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# About Malignant Mesothelioma

## Overview and Types

If you've been diagnosed with malignant mesothelioma or are worried about it, you likely have a lot of questions. Learning some basics is a good place to start.

- [What Is Malignant Mesothelioma?](#)

## Research and Statistics

See the latest estimates for new cases of malignant mesothelioma in the US and what research is currently being done.

- [Key Statistics About Malignant Mesothelioma](#)
- [What's New in Malignant Mesothelioma Research?](#)

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# What Is Malignant Mesothelioma?

Malignant mesothelioma is cancer that starts in cells in the linings of certain parts of the body, most commonly the linings of the chest or abdomen (belly).

Cancer starts when cells start to grow out of control. Cells in nearly any part of the body can become cancer. To learn more about how cancers start and spread, see [What Is Cancer?](#)<sup>1</sup>

## The mesothelium

A layer of specialized cells called mesothelial cells lines the inside of your chest, your abdomen, and the space around your heart. These cells also cover the outer surface of most of your internal organs. The lining formed by these cells is called the **mesothelium**.

The mesothelium helps protect your organs by making a special lubricating fluid that allows organs to slide against each other. For instance, this fluid makes it easier for your lungs to move (expand and contract) inside your chest when you breathe. The mesothelium has different names in different parts of the body:

- The **pleura** covers the lungs and the space in the chest that contains the lungs.
- The **peritoneum** lines the inside of the abdomen and covers many of the organs in the abdomen.
- The **pericardium** covers the heart and the space that holds the heart in the chest.
- The **tunica vaginalis** lines the testicles.

## Types of malignant mesothelioma

Mesothelial tumors can start in any of these linings. These tumors can be cancer (malignant) or not cancer (benign).

A cancer tumor of the mesothelium is called a **malignant mesothelioma**. This is often shortened to just mesothelioma. Mesotheliomas can start in 4 main parts of the body.

- **Pleural mesotheliomas** start in the chest. More than 3 out of 4 mesotheliomas are pleural mesotheliomas.
- **Peritoneal mesotheliomas** start in the abdomen. They make up most of the remaining cases.
- **Pericardial mesotheliomas** start in the covering around the heart and are very rare.
- **Mesotheliomas of the tunica vaginalis** are very rare tumors that start in the covering layer of the testicles.

Malignant mesotheliomas are grouped into 3 main types based on how the cancer cells look:

- More than half of mesotheliomas are **epithelioid**. This type tends to have a better outlook (prognosis) than the other types.
- About 10% to 20% of mesotheliomas are **sarcomatoid (fibrous)**.
- **Mixed (biphasic)** mesotheliomas have both epithelioid and sarcomatoid areas. They make up the remaining 20% to 30% of mesotheliomas.

## Hyperlinks

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# Key Statistics About Malignant Mesothelioma

Mesothelioma is fairly rare in the United States. About 3,000 new cases are diagnosed

each year.

The rate of mesotheliomas in the United States increased from the 1970s to the early 1990s, but since then it has leveled off and even gone down slightly. These changes have largely been seen in men, and are probably related to changes in workplace exposures to asbestos. (See [Risk Factors for Malignant Mesothelioma](#)<sup>1</sup>) The rate of mesothelioma is lower in women and has been fairly steady for some time. In many other countries, the rate of mesothelioma is still increasing.

Mesothelioma is more common in whites and Hispanics/Latinos than in African Americans or Asian Americans.

Mesotheliomas are much more common in older people than younger people. The average age at the time of diagnosis for pleural mesothelioma (mesothelioma in the chest) is 72.

Information on survival rates can be found in [Survival Statistics for Malignant Mesothelioma](#)<sup>2</sup>.

Visit the American Cancer Society's [Cancer Statistics Center](#)<sup>3</sup> for more key statistics.

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/causes-risks-prevention/risk-factors.html](http://www.cancer.org/cancer/malignant-mesothelioma/causes-risks-prevention/risk-factors.html)
2. [www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/survival-statistics.html](http://www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/survival-statistics.html)
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## What's New in Malignant Mesothelioma Research?

There's always research going on in the area of mesothelioma. Scientists are looking for better ways to prevent, diagnose, and treat mesothelioma, as well as find it before it causes problems.

Because mesothelioma is rare, it's been hard to study it well. Most experts agree that treatment in a [clinical trial](#)<sup>1</sup> should be considered for any type or stage of mesothelioma. This way people can get the best treatment available now and may also get the new treatments that are thought to be even better. The new and promising treatments discussed here are only available in clinical trials.

### Causes and prevention

The role of [asbestos](#)<sup>2</sup> in increasing the risk of mesothelioma is a public health concern. Researchers are learning more about which asbestos fibers can cause cancer, how they cause it, and what levels of exposure might be considered safe. Now that the dangers of asbestos are known, we can limit or stop exposure in homes, public buildings, and the workplace. Unfortunately, regulations protecting workers from asbestos exposure are much less stringent in some countries than in others.

Research is looking for genes that might affect a person's risk for mesothelioma.

### Early detection and diagnosis

Mesothelioma is easiest to treat and has the best outcomes if it's found early -- when it's small and hasn't spread. Today, it's hard to find it early. Most of the time it's not diagnosed until it's big enough to cause problems and a person goes to a doctor for help. Researchers are looking for early detection tests that might help find mesothelioma before it reaches this point. (Tests to look for cancer in people who don't

have symptoms are called screening tests.)

Early research on workers exposed to asbestos has found certain protein markers in the blood that have been linked to mesothelioma. The test was able to detect mesothelioma up to a year before it was diagnosed. But more research is needed to figure out if this test is useful. Other studies in at-risk people are looking at tests that can be done on the fluid that's removed from around the lungs and breath tests. All of these could one day lead to screening tests, as well as tests that could be used to diagnose this cancer.

And, as has been learned with other kinds of cancer, identifying and studying mesothelioma-specific biomarkers could even impact treatment choices and give a better understanding of the likely outcome for each patient. Biomarker levels might also prove to be a way to see if and how well treatment is working.

## Treatment

Mesothelioma is difficult to treat, and doctors are constantly trying to improve treatment approaches. The exact roles of [surgery](#)<sup>3</sup>, [radiation therapy](#)<sup>4</sup>, and [chemotherapy](#)<sup>5</sup> in the treatment of mesothelioma are being studied. Combinations of these treatments are now being tested and may provide the most promising option for some patients. And newer types of treatment that are being tested in clinical trials may give patients and their doctors even more options.

### Chemotherapy

Some chemotherapy drugs can shrink or slow the growth of mesotheliomas, but in most cases the effects last for a limited time. Studies are underway to test new chemotherapy drugs and new combinations of drugs.

### Photodynamic therapy

Another technique now being studied is photodynamic therapy (PDT). For this treatment, a light-activated drug is injected into a vein. The drug spreads throughout the body, but tends to collect in cancer cells. A few days later (usually in the operating room, just after surgery), a tube with a special light on the end is put into the chest. The light causes a chemical change that "turns on" the drug so it kills the cancer cells. Since the drug is only active in the areas exposed to the light, PDT might cause fewer side effects than using drugs that spread throughout the body. Several [clinical trials](#)<sup>6</sup> are now studying the use of PDT for mesothelioma.

To find out more, see [Photodynamic Therapy](#)<sup>7</sup>.

## Targeted therapy

Chemo drugs have a limited effect against mesothelioma. In recent years, researchers have learned more about the gene changes in mesothelioma cells that are not found in normal cells. This has led them to use targeted therapy to treat this cancer. These drugs target the cells with the gene changes (the cancer cells) and spare normal, healthy cells. They're also using this information to develop new drugs that target these changes.

Targeted therapy is already used to treat a lot of other kinds of cancer. These drugs work differently from standard chemo drugs. They sometimes work when chemo drugs don't, and they often have different (and less severe) side effects.

Other new drugs have different targets. For example, some new drugs target mesothelin, a protein found in high levels in mesothelioma cells.

To learn more, see [Targeted Therapy](#)<sup>8</sup>.

## Immunotherapy

Clinical trials are looking at the value of immunotherapy for mesothelioma. These drugs cause the body's immune system to attack the cancer cells.

Small studies have suggested this treatment works, but more research is needed. Researchers are looking at how to best combine immunotherapy drugs and how to get the best results when combining them with chemotherapy and other treatments. They're also looking for new immunotherapy drugs to treat mesothelioma.

To learn more, see [Cancer Immunotherapy](#)<sup>9</sup>.

## Other newer forms of treatment

Because standard treatments often have limited usefulness against mesothelioma, researchers are studying other new types of treatment as well. These are very early studies, and a lot more research is needed before they'll be widely available.

**Gene therapy:** A newer type of treatment being tested on mesothelioma is gene therapy, which attempts to add new genes to cancer cells to make them easier to kill. One approach to gene therapy uses special viruses that have been modified in the lab. The virus is injected into the pleural space and infects the mesothelioma cells. When this infection occurs, the virus injects the desired gene into the cells. In one version of

this approach, the virus carries a gene that helps turn on the immune system to attack the cancer cells.

**Vaccine therapy:** Other new treatments called [cancer vaccines](#)<sup>10</sup> are also aimed at getting the immune system to attack the cancer. In one approach, immune cells are removed from a patient's blood and treated in the lab to get them to react to tumor cells. The immune cells are then given back to the patient, where it is hoped they will cause the body's immune system to attack the cancer. Other vaccines being tested carry certain proteins to the cancer cells to keep them from growing. This is a promising cancer treatment, and a lot of different types of vaccines are being studied.

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1. [www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html](http://www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html)
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# Malignant Mesothelioma Causes, Risk Factors, and Prevention

## Risk Factors

A risk factor is anything that affects your chance of getting a disease such as cancer. Learn more about the risk factors for malignant mesothelioma.

- [Risk Factors for Malignant Mesothelioma](#)
- [What Causes Malignant Mesothelioma?](#)

## Prevention

There's no way to completely prevent mesothelioma. But there are things you can do that might lower your risk. Learn more.

- [Can Malignant Mesothelioma Be Prevented?](#)

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# Risk Factors for Malignant Mesothelioma

A risk factor is anything that increases 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 having a

known risk factor, or even many, does not mean that you will get the disease. And some people who get the disease may have few or no known risk factors. Researchers have found some factors that increase a person's risk of mesothelioma .

## Asbestos

The main risk factor for **pleural mesothelioma** is exposure to asbestos. In fact, most cases of pleural mesothelioma have been linked to high levels of asbestos exposure, usually in the workplace.

Asbestos is a group of minerals that occur naturally as bundles of tiny fibers. These fibers are found in soil and rocks in many parts of the world.

