

From the National Cancer Institute



**Plasma Cell Neoplasms  
(Including Multiple Myeloma)  
Information  
For You**

Learn about treatment  
options, staging  
and more.



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**Visit the AdventHealth Cancer Institute's  
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## About This Booklet

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The information in this booklet is from the National Cancer Institute PDQ cancer information summary on **plasma cell neoplasms**.

Learning about medical care for plasma cell neoplasms can help you take an active part in making choices about your care. This booklet tells about:

Diagnosis, Staging and Treatment

Side Effects

Taking Part in Research Studies

Coping with Cancer and Managing Cancer Care

You can read this booklet from front to back. Or, you can read only the sections you need right now.

For the latest information about small cell lung cancer, please visit the National Cancer Institute (NCI) website at [www.cancer.gov/types/bladder/patient/bladder-treatment-pdq](http://www.cancer.gov/types/bladder/patient/bladder-treatment-pdq)

Or contact the NCI Cancer Information Service. The Cancer Information Service can answer your questions about cancer. Call 1-800-4-CANCER (1-800-422-6237).

### Words to Know

Words in **bold** are in the “Words to Know” section on page 43. The “Words to Know” section explains these words. It also shows how to pronounce them.

### Links to Cancer-Related Websites

Links you may want to learn more about are in parenthesis. (i.e. [www.cancer.gov](http://www.cancer.gov)) A complete list of the cancer-related website links begins on page 58, at the end of this booklet.

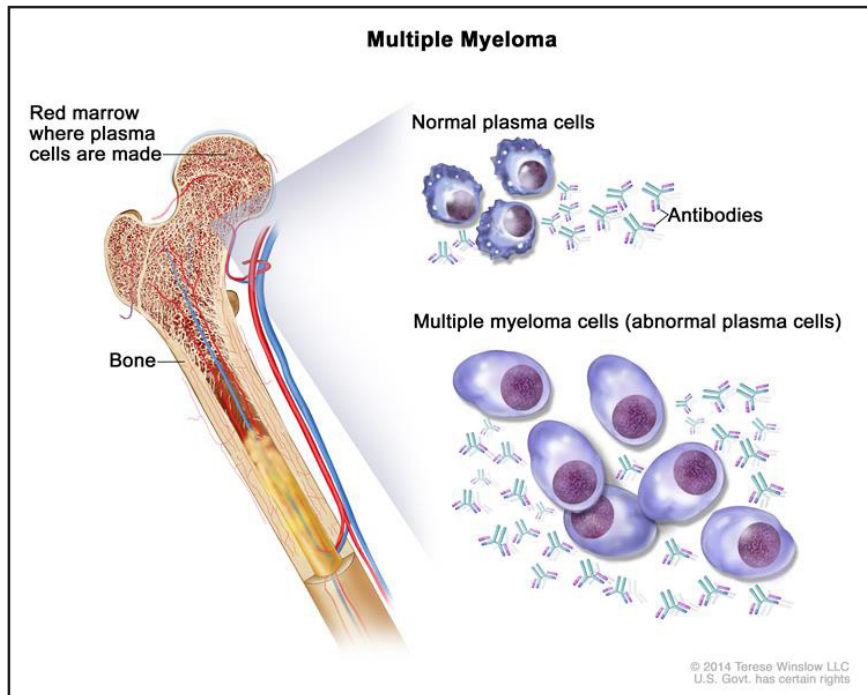
## General Information About Plasma Cell Neoplasms

### KEY POINTS

- Plasma cell neoplasms are diseases in which the body makes too many plasma cells.
- Plasma cell neoplasms can be benign (not cancer) or malignant (cancer).
- There are several types of plasma cell neoplasms.
  - Monoclonal gammopathy of undetermined significance (MGUS)
  - Plasmacytoma
  - Multiple myeloma
- Multiple myeloma and other plasma cell neoplasms may cause a condition called amyloidosis.
- Age can affect the risk of plasma cell neoplasms.
- Tests that examine the blood, bone marrow, and urine are used to detect (find) and diagnose multiple myeloma and other plasma cell neoplasms.
- Certain factors affect prognosis (chance of recovery) and treatment options.

## Plasma cell neoplasms are diseases in which the body makes too many plasma cells.

Plasma cells develop from **B lymphocytes** (B cells), a type of **white blood cell** that is made in the **bone marrow**. Normally, when **bacteria** or **viruses** enter the body, some of the **B cells** will change into plasma cells. The plasma cells make **antibodies** to fight bacteria and viruses, to stop **infection** and disease.



