of people who die of this disease, but the studies were not designed to prove this.

Studies in the United States have not found mass screening for stomach cancer useful because this disease is not that common. On the other hand, people with certain stomach cancer risk factors may benefit from screening. If you have any questions about your stomach cancer risk or about the benefits of screening, please ask your doctor. Some of the tests that could be used for screening, such as upper endoscopy, are described in the section “How is stomach cancer diagnosed?”

Because mass screening for stomach cancer is not done in the United States, most people with this disease are not diagnosed until they have certain signs and symptoms that point to the need for medical tests.

How is stomach cancer diagnosed?

Signs and symptoms of stomach cancer

Unfortunately, early-stage stomach cancer rarely causes symptoms. This is one of the reasons stomach cancer is so hard to detect early. The signs and symptoms of stomach cancer can include:

- Poor appetite
- Weight loss (without dieting)
- Abdominal (belly) pain
- Vague discomfort in the abdomen, usually above the navel
- A sense of fullness in the upper abdomen after eating a small meal
- Heartburn, indigestion, or ulcer-type symptoms
- Nausea
- Vomiting, with or without blood
- Swelling or fluid build-up in the abdomen

Most of these symptoms are more likely to be caused by things other than cancer, such as a stomach virus. They may also occur with other types of cancer. But people who have any of these problems, especially if they don't go away or get worse, should check with their doctor so the cause can be found and treated.

Since symptoms of stomach cancer often do not appear until the disease is advanced, only about 1 in 5 stomach cancers in the United States is found at an early stage, before it has spread to other areas of the body.

Medical history and physical exam

When taking your medical history, the doctor will ask you questions about risk factors and symptoms to see if they might suggest stomach cancer or another cause. The doctor may also want to know about your general health in case you need surgery.

A physical exam provides information about your general health, possible signs of stomach cancer, and other health problems. In particular, the doctor will feel your abdomen for any abnormal changes.

Upper endoscopy

Upper endoscopy (also called *esophagogastroduodenoscopy* or *EGD*) is the main test used to find stomach cancer. It may be used when someone has certain risk factors or when signs and symptoms suggest this disease may be present.

During this test, you are sedated (made sleepy). The doctor passes a thin, flexible, lighted tube called an *endoscope* down your throat. This lets the doctor see the lining of your esophagus, stomach, and first part of the small intestine. If abnormal areas are noted, *biopsies* (tissue samples) can be taken using instruments passed through the endoscope. The tissue samples are looked at under a microscope to see if cancer is present.

When seen through an endoscope, stomach cancer can look like an ulcer, a mushroom-shaped or protruding mass, or a flat, thickened area of mucosa known as *linitis plastica*.

Endoscopy can also be used as part of a special imaging test known as *endoscopic ultrasound*, which is described below.

Biopsy

Your doctor may suspect cancer if an abnormal-looking area is seen on endoscopy or an imaging test, but the only way to tell for sure if it is really cancer is by doing a biopsy. During a biopsy, the doctor removes a sample of the abnormal area. This sample is sent to a lab to be looked at under a microscope. Biopsies for stomach cancer are most often obtained during endoscopy. They may also be taken from areas of possible cancer spread.

The biopsy sample is checked to see if it contains cancer, and if it does, what kind it is (for example, adenocarcinoma or lymphoma). If it contains adenocarcinoma, it may be tested to see if it has too much of a growth-promoting protein called HER2/neu (often just shortened to HER2). The HER2/neu gene instructs the cells to make this protein. Tumors with increased levels of HER2/neu are called *HER2-positive*.

Cancers that are HER2-positive have too many copies of the HER2/neu gene in the cells, resulting in greater than normal amounts of the HER2/neu protein. Stomach cancers that are HER2-positive can be treated with a drug that targets the HER2/neu protein, called trastuzumab (Herceptin®). See the section, "How is stomach cancer treated?" for more information on this drug.

The biopsy sample may be tested in 2 different ways:

- Immunohistochemistry (IHC): In this test, special antibodies that identify the HER2/neu protein are applied to the sample, which cause cells to change color if many copies are present. This color change can be seen under a microscope. The test results are reported as 0, 1+, 2+, or 3+.
- Fluorescent in situ hybridization (FISH): This test uses fluorescent pieces of DNA that specifically stick to copies of the HER2/neu gene in cells, which can then be counted under a special microscope.

Often the IHC test is used first. If the results are 1+ (or 0), the cancer is considered HER2-negative. People with HER2-negative tumors are not treated with drugs (like trastuzumab) that target HER2. If the test comes back 3+, the cancer is HER2-positive. Patients with HER2-positive tumors may be treated with drugs like trastuzumab. When the result is 2+, the HER2 status of the tumor is not clear. This often leads to testing the tumor with FISH.

Imaging tests

Imaging tests use x-rays, magnetic fields, sound waves, or radioactive substances to create pictures of the inside of your body. Imaging tests may be done for a number of reasons, including to help find out whether a suspicious area might be cancerous, to learn how far cancer may have spread, and to help determine if treatment has been effective.

Upper gastrointestinal (GI) series

This is an x-ray test to look at the esophagus, stomach, and first part of the small intestine. For this test, the patient drinks a white chalky solution containing a substance called *barium*. The barium coats the lining of the esophagus, stomach, and small intestine. Because x-rays can't pass through the coating of barium, this will outline any abnormalities of the lining of these organs. Several x-ray pictures are then taken.

A "double contrast" technique may be used to look for early stomach cancer. With this technique, after the barium solution is swallowed, a thin tube is passed into the stomach and air is pumped in. This makes the barium coating very thin, so even small abnormalities will show up. This test is not used as often as endoscopy to look for stomach cancer.

Endoscopic ultrasound

Ultrasound uses sound waves to produce images of organs such as the stomach. During a standard ultrasound, a transducer, which is a wand-shaped probe, is placed on the skin. It emits sound waves and detects the echoes as they bounce off internal organs. The pattern of echoes is processed by a computer to produce a black and white image on a screen. Although this type of ultrasound is useful sometimes, the picture quality is limited because of the distance the sound waves and echoes have to travel and the layers of body tissue they have to go through.

In endoscopic ultrasound (EUS), a small transducer is placed on the tip of an endoscope. The endoscope is passed down the throat and into the stomach. This allows the ultrasound transducer to rest directly on the wall of the stomach where the cancer is. It lets the doctor look at the layers of the stomach wall, as well as the nearby lymph nodes and other structures. The picture quality is better than a standard ultrasound because of the shorter distance the sound waves have to travel.

EUS is most useful in seeing how far a cancer may have spread into the wall of the stomach, to nearby tissues, and to nearby lymph nodes. It can also be used to help guide a needle into a suspicious area to get a tissue sample (this is called *EUS-guided needle biopsy*).

Computed tomography (CT or CAT) scan

The CT scan is an x-ray test that produces detailed cross-sectional images of your body. Instead of taking one picture, like a standard x-ray, a CT scanner takes many pictures as it rotates around you. A computer then combines these pictures into images of slices of the part of your body being studied.

Before the CT scan, you may be asked to drink 1 or 2 pints of a contrast solution and/or receive an intravenous (IV) line through which a contrast dye is injected. This helps better outline structures in your body.

The IV contrast can cause some flushing (redness and warm feeling). Some people are allergic 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.

CT scans take longer than regular x-rays. You need to lie still on a table while they are being done. During the test, the table moves in and out of the scanner, a ring-shaped machine that completely surrounds the table. You might feel a bit confined by the ring you have to lay in when the pictures are being taken.

CT scans show the stomach fairly clearly and often can confirm the location of the cancer. CT scans can also show the organs near the stomach, such as the liver, as well as lymph nodes and distant organs where cancer might have spread. The CT scan can help determine the extent (stage) of the cancer and whether surgery may be a good treatment option.