When asbestos fibers in the air are inhaled, they can get into the lungs. Fibers that stay in the lungs can travel to the ends of the small airways and enter the [pleural lining of the lung](#)<sup>1</sup> and chest wall. These fibers can then injure the cells of the pleura, and, over time, cause mesothelioma. Asbestos fibers can also damage cells of the lung and result in **asbestosis** (scar tissue in the lung) and/or [lung cancer](#)<sup>2</sup> .

**Peritoneal** mesothelioma can form in the abdomen when inhaled asbestos fibers are coughed up and then swallowed.

Many people are exposed to very low levels of naturally occurring asbestos in outdoor air. It's in dust that comes from rocks and soil containing asbestos. This is more likely to happen in areas where rocks have higher asbestos content. In some areas, asbestos can be found in the water supply as well as in the air.

In the past, asbestos was used in many products because it was heat and fire-resistant. The link between asbestos and mesothelioma is now well known, and most of its use in the United States stopped several decades ago, but it's still used in some products.

Still, millions of Americans may already have been exposed to asbestos. People at risk for asbestos exposure in the workplace include some miners, factory workers, insulation manufacturers and installers, railroad and automotive workers, ship builders, gas mask manufacturers, plumbers, and construction workers. Family members of people exposed to asbestos at work can also be exposed because the workers can carry home asbestos fibers on their clothes.

Asbestos was also used to insulate many older homes, as well as commercial and public buildings around the country, including some schools. Because these particles are contained within the building materials, they're not likely to be found in the air in

large numbers. The risk of exposure is likely to be very low unless the particles somehow escape into the air, such as when building materials begin to decompose over time, or during remodeling or removal.

The risk of developing mesothelioma is loosely related to how much asbestos a person is exposed to and how long exposure lasts. People exposed at an early age, for a long time, and at higher levels are more likely to develop this cancer. Still, most people exposed to asbestos, even in large amounts, do not get mesothelioma. Other factors, such as a person's genes or having radiation treatments in the past, may make them more likely to develop mesothelioma when exposed to asbestos.

Mesotheliomas related to asbestos exposure take a long time to develop. The time between the first asbestos exposure and diagnosis of mesothelioma is usually between 20 and 50 years. And the risk of mesothelioma does not go down over time after the exposure to asbestos stops. The risk appears to be lifelong.

For more information, see [Asbestos and Cancer Risk](#)<sup>3</sup>.

## **Zeolites**

Zeolites are minerals chemically related to asbestos. An example is erionite, which is common in the rocks and soil in parts of Turkey. High mesothelioma rates in these areas are believed to be caused by exposure to this mineral. In the United States, erionite has been detected in Nevada, Oregon, Utah, Arizona, Montana, and South Dakota.

## **Radiation**

There have been a few published reports of mesotheliomas that developed after people were exposed to high doses of radiation to the chest or abdomen as treatment for another cancer. Although the risk of mesothelioma is higher in patients who have been treated with radiation, this cancer is still rare in these patients.

## **SV40 virus**

Some studies have raised the possibility that infection with simian virus 40 (SV40) might increase the risk of developing mesothelioma. But most experts agree that at this time we still don't know if SV40 is responsible for some mesotheliomas. This important topic is still being researched.

## Age

The risk of mesothelioma increases with age. Mesothelioma can occur in young people (even children), but it's rare in people under age 45. About 2 out of 3 people with mesothelioma of the chest are 65 or older.

## Gender

Mesothelioma is much more common in men than in women. This is probably because men have been more likely to work in jobs with heavy exposure to asbestos.

## Gene changes

A mutation or change in the gene called *BAP1* can be passed in families and has been linked to mesothelioma. But *BAP1* mutations are rare.

## Hyperlinks

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## What Causes Malignant Mesothelioma?

Researchers have found several factors that increase a person's risk of mesothelioma, but it's not yet clear exactly how all of these factors might cause this cancer.

Cancers, including mesotheliomas, occur when the DNA in cells is damaged. DNA is the chemical in each of our cells that makes up our *genes* – the instructions for how our cells function. We usually look like our parents because they are the source of our DNA. But DNA affects more than how we look. Some genes control when cells in the body grow, divide into new cells, and die. Changes in these genes may cause cells to grow out of control, which can lead to cancer.

Asbestos exposure is the main cause of pleural mesothelioma. About 8 out of 10 people with mesothelioma have been exposed to asbestos. When asbestos fibers are breathed in, they travel to the ends of small air passages and reach the pleura, where they can cause inflammation and scarring. This may damage cells' DNA and cause changes that result in uncontrolled cell growth. If swallowed, these fibers can reach the abdominal lining, where they can have a role in causing peritoneal mesothelioma. But most people exposed to asbestos, even in large amounts, do not get mesothelioma.

Radiation treatments for other cancers have been linked to mesothelioma in some studies. Radiation can damage the cells' DNA, leading to out-of-control cell growth.

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## Can Malignant Mesothelioma Be Prevented?

Being [exposed to asbestos](#)<sup>1</sup> is by far the biggest risk factor for mesothelioma, so the best way to reduce your risk is to limit your exposure to asbestos at home, in public buildings, and at work.

People who might be exposed to high levels of asbestos at work include some miners, factory workers, insulation manufacturers and installers, railroad and automotive workers, ship builders, gas mask manufacturers, plumbers, and construction workers. If there's a chance of on-the-job exposure, such as during the renovation of old buildings, you should use all protective equipment and safety procedures designed for working around asbestos.

Older homes may have asbestos or other toxic materials. A knowledgeable expert can check your home to find out if there's any asbestos and whether it poses any risk of exposure. This may mean testing the air for asbestos levels. Just because asbestos exists in a home doesn't mean that it needs to be removed. As long as the material isn't damaged or disturbed, for example by drilling or remodeling, the fibers won't be released into the air. If asbestos needs to be removed from your home, you should hire a qualified contractor to do this to avoid contaminating your home or causing any exposure to your family or to the workers. You shouldn't try to remove asbestos-containing material yourself.

Asbestos can also be found in some commercial and public buildings (including some schools), where the same basic principles apply. Intact, undisturbed materials containing asbestos generally do not pose a health risk. They may pose a risk if they are damaged, disturbed in some way, or deteriorate over time and release asbestos fibers into the air. By federal law, all schools are required to inspect materials with asbestos regularly and must have a plan in place for managing them.

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# Malignant Mesothelioma Early Detection, Diagnosis, and Staging

## Detection and Diagnosis

Finding cancer early, when it's small and before it has spread, often allows for more treatment options. Some early cancers may have signs and symptoms that can be noticed, but that's not always the case.

- [Can Malignant Mesothelioma Be Found Early?](#)
- [Signs and Symptoms of Mesothelioma](#)
- [Tests for Malignant Mesothelioma](#)

## Stages of Mesothelioma

After a cancer diagnosis, staging provides important information about the extent of cancer in the body and anticipated response to treatment.

- [Malignant Mesothelioma Stages](#)

## Outlook (Prognosis)

Doctors often use survival rates as a standard way of discussing a person's outlook (prognosis). These numbers can't tell you how long you will live, but they might help you better understand your prognosis. Some people want to know the survival statistics for people in similar situations, while others might not find the numbers helpful, or might even not want to know them.

- [Survival Rates for Mesothelioma](#)

## Questions to Ask About Mesothelioma

Here are some questions you can ask your cancer care team to help you better understand your diagnosis and treatment options.

- [Questions To Ask About Malignant Mesothelioma](#)

# Can Malignant Mesothelioma Be Found Early?

Mesothelioma is rare, and there are no recommended screening tests for this cancer in people who are not at increased risk. (Screening is testing for cancer in people who don't have any symptoms.)

For people who are known to have been exposed to asbestos, some doctors recommend regular [imaging tests](#)<sup>1</sup>, like chest x-rays or computed tomography (CT) scans, to look for changes in the lungs that might be signs of mesothelioma or [lung](#)<sup>2</sup> cancer. But it's not clear how useful these tests are in finding mesotheliomas early.

Doctors have found that people with mesothelioma have high levels of certain substances in their blood, including **fibulin-3** and **soluble mesothelin-related peptides** (SMRPs). Researchers continue to study how blood tests for these substances might help find mesotheliomas early, as well as how they might be used to monitor the course of the disease in people who have mesothelioma.

Most mesotheliomas are found when a person goes to a doctor because of symptoms, most often chest pain and shortness of breath. People who have been exposed to asbestos should know the possible signs and symptoms of mesothelioma. Many of these symptoms are more likely to be caused by something other than mesothelioma. Still, it's important to report any new symptoms to a health care provider right away so that the cause can be found and treated, if needed.

## Hyperlinks

1. [www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html)
2. [www.cancer.org/cancer/lung-cancer.html](http://www.cancer.org/cancer/lung-cancer.html)

## References

See all references for Malignant Mesothelioma ([www.cancer.org/cancer/malignant-mesothelioma/references.html](http://www.cancer.org/cancer/malignant-mesothelioma/references.html))

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# Signs and Symptoms of Mesothelioma

Many of the early symptoms of mesothelioma are the same as those likely to be caused by other problems, so at first people may ignore them or mistake them for common, minor ailments. Most people with mesothelioma have symptoms for at least a few months before they are diagnosed.

## Pleural mesothelioma (mesothelioma of the chest) symptoms

- Pain in the side of the chest or lower back
- Shortness of breath
- Cough
- Trouble swallowing (feeling like food gets stuck)
- Hoarseness
- Swelling of the face and arms

## Peritoneal mesothelioma symptoms

- Abdominal (belly) pain
- Swelling or fluid in the abdomen
- Nausea and vomiting

- Constipation

## Pericardial mesothelioma symptoms

- Chest pain
- Irregular heart rhythm
- Heart murmur
- Shortness of breath

## General mesothelioma symptoms

- Fever
- Excessive sweating
- Fatigue
- Weight loss (without trying)
- Blood clots
- Loss of appetite

These symptoms can be caused by mesothelioma, but more often they are caused by other conditions. Still, if you have any of these problems (especially if you have been exposed to asbestos ), it's important to see a health care provider right away so the cause can be found and treated, if needed.

## References

See all references for Malignant Mesothelioma ([www.cancer.org/cancer/malignant-mesothelioma/references.html](http://www.cancer.org/cancer/malignant-mesothelioma/references.html))

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# Tests for Malignant Mesothelioma

Mesothelioma is most often found after a person sees a health care provider because of symptoms they're having. If there's a reason to suspect you might have mesothelioma, you will be examined and some tested to find out more. Symptoms might suggest that you have mesothelioma, but tests must be done to find out what's causing your symptoms.

## Medical history and physical exam

Your provider will want to talk with you about your medical history to learn more about your symptoms and possible [risk factors](#)<sup>1</sup>, especially asbestos exposure.