**Multiple myeloma.** Multiple myeloma cells are abnormal plasma cells (a type of white blood cell) that build up in the bone marrow and form tumors in many bones of the body. Normal plasma cells make antibodies to help the body fight infection and disease. As the number of multiple myeloma

cells increases, more antibodies are made. This can cause the blood to thicken and keep the bone marrow from making enough healthy blood cells. Multiple myeloma cells also damage and weaken the bone.

Plasma cell **neoplasms** are diseases in which **abnormal** plasma cells or **myelomacells** form **tumors** in the bones or soft **tissues** of the body. The plasma cells also make an antibody **protein**, called **M protein**, that is not needed by the body and does not help fight infection. These antibody proteins build up in the bone marrow and can cause the **blood** to thicken or can damage the **kidneys**.

**Plasma cell neoplasms can be benign (not cancer) or malignant (cancer).**

**Monoclonal gammopathy of undetermined significance** (MGUS) is not cancer but can become **cancer**. The following types of plasma cell neoplasms are cancer:

- **Lymphoplasmacytic lymphoma.** (See Adult Non-Hodgkin Lymphoma Treatment ([Link: www.cancer.gov/types/lymphoma/patient/adult-nhl-treatment-pdq](http://www.cancer.gov/types/lymphoma/patient/adult-nhl-treatment-pdq)) for more information.)
- **Plasmacytoma.**
- **Multiple myeloma.**

## There are several types of plasma cell neoplasms.

Plasma cell neoplasms include the following:

### Monoclonal gammopathy of undetermined significance (MGUS)

In this type of **plasma cell neoplasm**, less than 10% of the **bone marrow** is made up of abnormal **plasma cells** and there is no **cancer**. The abnormal plasma cells make **M protein**, which is sometimes found during a routine **blood** or **urine test**. In most patients, the amount of M protein stays the same and there are no **signs, symptoms**, or health problems.

In some patients, **MGUS** may later become a more serious **condition**, such as **amyloidosis**, or cause problems with the kidneys, heart, or **nerves**. MGUS can also become cancer, such as **multiple myeloma**, **lymphoplasmacytic lymphoma**, or **chronic lymphocytic leukemia**.

### Plasmacytoma

In this type of **plasma cell neoplasm**, the **abnormal** plasma cells (**myelomacells**) are in one place and form one **tumor**, called a **plasmacytoma**. Sometimes plasmacytoma can be **cured**. There are two types of plasmacytoma.

- In isolated plasmacytoma of bone, one **plasma cell tumor** is found in the bone, less than 10%

of the **bone marrow** is made up of plasma cells, and there are no other **signs of cancer**. Plasmacytoma of the bone often becomes **multiple myeloma**.

- In extramedullary plasmacytoma, one plasma cell tumor is found in **soft tissue** but not in the bone or the bone marrow. Extramedullary plasmacytomas commonly form in **tissues** of the **throat, tonsil, and paranasal sinuses**.

Signs and **symptoms** depend on where the tumor is.

- In bone, the plasmacytoma may cause pain or broken bones.
- In soft tissue, the tumor may press on nearby areas and cause pain or other problems. For example, a plasmacytoma in the throat can make it hard to swallow.

### Multiple myeloma

In **multiple myeloma**, **abnormal plasma cells (myelomacells)** build up in the **bone marrow** and form **tumors** in many bones of the body. These tumors may keep the bone marrow from making enough healthy **blood** cells. Normally, the bone marrow makes **stem cells** (immature cells) that become three types of mature blood cells:

- **Red blood cells** that carry **oxygen** and other substances to all **tissues** of the body.
- **White blood cells** that fight **infection** and

disease.

- **Platelets** that form **blood clots** to help prevent bleeding.

As the number of myeloma cells increases, fewer red blood cells, white blood cells, and platelets are made. The myeloma cells also damage and weaken the bone.

Sometimes multiple myeloma does not cause any **signs** or **symptoms**. This is called **smoldering multiple myeloma**. It may be found when a **blood** or **urine** test is done for another **condition**. Signs and symptoms may be caused by multiple myeloma or other conditions. Check with your doctor if you have any of the following:

- Bone pain, especially in the back or ribs.
- Bones that break easily.
- **Fever** for no known reason or frequent infections.
- Easy bruising or bleeding.
- Trouble breathing.
- Weakness of the arms or legs.
- Feeling very tired.

A tumor can damage the bone and cause **hypercalcemia** (too much **calcium** in the blood). This can affect many **organs** in the body, including the **kidneys**, **nerves**, heart, muscles, and **digestive tract**,

and cause serious health problems.

Hypercalcemia may cause the following signs and symptoms:

- Loss of **appetite**.
- **Nausea** or **vomiting**.
- Feeling thirsty.
- Frequent **urination**.
- **Constipation**.
- Feeling very tired.
- Muscle weakness.
- Restlessness.
- **Confusion** or trouble thinking.