CT-guided needle biopsy: CT scans can also be used to guide a biopsy needle into a suspected area of cancer spread. The patient remains on the CT scanning table while a doctor moves a biopsy needle through the skin toward the mass. CT scans are repeated until the needle is within the mass. A fine-needle biopsy sample (tiny fragment of tissue) or a core-needle biopsy sample (a thin cylinder of tissue about ½-inch long and less than 1/8-inch in diameter) is then removed and looked at under a microscope.

Magnetic resonance imaging (MRI) scan

MRI scans use radio waves and strong magnets instead of x-rays. The energy from the radio waves is absorbed by the body and then released in a pattern formed by the type of body tissue and by certain diseases. A computer translates the pattern into a very detailed image of parts of the body. A contrast material might be injected just as with CT scans, but this is used less often.

Most doctors prefer to use CT scans to look at the stomach. But an MRI may sometimes provide more information. MRIs are often used to look at the brain and spinal cord.

MRI scans take longer than CT scans, often up to an hour. You may have to lie inside a narrow tube, which is confining and can upset people with a fear of enclosed spaces. Special, "open" MRI machines can help with this if needed. The MRI machine makes loud buzzing noises that you may find disturbing. Some places provide headphones to block this noise out.

Positron emission tomography (PET) scan

In this test, radioactive glucose (a type of sugar) is injected into the patient's vein. Because cancer cells are growing faster than normal cells, they use sugar much faster, so they take up the radioactive material. After about an hour, a special camera is used to create a picture of areas of radioactivity in the body.

PET is sometimes useful if your doctor thinks the cancer might have spread but doesn't know where. The picture is not finely detailed like a CT or MRI scan, but it provides helpful information about the whole body. This test can be useful for spotting cancer that has spread beyond the stomach and wouldn't be treatable by surgery.

Some machines can do both a PET and CT scan at the same time (PET/CT scan). This lets the radiologist compare areas of higher radioactivity on the PET with the appearance of that area on the CT.

PET scans and PET/CT are not routinely done when gastric cancer is diagnosed, but they can be helpful in some cases. For example, they may help show if the cancer has spread beyond the stomach to other parts of the body, in which case surgery might not be a good treatment. Ask your doctor if the results of this test could potentially change your treatment plan.

Chest x-ray

This test can help find out if the cancer has spread to the lungs. It might also determine if there are any serious lung or heart diseases present.

Other tests

Laparoscopy

This test is usually done only after stomach cancer has already been found. Although CT or MRI scans can create detailed pictures of the inside of the body, they can miss some tumors, especially if they are very small. Doctors often do a laparoscopy before any other surgery to help confirm a stomach cancer is still only in the stomach and can be removed completely with surgery.

A laparoscope (a thin, flexible tube) is inserted through a small surgical opening in the patient's side. The laparoscope has a small camera on its end, which sends pictures of the inside of the abdomen to a TV screen. Doctors can look closely at the surfaces of the organs and nearby lymph nodes, or even take small samples of tissue to make sure the cancer hasn't spread and that all the cancer can be removed. Sometimes laparoscopy is combined with ultrasound to give a better picture of the cancer.

Lab tests

When looking for signs of stomach cancer, a doctor may order a blood test called a complete blood count (CBC) to look for anemia (which could be caused by internal bleeding). A fecal occult blood test may be done to look for blood in stool (feces).

The doctor may recommend other tests if cancer is found, especially if you are going to have surgery. For instance, blood tests can be done to make sure your liver and kidney functions are normal. If surgery is planned or you are going to get medicines that may affect the heart, you may also have an electrocardiogram (EKG) and echocardiogram to make sure your heart is functioning well.

How is stomach cancer staged?

Staging is the process of finding out how far a cancer has spread. The extent of spread of stomach cancer is an important factor in choosing treatment options and predicting a patient's outlook (prognosis). The tests described in the section "How is stomach cancer diagnosed?" are the ones used to determine the stage of the cancer.

The stage of a cancer does not change over time, even if the cancer progresses. A cancer that comes back or spreads is still referred to by the stage it was given when it was first found and diagnosed, only information about the current extent of the cancer is added. A person keeps the same diagnosis stage, but more information is added to explain the current disease status.

The stage of a stomach cancer can be based either on the results of physical exams, biopsies, and imaging tests (called the *clinical stage*), or on the results of these tests plus the results of surgery (called the *pathologic stage*). The staging described here is the pathologic stage, which includes the findings from the tissues removed during surgery.

Pathologic staging is likely to be more accurate than clinical staging, as it allows the doctor to get a firsthand impression of the extent of the cancer.

A staging system is a way for members of the cancer care team to describe the extent of a cancer's spread. The system most often used to stage stomach cancer in the United States is the American Joint Commission on Cancer (AJCC) TNM system. The TNM system for staging contains 3 key pieces of information:

- **T** describes the extent of the primary **tumor** (how far it has grown into the wall of the stomach and into nearby organs).
- **N** describes the spread to nearby (regional) lymph **nodes**.
- **M** indicates whether the cancer has **metastasized** (spread) to other organs of the body. (The most common sites of distant spread of stomach cancer are the liver, the peritoneum (the lining of the space around the digestive organs), and distant lymph nodes. Less common sites of spread include the lungs and brain.)

Numbers or letters appear after T, N, and M to provide more details about each of these factors:

- The numbers 0 through 4 indicate increasing severity.
- The letter X means "cannot be assessed" because the information is not available.
- The letters "is" mean "carcinoma in situ," which means the tumor is contained within the top layer of mucosa cells and has not yet invaded deeper layers of tissue.

This system is for staging all stomach cancers except those either starting in the gastroesophageal junction (where the stomach and the esophagus meet) or starting in the cardia (the first part of the stomach) and growing into the gastroesophageal junction. Those cancers are staged (and often treated) like cancers of the esophagus.

T categories of stomach cancer

The T category describes how far down through the stomach's 5 layers the cancer has invaded. The innermost layer is the *mucosa*. This is where stomach acid and digestive enzymes are made. The mucosa has 3 parts: epithelial cells, which lie on top of a layer of connective tissue (the *lamina propria*), which is on top of a thin layer of muscle (the *muscularis mucosa*). Under the mucosa is a supporting layer called the *submucosa*. This is surrounded by the *muscularis*, a layer of muscle that moves and mixes the stomach contents. The next 2 layers, the *subserosa* and the *outermost serosa*, act as wrapping layers for the stomach.

TX: The main tumor cannot be assessed.

T0: No signs of a main tumor can be found.

Tis: Cancer cells are only in the top layer of cells of the mucosa (innermost layer of the stomach) and have not grown into deeper layers of tissue such as the lamina propria or muscularis mucosa. This stage is also known as carcinoma in situ.

T1: The tumor has grown from the top layer of cells of the mucosa into the next layers below such as the connective tissue (lamina propria), the muscularis mucosa, or submucosa.

- **T1a:** The tumor is growing into the lamina propria or muscularis mucosa.
- **T1b:** The tumor has grown through the lamina propria and muscularis mucosa and into the submucosa.

T2: The tumor is growing into the muscularis propria layer.

T3: The tumor is growing into the subserosa layer.

T4: The tumor has grown through the stomach wall and into the serosa and may be growing into a nearby organ (spleen, intestines, pancreas, kidney, etc.) or other structures such as major blood vessels.

- **T4a:** The tumor has grown through the stomach wall into the serosa (the outer covering of the stomach), but the cancer hasn't grown into any of the nearby organs or structures.
- **T4b:** The tumor has grown through the stomach wall and into nearby organs or structures.

N categories of stomach cancer

NX: Regional lymph nodes cannot be assessed.

N0: No spread to nearby (regional) lymph nodes.

N1: The cancer has spread to a few (1 to 2) nearby lymph nodes.

N2: The cancer has spread to some (3 to 6) nearby lymph nodes.

N3: The cancer has spread to many (more than 7) nearby lymph nodes.

- **N3a:** The cancer has spread to 7 to 15 nearby lymph nodes.
- **N3b:** The cancer has spread to 16 or more nearby lymph nodes.

M categories of stomach cancer

M0: No distant metastasis (the cancer has not spread to distant organs or sites, such as the lungs or brain).

