Multiple Myeloma Overview

The information that follows is an overview of this type of cancer. It is based on the more detailed information in our document, *Multiple Myeloma*. This document and other information can be obtained by calling 1-800-227-2345 or visiting our Web site at www.cancer.org.

What is cancer?

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

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

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

In most cases the cancer cells form a tumor. But some cancers, like leukemia, rarely form tumors. Instead, these cancer cells are in the blood and bone marrow.

When cancer cells get into the bloodstream or lymph vessels, they can travel to other parts of the body. There they begin to grow and form new tumors that replace normal tissue. This process is called *metastasis* (muh-**tas**-tuh-sis).

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

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

Not all tumors are cancerous. Tumors that aren't cancer are called *benign* (be-**nine**). Benign tumors can cause problems—they can grow very large and press on healthy organs and tissues. But they cannot grow into other tissues. Because of this, they also can't spread to other parts of the body (metastasize). These tumors are almost never life threatening.

What is multiple myeloma?

Multiple myeloma is a type of cancer formed by cancerous plasma cells. Normal plasma cells are found in the bone marrow and are an important part of the body's immune system.

The immune system is made up of several types of cells that work together to fight infections. Lymph cells (called *lymphocytes*) are the main type of cell in the immune system. There are 2 main types of lymph cells: T cells and B cells.

When B cells respond to an infection, they change into plasma cells. The plasma cells are mainly in the bone marrow — the soft, inner part of some bones. The plasma cells make proteins called *antibodies* that attack and help kill germs.

When plasma cells grow out of control, they can form a tumor, usually in a bone. If there is only one plasma cell tumor, it is called an isolated (or solitary) *plasmacytoma*. When there is more than one plasma cell tumor, it is called *multiple myeloma*.

Having too many plasma cells can cause problems in the bone marrow, where all blood cells are made. The cancer cells crowd out the normal cells and the bone marrow may not be able to make enough red blood cells, platelets, or normal white blood cells. This can cause problems like:

- **Anemia:** A shortage of red blood cells, which can cause you to be pale, weak, and tired.
- **Bruising or bleeding:** Cells called platelets help stop bleeding. Without enough platelets, there can be a lot of bruising or bleeding.
- **Leukopenia:** A shortage of white blood cells, which can make it very hard for the body to fight infections.

Another problem is that the myeloma cells do not help protect the body from infections. Instead of making normal antibodies, they all make many copies of the same antibody. Because it only one antibody, it isn't helpful in fighting germs.

The myeloma also reacts with cells that work to keep the bones strong. Normally, some cells build up bones and other cells work to dissolve them. Together, they give bone its proper shape and keep it healthy and strong. But myeloma cells cause too much bone to dissolve. Then the body does not get a signal to make new bone. Old bone is broken down without new bone to replace it. This makes the bones weak, and they break easily. When bone dissolves, it releases calcium into the blood. Often in myeloma the blood level of calcium gets too high. This causes problems like feeling very tired and weak. In extreme cases, it can even cause a person to go into a coma.

The myeloma protein can be toxic to the kidneys, leading to problems with kidney function or even kidney failure.

MGUS

Having many copies of the same antibody is called a *monoclonal gammopathy*. This is seen in multiple myeloma and some other diseases, but it can also be present and not cause problems. This is called *monoclonal gammopathy of undetermined significance* or MGUS. There may be extra plasma cells in the bone marrow, but they do not form a tumor or cause any problems. They do not cause the bones to weaken. But with time, MGUS can turn into multiple myeloma or another disease. People with MGUS don’t need treatment, but they are watched closely to see if they get a disease that does need to be treated (like multiple myeloma).

How many people get multiple myeloma?

The American Cancer Society's estimates for multiple myeloma in the United States for 2014 are:

- About 24,050 new cases of multiple myeloma
- About 11,090 deaths from multiple myeloma

In the United States, the lifetime risk of getting multiple myeloma is 1 in 149.

What are the risk factors for multiple myeloma?

A risk factor is something that affects a person’s chance of getting a disease. Some risk factors, such as smoking, can be controlled. Others, like a person’s age or race, can’t be changed. But risk factors don’t tell us everything. People who have no risk factors can still get the disease. Also, having a risk factor, or even several, does not mean that a person will get the disease.

Scientists have found few risk factors that may make a person more likely to get multiple myeloma.

Age: The risk of multiple myeloma goes up with age. Very few cases are found in people younger than 35. Most people with this cancer are at least 65 years old.