Your provider will also examine you to look for signs of other health problems. Pleural mesothelioma can cause fluid to build up around the lungs in the chest (called a **pleural effusion**). In cases of peritoneal mesothelioma, fluid can build up in the abdomen (called **ascites**). In pericardial mesothelioma, fluid builds up in the sac around the heart (called a **pericardial effusion**). Rarely, mesothelioma can develop in the groin and look like a hernia. All of these might be found during a physical exam, such as when your provider listens to these areas with a stethoscope or taps on your chest or belly.

Mesothelioma can be hard to diagnose. If the results of your history and physical exam suggest you might have mesothelioma, more tests will be needed. These could include imaging tests, blood tests, and/or biopsies.

## Imaging tests

[Imaging tests](#)<sup>2</sup> use x-rays, radioactive particles, sound waves, or magnetic fields to make pictures of the inside of your body. Imaging tests might be done to:

- Look at suspicious areas that might be cancer
- See if and/or how far cancer has spread
- Help find out if treatment is working
- Look for signs that the cancer has come back after treatment

## Chest x-ray

This is often the first test done to look for problems in the lung. Findings that might

suggest mesothelioma include an abnormal thickening of the pleura, calcium deposits on the pleura, fluid in the space between the lungs and the chest wall, or changes in the lungs themselves as a result of asbestos exposure.

### **Computed tomography (CT) scan**

A CT scan uses x-rays to make detailed cross-sectional images (like slices) of your body. CT scans are often used to help look for mesothelioma and to find the exact location of the cancer. They can also help determine the [stage](#) (extent) of the cancer. For instance, they can show if the cancer has spread to other organs. This can help decide if surgery might be a treatment option. Finally, CT scans can also be used to learn if treatment like chemotherapy is shrinking or slowing the growth of the cancer.

### **Echocardiogram**

This is an ultrasound of the heart. It may be done if your doctor suspects that you have fluid around your heart (a pericardial effusion). This test can also show how well your heart is working.

### **Positron emission tomography (PET) scan**

PET scans usually use a radioactive sugar that's put into the blood. The amount of radioactivity used is very low. Because cancer cells grow quickly, they absorb more of the sugar than most other cells. A special camera then creates a picture of areas of radioactivity in the body.

The picture from a PET scan can give the doctor a better idea of whether a thickening of the pleura or peritoneum seen on a CT scan is more likely cancer or scar tissue. If you have been diagnosed with mesothelioma, your doctor may use this test to see if the cancer has spread to lymph nodes or other parts of the body. A PET scan can also be useful if your doctor thinks the cancer may have spread but doesn't know where.

**PET/CT scan:** Some machines can do both a PET and CT scan at the same time. This lets the doctor compare areas of higher radioactivity on the PET scan with the more detailed picture of that area on the CT scan.

### **Magnetic resonance imaging (MRI) scan**

Like CT scans, MRI scans show detailed images of the soft tissues in the body. But MRI scans use radio waves and strong magnets instead of x-rays. A contrast material called **gadolinium** is often injected into a vein before the scan to better show details.

MRI scans can sometimes help show the exact location and extent of a tumor since they provide very detailed images of soft tissues. For mesotheliomas, they may be useful in looking at the diaphragm (the thin band of muscle below the lungs that helps us breathe), a possible site of cancer spread.

## Blood tests

Blood levels of certain substances are often higher in people with mesothelioma:

- Fibulin-3
- Soluble mesothelin-related peptides (SMRPs)

Mesothelioma can't be diagnosed with these blood tests alone, but high levels of these substances can make the diagnosis more likely. Still, more research is needed, and these tests are not routinely used in because of their limited value.

Other blood tests might be used to get an idea of your overall health and how well other organs, like the liver and kidneys, are working.

## Tests of fluid and tissue samples

Symptoms and test results may strongly suggest that a person has mesothelioma, but the actual diagnosis is made by removing cells from an abnormal area and looking at them under a microscope. This is called a [biopsy](#)<sup>3</sup>. It can be done in different ways.

### Removing fluid for testing

If there is a build-up of fluid in part of the body that might be due to mesothelioma, a sample of this fluid can be taken out by putting a thin, hollow needle through the skin and into the fluid. The skin is numbed before the needle is put in. This may be done in a doctor's office or in the hospital. Sometimes ultrasound (or an echocardiogram) is used to guide the needle.

This procedure has different names depending on where the fluid is:

- **Thoracentesis** removes fluid from the chest.
- **Paracentesis** removes fluid from the belly.
- **Pericardiocentesis** removes fluid from the sac around the heart.



The fluid is then tested and looked at with a microscope to see if it contains cancer cells. If cancer cells are found, special tests might be done to see if the cancer is a mesothelioma, a lung cancer, or another type of cancer.

Even if no cancer cells are found in the fluid, a person might still have cancer. In many cases, doctors need to get an actual sample of the mesothelium (the pleura, peritoneum, or pericardium) to know if a person has mesothelioma.

## Needle biopsies

Tiny pieces of tumors in the chest are sometimes taken out by needle biopsy. A long, thin, hollow needle is passed through the skin of the chest, between the ribs, and into the pleura. Imaging tests, like CT scans, are used to guide the needle into the tumor so that small samples can be taken out. This is often done using just numbing medicine.

Needle biopsy can also be used to get samples of the lymph nodes in the space between the lungs to see if the cancer has spread there. (See Endobronchial ultrasound needle biopsy below.)

Needle biopsies do not require a surgical cut or overnight hospital stay. But the downside is that sometimes the sample taken out isn't big enough to make an accurate diagnosis. This is especially true for mesothelioma. And a more invasive biopsy method is usually needed.

**Needle biopsy risk:** There's a slight chance that the needle could put a small hole in the lung during the biopsy. This can cause air to build up in the space between the lung and the chest wall (known as a *pneumothorax*). A small pneumothorax might not cause any symptoms. It may only be seen on an x-ray done after the biopsy, and will often go away on its own. But a larger pneumothorax can make part of a lung collapse and might need to be treated. The treatment is putting a small, flexible tube (a catheter) through the skin and into the space between the lungs. The tube is used to suck the air out in order to re-expand the lung. It's left in place for a short time as the hole heals.

## Endoscopic biopsies

Endoscopic biopsy is commonly used to diagnose mesothelioma. An [endoscope](#)<sup>4</sup> is a thin, tube-like instrument used to look inside the body. It has a light and a lens (or tiny video camera) on the end that allows your provider to look inside your body. Tools can be used through the endoscope to take out tissue samples. Endoscopes have different names depending on the part of the body where they're used.

**Thoracoscopy:** This procedure uses an endoscope called a thoracoscope to look inside the chest. It can be used to look at the pleura and take tissue samples for biopsies.

Thoracoscopy is done in the operating room while drugs are used to put you in a deep sleep (general anesthesia). The doctor slides the thoracoscope through one or more small cuts made on your chest to look at the space between your lungs and the chest wall. This lets the doctor see possible areas of cancer and take out small pieces of tissue for testing. The doctor can also take out lymph nodes and fluid. They may be able to see if a tumor is growing into nearby tissues or organs.

Thoracoscopy can also be used as part of a procedure to keep fluid from building up in the chest. This is called **pleurodesis** and is covered in [Palliative Procedures Used for Malignant Mesothelioma](#)<sup>5</sup>.

**Laparoscopy:** For this test, the doctor uses an endoscope called a **laparoscope** to look inside your belly and biopsy any tumors there. This is done in the operating room while you are under general anesthesia (in a deep sleep). The laparoscope is put into your abdomen through small cuts on the front of your belly.

**Mediastinoscopy:** If imaging tests suggest that the cancer might have spread to the lymph nodes between the lungs, the doctor may want to sample some of them to see if they really contain cancer. The area between the lungs is called the **mediastinum**, and looking at it with an endoscope is called *mediastinoscopy*. This is done in an operating room while you are under general anesthesia (in a deep sleep).

A small cut is made in the front of your neck above your breast bone (sternum). Then a thin, hollow, lighted tube (a mediastinoscope) is slid in behind the sternum and in front of the windpipe to look at the area. Special instruments can be passed through this tube to take tissue samples from the lymph nodes along the windpipe and the space around the major breathing (bronchial) tubes.

Lung cancers often spread to lymph nodes, but mesotheliomas do this less often. Testing the lymph nodes can help show whether a cancer has started to spread, which might affect treatment options. It can also sometimes help tell lung cancers from mesotheliomas. People with mesothelioma don't need to have a bronchoscopy. (This is when a tube is used to look inside the breathing tubes.) It's not needed because mesothelioma doesn't spread inside the breathing tubes. Instead, sometimes a bronchoscopy may be used to biopsy lymph nodes near the lungs instead of a mediastinoscopy.

**Endobronchial ultrasound needle biopsy:** For this test, a bronchoscope (a long, thin,

flexible, fiber-optic tube) with an ultrasound device at its tip is passed down the throat and into the windpipe. The ultrasound lets the doctor see the nearby lymph nodes. A hollow needle is passed down the bronchoscope and through the airway wall into the nodes to take biopsy samples. This procedure may be done with either general anesthesia (where you are asleep), or with numbing medicine (local anesthesia) and light sedation.

### **Open surgical biopsy**

Sometimes, endoscopic biopsies aren't enough to make a diagnosis, so more invasive procedures are needed. By making an incision in the chest (thoracotomy) or in the abdomen (laparotomy) the surgeon can remove a larger sample of tumor or, sometimes, take out the entire tumor.

### **Testing the samples in the lab**

All biopsy and fluid samples are sent to a pathology lab. There, a doctor will look at them with a microscope and test them to find out if they contain cancer cells (and if so, what type of cancer it is).

It's often hard to diagnose mesothelioma by looking at cells from fluid samples. It can even be hard to diagnose mesothelioma with tissue from small needle biopsies. Under the microscope, mesothelioma often looks like other types of cancer. For example, pleural mesothelioma can look a lot like some types of [lung cancer](#)<sup>6</sup>, and peritoneal mesothelioma in women may look like some cancers of the [ovaries](#)<sup>7</sup>.

For this reason, special lab tests are often done to help tell mesothelioma from some other cancers. To learn more about some of the tests that might be done on tissue samples, see [Testing Biopsy and Cytology Specimens for Cancer](#)<sup>8</sup>.

If mesothelioma is diagnosed, the doctor will also determine what [type of mesothelioma](#)<sup>9</sup> it is, based on the patterns of cells seen in the microscope. Most mesotheliomas are classified as either epithelioid, sarcomatoid, or mixed/biphasic .

### **Pulmonary function tests**

If mesothelioma has been diagnosed, pulmonary function tests (PFTs) may be done to see how well your lungs are working. This is especially important if [surgery](#)<sup>10</sup> might be an option to treat the cancer. Surgery often requires removing part or all of a lung, so it's important to know how well the lungs are working to start with. These tests can give the surgeon an idea of whether surgery may be an option, and if so, how much lung can

safely be removed safely.