M1: Distant metastasis (spread of the cancer to organs or lymph nodes far away from the stomach).

TNM Stage Grouping

The T, N, and M categories are combined and expressed as a stage, using the number 0 (zero) and the Roman numerals I through IV. This is known as stage grouping. Some stages are split into substages, indicated by letters.

Stage 0: Tis, N0, M0

This is cancer in its earliest stage. It has not grown beyond the inner layer of cells that line the stomach. The cancer has not spread to any lymph nodes (N0) or anywhere else (M0). This stage is also known as carcinoma in situ.

Stage IA: T1, N0, M0

The cancer has grown beneath the top layer of cells in the mucosa into tissue below, such as the connective tissue (lamina propria), the thin muscle layer (muscularis mucosa), or the submucosa (T1). But it has not grown into the main muscle layer of the stomach, called the muscularis propria. The cancer has not spread to any lymph nodes (N0) or anywhere else (M0).

Stage IB: Any of the following:

T1, N1, M0: Just as in stage IA, the cancer has grown into the layer of connective tissue (lamina propria), and may have grown into the thin layer of muscle beneath it (muscularis mucosa) or deeper into the submucosa (T1). It has not grown into the muscularis propria, the main muscle layer of the stomach. Cancer has also spread to 1 or 2 lymph nodes near the stomach (N1), but not to any other tissues or organs (M0).

OR

T2, N0, M0: The cancer has grown into the main muscle layer of the stomach wall, called the muscularis propria (T2). It has not spread to nearby lymph nodes (N0) or to any other tissues or organs (M0).

Stage IIA: Any of the following:

T1, N2, M0: The cancer has grown beneath the top layer of cells of the mucosa into the layer of connective tissue (lamina propria), thin muscle layer (muscularis mucosa), or the submucosa (T1). It has not grown into the main muscle layer, but it has spread to between 3 and 6 lymph nodes near the stomach (N2). It has not spread to distant sites (M0).

OR

T2, N1, M0: The cancer has grown into the main muscle layer of the stomach called the muscularis propria (T2). It has spread to 1 or 2 nearby lymph nodes (N1), but has not spread to distant sites (M0).

OR

T3, N0, M0: The cancer has grown through the main muscle layer into the subserosa, but has not grown through all the layers to the outside the stomach (T3). It has not spread to any nearby lymph nodes (N0) or to tissues or organs outside of the stomach (M0).

Stage IIB: Any of the following:

T1, N3, M0: The cancer has grown beneath the top layer of cells of the mucosa into the layer of connective tissue (lamina propria), the thin muscle layer, or the submucosa (T1). It has not grown into the main muscle layer, but it has spread to 7 or more lymph nodes near the stomach (N3). It has not spread to tissues or organs outside the stomach (M0).

OR

T2, N2, M0: The cancer has grown into the main muscle layer (T2). It has spread to between 3 and 6 lymph nodes near the stomach (N2), but it has not spread to any tissues or organs outside the stomach (M0).

OR

T3, N1, M0: The cancer has grown into the subserosa layer, but not completely through all the layers to the outside of the stomach (T3). It has spread to 1 or 2 nearby lymph nodes (N1), but has not spread to tissues or organs outside the stomach (M0).

OR

T4a, N0, M0: The cancer has grown completely through all the layers of stomach wall into the outer covering of the stomach (the serosa), but has not started growing into other nearby organs or tissues, such as the spleen, intestines, kidneys, or pancreas (T4a). It has not spread to any nearby lymph nodes (N0) or distant sites (M0).

Stage IIIA: Any of the following:

T2, N3, M0: The cancer has grown into the main muscle layer (T2). It has spread to 7 or more lymph nodes near the stomach (N3), but has not spread to tissues or organs outside the stomach (M0).

OR

T3, N2, M0: The cancer has grown into the subserosa layer, but not completely through all the layers to the outside of the stomach (T3). It has spread to between 3 and 6 nearby lymph nodes (N2), but has not spread to tissues or organs outside the stomach (M0).

OR

T4a, N1, M0: The cancer has grown completely through all the layers of the stomach wall into the outer covering of the stomach (the serosa), but has not started growing into nearby organs or tissues (T4a). It has spread to 1 or 2 nearby lymph nodes (N1), but has not spread to distant sites (M0).

Stage IIIB: Any of the following:

T3, N3, M0: The cancer has grown into the subserosa layer, but not completely through all the layers to the outside of the stomach (T3). It has spread to 7 or more nearby lymph nodes (N2), but has not spread to distant sites (M0).

OR

T4a, N2, M0: The cancer has grown completely through all the layers of the stomach wall into the serosa (the outer covering of the stomach), but has not started growing into nearby organs or tissues (T4a). It has spread to 3 to 6 nearby lymph nodes (N2), but has not spread to distant sites (M0).

OR

T4b, N0 or N1, M0: The cancer has grown through the stomach wall and into nearby organs or structures (such as the spleen, intestines, liver, pancreas, or major blood vessels) (T4b). It may also have spread to up to 2 nearby lymph nodes (N0 or N1). It has not spread to distant sites (M0).

Stage IIIC: Any of the following:

T4a, N3, M0: The cancer has grown completely through all the layers of the stomach wall into the serosa, but has not started growing into nearby organs or tissues (T4a). It has spread to 7 or more nearby lymph nodes (N3), but has not spread to distant sites (M0).

OR

T4b, N2 or N3, M0: The cancer has grown through the stomach wall and into nearby organs or structures (such as the spleen, intestines, liver, pancreas, or major blood vessels) (T4b). It has spread to 3 or more nearby lymph nodes (N2 or N3). It has not spread to distant sites (M0).

Stage IV: Any T, any N, M1:

The cancer has spread to distant organs such as the liver, lungs, brain, or bones (M1).

If you have any questions about the stage of your disease, ask your doctor to explain this to you. The stage of a stomach cancer is an important factor, but it is not the only factor in considering treatment options and in predicting outlook for survival.

Resectable vs. unresectable cancer

Resectable cancers are those the doctor believes can be completely removed during surgery. Unresectable cancers can't be removed completely. This might be because the tumor has grown too far into nearby organs or lymph nodes, it has grown too close to major blood vessels, or it has spread to distant parts of the body. There is no distinct dividing line between resectable and unresectable in terms of the TNM stage of the cancer, but earlier stage cancers are more likely to be resectable.

5-year survival statistics by stage

Survival rates are often used by doctors as a standard way of discussing a person's prognosis (outlook). Some patients with cancer may want to know the survival statistics for people in similar situations, while others may not find the numbers helpful, or may even not want to know them. If you do not want to read about the survival statistics for stomach cancer, stop reading here and skip to the next section.

The 5-year survival rate refers to the percentage of patients who live at least 5 years after their cancer is diagnosed. Of course, many people live much longer than 5 years (and many are cured).

To get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. Improvements in treatment since then may result in a more favorable outlook for people now being diagnosed with stomach cancer.

Survival rates are often based on previous outcomes of large numbers of people who had the disease, but they cannot predict what will happen in any particular person's case. Many other factors may affect a person's outlook, such as their general health, the location of the cancer in the stomach, and how well the cancer responds to treatment. Your doctor can tell you how these survival rates may apply to you.

The survival rates that follow come from the National Cancer Institute's SEER database. They are based on people diagnosed with stomach cancer and treated with surgery between 1991 and 2000. Survival for patients not treated with surgery is likely to be poorer.

The 5-year survival rates for stomach cancer, by stage are as follows:

Stage IA	71%
Stage IB	57%
Stage IIA	45%
Stage IIB	33%
Stage IIIA	20%
Stage IIIB	14%
Stage IIIC	9%
Stage IV	4%

The overall 5-year *relative* survival rate of all people with stomach cancer in the United States is about 28%. The *5-year relative survival rate* compares the observed survival of people with stomach cancer to that expected for people without stomach cancer. Since

some people may die from other causes, this is a better way to see the impact of cancer on survival.