Gender: Men are slightly more likely to get multiple myeloma than women.

Race: Multiple myeloma is almost twice as common among black Americans as white Americans. The reason is not known.

Radiation: People who were exposed to radiation from an atomic bomb blast had a higher risk of multiple myeloma. Lower levels of radiation may also increase the risk, but at most, this accounts for a very small number of cases.

Family history: This cancer seems to run in some families. If a person has a parent, brother, or sister with the disease, their risk of getting it is 4 times higher than that of other people. But this is rare. Most patients have no other relatives with the disease.

Weight: A study by the American Cancer Society found that being overweight or obese increases a person's risk of getting this cancer.

Other plasma cell diseases: Many people with certain other plasma cell diseases will develop multiple myeloma later.

While the exact cause of multiple myeloma is not known, scientists are learning how changes in DNA can cause plasma cells to become cancer. DNA is the substance that tells our cells how to behave. Cancer can be caused by changes (mutations) in the DNA that controls cell growth.

Can multiple myeloma be prevented?

For some types of cancer, risk factors that account for many of cases are known. For instance, smoking causes most lung cancers. This means there is a chance to prevent some cases. For other cancers, such as cervical cancer, pre-cancerous changes can be found early by the Pap test and treated before they change into cancer.

For multiple myeloma, few cases are linked to risk factors that you can avoid in order to prevent the disease. And there is no known way to prevent the disease in those who have other plasma cell diseases.

How is multiple myeloma found?

Multiple myeloma is hard to find early. Many patients don’t have any symptoms until after their disease has reached an advanced stage. In some patients, the cancer causes symptoms that at first seem to be caused by something else. Rarely, the disease may be

found in people without symptoms when a routine blood test shows a high amount of protein in the blood.

Symptoms of multiple myeloma

While some people don’t have any symptoms at all, the following are the most common symptoms of this disease:

Bone problems

Normally, 2 kinds of bone cells work together to keep bones healthy and strong. Some cells lay down new bone; other cells break down old bone. Myeloma cells make a substance that causes the bone to dissolve, but the other cells do not get a signal to make new bone. So old bone is being broken down without new bone to replace it. This can cause small areas of bone weakness. The weak areas are often painful. These changes increase the risk of broken bones from minor stress or injury. Any bone can be involved, but pain in the backbone, hip bones, and skull is most common.

Low blood counts

When myeloma replaces normal blood-forming marrow cells, the bone marrow often does not make enough red blood cells, white blood cells, and blood platelets. Symptoms include:

- Low red blood cells (anemia): weakness, pale skin, not being able to exercise, shortness of breath, dizziness
- Low white blood cells: less able to fight infections
- Low platelet count: heavy bleeding from minor scrapes or cuts, or easy bruising

High blood calcium

When bone dissolves it can lead to high levels of calcium in the blood. This can cause kidney problems. It can also cause symptoms like feeling very thirsty, drinking a lot, and urinating (peeing) a lot. Other symptoms include loss of appetite, constipation, belly pain, and feeling sleepy or confused. If the problem isn’t treated, the person may go into a coma.

Nervous system symptoms

Bones in the spine may get weak and even collapse. They can press on certain nerves, causing pain, numbness, and/or muscle weakness. This, called *spinal cord compression*

and is serious. You must contact your doctor right away or go to the emergency room if this happens.

Sometimes, the abnormal proteins made by myeloma cells can damage nerves, causing weakness and numbness. In some patients, a lot of this protein can make the blood "thicken." This can slow blood flow to the brain and cause confusion, dizziness, and stroke-like symptoms. People with these symptoms should contact their doctor right away. Treatment works quickly. The doctor removes some of the protein from the blood using a treatment called *plasmapheresis*.

Kidney symptoms

Too much myeloma protein or calcium in the blood can damage the kidneys. This makes it harder for the body to get rid of excess salt, fluid, and body waste products. People with this problem can feel weak and have shortness of breath, itching, and leg swelling.

Infections

Myeloma patients are much more likely to get infections. The most common and serious is pneumonia.

Tests for multiple myeloma

Lab tests on the blood or urine, x-rays of the bones, and a bone marrow biopsy are usually done if symptoms suggest that a person might have multiple myeloma.

Blood count: The complete blood count (CBC) is a test that measures the levels of red cells, white cells, and platelets in the blood. If myeloma cells take up too much of the bone marrow, some of these levels will be low. The most common finding is a low red blood cell count (anemia).