There are a few different types of PFTs, but basically you breathe in and out through a tube connected to a machine that measures airflow and how much air your lungs can hold.

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/causes-risks-prevention/risk-factors.html](http://www.cancer.org/cancer/malignant-mesothelioma/causes-risks-prevention/risk-factors.html)
2. [www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html)
3. [www.cancer.org/treatment/understanding-your-diagnosis/tests/testing-biopsy-and-cytology-specimens-for-cancer/biopsy-types.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/testing-biopsy-and-cytology-specimens-for-cancer/biopsy-types.html)
4. [www.cancer.org/treatment/understanding-your-diagnosis/tests/endoscopy.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/endoscopy.html)
5. [www.cancer.org/cancer/malignant-mesothelioma/treating/palliative-procedures.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/palliative-procedures.html)
6. [www.cancer.org/cancer/lung-cancer.html](http://www.cancer.org/cancer/lung-cancer.html)
7. [www.cancer.org/cancer/ovarian-cancer.html](http://www.cancer.org/cancer/ovarian-cancer.html)
8. [www.cancer.org/treatment/understanding-your-diagnosis/tests/testing-biopsy-and-cytology-specimens-for-cancer.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/testing-biopsy-and-cytology-specimens-for-cancer.html)
9. [www.cancer.org/cancer/malignant-mesothelioma/about/malignant-mesothelioma.html](http://www.cancer.org/cancer/malignant-mesothelioma/about/malignant-mesothelioma.html)
10. [www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html)

## References

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# Malignant Mesothelioma Stages

After malignant mesothelioma is diagnosed, the next step is to try to figure out if it has spread, and if so, how far. This process is called **staging**. The stage of a cancer describes how much cancer is in the body. It helps determine how serious the cancer is and [how best to treat it](#)<sup>1</sup>. Doctors also use a cancer's stage when talking about survival statistics.

The stages of mesothelioma range from I (1) through IV (4). As a rule, the lower the number, the less the cancer has spread. A higher number, such as stage IV, means cancer has spread more. And within a stage, an earlier letter (after the number) means a lower stage. Each person with cancer is unique, but cancers with similar stages tend to have a similar outlook and are often treated in much the same way.

## How is the stage determined?

**Malignant pleural mesothelioma (MPM)**, the most common type, is the only mesothelioma that has a formal staging system. These mesotheliomas start in the pleura, which includes the lining of the lungs and the inner lining of the chest wall.

The staging system most often used for MPM is the American Joint Committee on Cancer (AJCC) **TNM** system, which is based on 3 key pieces of information:

- The extent (size) of the main **tumor (T)**: How far has cancer spread in the pleura? Has it spread into other nearby pleura or structures? Can it be removed with surgery?
- The spread to nearby lymph **nodes (N)**: Has the cancer spread to nearby lymph nodes?
- The spread (**metastasis**) to distant sites (**M**): Has the cancer spread to distant organs, like the bones, liver, the lungs or pleura (lining of the lung) on the other side of the body, or the peritoneum (the lining of the abdomen)?

Numbers or letters after T, N, and M provide more details about each of these factors. Higher numbers mean the cancer is more advanced. Once a person's T, N, and M categories have been determined, this information is combined in a process called stage grouping to assign an overall stage. For more on this, see [Cancer Staging](#)<sup>2</sup>.

The system described below is the most recent AJCC system, effective as of January 2018. **It's used only for malignant pleural mesotheliomas.** Mesotheliomas starting in other places are less common and do not have formal staging systems.

MPM typically is given a **clinical stage** based on the results of a physical exam, biopsy,

and imaging tests (as described in [How Is Malignant Mesothelioma Diagnosed?](#)). If surgery is done, the **pathologic stage** (also called the **surgical stage**) is determined by examining the tissue removed during the operation.

Cancer staging can be complex, so ask your doctor to explain it to you in a way you understand.

## Stages of malignant pleural mesothelioma

AJCC Stage	Stage grouping	Stage description*
IA	T1 N0 M0	Mesothelioma is in the pleura lining the chest wall on one side of the chest. It may or may not also affect the pleura lining the diaphragm (the thin breathing muscle below the lungs), the mediastinum (the space between the lungs), or the pleura covering the lung (T1). It has not spread to nearby lymph nodes (N0) or to distant parts of the body (M0).
	T2 N0 M0	Mesothelioma is in the pleura lining the chest wall on one side of the chest, as well as in the pleura coating the diaphragm, the mediastinum, and the lung. It also has grown into the diaphragm or the lung itself (T2). It has not spread to nearby lymph nodes (N0) or to distant parts of the body (M0).
IB	OR	
	T3 N0 M0	<p>Mesothelioma has grown into nearby structures but may still possibly be removed (resected) with surgery (T3). The tumor is in the pleura lining the chest wall on one side of the chest, as well as the pleura coating the lung, the diaphragm, and the mediastinum on the same side. It also has grown into at least 1 of the following:</p> <ul style="list-style-type: none"> <li>• The first layer of the chest wall (called the <b>endothoracic fascia</b>)</li> <li>• The fatty tissue in the mediastinum</li> <li>• A single place in the deeper layers of the chest wall</li> <li>• The surface of the pericardium (outer covering layer of the heart)</li> </ul> <p>The cancer has not spread to nearby lymph nodes (N0) or to</p>

		distant parts of the body (M0).
<b>II</b>	<b>T1 or T2</b> <b>N1</b> <b>M0</b>	Mesothelioma is in the pleura lining the chest wall on one side of the chest (T1), and it may have grown into the diaphragm or the lung itself (T2). The cancer has spread to nearby lymph nodes on the same side of the body as the main tumor (N1). It has not spread to distant parts of the body (M0).
<b>IIIA</b>	<b>T3</b> <b>N1</b> <b>M0</b>	<p>Mesothelioma has grown into nearby structures but may still possibly be removed (resected) with surgery (T3). The tumor is in the pleura lining the chest wall on one side of the chest, as well as the pleura coating the lung, the diaphragm, and the mediastinum on the same side. It also has grown into at least 1 of the following:</p> <ul style="list-style-type: none"> <li>• The first layer of the chest wall ( <b>endothoracic fascia</b> )</li> <li>• The fatty tissue between the lungs (in the mediastinum)</li> <li>• A single place in the deeper layers of the chest wall</li> <li>• The surface of the pericardium (outer covering of the heart)</li> </ul> <p>The cancer has spread to nearby lymph nodes on the same side of the body as the main tumor (N1). It has not spread to distant parts of the body (M0).</p>
<b>IIIB</b>	<b>T1-T3</b> <b>N2</b> <b>M0</b>	Mesothelioma may or may not have grown into nearby structures, and it may still possibly be removed (resected) with surgery (T1 to T3). The cancer has spread to nearby lymph nodes on the other side of the body, or to lymph nodes above the collarbone (supraclavicular lymph nodes) on either side (N2). It has not spread to distant parts of the body (M0).
	<b>OR</b>	
	<b>T4</b> <b>Any N</b>	Mesothelioma has grown too far to be removed completely with surgery (T4). The tumor is in the pleura lining the chest wall on one side of the chest, as well as the pleura coating the lung, diaphragm, and mediastinum on the same side. The tumor also has grown into at least 1 of the following:

	<b>M0</b>	<ul style="list-style-type: none"> <li>• More than 1 place in the deeper layers of the chest wall, including the muscle or ribs</li> <li>• Through the diaphragm and into the peritoneum (the lining around the abdomen)</li> <li>• Any organ in the mediastinum (esophagus, trachea, thymus, or blood vessels)</li> <li>• The spine</li> <li>• Across to the pleura on the other side of the chest</li> <li>• Through the heart lining (pericardium) or into the heart itself</li> </ul> <p>The cancer may or may not have spread to nearby lymph nodes (any N). It has not spread to distant parts of the body (M0).</p>
<b>IV</b>	<b>Any T</b> <b>Any N</b> <b>M1</b>	Mesothelioma may or may not have grown into nearby structures (any T). It may or may not have spread to nearby lymph nodes (any N). It has spread to distant organs, like the bones, the liver, the lung or pleura on the other side of the body, or the peritoneum (the lining of the abdomen) (M1).

\* The following categories may be used, but are not listed on the table above:

- **TX:** Main tumor cannot be assessed due to lack of information.
- **T0:** There's no evidence of a primary tumor.
- **NX:** Nearby lymph nodes cannot be assessed due to lack of information.

## Resectable versus unresectable cancer

The TNM system groups mesotheliomas into stages that help give doctors an idea about a person's prognosis (outlook). But for treatment purposes, doctors often use a simpler system, based on whether the cancer is likely to be **resectable** (where all visible tumor can be removed by [surgery](#)<sup>3</sup>) or **unresectable** (all of the cancer cannot be removed).

In general, most stage I and II mesotheliomas, as well as some stage III, might be resectable, but there are exceptions. Whether the cancer can be removed depends not only on how far the tumor has grown, but also on its subtype (most doctors believe only epithelioid and mixed/biphasic tumors are potentially resectable), where it's located, and if the patient is healthy enough to have surgery.



Even for resectable mesotheliomas, in most cases cancer cells that can't be seen are left behind after surgery. Because of this, many doctors use other treatments ([radiation therapy](#)<sup>4</sup> and/or [chemotherapy](#)<sup>5</sup>) along with surgery when possible.

## Other prognostic factors

Stage is an important factor in predicting a person's prognosis (outlook), but other factors also play a role. Some factors linked to longer survival times include:

- Still being able to carry out normal daily tasks
- Being younger
- Being female
- Having the epithelioid subtype of mesothelioma
- Having normal levels of LDH in the blood
- Having normal levels of red blood cells, white blood cells, and platelets

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/treating/by-extent.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/by-extent.html)
2. [www.cancer.org/treatment/understanding-your-diagnosis/staging.html](http://www.cancer.org/treatment/understanding-your-diagnosis/staging.html)
3. [www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html)
4. [www.cancer.org/cancer/malignant-mesothelioma/treating/radiation.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/radiation.html)
5. [www.cancer.org/cancer/malignant-mesothelioma/treating/chemotherapy.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/chemotherapy.html)

## References

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## Survival Rates for Mesothelioma

Survival rates can give you an idea of what percentage of people with the same type and stage of cancer are still alive a certain amount of time (usually 5 years) after they were diagnosed. They can't tell you how long you will live, but they may help give you a better understanding of how likely it is that your treatment will be successful.