**Multiple myeloma and other plasma cell neoplasms may cause a condition called amyloidosis.**

In rare cases, multiple myeloma can cause peripheral nerves (nerves that are not in the brain or spinal cord) and organs to fail. This may be caused by a condition called amyloidosis. Antibody proteins build up and stick together in peripheral nerves and organs, such as the kidney and heart. This can cause the nerves and organs to become stiff and unable to work the way they should.

Amyloidosis may cause the following signs and

symptoms:

- Feeling very tired.
- Purple spots on the skin.
- Enlarged tongue.
- **Diarrhea.**
- Swelling caused by **fluid** in your body's tissues.
- Tingling or numbness in your legs and feet.

## Age can affect the risk of plasma cell neoplasms.

Anything that increases your risk of getting a disease is called a **risk factor**. Having a risk factor does not mean that you will get cancer; not having risk factors doesn't mean that you will not get cancer. Talk with your doctor if you think you may be at risk.

Plasma cell neoplasms are most common in people who are middle aged or older. For multiple myeloma and plasmacytoma, other risk factors include the following:

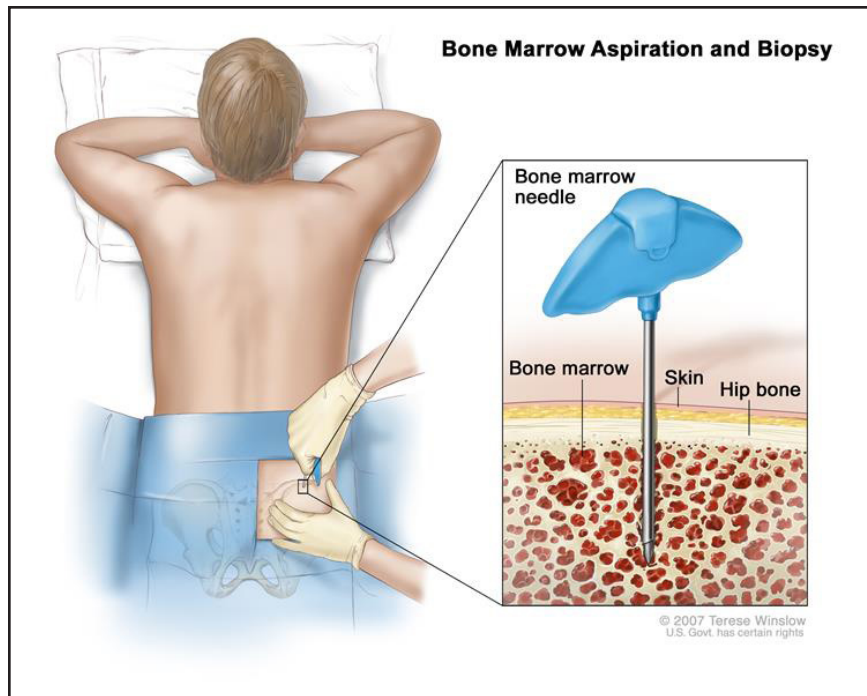
- Being black.
- Being male.
- Having a **personal history** of MGUS or plasmacytoma.

- Being exposed to **radiation** or certain **chemicals**.

## Tests that examine the blood, bone marrow, and urine are used to detect (find) and diagnose multiple myeloma and other plasma cell neoplasms.

The following tests and procedures may be used:

- **Physical exam and history:** An exam of the body to check general signs of health, including checking for signs of disease, such as lumps or anything else that seems unusual. A history of the patient's health habits and past illnesses and treatments will also be taken.
- **Blood and urine immunoglobulin studies:** A procedure in which a blood or urine sample is checked to measure the amounts of certain antibodies (immunoglobulins). For multiple myeloma, **beta-2-microglobulin**, M protein, free light chains, and other proteins made by the myeloma cells are measured. A higher-than-normal amount of these substances can be a sign of disease.
- **Bone marrow aspiration and biopsy:** The removal of bone marrow, blood, and a small piece of bone by inserting a hollow needle into the hipbone or **breastbone**. A **pathologist** views the bone marrow, blood, and bone under a **microscope** to look for abnormal cells.



**Bone marrow aspiration and biopsy.** After a small area of skin is numbed, a bone marrow needle is inserted into the patient's hip bone. Samples of blood, bone, and bone marrow are removed for examination under a microscope.

The following test may be done on the sample of tissue removed during the bone marrow aspiration and biopsy:

- **Cytogenetic analysis:** A test in which cells in a sample of bone marrow are viewed under a microscope to look for certain changes in the **chromosomes**. Other tests, such as **fluorescence in situ hybridization (FISH)** and **flow cytometry**, may also be done to look for certain changes in the chromosomes.