Quantitative immunoglobulins: This test measures the blood levels of the different antibodies called immunoglobulins. The levels of these are measured to see if any are too high or too low. In multiple myeloma, the level of one type may be high while the others are low. Many other tests can be done to measure antibodies, blood proteins, and urine proteins, too.

SPEP (serum protein electrophoresis): This test looks at the different proteins in the blood to see if the blood contains an abnormal myeloma protein. It is one of the first tests your doctor will order if myeloma is suspected.

Beta-2 microglobulin: The level of this protein is elevated in multiple myeloma. It is used to predict outlook and also to watch the results of treatment.

Blood chemistry tests: Tests will be done to check the level of different chemicals and electrolytes (like calcium, potassium, and sodium) in the blood.

Urine tests: You may be asked to collect all of your urine over a 24 hour period so that it can be checked for myeloma protein

Bone marrow biopsy: People with multiple myeloma have too many plasma cells in their bone marrow. The test to check the bone marrow is called a *bone marrow biopsy.* It can be either done at the doctor's office or at the hospital. A doctor will use a microscope to look at the bone marrow tissue to find out if there are myeloma cells in the bone marrow and, if so, how many.

For this test, the back of the hip bone is first numbed. Then a needle is used to remove some solid bone and some bone marrow. This causes a brief sharp pain, and there is some soreness in the biopsy area when the numbing medicine wears off. The biopsy can be done either at the doctor's office or at the hospital. Most patients can go home right after the test.

Other biopsy tests: In a fine needle aspiration (FNA) a very thin (fine) needle and a syringe are used to take out a small amount of tissue from a tumor or lymph node. The core needle biopsy is much like a FNA, but a larger needle is used and a larger tissue sample is removed. In multiple myeloma, these types of biopsies are most often used to check out abnormal areas that could be plasmacytomas.

Imaging tests

Bone x-rays: Bone damage caused by the myeloma cells can be seen with x-rays. Often doctors will do a series of x-rays that includes most of the bones. This is called a *bone survey* or s*keletal survey.*

CT (CAT) scan: A CT scan is a special type of x-ray that takes many pictures of the body. A computer combines the x-rays to make detailed pictures. CT scans can help to tell if your bones have been damaged by myeloma. They can also be used to guide a biopsy needle into a tumor.

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

You might be asked to drink some liquid before the test. This helps outline the intestine so that it is not confused for tumors. Also, a kind of dye might be put into one of your veins. The dye helps to outline structures in the body. The dye can cause a feeling of warmth or flushing. Some people are allergic and get hives or other, more serious, reactions. Be sure to tell the doctor if you think you might be allergic to the dye. Also, tell the people doing the test that you have myeloma. Some of the dyes can damage the kidneys of people with myeloma.

CT scans take longer than regular x-rays. You will need to lie still on a table while they are being done. You might feel a bit confined by lying within the machine while the pictures are being taken. But CT scans are getting much faster and most only take a few minutes.

CT scans can also be used to guide a biopsy needle (see above) right into a something that might be a tumor.

MRI (magnetic resonance imaging): This test uses radio waves and strong magnets instead of x-rays to take pictures. A computer translates the pattern of radio waves into cross-sectional pictures of the body. MRI scans are very helpful in looking at bones, the brain, and the spinal cord. They may be able to find plasmacytomas that cannot be seen on regular x-rays. MRI scans can also be used to look at the bone marrow in patients with multiple myeloma. They take longer than CT scans. You will be inside a tube-like machine during the scan, which some people find upsetting. The machine also makes a thumping noise, but some places will give you earplugs with music to block this out. A dye (contrast material) might be used just as with CT scans but this is done less often.

PET scan (positron emission tomography): For a PET scan, a type of radioactive sugar (glucose) is put into one of your veins. Cancer cells absorb high amounts of this sugar. A special camera can then spot the radioactivity. When a patient appears to have a solitary plasmacytoma, a PET scan may be used to look for other plasmacytomas.

Putting it all together

No one test is enough to tell for sure if a person has multiple myeloma. Doctors look at all of these factors:

- Symptoms
- Physical exam
- Results of blood tests, urine tests, and x-rays
- Results of biopsies

Staging for multiple myeloma

Staging is the process of finding out how widespread or advanced the cancer is. This is very important because treatment options and the outlook for recovery depend on the stage of the cancer. Knowing all you can about staging helps you make the best choice about your treatment.