**Keep in mind that survival rates are estimates and are often based on previous outcomes of large numbers of people who had a specific cancer, but they can't predict what will happen in any particular person's case. These statistics can be confusing and may lead you to have more questions. Talk with your doctor about how these numbers may apply to you, as he or she is familiar with your situation.**

### What is a 5-year relative survival rate?

A **relative survival rate** compares people with the same type and stage of malignant pleural mesothelioma (MPM) to people in the overall population. For example, if the **5-year relative survival rate** for a specific stage of MPM is 30%, it means that people who have that cancer are, on average, about 30% as likely as people who don't have that cancer to live for at least 5 years after being diagnosed.

### Where do these numbers come from?

The American Cancer Society relies on information from the SEER\* database, maintained by the National Cancer Institute (NCI), to provide survival statistics for different types of cancer.

The SEER database tracks 5-year relative survival rates for MPM in the United States, based on how far the cancer has spread. The SEER database, however, does not group cancers by [AJCC TNM stages](#) (stage 1, stage 2, stage 3, etc.). Instead, it groups cancers into localized, regional, and distant stages:

- **Localized:** The cancer is limited to the pleura.
- **Regional:** The cancer has spread to nearby structures or to nearby lymph nodes.
- **Distant:** The cancer has spread to distant parts of the body such as the liver, bones or pleura on the other side of the body.

### 5-year relative survival rates for malignant pleural mesothelioma

(Based on people diagnosed with MPM between 2008 and 2014.)

SEER Stage	5-Year Relative Survival Rate
Localized	18%
Regional	11%
Distant	7%
All SEER stages combined	9%

### Understanding the numbers

- **These numbers apply only to the stage of the cancer when it is first diagnosed.** They do not apply later on if the cancer grows, spreads, or comes back after treatment.
- **These numbers don't take everything into account.** Survival rates are grouped based on how far the cancer has spread, but your age, overall health, [how resectable the cancer is](#)<sup>1</sup>, [type of mesothelioma](#)<sup>2</sup>, how well the cancer responds to treatment, and [other factors](#) can also affect your outlook.
- **People now being diagnosed with MPM may have a better outlook than these numbers show.** Treatments improve over time, and these numbers are based on people who were diagnosed and treated at least five years earlier.

\*SEER= Surveillance, Epidemiology, and End Results

### Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html)
2. [www.cancer.org/cancer/malignant-mesothelioma/about/malignant-](http://www.cancer.org/cancer/malignant-mesothelioma/about/malignant-)

[mesothelioma.html](#)

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# Questions To Ask About Malignant Mesothelioma

It's important to have honest, open discussions with your cancer care team. You should ask any question, no matter how small it might seem.

Here are some questions you can use to help better understand mesothelioma and your treatment options. Don't be afraid to take notes and tell the doctors or nurses when you don't understand what they're saying. You might want to bring another person with you and have them take notes to help you remember what was said.

## When you're told you have mesothelioma

- What [kind of mesothelioma](#)<sup>1</sup> do I have?
- Where is the cancer? Has my cancer spread beyond where it started?
- What's the [stage](#) (extent) of the cancer, and what does that mean?
- Do I need other [tests](#) before we can decide on treatment?
- Do I need to see any other types of doctors?
- If I'm concerned about the costs and [insurance coverage](#)<sup>2</sup> for my diagnosis and treatment, who can help me?

## When deciding on a treatment plan

- How much experience do you have treating this type of cancer?
- Should I get a [second opinion](#)<sup>3</sup> ? How do I do that?
- What are my [treatment options](#)<sup>4</sup>?
- Do you think my cancer can be removed by [surgery](#)<sup>5</sup>?
- Should I think about taking part in a [clinical trial](#)<sup>6</sup>?
- What is the goal of treatment?
- What do you recommend and why?
- How soon do I need to start treatment?
- What should I do to be ready for treatment?
- How long will treatment last? What will it be like? Where will it be done?
- What risks or side effects are there to the treatments you suggest? Is there anything we can do to reduce side effects?
- How will treatment affect my daily activities? Can I still work?
- What will we do if the treatment doesn't work or if the cancer recurs?

## During treatment

Once treatment starts, you'll need to know what to expect and what to look for. Not all of these questions may apply to you, but asking the ones that do may be helpful.

- How will we know if treatment is working?
- Is there anything I can do to help manage side effects?
- What [symptoms](#)<sup>7</sup> or side effects should I tell you about right away?
- How can I reach you on nights, holidays, or weekends?
- Will I need to change what I eat during treatment?
- Are there any limits on what I can do?
- Can I exercise during treatment? If so, what kind of exercise should I do, and how often?
- Can you suggest a mental health professional I can see if I start to feel overwhelmed, depressed, or distressed?
- Will I need special tests, such as imaging scans or blood tests? How often?

## After treatment

- What type of [follow-up](#)<sup>8</sup> might I need after treatment?
- Are there any limits on what I can do?
- How often will I need follow-up exams, blood tests, or imaging tests?
- How will we know if the cancer comes back? What should I watch for?
- What will my options be if the cancer comes back?

Be sure to write down questions of your own. For instance, you might want to ask about nearby or online support groups where you can talk with other people going through similar situations. Or you may want to ask if you qualify for any [clinical trials](#)<sup>9</sup>.

Keep in mind that doctors aren't the only ones who can give you information. Other health care professionals, such as nurses and social workers, can answer some of your questions. To find out more about speaking with your health care team, see [The Doctor-Patient Relationship](#)<sup>10</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/about/malignant-mesothelioma.html](http://www.cancer.org/cancer/malignant-mesothelioma/about/malignant-mesothelioma.html)
2. [www.cancer.org/treatment/finding-and-paying-for-treatment/understanding-health-insurance.html](http://www.cancer.org/treatment/finding-and-paying-for-treatment/understanding-health-insurance.html)
3. [www.cancer.org/treatment/finding-and-paying-for-treatment/choosing-your-treatment-team/seeking-a-second-opinion.html](http://www.cancer.org/treatment/finding-and-paying-for-treatment/choosing-your-treatment-team/seeking-a-second-opinion.html)
4. [www.cancer.org/cancer/malignant-mesothelioma/treating.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating.html)
5. [www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/surgery.html)
6. [www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html](http://www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html)
7. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)
8. [www.cancer.org/cancer/malignant-mesothelioma/after-treatment.html](http://www.cancer.org/cancer/malignant-mesothelioma/after-treatment.html)
9. [www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html](http://www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html)
10. [www.cancer.org/treatment/understanding-your-diagnosis/talking-about-cancer/the-doctor-patient-relationship.html](http://www.cancer.org/treatment/understanding-your-diagnosis/talking-about-cancer/the-doctor-patient-relationship.html)

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# Treating Malignant Mesothelioma

## How is mesothelioma treated?

The main factors in selecting treatment for mesotheliomas are the location and extent of the tumor, whether it has spread to lymph nodes or other organs, and your health and personal preferences. Based on these factors, your treatment options may include:

- [Surgery for Malignant Mesothelioma](#)
- [Palliative Procedures for Malignant Mesothelioma](#)
- [Radiation Therapy for Malignant Mesothelioma](#)
- [Chemotherapy for Malignant Mesothelioma](#)
- [Immunotherapy for Malignant Mesothelioma](#)
- [Targeted Therapy for Malignant Mesothelioma](#)

## Common treatment approaches

Mesothelioma can be hard to treat because it typically does not grow as a single tumor mass. It tends to spread along nearby surfaces, nerves, and blood vessels. This often makes it very hard to get rid of the cancer completely with surgery and/or radiation. For some people, palliative procedures might be used to help treat some symptoms of mesothelioma.

Because mesothelioma is a rare cancer, it has been hard for doctors to compare the value of different treatments. Only a few large clinical trials of treatments for mesothelioma have been done. In addition, many doctors have very little experience treating this disease. They usually refer patients to specialists who treat large numbers of mesothelioma patients at major medical centers.

- [Treatment of Mesothelioma By the Extent of the Cancer](#)



## Who treats mesothelioma?

You might have different types of doctors on your treatment team, depending on the stage of your cancer and your treatment options. These doctors may include:

- A **thoracic surgeon**: a doctor who treats diseases of the lungs and chest with surgery
- A **surgical oncologist**: a doctor who treats cancer with surgery
- A **radiation oncologist**: a doctor who treats cancer with radiation therapy.
- A **medical oncologist**: a doctor who treats cancer with medicines such as chemotherapy
- A **pulmonologist**: a doctor who specializes in medical treatment of diseases of the lungs

Many other specialists may be involved in your care as well, including nurse practitioners, nurses, psychologists, social workers, rehabilitation specialists, and other health professionals.

- [Health Professionals Associated With Cancer Care<sup>1</sup>](#)

## Making treatment decisions

Before deciding on a treatment plan, it's very important to have an idea of its likely benefits and possible risks. You will probably have many questions about the treatment options suggested. If there's anything you don't understand, ask to have it explained.

Mesotheliomas are rare, so if time allows it's often a good idea to get a second opinion from a doctor who has a lot of experience in treating people with these cancers. A second opinion can give you more information and help you feel more confident about the treatment plan you choose.

- [Questions To Ask About Malignant Mesothelioma<sup>2</sup>](#)
- [Seeking a Second Opinion<sup>3</sup>](#)

## Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. Clinical trials are one way to get state-of-the-art cancer treatment. In some cases they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to

treat cancer. Still, they're not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials.

- [Clinical Trials](#)<sup>4</sup>

## Considering complementary and alternative methods

You may hear about alternative or complementary methods that your doctor hasn't mentioned to treat your cancer or relieve symptoms. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

Complementary methods refer to treatments that are used along with your regular medical care. Alternative treatments are used instead of a doctor's medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be harmful.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision.

- [Complementary and Alternative Medicine](#)<sup>5</sup>

## Help getting through cancer treatment

Your cancer care team will be your first source of information and support, but there are other resources for help when you need it. Hospital- or clinic-based support services are an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

The American Cancer Society also has programs and services – including rides to treatment, lodging, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists.

- [Find Support Programs and Services in Your Area](#)<sup>6</sup>

## Choosing to stop treatment or choosing no treatment at all

For some people, when treatments have been tried and are no longer controlling the cancer, it could be time to weigh the benefits and risks of continuing to try new treatments. Whether or not you continue treatment, there are still things you can do to help maintain or improve your quality of life.

Some people, especially if the cancer is advanced, might not want to be treated at all. There are many reasons you might decide not to get cancer treatment, but it's important to talk to your doctors and you make that decision. Remember that even if you choose not to treat the cancer, you can still get supportive care to help with pain or other symptoms.