This survival rate has improved gradually over the last 30 years. One reason the survival rate is so poor is that most stomach cancers in the United States are diagnosed at an advanced rather than an early stage. The stage of the cancer has a major effect on a patient's prognosis (outlook for survival).

How is stomach 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.

General treatment information

No matter what stage of stomach cancer you have, treatment is available. The choice of treatment you receive depends on many factors. The location and the stage (extent of spread) of the tumor are very important. In choosing your treatment plan, you and your cancer care team will also take your age, general state of health, and personal preferences into account.

The main treatments for stomach cancer are surgery, chemotherapy, and radiation therapy. Often the best approach uses 2 or more of these treatment methods.

It is important that you understand the goal of your treatment — whether it is to cure your cancer or to relieve symptoms — before starting treatment. If the goal of your treatment is a cure, you will also receive treatment to relieve symptoms and side effects. If a cure is not possible, treatment is aimed at relieving symptoms, such as trouble eating, pain, or bleeding.

It is also important to have a team of doctors with different specialties involved in your care before plans for treating your stomach cancer are made. Most likely, a surgeon, medical oncologist, and possibly a radiation oncologist will collaborate on a treatment plan before the start of your treatment.

Surgery for stomach cancer

Surgery is the main treatment for stomach cancer. It offers the only realistic chance for cure, at this time. Surgery may be used to remove the cancer and part or all of the stomach and some nearby lymph nodes, depending on the type and stage of stomach

cancer. The surgeon will try to leave behind as much normal stomach as possible. Sometimes other organs need to be removed, as well.

Surgery is part of the treatment for many different stages of stomach cancer. If a patient has a stage 0, I, II, or III cancer and is healthy enough, an attempt will be made to treat the cancer with surgery.

Even when the cancer is too widespread to be removed completely, patients may be helped by surgery because it may help prevent bleeding from the tumor or prevent the stomach from being blocked by tumor growth. This type of surgery is called *palliative surgery*, meaning that it relieves or prevents symptoms but it is not expected to cure the cancer.

The type of operation usually depends on what part of the stomach is involved and how much cancer is in the surrounding tissue. Three kinds of surgery can be used to treat stomach cancer:

Endoscopic mucosal resection

In this procedure, the cancer is removed through an endoscope (a long, flexible tube passed down the throat and into the stomach). This procedure is only done for some very early stage cancers, where the chance of spread to the lymph nodes is very low.

Subtotal gastrectomy

This operation is often recommended if the cancer is only in the lower part of the stomach. It is also sometimes used for cancers that are only in the upper part of the stomach. Only part of the stomach is removed, sometimes along with part of the esophagus or the first part of the small intestine (the duodenum). Nearby lymph nodes are also removed. The remaining section of stomach is then reattached. Eating is much easier if only part of the stomach is removed instead of the entire stomach.

Total gastrectomy

This operation is done if the cancer has spread throughout the stomach. It is also often advised if the cancer is in the upper part of the stomach, near the esophagus. It totally removes the stomach and nearby lymph nodes, and may include removal of the spleen and parts of the esophagus, intestines, pancreas, and other nearby organs.

If you have a total gastrectomy, the surgeon will make a new "stomach" out of intestinal tissue. Usually the end of the esophagus is attached to part of the small intestine, and some extra intestine is also attached. This can make room for food to be stored before moving down the intestinal tract, and will allow you to eat some food before getting filled up. But people who have a total gastrectomy can only eat a small amount of food at a time. Because of this, they must eat more often.

Placement of a feeding tube

Some patients have trouble taking in enough nutrition after surgery for stomach cancer. Further treatment, like chemotherapy with radiation can make this problem worse. To help with this, a tube can be placed into the intestine at the time of gastrectomy. This, called a *jejunostomy*, allows liquid nutrition to go directly into the intestine and can help prevent and treat malnutrition.

Lymph node removal

In either a subtotal or total gastrectomy, the nearby lymph nodes and some of the omentum are usually removed. The omentum is an apron-like layer of fatty tissue that covers the stomach and intestines.

Lymph node removal is a very important part of the operation. Many doctors feel that the success of the surgery is directly related to how many lymph nodes the surgeon removes. In the United States, it is recommended that a gastrectomy be accompanied by nearby lymph node removal (called a *D1 lymphadenectomy*) with the goal of removing at least 15 nodes. Surgeons in Japan have had very high success rates by doing a more extensive removal of the lymph nodes near the cancer (called a *D2 lymphadenectomy*). Surgeons in Europe and the United States have not been able to equal the results of the Japanese surgeons. It is not clear if this is because Japanese surgeons are more experienced (stomach cancer is much more common in their country), because Japanese patients have earlier stage disease (because they screen for stomach cancer) and are healthier, or if other factors play a role.

In any event, it takes a skilled surgeon who is experienced in stomach cancer surgery to remove all the lymph nodes successfully. Ask your surgeon about his or her experience in operating on stomach cancer patients. Studies have shown that the results are better when both the surgeon and the hospital have had extensive experience in treating patients with stomach cancer.

Possible complications and side effects of surgery

Surgery for stomach cancer is difficult, and complications can occur. These can include bleeding from the surgery, blood clots, and damage to nearby organs during the operation. Rarely, the new connections made between the ends of the stomach or esophagus and small intestine may leak.

Surgical techniques have improved in recent years, so only about 1% to 2% of people die from surgery for stomach cancer. This number is higher (as high as 5% to 15%) when the operation is more extensive, such as when all the lymph nodes are removed, but lower in the hands of highly skilled surgeons.

You may develop other side effects after you have recovered from surgery. These can include frequent heartburn, abdominal pain (particularly after eating), and vitamin deficiencies. The stomach helps the body absorb some vitamins. If certain parts of the stomach are removed, doctors routinely prescribe vitamin supplements, some of which

can only be injected. Changes in your diet will often be needed after a partial or total gastrectomy. The biggest change is that you will need to eat smaller, more frequent meals.

Because of these problems, ask your surgeon how much surgery he or she intends to do. Some surgeons try to leave behind as much of the stomach as they can to allow patients to eat more normally afterward. The tradeoff is that the cancer might be more likely to come back. The extent of the surgery should be discussed between patient and doctor before it is done.

It cannot be stressed enough that your surgeon must be highly skilled. He or she should be experienced in treating stomach cancer and able to perform the most up-to-date operations to reduce your risk of complications.

Chemotherapy for stomach cancer

Chemotherapy (chemo) uses anti-cancer drugs that are injected into a vein or given by mouth as pills. These drugs enter the bloodstream and reach all areas of the body, making this treatment useful for cancer that has spread to organs beyond the stomach.

Chemo may be given as the primary (main) treatment for stomach cancer that has spread to distant organs. It may help relieve symptoms for some patients, especially those whose cancer has spread (metastasized) to other areas of the body. It may also help some patients live longer.

Chemo may also be given after surgery to remove the cancer. This is called *adjuvant treatment*. Adjuvant treatment is meant to kill any cancer cells that may have been left behind but are too small to see. The goal is to keep the cancer from coming back. Often, for stomach cancer, chemo is given with radiation therapy after surgery. This combination is called *chemoradiation*. It may delay the cancer coming back (known as *recurrence*) and extend the life span of people with less advanced stomach cancer. This may be especially helpful for cancers that could not be removed completely by surgery.

Chemo can also be given before surgery for stomach cancer. This, known as *neoadjuvant* treatment, can shrink the tumor and possibly make surgery easier. It may also help keep the cancer from coming back and help patients live longer. For some stages of stomach cancer, neoadjuvant chemo is one of the standard treatment options. Often, treatment with chemo starts again after surgery (adjuvant chemotherapy).

A number of drugs are used to treat stomach cancer, including 5-FU (fluorouracil), doxorubicin (Adriamycin[®]), methotrexate, epirubicin (Ellence[®]), etoposide (VP-16), cisplatin docetaxel (Taxotere[®]), paclitaxel (Taxol[®]), irinotecan (Camptosar[®], CPT-11), capecitabine (Xeloda[®]), and oxaliplatin. 5-FU is often given with a vitamin-like drug called leucovorin (or folinic acid) which helps it work better.