Staging systems used for multiple myeloma

The International Staging System

The International Staging System for Multiple Myeloma divides cases of myeloma into 3 stages based only on the serum beta-2 microglobulin and serum albumin levels. (These are blood proteins that are measured with a blood test.)

The Durie-Salmon staging system

Multiple myeloma may also be staged using the Durie-Salmon system. Some doctors use this system, but it is not used as much because of newer tests that can be used. This system is based on 4 factors:

- The amount of abnormal antibodies or proteins in the blood or urine: Large amounts show that there are many cancerous plasma cells.
- The amount of calcium in the blood: High blood calcium levels are linked to advanced bone damage. Because bone contains lots of calcium, bone damage releases calcium into the blood.
- The degree of bone damage based on x-rays: Many areas of bone damage seen on x-rays are a sign of an advanced stage of the cancer.
- The amount of hemoglobin in the blood: Hemoglobin is the part of red blood cells that carries oxygen. Low hemoglobin levels mean that the myeloma cells fill a lot of the bone marrow. Not enough space is left for the marrow cells that make red blood cells.

This system uses these factors to divide myeloma into 3 stages. Stage I is the smallest amount of tumor, and stage III the largest.

Other ways to describe multiple myeloma

Smoldering myeloma: This term refer to early myeloma that does not seem to be growing and is not causing any symptoms. People with smoldering myeloma have normal blood counts, normal calcium levels, normal kidney function, and no bone or organ damage. These patients are often watched very carefully without treatment.

Recurrent multiple myeloma: Recurrent disease means that the cancer has come back (recurred) after treatment. Multiple myeloma can come back in the bone or in another part of the body.

Other factors used to predict outlook

Kidney function: A substance called *creatinine* is removed from the body by the kidneys. The blood creatinine level shows the kidney's health. The levels go up when the kidneys are damaged. High blood creatinine levels mean the patient's outlook is not as good.

Age: Age is also important. Older people with myeloma do not live as long.

Myeloma cell labeling index: This tells how fast the cancer cells are growing. This test is done in special labs, using myeloma cells from bone marrow samples. A high labeling index predicts faster growth of cancer cells and a worse outlook.

Chromosome studies: The bone marrow may be sent for tests to look at the chromosomes in the cancer cells. Certain chromosome changes can point to a worse outlook.

Survival rates by stage for multiple myeloma

Some people with cancer may want to know the survival rates for their type of cancer. Others may not find the numbers helpful, or may even not want to know them. If you decide that you don't want to know them, stop reading here and skip to the next section.

The numbers below are from the International Staging System stages. These times are measured from the point that treatment (most often chemotherapy) first started. *Median survival* refers to the time it took for half of the patients to die. So half the patients lived longer than the median survival.

Many patients, such as those with or smoldering myeloma, have a good deal of time after the cancer is found before treatment is started.

International Staging System stage	**Median survival**
Stage I	62 months
Stage II	44 months
Stage III	29 months

These rates are based on people first treated 5 to 25 years ago. Recent improvements in treatment often mean a better outlook for people today.

These numbers give an overall picture, but keep in mind that every person is unique and statistics can't predict exactly what will happen in your case. Talk with your cancer care team if you have questions about your own chances of a cure, or how long you might survive your cancer. They know your situation best.

How is multiple myeloma treated?

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

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

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

About treatment

After multiple myeloma is found and staged, your cancer care team will talk to you about treatment options. You should take time to think about all of the choices. You may want to get a second opinion. Doing so can give you more information. It can also help you feel better about the treatment plan you choose. In fact, some insurance companies say you must a second opinion before they will agree to pay for certain treatments.

The treatment for multiple myeloma could include:

- Chemotherapy and other drugs
- Bisphosphonates
- Radiation
- Surgery
- Biologic therapy
- Stem cell transplant
- Plasmapheresis

Chemotherapy and other drugs for multiple myeloma

Chemotherapy (chemo) is the use of drugs to kill or control the cancer cells. These drugs are either taken by mouth as a pill or given into a vein or a muscle. The drugs enter the blood and reach throughout the body. This treatment is useful for cancers such as multiple myeloma that often spreads widely. To learn more about chemo for multiple myeloma, please see the section “Chemotherapy” in our document *Multiple Myeloma*.

Chemo side effects

Chemo drugs kill cancer cells but also can damage normal cells. These side effects depend on the type and dose of drugs given and the length of time they are taken. Common side effects of chemo include:

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

Chemo often leads to low blood counts, which can cause:

- Greater chance of infection (low white blood cell counts)
- Easy bruising or bleeding (low blood platelets)
- Fatigue and anemia (low red blood cells).