- [If Cancer Treatments Stop Working](#)<sup>7</sup>
- [Palliative or Supportive Care](#)<sup>8</sup>

*The treatment information given here is not official policy of the American Cancer 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.*

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## Surgery for Malignant Mesothelioma

Surgery for mesothelioma may be done:

- To try to cure the cancer (potentially curative surgery)
- To relieve pain and other symptoms caused by the tumor (palliative surgery)

**Potentially curative surgery** may be an option if you're in otherwise good health and the cancer can be removed completely. But even when the surgeon removes all of the cancer that can be seen, some cancer cells are often left behind. These cells can grow and divide, causing the cancer to come back after surgery. Because of this, not all doctors agree on the exact role of surgery. In most cases it won't cure you, but it could help you live longer. Still, potentially curative surgery is being done in some major cancer centers, and a small number of people who have had the surgery have had long periods of time with no sign of cancer.

**Palliative surgery** may be an option if the tumor has already spread beyond where it started and would be hard to remove completely. It may also be used if you're too ill for a more extensive operation. The goal of this surgery is to ease or prevent symptoms, not to cure the cancer.

## Types of surgery for pleural mesothelioma

Either potentially curative or palliative surgery might be used for pleural mesothelioma. But in most cases, these tumors have spread too far to be removed completely. Sometimes, the surgeon might not be able to tell the full extent of the cancer – and not know which type of surgery might be best – until the operation has started.

**Extrapleural pneumonectomy (EPP):** This is a major operation, but it may offer the best chance to remove all of the cancer for many patients. It might be used when the surgeon thinks a cure is possible – mostly in patients with resectable epithelioid mesothelioma that has not spread to the lymph nodes.

In EEP, the surgeon removes the lung on the side of the cancer along with the pleura lining the chest wall on that side, the diaphragm (thin breathing muscle) on that side, maybe the pericardium (the sac around the heart), and nearby lymph nodes. The diaphragm and the pericardium are then rebuilt with man-made materials.

This is a complex operation that's only done by experienced surgeons in large medical centers. You must be in good overall health with good lung function and no other serious illnesses to withstand EEP. A lot of tests must be done beforehand to be sure you're healthy enough for this surgery. About 1 in 3 patients who have this operation can have major complications.

**Pleurectomy/decortication (P/D):** This is a less extensive operation in which all of the pleura lining the chest wall (on the side with the cancer) is removed, along with the pleura coating the lung on that same side. The pleura coating the mediastinum and the diaphragm is also removed. The lung and diaphragm muscle are not removed.

In a slightly more extensive version of this operation ( a radical orextended P/D), the diaphragm on the side with cancer and/or pericardium are removed too.

This surgery can be used to try to cure some early cancers, but it can also be used as a palliative procedure to relieve symptoms if the entire tumor can't be removed. It can help control the buildup of fluid, improve breathing, and lessen pain caused by the cancer.

**Debulking (partial pleurectomy):** The goal of this surgery is to remove as much of the cancer and mesothelioma as possible. In general, less tissue is removed in this operation than in a P/D procedure.

### **Possible side effects of surgery**

The operations used to treat mesothelioma can have serious risks and side effects, which depend on the extent of the surgery and the person's health beforehand. Serious complications of EPP can include bleeding, blood clots, wound infections, changes in heart rhythm, pneumonia, fluid build-up in the chest, and loss of lung function. These tend to be less common with less extensive operations.

Because the surgeon must often spread the ribs during surgery, the incision will hurt for some time afterward. Your activity will be limited for at least a month or two.

Studies have suggested that P/D is preferred because there are fewer problems linked to it, and overall outcomes are much the same as, if not better than EPP. P/D tends to be used more often in most treatment centers, but more studies are needed to compare the 2 surgeries. At this time the type of surgery used depends on the hospital and surgeon's experience along with the details of each patient's cancer and overall health, as well as their personal preferences.

### **Surgery for peritoneal mesothelioma**

Surgery for peritoneal mesothelioma can be used to help ease symptoms or to remove the tumor from the wall of the abdomen (belly) and digestive organs. As is the case with pleural mesothelioma, these tumors often have spread too far to be removed completely.

**Debulking:** The goal of this surgery is to remove as much of the mesothelioma as possible. Sometimes this means removing pieces of the intestine as well.

After as much of the visible cancer is removed as possible (but before the operation is finished), [chemotherapy](#) may be put into the abdomen. This is called **intraoperative or intraperitoneal chemotherapy**. If the chemotherapy drugs are heated, it's called **heated intraoperative chemotherapy or HIPEC**. In either treatment, the drugs are left in for a short time, then they're removed and the incision is closed.

**Omentectomy:** The omentum is an apron-like layer of fatty tissue that drapes over the organs inside the abdomen. Cancers in the peritoneum often spread to this tissue, so it may be removed as part of surgery for peritoneal mesothelioma.

## Surgery for pericardial mesothelioma

Surgery can remove a mesothelioma from the pericardium (the sac around the heart). The entire pericardium may be removed (called a pericardectomy) can be removed to ease pressure on the heart. Surgery may be done to make a hole in the pericardium, which is called a pericardial window. This can be used to put chemo into the area around the heart.

## Surgery for mesothelioma of the tunica vaginalis

Surgery for mesothelioma of the tunica vaginalis, which covers the testicles, rarely cures this cancer. Most of the time surgery is done when the tumor is mistaken for a hernia. The surgeon attempts to treat a suspected hernia and only realizes the diagnosis after the surgery has begun. This kind of mesothelioma can seldom be removed entirely.

For more on surgery as a treatment for cancer, see [Cancer Surgery](#)<sup>1</sup>.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html)

## References

See all references for Malignant Mesothelioma ([www.cancer.org/cancer/malignant-mesothelioma/references.html](http://www.cancer.org/cancer/malignant-mesothelioma/references.html))

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# Palliative Procedures for Malignant Mesothelioma

Mesotheliomas can often be hard to remove or destroy completely. Still, treatments can often help control it for a time or ease problems it's causing. For instance, some types of [surgery](#) or [chemotherapy](#) might help keep the cancer in check. [Radiation therapy](#) might also be useful to ease chest pain or blockages in the breathing tubes.

## Removing fluid

If pleural mesothelioma is causing fluid to build up in the body, it can often cause trouble breathing and other problems. Sometimes procedures can be used to remove the fluid or help keep it from coming back.

Thoracentesis, paracentesis, and pericardiocentesis are procedures that can be used to take out fluid that has built up and is causing symptoms such as trouble breathing. A long, hollow needle is used to remove the fluid. These procedures are described in [Tests for Malignant Mesothelioma](#).<sup>1</sup> The fluid often builds up again, so these procedures might need to be repeated.

## Pleurodesis

This procedure may be done to try to keep fluid from building up in the chest. A small cut is made in the skin of the chest wall, and a hollow tube (called a chest tube) is put into the chest so that the fluid can drain out. Then, a talc mixed in a fluid (talc slurry), the antibiotic doxycycline, or the chemotherapy drug bleomycin is put into the chest tube. This irritates the linings of the lung (visceral pleura) and chest wall (parietal pleura) so that they stick together, sealing the space and preventing further fluid build-up. The tube is generally left in for a day or two to drain any new fluid. Pleurodesis can also be done during a [thoracoscopy](#).<sup>2</sup>

## Shunt placement

A shunt is a device that allows fluid to move from one part of the body to another. For example, a pleuro-peritoneal shunt lets excess fluid in the chest drain into the abdomen (belly). There, it's more likely to be absorbed by the body. A shunt may be used if pleurodesis or other techniques don't work.

The shunt is a long, thin, flexible tube with a small pump in the middle. In the operating room, the doctor puts one end of the shunt into the chest space and the other end into the abdomen. (The pump part stays just under the skin over the ribs.) Once the shunt is in place, the patient pushes down on the pump several times to move the fluid from the chest to the abdomen. This is usually done a few times each day.

## Catheter placement

This is another approach sometimes used to control fluid build-up. One end of the catheter (a thin, flexible tube) is put in the chest (or abdomen for peritoneal mesothelioma) through a small cut in the skin, and the other end is left outside the body. This is done in a doctor's office or hospital. Once in place, the catheter can be attached to a special bottle or other device to drain fluid out on a regular basis.

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html](http://www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html)
2. [www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html](http://www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html)

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# Radiation Therapy for Malignant Mesothelioma

Radiation therapy uses high-energy x-rays or particles to kill cancer cells. Mesotheliomas tend to be hard to treat with radiation therapy. They don't usually grow as single, distinct tumors, so it can be hard to aim radiation at them while avoiding nearby normal tissues. Still, newer techniques give better control of the radiation beams and may make this form of treatment more useful for some people.

Radiation therapy can be used in different ways to treat mesothelioma:

- It can be used after [surgery](#) to try to kill any small areas of cancer that couldn't be



seen and removed during surgery. This is called **adjuvant** radiation therapy.

- It can be used as a [palliative procedure](#)<sup>1</sup> to ease symptoms of mesothelioma such as shortness of breath, pain, bleeding, or trouble swallowing.

## Types of radiation therapy

### External beam radiation therapy (EBRT)

This is the main type of radiation therapy used for mesothelioma. It uses x-rays from a machine outside the body to kill cancer cells.

With newer techniques, for example, intensity-modulated radiation therapy (IMRT), doctors can treat mesotheliomas more accurately while reducing the radiation damage to nearby healthy tissues. This might offer a better chance of radiation working, while limiting side effects.

### Brachytherapy

For this type of radiation therapy, a radiation source is put inside the body, in or near the cancer. Brachytherapy is seldom used for mesothelioma unless it's part of a [clinical trial](#).<sup>2</sup>

### Possible side effects

Side effects of external radiation therapy include fatigue, sunburn-like skin problems, and hair loss where the radiation enters the body. These usually go away once treatment is finished. Chest radiation therapy can damage the lungs over time and lead to trouble breathing and shortness of breath. Abdominal radiation therapy may cause [nausea](#)<sup>3</sup>, [vomiting](#)<sup>4</sup>, diarrhea, and [loss of appetite](#).<sup>5</sup>

If radiation therapy is used together with [chemotherapy](#), the side effects tend to be worse.

If you're having any side effects from radiation, talk with your treatment team. There are often ways to help control these symptoms.

To learn more, see [Radiation Therapy](#)<sup>6</sup>.

## Hyperlinks

1. </content/cancer/en/cancer/malignantmesothelioma/detailedguide/malignant-mesothelioma-treating-palliative-procedures.html>
2. [www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html](http://www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html)
3. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/nausea-and-vomiting.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/nausea-and-vomiting.html)
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# Chemotherapy for Malignant Mesothelioma

Chemotherapy (chemo) is treatment with anti-cancer drugs. It's used in many different ways to treat mesothelioma. More studies are needed to find the best drugs and the best way to use chemo. Today, the best results are seen when it's used along with surgery.

If mesothelioma can be treated with surgery, chemo may be given first (before surgery) to try to shrink the cancer and lower the risk that it will spread. This is called **neoadjuvant therapy**.