These drugs are often given in combination. Some common combinations used when surgery is planned include:

- ECF (epirubicin, cisplatin, and 5-FU), which may be given before and after

- Docetaxel or paclitaxel plus either 5-FU or capecitabine combined with radiation as treatment before surgery
- Cisplatin plus either 5-FU or capecitabine combined with radiation as treatment before surgery

When chemo is given with radiation after surgery, a single drug such as 5-FU or capecitabine may be used.

To treat advanced stomach cancer, ECF may also be used, but some other combinations may also be helpful. They include:

- DCF (Docetaxel, cisplatin and 5-FU)
- Irinotecan plus cisplatin
- Irinotecan plus 5-FU or capecitabine
- Oxaliplatin plus 5-FU or capecitabine

Other combinations may also be helpful in treating stomach cancer.

Side effects of chemotherapy

Chemotherapy drugs kill cancer cells but also damage some normal cells, which can lead to side effects. The type of side effects depends on the type of drugs, the amount taken, and the length of treatment. Short-term side effects common to most chemotherapy drugs can include:

- Nausea and vomiting
- Loss of appetite
- Hair loss
- Diarrhea
- Mouth sores
- Low blood cell counts

Because chemotherapy can damage the bone marrow, where new blood cells are made, your blood cell counts might become low. This can result in:

- Increased chance of infection (a shortage of white blood cells)
- Bleeding or bruising after minor cuts or injuries (a shortage of platelets)
- Fatigue and shortness of breath (low red blood cell counts)

These side effects are usually short-term and go away once treatment is finished. For example, hair will usually grow back after treatment ends.

Some chemotherapy drugs have specific side effects:

Neuropathy: Cisplatin, oxaliplatin, docetaxel, and paclitaxel can damage nerves outside the brain and spinal cord. This can sometimes lead to symptoms (mainly in the hands and feet) such as pain, burning or tingling sensations, sensitivity to cold or heat, or weakness. In most cases this goes away once treatment is stopped, but it may be long-lasting in some patients. Oxaliplatin can also affect nerves in the throat, causing throat pain that is much worse when trying to eat or drink cold liquids or foods. This pain can lead to trouble swallowing or even breathing, and can last a few days after treatment.

Heart damage: Doxorubicin, epirubicin, and some other drugs may cause permanent heart damage if used for a long time or in high doses. For this reason, doctors carefully control the doses and use heart tests such as echocardiograms or MUGA scans (a procedure that lets the doctor see how well your heart is pumping) to monitor heart function. Treatment with these drugs is stopped at the first sign of heart damage.

Low blood counts: This is a very common side effect of chemo. Low white blood cell counts can increase your risk of serious infection. G-CSF (Neupogen[®]) and GM-CSF (Leukine[®]) are drugs known as growth factors. One of these may be given to increase your white blood cell counts and thus reduce the chance of infection while you are on chemo. If your white blood cell counts are very low during treatment, you can also reduce your risk of infection by avoiding exposure to germs. During this time, your doctor may suggest that you:

- Wash your hands often.
- Avoid fresh, uncooked fruits and vegetables and other foods that might carry germs.
- Avoid fresh flowers and plants because they may carry mold.
- Make sure other people wash their hands when they come in contact with you.
- Avoid large crowds and people who are sick (wearing a surgical mask offers some protection in these situations).

You might also be given antibiotics before you have signs of infection or at the earliest sign that an infection may be developing.

If your platelet counts are low, you may be given drugs or platelet transfusions to help protect against bleeding. Likewise, shortness of breath and extreme fatigue caused by low red blood cell counts may be treated with drugs or with red blood cell transfusions.

You should be given specific information about each drug you are receiving and you should review it before you start treatment.

Be sure to tell your cancer care team about any side effects you have because there are often ways to lessen them. For example, you can be given drugs to prevent or reduce nausea and vomiting.

Targeted therapies for stomach cancer

Chemotherapy (chemo) drugs target cells that divide rapidly, which is why they are often effective against cancer cells. But there are other aspects of cancer cells that make them different from normal cells. In recent years, researchers have developed several new targeted drugs to try to exploit these differences. Targeted drugs generally do not have the same types of severe side effects as standard chemo drugs.

About 1 out of 5 of patients has too much of a growth-promoting protein called HER2/neu (or just HER2) on the surface of their stomach cancer cells. Tumors with increased levels of HER2/neu are called *HER2-positive*. Trastuzumab (Herceptin) is a drug that targets HER2. Trastuzumab is a type of drug known as a monoclonal antibody — a man-made version of a very specific immune system protein. It is used more often to treat breast cancer. In patients whose cancers are HER2-positive, giving trastuzumab with chemo can help patients with metastatic gastric cancer live longer than giving chemo alone.

Trastuzumab is injected into a vein (IV). For stomach cancer it is given every 3 weeks along with chemo. The best length of time to continue to give it is not yet known.

The side effects of trastuzumab are relatively mild. They may include fever and chills, weakness, nausea, vomiting, cough, diarrhea, and headache. These side effects occur less often after the first dose. This drug can also rarely lead to heart damage. The risk of heart damage is increased if trastuzumab is given with certain chemo drugs called anthracyclines. Examples of anthracyclines include epirubicin (Ellence) and doxorubicin (Adriamycin).

Since this drug only works if the cancer cells have too much HER2, samples of the patient's tumor must be tested to look for HER2. This was discussed in the section, “How is stomach cancer diagnosed?”

Other targeted therapy drugs are being tested against stomach cancer. Some of these are discussed in more detail in the section “What's new in stomach cancer research and treatment?”

Radiation therapy for stomach cancer

Radiation therapy uses high-energy rays or particles to kill cancer cells in a specific area of the body.

External beam radiation therapy is the type of radiation therapy often used to treat stomach cancer. This treatment focuses radiation on the cancer from a machine outside the body. Having this type of radiation therapy is like having an x-ray, except that each treatment lasts longer, and the patient usually receives 5 treatments per week over a period of weeks or months.

After surgery, radiation therapy can be used to kill very small remnants of the cancer that cannot be seen and removed during surgery. Radiation therapy — especially when combined with chemotherapy drugs such as 5-FU — may delay or prevent cancer

recurrence after surgery and may help patients live longer. Radiation therapy can also be used to ease the symptoms of advanced stomach cancer, such as pain, bleeding, and eating problems.

Side effects from radiation therapy for stomach cancer can include:

- Mild skin problems at the site where the radiation was aimed
- Nausea and vomiting
- Diarrhea
- Fatigue
- Low blood cell counts

These usually go away within several weeks after the treatment is finished. When radiation is given with chemotherapy, side effects are often worse. Please be sure to tell your doctor about any side effects you have, because there are often ways to relieve them. It is also very important that you get treated at a center that has extensive experience in treating stomach cancer.

Clinical trials for stomach cancer

You may have had to make a lot of decisions since you've been told you have cancer. One of the most important decisions you will make is choosing which treatment is best for you. You may have heard about clinical trials being done for your type of 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 get a closer look at promising new treatments or procedures.

If you would like to take part in a clinical trial, you should 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 clinical trials that meet your medical needs. You can reach this service at 1-800-303-5691 or on our Web site 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 toll-free at 1-800-4-CANCER (1-800-422-6237) or by visiting the NCI clinical trials Web site at www.cancer.gov/clinicaltrials.

There are requirements you must meet to take part in any clinical trial. If you do qualify for a clinical trial, it is up to you whether or not to enter (enroll in) it.

Clinical trials are one way to get state-of-the-art cancer treatment. They are the only way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

You can get a lot more information on clinical trials in our document called *Clinical Trials: What You Need to Know*. You can read it on our Web site or call our toll-free number and have it sent to you.

Complementary and alternative therapies for stomach cancer

When you have 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 Internet groups and Web sites 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 exactly are complementary and alternative therapies?