Most side effects are temporary and go away after treatment is finished.

If you have side effects, your cancer care team can suggest steps to ease them. For instance, drugs can be given along with the chemo to prevent or reduce nausea and vomiting.

Some chemo drugs can also permanently damage certain organs such as the heart or kidneys. The risks of using these drugs are carefully balanced against their benefits. The doctor will watch these organs during treatment. If damage occurs, the drug that caused it is stopped and replaced with another.

Chemo drugs can be used alone or along with other drugs, like those listed below.

Other drugs used to treat multiple myeloma

Corticosteroids

These drugs are an important part of the treatment of multiple myeloma and can be used alone or combined with other drugs. They also help decrease the nausea and vomiting caused by chemo. These drugs have short term side effects like high blood sugar, increased appetite, and problems sleeping. They can also weaken the immune system while you are taking them. This leads to an increased risk of serious infections. If taken for a long time, corticosteroids can cause the bones to become weak.

The corticosteroids most often used in treating multiple myeloma are dexamethasone and prednisone.

Immunomodulating agents

There are 3 immunomodulating agents used to treat multiple myeloma: *thalidomide* (Thalomid®), *lenalidomide* (Revlimid®), and *pomalidomide* (Pomalyst®). Thalidomide was the first of this type of drug. It was first used decades ago as a sedative and as a treatment for morning sickness in pregnant women. When it was found to cause birth defects, it was taken off the market. Later, it became available again as a treatment for multiple myeloma. With the success of thalidomide, other similar drugs were developed to treat multiple myeloma. Because thalidomide causes birth defects if taken during pregnancy, these drugs are only available through a special program run by the drug company that makes them.

Side effects of these drugs can include low blood counts, painful nerve damage, and an increased risk of serious blood clots that start in the leg and can travel to the lungs. Each of these drugs can have its own side effects, so ask your doctor about what to expect.

Proteasome inhibitors

There are 2 proteosome inhibitors available to treat multiple myeloma: bortezomib (Velcade®) and carfilzomib (Kyprolis™). Bortezomib was the first of these drugs. It seems to be helpful in treating patients with kidney problems from their myeloma.

Common side effects include nausea and vomiting, tiredness, diarrhea, low blood counts, and fever. Some other, more serious side effects can also occur. Bortezomib can also cause nerve damage that can lead to numbness, tingling, or even pain in the arms and legs. Also, some patients develop shingles (herpes zoster) while taking this drug. To help prevent this, your doctor may have you take a medicine (like acyclovir) while you take this drug. Each of these drugs can have its own side effects, so ask your doctor about what to expect.

Drug treatment

The choice and dose of the drugs depend on many things, such as:

- The stage of the cancer
- The patient’s age

- The health of the patient's kidneys
- Whether a stem cell transplant is planned (If a stem cell transplant is planned, most doctors avoid using drugs that can damage the bone marrow.)

Bisphosphonates for multiple myeloma

Myeloma cells can weaken, dissolve and even cause bones to break. This can lead to bone weakness and broken bones. Drugs called bisphosphonates can help bones stay strong by slowing down this process. The bisphosphonates most often used for myeloma are zoledronic acid (Zometa®) and pamidromate (Aredia®). These are given into a vein (IV), most often once a month.

Bisphosphonate treatment does have a rare but serious side effect. Some patients complain of pain in the jaw and doctors find that part of the bone of the upper or lower jaw bone has died. This can lead to loss of teeth in that area. Infections of the jaw bone may also develop. Doctors aren't sure why this happens or how best to prevent it. But having jaw surgery or having a tooth removed can trigger this problem. These should not be done during treatment. One way to avoid these dental procedures is to take good care of your mouth by flossing, brushing, making sure that dentures fit right, and having regular dental check-ups. Many doctors suggest that patients have a dental check-up and have any tooth or jaw problems treated before they start bisphosphonate treatment.

Radiation therapy for multiple myeloma

Radiation treatment is the use of high-energy x-rays to kill cancer cells. It may be used to treat areas of damaged bone that have not responded to chemotherapy and are causing pain. It is also the most common treatment for solitary plasmacytomas.

Myeloma can weaken back bones so badly that the bones collapse and put pressure on the spinal cord and spinal nerves. This can cause sudden numbness or tingling, sudden weakness of leg muscles, or sudden problems passing urine or moving the bowels. This is a medical emergency that must be treated right away. The treatment may involve radiation therapy and/or surgery.