Chemo can also be given after surgery to try to kill any cancer cells that were left behind. This type of treatment, called **adjuvant therapy**, may help delay or help keep the cancer from growing back.

For cancers that can't be removed with surgery, chemo may be the main treatment (alone or along with [radiation therapy](#)). Chemo may shrink the cancer or slow its growth, but it's very unlikely that it will make it go away completely.

## How chemotherapy is given

Doctors usually give chemo in cycles, with each period of treatment followed by a rest period to allow the body time to recover. Chemo cycles generally last about 3 to 4 weeks. Chemo is often not recommended for patients in poor health, but advanced age by itself is not a barrier to getting it.

There are 2 main ways chemo can be given to treat mesothelioma.

### Systemic chemo

In systemic therapy, chemo is injected into the blood through a vein. The drug goes into the bloodstream and travels throughout the body to reach and destroy the cancer cells wherever they may be.

### Intrapleural or intraperitoneal chemo

Chemo drugs can also be put right into the body space where the cancer is – either intrapleurally (into the chest) or intraperitoneally (into the abdomen). This is done with a small catheter (tube) placed through a small cut in the chest or abdominal wall. Chemo drugs given this way are still absorbed into the bloodstream, but the highest concentrations of the drugs go right to where the cancer cells are.

For intrapleural or intraperitoneal chemo, the drugs are sometimes heated before they are put into the body space. This is called **hyperthermic chemotherapy**. Heating the chemo drugs may help them work better. Sometimes this treatment is given as a single dose in the operating room, right after surgery is done to remove the cancer. This is called **heated intraoperative chemotherapy**. It's more often used to treat peritoneal cancers, in which case it may be called **heated intraperitoneal chemotherapy** or HIPEC.

## Chemotherapy drugs used for mesothelioma

Many chemo drugs can be used to treat mesothelioma, including:

- Pemetrexed (Alimta<sup>®</sup>)
- Cisplatin
- Carboplatin
- Gemcitabine (Gemzar<sup>®</sup>)
- Vinorelbine

These are often given as combinations of 2 drugs. But single drugs can be used in people who may not be able to tolerate more than one drug.

When 2 drugs are used, most doctors give pemetrexed and cisplatin. Pemetrexed lowers levels of folic acid and vitamin B12 in the body, so patients get these as well to help avoid certain side effects. Other possible combinations include pemetrexed with carboplatin, or cisplatin with gemcitabine.

The drugs used for HIPEC include:

- Cisplatin plus doxorubicin (most common)
- Paclitaxel
- Pemetrexed

## Possible side effects

Chemo drugs attack cells that are dividing quickly, which is why they work against cancer cells. But other cells in the body, such as those in the bone marrow (where new blood cells are made), the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are likely to be affected by chemo, which can lead to side

effects.

The [side effects](#)<sup>1</sup> of chemo depend on the type and dose of drugs given, how they're given, and how long they're used. Common side effects include:

- Hair loss
- Mouth sores
- Loss of appetite
- [Nausea and vomiting](#)<sup>2</sup>
- Diarrhea
- Increased chance of [infections](#)<sup>3</sup> (from having too few white blood cells)
- Easy bruising or bleeding (from having too few blood platelets)
- [Fatigue](#)<sup>4</sup> (from having too few red blood cells)

These side effects usually go away after treatment is finished. There are often ways to lessen these side effects. For example, drugs can be given to help prevent or reduce nausea and vomiting. Be sure to ask your doctor or nurse about medicines to help reduce side effects, and let him or her know if you have side effects, so they can be managed.

Intraleural or intraperitoneal chemo tends to cause fewer problems than systemic chemo.

Some drugs can have other side effects. For example, cisplatin and carboplatin can damage nerves (called [peripheral neuropathy](#)<sup>5</sup>). This can sometimes lead to hearing loss or symptoms in the hands and feet such as pain, burning or tingling sensations, sensitivity to cold or heat, or weakness. This usually goes away over time once treatment is stopped, but it can last a long time in some people.

Be sure to report any side effects or changes you notice to your medical team so that you can get them treated right away. In some cases, the doses of the drugs may need to be reduced or treatment may need to be delayed or stopped to keep the effects from getting worse.

To learn more, see [Chemotherapy](#)<sup>6</sup>.

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1. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)
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## Immunotherapy for Malignant Mesothelioma

Immunotherapy is the use of drugs to stimulate a person's own immune system so it can better recognize and destroy cancer cells.

### Immune checkpoint inhibitors

An important part of the immune system is its ability to keep itself from attacking normal cells in the body. To do this, it uses “checkpoints” – molecules on immune cells that need to be turned on (or off) to start an immune response. Cancer cells sometimes use these checkpoints to keep from being attacked by the immune system. Newer drugs that target these checkpoints hold a lot of promise as cancer treatments. These drugs are called checkpoint inhibitors.

These drugs are used for people whose cancer is still growing after treatment with chemotherapy.

### PD-1 inhibitors

**Pembrolizumab (Keytruda®)** and **nivolumab (Opdivo®)** are drugs that target PD-1, a protein on immune system cells called T cells. PD-1 helps keep the T cells from attacking other cells in the body. By blocking PD-1, these drugs boost the immune response against cancer cells. This can shrink some tumors or slow their growth.

These drugs are given as an intravenous (IV) infusion every 2 or 3 weeks.

Side effects of these drugs can include fatigue, cough, nausea, itching, skin rash, decreased appetite, constipation, joint pain, and diarrhea.

Other, more serious side effects occur less often. These drugs work by removing the brakes from the body's immune system. Sometimes the immune system then starts attacking other parts of the body, which can cause serious or even life-threatening problems in the lungs, intestines, liver, hormone-making glands, kidneys, or other organs.

### **CTLA-4 inhibitor**

**Ipilimumab (Yervoy®)** is another drug that boosts the immune response, but it has a different target. It blocks CTLA-4, another protein on T cells that normally helps keep them in check.

This drug can be used along with nivolumab to treat mesothelioma, but it's not used alone.

It's given as an intravenous (IV) infusion, usually once every 3 weeks.

The most common side effects from this drug include fatigue, diarrhea, skin rash, and itching.

Serious side effects seem to happen more often with this drug than with the PD-1 inhibitors. Like the PD-1 inhibitors, this drug can cause the immune system to attack other parts of the body, which can lead to serious problems in the intestines, liver, hormone-making glands, nerves, skin, eyes, or other organs. In some people these side effects can be life threatening.

### **Side effects**

Talk to your treatment team about the side effects you should watch for. Most side effects can be treated, and some can even be prevented.

Still, it's very important to report any new side effects during or after treatment with any of these drugs to your health care team right away. If serious side effects do occur, you may need to stop treatment and take high doses of corticosteroids to suppress your immune system.

### **More information about immunotherapy**



To learn more about how drugs that work on the immune system are used to treat cancer, see [Cancer Immunotherapy](#)<sup>1</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>2</sup>.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html)
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# Targeted Therapy for Malignant Mesothelioma

As researchers learn more about the gene and protein changes in mesothelioma, they've tried to develop new drugs to target these changes. Many kinds of cancer are treated with targeted therapy today. Research is being done to see if they might work for mesothelioma, too.

Targeted therapy drugs work differently from standard chemotherapy (chemo) drugs. They sometimes work when standard chemo drugs don't, and they often have different (and less severe) side effects.

## Drugs that target blood vessel formation (VEGF)

Vascular endothelial growth factor (VEGF) is a protein that helps tumors form new blood vessels (a process known as angiogenesis) to get nutrients they need to grow.

Bevacizumab (Avastin<sup>®</sup>) is a drug that stops VEGF from working. It's been found to help people with pleural mesothelioma live longer when it's given along with pemetrexed and cisplatin, when compared to giving these chemo drugs alone.

Bevacizumab, pemetrexed, and cisplatin might be used as the main treatment for mesothelioma that can't be removed with surgery. It may then be followed by "maintenance" bevacizumab for up to a year.

Bevacizumab is given as an infusion into your vein (IV) every 2 or 3 weeks.

## Possible side effects of drugs that target VEGF

Common side effects of these drugs include:

- High blood pressure
- Extreme tiredness (fatigue)
- Bleeding
- Low white blood cell counts (with increased risk of infections)
- Headaches
- Mouth sores
- Loss of appetite
- Diarrhea

Rare, but possibly serious side effects include blood clots, severe bleeding, holes forming in the colon (called perforations), heart problems, kidney problems, and slow wound healing. If a hole forms in the colon it can lead to severe infection and surgery may be needed to fix it.

Another rare, but serious side effect of these drugs is an allergic reaction during the infusion, which could cause breathing problems and low blood pressure. You'll be watched closely while getting targeted therapy.

## More information about targeted therapy

To learn more about how targeted drugs are used to treat cancer, see [Targeted Cancer Therapy](#)<sup>1</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>2</sup>.

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## Treatment of Mesothelioma By the Extent of the Cancer

The [stage](#)<sup>1</sup> (extent) of mesothelioma is an important factor in determining treatment options. But other factors, such as whether the doctor feels the cancer is resectable (all visible cancer can be removed by surgery), as well as a person's general health and preferences, also play a role.

Mesothelioma tends to be hard to treat, whether the cancer is resectable or not. It's best to be treated by a team of doctors who have a lot of experience with mesothelioma. It's also very important that you understand the goal of treatment before it starts – whether it's to try to cure the cancer or to help relieve symptoms – as well as the possible benefits and risks. This can help you make an informed decision when looking at your treatment options.

### Resectable mesotheliomas

Most stage I and some stage II and III pleural mesotheliomas are potentially resectable, but there are exceptions. Whether a tumor is resectable is also based on the [subtype](#)<sup>2</sup> (most doctors don't believe that sarcomatoid tumors are helped by resection), where it is in the body, how far it has grown into nearby tissues, and if the person is healthy enough to have [surgery](#).

Many people with resectable pleural mesothelioma have it removed by either pleurectomy/decortication (P/D) or extrapleural pneumonectomy (EPP). Surgery is more likely to have long-term benefits in early-stage cancers, where there's a better chance that most or all of the cancer can be removed. EPP might offer the best chance to remove the cancer, but it's a complex and extensive operation that's more likely to cause complications, and not all patients can tolerate it.

Patients with early-stage peritoneal mesotheliomas might also benefit from surgery to take out as much of the cancer as possible. This may be combined with [heated intraperitoneal chemotherapy \(HIPEC\)](#). Some patients have long remissions after this treatment. (This means the cancer is under control and not growing or spreading.)

Surgery may also be helpful for some later-stage cancers, but the benefits are more likely to last only a short time.