Not everyone uses these terms the same way, and they are used to refer to many different methods, so it can be confusing. 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 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 be helpful, and a few have even been found 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 pose danger, or have life-threatening side effects. But the biggest danger in most cases is that you may lose the chance to be helped by standard medical treatment. Delays or interruptions in your medical treatments may give the cancer more time to grow and make it less likely that treatment will help.

Finding out more

It is 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 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 of these alternative methods have not been tested and proven to work in treating cancer.

As you consider 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 about using.
- Contact us at 1-800-227-2345 to learn more about complementary and alternative methods in general and to find out about the specific methods you are looking at.

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.

Treatment choices by type and stage of stomach cancer

Treatment of stomach cancer depends to a large degree on where the cancer started in the stomach and how far it has spread.

Stage 0

Because stage 0 cancers are limited to the inner lining layer of the stomach and have not invaded deeper layers, they can be treated by surgery alone. No chemotherapy or radiation therapy is needed. Gastrectomy (surgical removal of part or all of the stomach) and lymphadenectomy (removal of the nearby lymph nodes) is usually done.

If these stage 0 cancers are small, they can sometimes be treated by endoscopic mucosal resection. In this procedure the cancer is removed through an endoscope passed down the throat. This is done more often in Japan, where stomach cancer is often detected early because of screening. (Screening is done in Japan because stomach cancer is so common there.) It is rare to find stomach cancer so early in the United States, so this treatment has not been practiced much here. If it is done, it should be at a center that has a great deal of experience with this technique.

Stage I

Stage IA: People with stage IA stomach cancer typically have their cancer removed by removing all or part of the stomach. The omentum (an apron-like layer of fatty tissue in the abdomen) and nearby lymph nodes are also removed. Endoscopic mucosal resection may rarely be an option for some small T1a cancers. No further treatment is usually needed after surgery.

Stage IB: The main treatment for this stage of stomach cancer is surgery to remove all or part of the stomach along with the omentum and nearby lymph nodes. Chemotherapy (chemo) may be given before surgery. After surgery, patients whose lymph nodes (removed at surgery) show no signs of cancer spread, are sometimes observed without further treatment, but the doctor could also recommend either chemotherapy with radiation therapy (chemoradiation) or chemotherapy alone be given after surgery. When chemoradiation is given, the chemo drug used is most often either 5-FU or capecitabine (Xeloda). Another option for patients who were treated with chemotherapy before surgery is to give them the same chemo (without radiation) after surgery. Often, the chemo drugs etoposide, cisplatin, and 5-FU are used. If cancer is found in the lymph nodes, treatment with either chemoradiation or more chemo is often recommended.

If someone with stomach cancer is too sick (from other illnesses) to have surgery, they may be treated with radiation, which may be given with chemo.

Stage II

The main treatment for stage II stomach cancer is surgery to remove all or part of the stomach, the omentum, and nearby lymph nodes. Some patients are treated with chemo before surgery. Treatment after surgery may include chemo alone or chemoradiation.

If someone with stomach cancer is too sick (from other illnesses) to have surgery, they may be treated with radiation, which may be given with chemo.

Stage III

Surgery is still the main treatment for patients with this stage disease (unless they have other medical conditions that make them too ill for it). Some of these patients may be cured by surgery, while for others the surgery may be able to help relieve symptoms from the cancer. Some people may get chemotherapy before surgery (neoadjuvant chemotherapy) to shrink the cancer and make it more likely that it will be able to be removed completely at surgery. Patients who get chemo before surgery will probably get chemo after, as well. For patients who don't get chemo before surgery and for those who have surgery but have some cancer left behind, treatment after surgery, includes chemotherapy with 5-FU along with radiation therapy.

Stage IV

Because stage IV stomach cancer has spread to distant organs, a cure is usually not possible. Patients with advanced stomach cancer may receive palliative treatment, including surgery to keep the stomach and/or intestines from becoming obstructed (blocked) or to control bleeding.

In some cases, a laser beam directed through an endoscope (a long, flexible tube passed down the throat) can vaporize most of the tumor and relieve obstruction without surgery. If needed, a stent (a hollow metal tube) may be placed where the esophagus and stomach meet to help keep it open and allow food to pass through it. This can also be done at the junction of the stomach and the small intestine.

Chemotherapy and/or radiation therapy can often help shrink the cancer and relieve some symptoms as well as help patients live longer, but is usually not expected to cure the cancer. The chemotherapy drugs often used include 5-FU, cisplatin, and either epirubicin or etoposide. Docetaxel, oxaliplatin, capecitabine, or irinotecan may also be used. Trastuzumab (Herceptin) is also an option for patients whose tumors are HER2-positive.

Combinations of these drugs are most commonly used, but which combination is best is not clear. The preferred way to give 5-FU is by continuous infusion through a catheter (a thin tube used to inject or withdraw fluids) placed into a large vein. But other approaches may be just as successful. New treatments being tested in clinical trials may benefit some patients.

Even if treatments do not succeed in destroying or shrinking the cancer, there are ways to relieve the pain and symptoms from the disease. Patients should tell their cancer care team about any symptoms or pain they have right way, so they can be effectively managed.

Nutrition is another concern for many patients with stomach cancer. Help is available ranging from nutritional counseling to placement of a tube into the small intestine to help provide nutrition for those who have trouble eating, if needed.

Recurrent cancer

Cancer that comes back after initial treatment is known as *recurrent cancer*. Treatment options for recurrent disease are generally the same as they are for stage IV cancers. However, prior treatments and the person's general state of health must be taken into account and may affect their treatment options. Clinical trials may be an option and should always be considered.

More treatment information

For more details on treatment options — including some that may not be addressed in this document — the National Comprehensive Cancer Network (NCCN) and the National Cancer Institute (NCI) are good sources of information.

The NCCN, made up of experts from many of the nation's leading cancer centers, develops cancer treatment guidelines for doctors to use when treating patients. Those are available on the NCCN Web site (www.nccn.org).

The NCI provides treatment guidelines via its telephone information center (1-800-4-CANCER) and its Web site (www.cancer.gov). Detailed guidelines intended for use by cancer care professionals are also available on that Web site.

What should you ask your doctor about stomach cancer?

It is important to have honest, open discussions with your cancer care team. They want to answer all of your questions, no matter how trivial they might seem to you.

For instance, consider these questions:

- What kind of stomach cancer do I have?
- Where is the cancer in my stomach?
- What is the stage of my cancer and what does that mean in my case?
- What treatment choices do I have?
- What do you recommend and why?

- Are there any clinical trials I should think about now?
- What risks or side effects are there to the treatments you suggest? How would treatment affect my daily life?
- How long will treatment last? What will it involve? Where will it be done?
- What are the chances of recurrence of my cancer with these treatment plans?
- What should I do to be ready for treatment?
- Based on what you've learned about my cancer, what is my prognosis (outlook)?
- What is the goal of my treatment? To cure or to ease symptoms?
- If I am to have surgery, what is your experience in this type of surgery for stomach cancer?
- If I am to have surgery, what is the experience of the hospital in this type of surgery for stomach cancer?
- What type of follow-up will I need after treatment?

In addition to these sample questions, be sure to write down some of your own. For instance, you might want more information about recovery times, or you might want to ask about getting a second opinion.

What happens after treatment for stomach cancer?

For some people with stomach cancer, treatment may remove or destroy the cancer totally. Completing treatment can be both stressful and exciting. You may be relieved to finish treatment, but find it 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 leading full lives. Our document, *Living with Uncertainty: The Fear of Cancer Recurrence*, gives more detailed information on this.

In others, the cancer may never go away completely. These people may get regular treatments with chemotherapy, radiation therapy, or other therapies to try to help keep the cancer in check. Learning to live with cancer that does not go away can be difficult 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

When treatment ends, your doctors will still want to watch you closely. It is very important to go to all of your follow-up appointments. During these visits, your doctors will ask questions about any problems you may have and may do exams and lab tests or x-rays and scans to look for signs of cancer or treatment side effects. Almost any cancer treatment can have side effects. Some last for a few weeks to months, but others can last the rest of your life. This is the time for you to talk to your cancer care team about any changes or problems you notice and any questions or concerns you have.