The type of radiation treatment used for multiple myeloma is called external beam radiation therapy. This means the radiation is given from outside the body. Having this treatment is much like getting an x-ray. But the treatment lasts longer and is usually done 5 days a week for many weeks.

Surgery for multiple myeloma

Surgery is not often used to treat multiple myeloma. Emergency surgery may be needed when the spinal cord is pinched. Surgery to attach metal rods or plates can help support weight-bearing bones in the spine or legs. This may be done to prevent or treat fractures.

Biologic therapy for multiple myeloma

Biologic therapy (or *immunotherapy*) is treatment that uses proteins that are normally found in the body to fight disease. *Interferon* is a hormone-like substance made by some white blood cells and bone marrow cells. Interferon slows the growth of myeloma cells. A man-made version of this substance is sometimes used along with chemotherapy (chemo). But interferon has mostly helped patients who have had chemo and are in remission (there is no sign of the cancer). It seems to make remission last longer.

Side effects of this drug include tiredness and flu-like symptoms. Some patients have trouble dealing with these symptoms. But overall, the benefits of longer remission and fewer symptoms usually outweigh these side effects.

Stem cell transplant for multiple myeloma

This has become the standard treatment for younger myeloma patients in good health. It allows higher doses of chemotherapy (chemo) to be used. Many centers are using this treatment for older patients, too. Studies have shown that this treatment increases how long patients live compared to standard chemo.

The first step in the transplant process is to lower the amount of cancer in a patient's body. This is done with chemo and other drugs. At the same time, blood-forming cells are taken from the patient's (or a donor's) blood or bone marrow. These cells, called stem cells, are then frozen.

Next, the patient gets high-dose chemo to kill any myeloma cells left behind. The treatment also destroys all the bone marrow stem cells. This would normally kill the patient. But the frozen stem cells are given to the patient after chemo. They are put into the bloodstream through an IV. The stem cells travel to the bone marrow where they begin to make new blood cells.

There are 2 types of stem cell transplant (SCT):

Autologous transplant

If the patient's own stem cells are used, it is called an *autologous* transplant. These transplants are fairly safe and have a low risk of serious complications. Because of this, they can be used for older patients. But it is hard to kill all the myeloma cells with high-dose chemo. Most patients who have autologous transplants will have their myeloma

return later. A few patients will be free of myeloma for a long time, but this procedure doesn't cure the disease.

The high doses of chemo used in autologous transplant can cause many problems. Many patients have high fevers from infections. These are treated with IV antibiotics. Another common problem is mouth sores, which can be very painful. Morphine may be given to reduce the pain. The chemo also kills cells in the intestines, which may lead to cramps and diarrhea. Since the bone marrow is unable to make blood cells, transfusions of red blood cells and platelets are often needed. When the new stem cells start making new blood cells, the transfusions are no longer needed.

Autologous transplants are better than regular chemo at treating myeloma and help patients live longer. They are a standard part of myeloma treatment. Some doctors recommend that patients have 2 autologous transplants, 6 to 12 months apart. This approach is called *tandem transplant*. Studies show that this may help patients live longer than a single transplant. The drawback, of course, is that it causes more side effects.

Allogeneic transplant

When stem cells from a donor are used, the transplant is called an *allogeneic* transplant. The donor is usually a close relative. Less often, it is an unrelated person whose tissue type closely matches that of the patient. Allogeneic transplants carry a higher risk of severe complications, even death. But they may lead to longer remissions. This is because the donor's immune system cells may help to destroy the myeloma cells. Allogeneic transplants are not used often in myeloma patients. There are 2 reasons for this: First, the patient must be fairly young and healthy to withstand the side effects of transplant — most myeloma patients are elderly. Second, a donor's tissue type must match the patient's. These matches can be hard to find.

Mini-transplant: Some allogeneic transplants use low doses of certain kinds of chemo drugs to allow the transplanted stem cells to "take" without all the side effects of high doses. This is sometimes called a "mini-transplant" or a non-myeloablative transplant. This type of transplant allows the treatment to be done on older patients. Although the myeloma hasn't been destroyed by the low-dose chemo, the transplanted stem cells are expected to act against the myeloma cells and destroy them. Although this type of transplant has fewer risks than a standard allogeneic transplant, it can still have serious side effects.

Plasmapheresis for multiple myeloma

For this treatment, a machine removes blood from a vein. The blood cells are then separated from the plasma (the liquid part of the blood) and returned into another vein. The large amounts of abnormal proteins released by the myeloma cells are in the plasma. The plasma is discarded and replaced with a salt solution and plasma from donors.