Sometimes, the surgeon may think the cancer is resectable based on imaging tests (like CT scans) done before surgery, but once the operation starts it becomes clear that not all of the cancer can be removed. In these cases the surgeon may switch to a less extensive operation like P/D (which is easier to tolerate) or even stop the surgery altogether if it's not likely to be helpful. Treatment would then be the same as for unresectable mesotheliomas (see below).

Doctors are still studying whether giving [chemotherapy](#) (chemo) before surgery (called neoadjuvant therapy) or giving chemo and/or [radiation therapy](#) after surgery (adjuvant therapy) is helpful. Not all doctors agree on the best ways to use these treatments together. Some doctors prefer to give chemo, either before or after surgery. Radiation therapy might be used after surgery, either alone or along with chemo.

If you're not healthy enough to have a major operation, you'll be treated for unresectable mesothelioma.

If you have symptoms because of fluid buildup in the chest or abdomen (belly), other approaches such as thoracentesis/paracentesis or pleurodesis may be helpful. (These are described in [palliative procedures](#).)

Because these cancers can be hard to treat, taking part in a [clinical trial](#)<sup>3</sup> of a new, and maybe better, treatment may be another option. These types of studies are usually done in large medical centers.

## Unresectable mesotheliomas

Stage IV mesotheliomas, as well as many earlier-stage mesotheliomas, can't be removed completely by surgery. This might be because of the extent or subtype of the cancer or because a person isn't healthy enough to have an operation.

Chemo is the main treatment for these cancers. It may ease symptoms and shrink or slow the growth of the cancer for a time. Targeted therapy or immunotherapy may also be used. Though these treatments may help people live longer, it's very unlikely that

they will cure these cancers. Before starting treatment, the goals of the treatment should be clear to you and your family.

In people with early-stage mesotheliomas that are likely to grow slowly and aren't causing any symptoms, watching the cancer closely at first may be a reasonable option. Treatment can then be started if there are signs that the cancer is growing quickly or if it starts to cause symptoms.

Because these cancers can be hard to treat, taking part in a [clinical trial](#)<sup>4</sup> of a new plan for treatment may be a reasonable option.

In many cases, treatment aimed at relieving symptoms and making you more comfortable is a good choice. This could include treatments that prevent or reduce fluid buildup in the body, such as thoracentesis/paracentesis or pleurodesis (described in the section on palliative procedures ). Sometimes [pleurectomy/decortication](#) can help with breathing and pain in the chest.

[Pain management](#)<sup>5</sup> is another important aspect of care for these cancers. Some minor operations and types of radiation therapy can be used to help relieve pain. Doctors can also prescribe strong pain-relieving drugs. Some people with cancer are worried about taking opioid drugs (such as morphine) for fear of being sleepy all the time or becoming addicted to them. But many people get very good pain relief from these medicines without serious side effects. It's very important to let your cancer care team know if you're having pain so that it can be treated.

## Recurrent mesotheliomas

Cancer is called **recurrent** when it come backs after treatment. Recurrence can be local (in or near the same place it started) or distant (spread to organs such as the brain or liver). Mesotheliomas often come back after the initial treatment. If this happens, further treatment options depend on where the cancer is, what treatments have already been used, and a person's overall health.

In most cases the options will be a lot like those listed above for unresectable mesotheliomas. For example, chemo or radiation therapy might be used to try to shrink or slow the growth of the cancer and to relieve any symptoms. Because recurrent mesothelioma is hard to treat, [clinical trials](#)<sup>6</sup> of new types of treatment may be a good option. For more on dealing with cancer that comes back, see [Understanding Recurrence](#)<sup>7</sup>.

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# After Treatment for Malignant Mesothelioma

## Living as a Cancer Survivor

For many people, cancer treatment often raises questions about next steps as a survivor.

- [Living As a Malignant Mesothelioma Survivor](#)
- 

# Living As a Malignant Mesothelioma Survivor

For some people with mesothelioma, treatment can remove or destroy the cancer. The end of treatment can be both stressful and exciting. You may be relieved to finish treatment, but find it hard not to worry about the cancer coming back. This is a very common concern in people who have had cancer.

For many people, mesothelioma may never go away completely. Some people may get regular treatments with [chemotherapy](#)<sup>1</sup>, [radiation therapy](#)<sup>2</sup>, or other types of treatment to try to keep the cancer in check. Learning to live with cancer that doesn't go away can be difficult and very stressful.

Life after malignant mesothelioma means returning to some familiar things and also making some new choices.

## Follow-up care

If you have completed treatment, your doctors will still want to watch you closely. It's very important to all your follow-up appointments. During these visits, your doctors will ask about symptoms, examine you, and may order blood tests or imaging tests, such as CT scans or PET scans. There's no widely agreed upon follow-up schedule for people with mesothelioma. Your doctor will most likely want to see you fairly often (at least every few months or so) at first. The time between visits may get longer if there are no problems.

Follow-up is needed to check for signs of cancer recurrence or spread, as well as possible [side effects](#)<sup>3</sup> of certain treatments. This is a good time for you to ask your health care team any [questions](#)<sup>4</sup> you might have and to discuss any concerns.

Almost any cancer treatment can have side effects. Some can last for weeks or months, but others can be permanent. Tell your cancer care team about any symptoms or side effects that bother you so they can help you manage them.

If the cancer does come back, further treatment will depend on where the cancer is, what treatments you've had before, and your overall health. For more on how recurrent cancer is treated, see [Treatment of Mesothelioma Based on the Extent of the Cancer](#)<sup>5</sup>. For more general information on dealing with a recurrence, see [Understanding Recurrence](#)<sup>6</sup>.

### Ask your doctor for a survivorship care plan

Talk with your doctor about developing a [survivorship care plan](#)<sup>7</sup> for you. This plan might include:

- A suggested schedule for follow-up exams and tests
- A schedule for other tests you might need in the future, such as early detection (screening) tests for other types of cancer, or tests to look for long-term health effects from your cancer or its treatment
- A list of possible late- or long-term side effects from your treatment, including what to watch for and when you should contact your doctor
- Diet and physical activity suggestions
- Reminders to keep your appointments with your primary care provider (PCP), who will monitor your general health care

## Keeping health insurance and copies of your medical records

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

At some point after your cancer treatment, you might find yourself seeing a new doctor who doesn't know about your medical history. It's important to keep copies of your medical records to give your new doctor the details of your diagnosis and treatment. Learn more in [Keeping Copies of Important Medical Records](#)<sup>8</sup>.

## Can I lower my risk of mesothelioma progressing or coming back?

If you have (or have had) mesothelioma, you probably want to know if there are things you can do that might lower your risk that it will or come back, such as exercising, eating a certain type of diet, or taking nutritional supplements. Unfortunately, it's not yet clear if there are things you can do that will help.

Adopting healthy behaviors such as [not smoking](#)<sup>9</sup>, [eating well](#)<sup>10</sup>, [getting regular physical activity](#)<sup>11</sup>, and [staying at a healthy weight](#)<sup>12</sup> might help, but no one knows for sure. Still, we do know that these types of changes can have positive effects on your health that can extend beyond your risk of mesothelioma or other cancers.

### About dietary supplements

So far, no [dietary supplements](#)<sup>13</sup> (including vitamins, minerals, and herbal products) have been shown to clearly help lower the risk of mesothelioma progressing or coming back. This doesn't mean that no supplements will help, but it's important to know that none have been proven to do so.

Dietary supplements are not regulated like medicines in the United States – they do not have to be proven effective (or even safe) before being sold, although there are limits on what they're allowed to claim they can do. If you're thinking about taking any type of nutritional supplement, talk to your health care team. They can help you decide which ones you can use safely while avoiding those that might be harmful.

### If the cancer comes back

If mesothelioma does recur at some point, your treatment options will depend on where the cancer is located, what treatments you've had before, and your health. For more information on how recurrent cancer is treated, see [Treatment of Mesothelioma By the](#)

## [Extent of the Cancer](#)<sup>14</sup>.

For more general information on recurrence, you may also want to see [Understanding Recurrence](#)<sup>15</sup>.

## Getting emotional support

Some amount of feeling depressed, anxious, or worried is normal when cancer is a part of your life. Some people are affected more than others. But everyone can benefit from help and support from other people, whether friends and family, religious groups, support groups, professional counselors, or others. Learn more in [Life After Cancer](#)<sup>16</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/treating/chemotherapy.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/chemotherapy.html)
2. [www.cancer.org/cancer/malignant-mesothelioma/treating/radiation.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/radiation.html)
3. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)
4. [www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/talking-with-doctor.html](http://www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/talking-with-doctor.html)
5. [www.cancer.org/cancer/malignant-mesothelioma/treating/by-extent.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/by-extent.html)
6. [www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html](http://www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html)
7. [www.cancer.org/treatment/survivorship-during-and-after-treatment/survivorship-care-plans.html](http://www.cancer.org/treatment/survivorship-during-and-after-treatment/survivorship-care-plans.html)
8. [www.cancer.org/treatment/survivorship-during-and-after-treatment/be-healthy-after-treatment/keeping-copies-of-important-medical-records.html](http://www.cancer.org/treatment/survivorship-during-and-after-treatment/be-healthy-after-treatment/keeping-copies-of-important-medical-records.html)
9. [www.cancer.org/healthy/stay-away-from-tobacco.html](http://www.cancer.org/healthy/stay-away-from-tobacco.html)
10. [www.cancer.org/healthy/eat-healthy-get-active/eat-healthy.html](http://www.cancer.org/healthy/eat-healthy-get-active/eat-healthy.html)
11. [www.cancer.org/healthy/eat-healthy-get-active/get-active.html](http://www.cancer.org/healthy/eat-healthy-get-active/get-active.html)
12. [www.cancer.org/healthy/eat-healthy-get-active/take-control-your-weight.html](http://www.cancer.org/healthy/eat-healthy-get-active/take-control-your-weight.html)
13. [www.cancer.org/treatment/treatments-and-side-effects/complementary-and-alternative-medicine/dietary-supplements.html](http://www.cancer.org/treatment/treatments-and-side-effects/complementary-and-alternative-medicine/dietary-supplements.html)
14. [www.cancer.org/cancer/malignant-mesothelioma/treating/by-extent.html](http://www.cancer.org/cancer/malignant-mesothelioma/treating/by-extent.html)
15. [www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html](http://www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html)
16. [www.cancer.org/treatment/survivorship-during-and-after-treatment/be-healthy-after-treatment/life-after-cancer.html](http://www.cancer.org/treatment/survivorship-during-and-after-treatment/be-healthy-after-treatment/life-after-cancer.html)

## References

See all references for Malignant Mesothelioma ([www.cancer.org/cancer/malignant-mesothelioma/references.html](http://www.cancer.org/cancer/malignant-mesothelioma/references.html))

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