Most doctors recommend careful follow-up, with a physical exam and review of symptoms every 4 to 6 months for the first 3 years, then at least yearly after that. Scans and lab tests are not usually needed at each visit, but should be done if there are any suspicious symptoms or physical findings. However, your doctor will probably check your vitamin B12 levels regularly if the upper part of your stomach has been removed.

Having surgery for stomach cancer will probably mean that your eating habits will have to change to some degree. You might not be able to eat large amounts of food at one time. Your health care team may suggest that you meet with a nutritionist, who can help you adjust to this.

People who have had surgery — especially if they had the upper part of their stomach removed (in either a subtotal or total gastrectomy) — will probably need to have their vitamin blood levels tested regularly and may need to get vitamin supplements, which may include B12 injections. (The pill form of vitamin B12 isn't absorbed if the upper part of the stomach has been removed.)

It is important to keep your 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.

Should your cancer come back, our document, *When Your Cancer Comes Back: Cancer Recurrence* can give you information on how to manage and cope with this phase of your treatment.

Seeing a new doctor

At some point after your cancer diagnosis and treatment, you may find yourself seeing a new doctor who does not know anything about your medical history. It is important that you be able to give your new doctor the details of your diagnosis and treatment. Make sure you have the following information handy:

- A copy of your pathology report(s) from any biopsies or surgeries
- If you had surgery, a copy of your operative report(s)
- If you were in the hospital, a copy of the discharge summary that doctors must prepare when patients are sent home
- If you had radiation therapy, a copy of the treatment summary

- If you had chemotherapy or targeted therapies, a list of the drugs, drug doses, and when you took them
- Copies of your x-rays and imaging tests (these can often be placed on a DVD)

The doctor may want copies of this information for his records, but always keep copies for yourself.

Lifestyle changes

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 are thinking about how to improve your health over the long term. Some people even start during cancer treatment.

Making healthier choices

For many people, a diagnosis of 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.

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 for information and support. This tobacco cessation and coaching service can help increase your chances of quitting for good.

Eating better

Eating right can be hard for anyone, but it can get even tougher during and after cancer treatment. Treatment may change your sense of taste. Nausea can be a problem. You may not feel like eating and lose weight when you don't want to. Or you may have gained weight that you can't seem to lose. All of these things can be very frustrating.

If treatment caused weight changes or eating or taste problems, do the best you can and keep in mind that these problems usually 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 put healthy eating habits into place. 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.

Rest, fatigue, and exercise

Extreme tiredness, called *fatigue*, is very common in people treated for cancer. This is not a normal tiredness, but a "bone-weary" exhaustion that doesn't get better with rest. For some people, fatigue lasts a long time after treatment, and can make it hard for them to exercise and do other things they want to do. But exercise can help reduce fatigue. Studies have shown that patients who follow an exercise program tailored to their personal needs feel better physically and emotionally and can cope better, too.

If you were sick and not very active during treatment, it is normal for your fitness, endurance, and muscle strength to decline. Any plan for physical activity should fit your situation. An older person who has never exercised will not be able to take on the same amount of exercise as a 20-year-old who plays tennis twice a week. 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 anything. Get their opinion about your exercise plans. Then, try to find an exercise buddy so you're not doing it alone. Having family or friends involved when starting a new exercise program can give you that extra boost of support to keep you going when the push just isn't there.

If you are very tired, you will need to balance activity with rest. It is OK to rest when you need to. Sometimes it's really hard for people to allow themselves to rest when they are used to working all day or taking care of a household, but this is not the time to push yourself too hard. Listen to your body and rest when you need to. (For more information on dealing with fatigue, please see *Fatigue in People With Cancer* and *Anemia in People With Cancer*.)

Keep in mind exercise can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.
- Along with a good diet, it will 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.

And long term, we know that getting regular physical activity plays a role in helping to lower the risk of some cancers, as well as having other health benefits.

How does having stomach cancer affect your emotional health?

When treatment ends, you may find yourself overcome with many different emotions. This happens to a lot of people. You may have been going through so much during treatment that you could only focus on getting through each day. Now it may feel like a lot of other issues are catching up with you.

You may find yourself thinking about death and dying. Or maybe you're more aware of the effect the cancer has on your family, friends, and career. You may take a new look at your relationship with those around you. Unexpected issues may also cause concern. For instance, as you feel better and have fewer doctor visits, you will see your health care team less often and have more time on your hands. These changes can make some people anxious.

Almost everyone who has been through cancer can benefit from getting some type of support. You need people you can turn to for strength and comfort. Support can come in many forms: family, friends, cancer support groups, church or spiritual groups, online support communities, or one-on-one counselors. What's best for you depends on your situation and personality. Some people feel safe in peer-support groups or education groups. Others would rather talk in an informal setting, such as church. Others may feel more at ease talking one-on-one with a trusted friend or counselor. Whatever your source of strength or comfort, make sure you have a place to go with your concerns.

The cancer journey can feel very lonely. It is not necessary or good for you to try to deal with everything on your own. And your friends and family may feel shut out if you do not include them. Let them in, and let in anyone else 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.

If treatment for stomach cancer stops working

If cancer keeps growing or comes back after one kind of treatment, it is possible that another treatment plan might still cure the cancer, or at least shrink it enough to help you live longer and feel better. But when a person has tried many different treatments and the cancer has not gotten any better, the cancer tends to become resistant to all treatment. If this happens, it's important to weigh the possible limited benefits of a new treatment against the possible downsides. Everyone has their own way of looking at this.

This is likely to be the hardest part of your battle with cancer — when you have been through many medical treatments and nothing's working anymore. Your doctor may offer you new options, but at some point you may need to consider that treatment is not likely to improve your health or change your outcome or survival.

If you want to continue to get treatment for as long as you can, you need to think about the odds of treatment having any benefit and how this compares to the possible risks and

side effects. In many cases, your doctor can estimate how likely it is the cancer will respond to treatment you are considering. For instance, the doctor may say that more chemo or radiation might have about a 1% chance of working. Some people are still tempted to try this. But it is important to think about and understand your reasons for choosing this plan.

No matter what you decide to do, you need to feel as good as you can. Make sure you are asking for and getting treatment for any symptoms you might have, such as nausea or pain. This type of treatment is called *palliative care*.

Palliative care helps relieve symptoms, but is not expected to cure the disease. It can be given along with cancer treatment, or can even be cancer treatment. The difference is its purpose — the main purpose of palliative care is to improve the quality of your life, or help you feel as good as you can for as long as you can. Sometimes this means using drugs to help with symptoms like pain or nausea. Sometimes, though, the treatments used to control your symptoms are the same as those used to treat cancer. For instance, radiation might be used to help relieve bone pain caused by cancer that has spread to the bones. Or chemo might be used to help shrink a tumor and keep it from blocking the bowels. But this is not the same as treatment to try to cure the cancer.

At some point, you may benefit from hospice care. This is special care that treats the person rather than the disease; it focuses on quality rather than length of life. Most of the time, it is given at home. Your cancer may be causing problems that need to be managed, and hospice focuses on your comfort. You should know that while getting hospice care often means the end of treatments such as chemo and radiation, it doesn't mean you can't have treatment for the problems caused by your cancer or other health conditions. In hospice, the focus of your care is on living life as fully as possible and feeling as well as you can at this difficult time. You can learn more about hospice in our document called *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 happiness and meaning. Pausing at this time in your cancer treatment gives you a chance to refocus 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.

What's new in stomach cancer research and treatment?

Research is always being done in the area of stomach cancer. In addition to looking for the causes and ways to prevent stomach cancer, scientists continue to research improved treatments.