Plasmapheresis is helpful when the build-up of myeloma proteins thickens the blood and slows circulation. While this treatment lowers protein levels and relieves some symptoms for a time, it does not kill the myeloma cells. Without further treatment, the level of myeloma protein will just go back up again. For that reason, plasmapheresis is often followed by chemotherapy or some other type of drug treatment to kill the cells that make the proteins.

Clinical trials for multiple myeloma

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

Clinical trials are carefully controlled research studies that are done with patients who volunteer for them. They are done to get a closer look at promising new treatments or procedures.

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

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

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

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

Complementary and alternative therapies for multiple myeloma

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

What are complementary and alternative therapies?

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

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

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

Finding out more

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

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

- Look for “red flags” that suggest fraud. Does the method promise to cure all or most cancers? Are you told not to have regular medical treatments? Is the treatment a “secret” that requires you to visit certain providers or travel to another country?
- Talk to your doctor or nurse about any method you are thinking of using.
- Contact us at 1-800-227-2345 to learn more about complementary and alternative methods in general and to find out about the specific methods you are looking at.

The choice is yours

Decisions about how to treat or manage your cancer are always yours to make. If you want to use a non-standard treatment, learn all you can about the method and talk to your doctor about it. With good information and the support of your health care team, you may

be able to safely use the methods that can help you while avoiding those that could be harmful.

What are some questions I can ask my doctor about multiple myeloma?

As you cope with cancer and cancer treatment, we encourage you to have honest, open talks with your doctor. Feel free to ask any question that’s on your mind, no matter how small it might seem. Here are some questions you might want to ask. Be sure to add your own questions as you think of them. Nurses, social workers, and other members of the treatment team may also be able to answer many of your questions.

- Would you please write down the exact type of cancer I have?
- What is the stage of my cancer? What does the stage mean in my case?
- What treatment choices do I have?
- What do you suggest and why?
- What is the goal of this treatment?
- What are the risks or side effects that I should expect?
- How long will it take me to recover from treatment?
- When can I go back to work or other activities after treatment?
- What are the chances of the cancer coming back after treatment?
- Does one type of treatment reduce the risk of the cancer coming back more than another?
- What should I do to be ready for treatment?
- Based on what you've learned about my cancer, how long do you think I'll survive?
- Should I get a second opinion?

Moving on after treatment for multiple myeloma

For most people, multiple myeloma never goes away completely. These people may get regular treatments with chemotherapy and other drugs, radiation treatment, or other treatments to try to help keep the cancer in check. Although there may be a time when

they stop treatment for a time, most patients never really finish treatment. Follow up is needed for the doctor to know when to start treatment again. This can help prevent problems that can interfere with daily life.

Learning to live with cancer that does not go away can be hard and very stressful. Our document, *When Cancer Doesn't Go Away*, talks more about this.

Follow-up care

During and after treatment, ongoing follow-up is very important. Your doctors will ask about symptoms, do an exam, and order blood tests or tests like CT scans or x-rays. Follow-up is done to see if more treatment is needed, and to check for any side effects. This is the time for you to talk to your cancer care team about any changes or problems you notice and any questions or concerns you have.

Almost any cancer treatment can have side effects. Some may last for a few weeks or months, but others can be permanent. Please tell your cancer care team about any symptoms or side effects that bother you so they can help you manage them. Use this time to ask your health care team questions and discuss any concerns you might have.

It is also important to keep your health insurance. Myeloma is rarely curable at this time. It may go away for a while, but the disease is likely to come back again. If it does, you don’t want to have to worry about paying for treatment. Should your cancer come back, our document *When Your Cancer Comes Back: Cancer Recurrence* helps you manage and cope with this phase of your treatment.

Seeing a new doctor

At some point after your cancer is found and treated, you may find yourself seeing a new doctor who does not know anything about your medical history. It is important that you be able to give your new doctor the details of your diagnosis and treatment. Gathering these details soon after treatment may be easier than trying to get them at some point in the future. Make sure you have this information handy and always keep copies for yourself:

- A copy of your pathology report from any biopsy or surgery
- Copies of your lab results
- If you had surgery, a copy of your operative report
- If you stayed in the hospital, a copy of the discharge summary that the doctor wrote when you were sent home from the hospital
- If you had radiation treatment, a summary of the type and dose of radiation and when and where it was given

- Finally, since some drugs can have long-term side effects, a list of your drugs, drug doses, and when you took them

Lifestyle changes after multiple myeloma

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

Making healthier choices

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

You can start by working on those things that worry you most. Get help with those that are harder for you. For instance, if you are thinking about quitting smoking and need help, call the American Cancer Society for information and support. We can help increase your chances of quitting for good.