Risk factors

Diet

Research has clearly shown that differences in diet are an important factor in explaining variations in stomach cancer risk around the world. Recent research in countries with relatively low stomach cancer risk has provided some insight into risk factors. Diets high in preserved meats and low in fresh fruits and vegetables have been linked with higher risk.

Some studies have found that a diet high in red meat is another possible risk factor. Eating red meat an average of about twice a day seems to raise the risk of stomach cancer. This risk is increased even more if the meat is barbecued and well done.

Helicobacter pylori infection

Recent studies have shown that certain types of *H pylori* (especially the *cagA* strains) are more strongly linked to stomach cancer. Some inherited traits related to blood groups may also affect whether someone infected with *H pylori* will develop cancer. Further research is needed to help doctors determine how to use this information to test which people might be at higher risk for developing stomach cancer. Recent research has also studied the interaction of *H pylori* infection with other risk factors. For example, they have found that a healthy diet is especially important for reducing stomach cancer risk for people infected with *H pylori*.

Chemoprevention

Chemoprevention is the use of natural or man-made chemicals to lower the risk of developing cancer. Two types of chemicals might be useful in preventing stomach cancer: antioxidants and antibiotics.

Antioxidants

Many cancer-causing factors cause changes in cells that form a type of chemical called a *free radical*. Free radicals can damage important parts of cells such as genes. Depending on how severe the damage is, the cells may die or they may become cancerous.

Antioxidants are a group of nutrients and other chemicals that can destroy free radicals or prevent them from forming. These nutrients include vitamin C, beta-carotene, vitamin E (alpha-tocopherol), and the mineral selenium. Studies that have looked at using dietary supplements to lower stomach cancer risk have had mixed results so far. There is some evidence that combinations of antioxidant supplements may reduce the risk of stomach cancer in people with poor nutrition to begin with. Further research in this area is needed.

Antibiotics

Studies are being done to see whether antibiotic treatment of people who are chronically infected by *Helicobacter pylori* will help prevent stomach cancer. Some studies have found that treating this infection may prevent pre-cancerous stomach abnormalities, but more research is needed.

Although not truly chemoprevention, antibiotics may help prevent stomach cancer from recurring in some cases. Researchers have shown that antibiotics may lower the risk that the cancer will come back in another part of the stomach in people who have been treated with endoscopic resection for early stage stomach cancer. Unfortunately, in the United States these cancers are more often found at a later stage, so it's not clear how useful these results might be here.

Aspirin

An early study looked at giving aspirin to patients who had cancer of the upper part of the stomach (the cardia) after surgery. The patients who took aspirin were more likely to be alive 5 years after diagnosis than the patients that didn't. This is being looked at further in larger studies.

Staging

Sentinel lymph node mapping

Doctors are trying to identify the spread of stomach cancer to lymph nodes using this technique, which has proved very successful in melanoma and breast cancer. In sentinel lymph node mapping, the surgeon injects a blue dye and/or a radioactive tracer substance into the cancer. These concentrate in the lymph nodes that would be the first site of cancer spread. Doctors can remove these lymph nodes and look for cancer. If no cancer is found in those lymph nodes, then the cancer is unlikely to have reached others, and a full lymph node removal might not be needed. If cancer is present in the sentinel lymph node(s), then all the lymph nodes would still need to be removed.

In one study that used this technique for stomach cancer, it helped the surgeon find more lymph nodes to remove. Also, the lymph nodes that were removed were more likely to contain cancer cells. Still, this technique is still being studied in stomach cancer and is not yet ready for widespread use.

Treatment

Laparoscopic surgery

Laparoscopy is commonly used to help stage (determine the extent of) stomach cancer. In countries such as Japan, doctors are now studying the use of laparoscopic (keyhole) surgery to remove small stomach cancers. In this technique, the surgeon creates several

small holes in the abdomen, each about an inch long. Special long, thin instruments are inserted into these holes. One of the instruments has a small video camera on the end. The others are used to cut, staple, or sew sections of the stomach.

One of the advantages of this type of surgery is that it does not require a large incision in the abdomen, so recovery time is usually quicker. In one study, laparoscopy seemed to be as effective as standard surgery. Still, it is not widely used to treat stomach cancer in the United States, and more studies may be needed to prove that it is as good as the standard approach.

Chemotherapy drugs and combinations

Some studies are testing new ways to combine drugs already known to be active against stomach cancer or other cancers. Newer chemotherapy (chemo) drugs are also being studied. For example, S-1 is an oral chemo drug related to 5-FU. This is an active drug for stomach cancer that is commonly used in some other parts of the world, but it is not yet available in the United States.

Other studies are testing the best ways to combine chemo with radiation therapy, targeted therapies, or immunotherapy. A good deal of effort is being directed at improving the results of surgery by adding chemo and/or radiation therapy either before or after surgery. Several clinical trials of this approach are in progress.

New ways of giving chemo are also being studied. For example, some doctors are looking at infusing chemo directly into the abdomen (intraperitoneal chemotherapy) to see if it might work better with fewer side effects.

Targeted therapies

Chemo drugs target cells that divide rapidly, which is why they are often effective against cancer cells. But there are other aspects of cancer cells that make them different from normal cells. In recent years, researchers have developed several new targeted drugs to try to exploit these differences. Targeted drugs generally do not have the same types of severe side effects as chemo drugs.

An example of a targeted therapy is a drug called *bevacizumab* (Avastin®). This drug is thought to work by affecting the blood vessels that supply tumors. Some small, early studies have found that when this drug is combined with chemo, it seems to work better than chemo alone for stomach cancer. Larger studies are now trying to confirm this finding. Bevacizumab is already FDA-approved to treat some other cancers.

Cetuximab is a drug that targets EGFR, a protein that seems to help some cancers grow. This drug has shown encouraging early results when combined with chemo for advanced cancers of the stomach and esophagus. It has also helped some patients when given by itself (without chemo). Studies are being done to confirm these findings. Cetuximab (Erbix®) is already FDA-approved to treat colorectal cancer and some other cancers.

Other targeted agents that are FDA-approved for other types of cancer have also shown encouraging early results in studies for stomach cancer. These include bortezomib (Velcade®), everolimus (Afinitor®), sunitinib (Sutent®), and sorafenib (Nexavar®), among others.

Most of the research in this area is looking at combining targeted agents with chemotherapy or with each other.

Immunotherapy

Immunotherapy is an approach to treating cancer that uses drugs to try and help the body's immune system fight the cancer. A Korean study showed that combining chemotherapy with an immunotherapy called polyadenylic-polyuridylic acid (poly A:U) slowed the gastric cancer from returning when given as adjuvant therapy after surgery. It also helped some patients live longer.

If you want to search for clinical trials in your area, contact the American Cancer Society at 1-800-227-2345 or visit us on the Web at www.cancer.org/clinicaltrials.

Additional resources for stomach cancer

More information from your American Cancer Society

The following related information may also be helpful to you. These materials may be ordered from our toll-free number, 1-800-227-2345.

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

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

Living With Uncertainty: The Fear of Cancer Recurrence

Pain Control: A Guide for Those With Cancer and Their Loved Ones (also available in Spanish)

Surgery

Understanding Chemotherapy: A Guide for Patients and Families (also available in Spanish)

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

Books

The following books are available from the American Cancer Society. Call us at 1-800-ACS-2345 (1-800-227-2345) to ask about costs or to place your order.

American Cancer Society's Guide to Pain Control

Cancer in the Family: Helping Children Cope With a Parent's Illness

Caregiving: A Step-By-Step Resource for Caring for the Person With Cancer at Home

What Helped Get Me Through: Cancer Patients Share Wisdom and Hope

What to Eat During Cancer Treatment

National organizations and Web sites*

In addition to the American Cancer Society, other sources of patient information and support include:

National Cancer Institute

Toll-free number: 1-800-422-6237 (1-800-4-CANCER)

Web site: www.cancer.gov

National Coalition for Cancer Survivorship

Toll-free number: 1-888-650-9127

Web site: www.canceradvocacy.org

**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** or visit www.cancer.org.

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