Eating better

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

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

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

Rest, fatigue, and exercise

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

If you were very ill or weren't able to do much during treatment, it is normal that your fitness, staying power, and muscle strength declined. You need to find an exercise plan that fits your own needs. Talk with your health care team before starting. Get their input on your exercise plans. Then try to get an exercise buddy so that you're not doing it alone.

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

Exercise can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.
- It makes your muscles stronger.
- Along with a good diet, it will help you get to and stay at a healthy weight.
- It reduces fatigue and helps you have more energy.
- It can help lower anxiety and depression.
- It can help make you feel happier.
- It can help you feel better about yourself.

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

How about your emotional health after multiple myeloma?

At some point, you may find yourself overcome with many different emotions. This happens to a lot of people. You may have been going through so much when your cancer was first found that you could only focus on getting through each day. Now it may feel like a lot of other issues are catching up with you.

You may find yourself thinking about death and dying. Or maybe you’re more aware of the effect the cancer has on your family, friends, and career. You may take a new look at your relationships with those around you. Other issues may also cause concern. For instance, as you feel better and have fewer doctor visits, you will see your health care

team less often and have more time on your hands. These changes can make some people anxious.

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

The cancer journey can feel very lonely. It is not necessary or good for you to try to deal with everything on your own. And your friends and family may feel shut out if you do not include them. Let them in, and let in anyone else who you feel may help. If you aren't sure who can help, call your American Cancer Society at 1-800-227-2345 and we can put you in touch with a group or resource that may work for you.

If treatment for multiple myeloma stops working

When a person has had many different treatments and the cancer has not been cured, over time the cancer tends to resist all treatment. At this time you may have to weigh the possible benefits of a new treatment against the downsides, like treatment side effects and clinic visits.

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

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

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

Staying hopeful is important, too. Your hope for a cure may not be as bright, but there is still hope for good times with family and friends — times that are filled with joy and meaning. Pausing at this time in your cancer treatment gives you a chance to focus on the

most important things in your life. Now is the time to do some things you've always wanted to do and to stop doing the things you no longer want to do. Though the cancer may be beyond your control, there are still choices you can make.

What's new in multiple myeloma research and treatment?

Important research into multiple myeloma is taking place all over the world. Each year, we learn more about what causes the disease and how to better treat it.

Researchers have now found that bone marrow-support tissues and bone cells make growth factors that increase the growth of myeloma cells. In turn, the myeloma cells make substances that cause bone cells to go through changes that weaken the bones. This knowledge is helping the doctors develop new drugs to block these growth factors, slow down the cancer, and reduce the harm to bone. For instance, some current research is looking at ways to block the function of IL-6, a strong growth factor for multiple myeloma cells that leads to bone damage.

A form of arsenic is also being tested as a treatment for myeloma. Drugs that block blood vessel growth and others that block tumor growth are also being tested in clinical trials.

Research is also looking at improving stem cell transplants. A newer approach is to follow an autologous (self) transplant with an allogeneic (donor) transplant. So far, results have been mixed, and more studies are needed.

A new test that may be able to tell if and when a patient with multiple myeloma needs to have chemotherapy has been developed. Much more work lies ahead, though, before this test can be used routinely.

More information about multiple myeloma

From your American Cancer Society

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

Multiple Myeloma Detailed Guide (also in Spanish)

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

Caring for the Patient With Cancer at Home (also in Spanish)

Stem Cell Transplant (Peripheral Blood, Bone Marrow, and Cord Blood Transplants) (also in Spanish)

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

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

When Cancer Doesn't Go Away

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

National organizations and websites*

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

International Myeloma Foundation
Toll-free number: 1-800-452-2873 (1-800-452-CURE)
Website: www.myeloma.org

The Leukemia & Lymphoma Society
Toll-free number: 1-800-955-4572
Website: www.lls.org

Multiple Myeloma Research Foundation
Telephone number: 203-229-0464
Website: www.multiplemyeloma.org

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

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

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

Last Medical Review: 2/1/2013
Last Revised: 2/13/2013

2013 Copyright American Cancer Society

For additional assistance please contact your American Cancer Society
1-800-227-2345 or www.cancer.org