- **Skeletal bone survey:** In a skeletal bone survey, **x-rays** of all the bones in the body are taken. The x-rays are used to find areas where the bone is damaged. An x-ray is a type of energy beam that can go through the body and onto film, making a picture of areas inside the body.
- **Complete blood count (CBC) with differential:** A procedure in which a sample of blood is drawn and checked for the following:
  - The number of red blood cells and platelets.
  - The number and type of white blood cells.
  - The amount of **hemoglobin** (the protein that carries **oxygen**) in the red blood cells.
  - The portion of the blood sample made up of red blood cells.
- **Blood chemistry studies:** A procedure in which a blood sample is checked to measure the amounts of certain substances, such as **calcium** or **albumin**, released into the blood by **organs** and **tissues** in the body. An unusual (higher or lower than normal) amount of a substance can be a sign of disease.



- **Twenty-four-hour urine test:** A test in which urine is collected for 24 hours to measure the amounts of certain substances. An unusual (higher or lower than normal) amount of a substance can be a sign of disease in the organ or tissue that makes it. A higher than normal amount of protein may be a sign of multiple myeloma.
- **MRI (magnetic resonance imaging):** A procedure that uses a magnet, **radio waves**, and a computer to make a series of detailed pictures of areas inside the body. This procedure is also called nuclear magnetic resonance imaging (NMRI). An MRI of the **spine** and **pelvis** may be used to find areas where the bone is damaged.
- **PET scan (positron emission tomography scan):** A procedure to find **malignant** tumor cells in the body. A small amount of **radioactive glucose** (sugar) is **injected** into a **vein**. The PET **scanner** rotates around the body and makes a picture of where glucose is being used in the body. Malignant tumor cells show up brighter in the picture because they are more active and take up more glucose than normal cells do.
- **CT scan (CAT scan):** A procedure that makes a series of detailed pictures of areas inside the body, such as the spine, taken from different angles. The pictures are made by a comput-

er linked to an x-ray machine. A **dye** may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography.

- **PET-CT scan:** A procedure that combines the pictures from a positron emission tomography (PET) scan and a computed tomography (CT) scan. The PET and CT scans are done at the same time with the same machine. The combined scans give more detailed pictures of areas inside the body, such as the spine, than either scan gives by itself.

### Certain factors affect prognosis (chance of recovery) and treatment options.

The **prognosis** (chance of **recovery**) depends on the following:

- The type of plasma cell neoplasm.
- The **stage** of the disease.
- Whether a certain immunoglobulin (antibody) is present.
- Whether there are certain **genetic** changes.
- Whether the kidney is damaged.
- Whether the cancer **responds** to **initial treatment** or **recurs** (comes back).

Treatment options depend on the following:

- The type of plasma cell neoplasm.
- The age and general health of the patient.
- Whether there are signs, symptoms, or health problems, such as **kidney failure** or infection, related to the disease.
- Whether the cancer responds to initial treatment or recurs (comes back).

## Stages of Plasma Cell Neoplasms

### KEY POINTS

- There are no standard staging systems for monoclonal gammopathy of undetermined significance (MGUS), macroglobulinemia, and plasmacytoma.
- After multiple myeloma has been diagnosed, tests are done to find out the amount of cancer in the body.
- The stage of multiple myeloma is based on the levels of beta-2-microglobulin and albumin in the blood.
- The following stages are used for multiple myeloma:
  - Stage I multiple myeloma
  - Stage II multiple myeloma

- Stage III multiple myeloma

**There are no standard staging systems for monoclonal gammopathy of undetermined significance (MGUS), macroglobulinemia, and plasmacytoma.**

**After multiple myeloma has been diagnosed, tests are done to find out the amount of cancer in the body.**

The process used to find out the amount of **cancer** in the body is called **staging**. It is important to know the **stage** in order to plan treatment. The following tests and procedures may be used in the staging process:

- **Skeletal bone survey**: In a skeletal bone survey, **x-rays** of all the bones in the body are taken. The x-rays are used to find areas where the bone is damaged. An x-ray is a type of energy beam that can go through the body and onto film, making a picture of areas inside the body.
- **MRI (magnetic resonance imaging)**: A procedure that uses a magnet, **radio waves**, and a computer to make a series of detailed pictures of areas inside the body, such as the **bone marrow**. This procedure is also called nuclear magnetic resonance imaging (NMRI).
- **Bone densitometry**: A procedure that uses a

special type of x-ray to measure **bone density**.

## The stage of multiple myeloma is based on the levels of beta-2-microglobulin and albumin in the blood.

**Beta-2-microglobulin** and **albumin** are found in the **blood**. Beta-2-microglobulin is a **protein** found on **plasma cells**. Albumin makes up the biggest part of the blood **plasma**. It keeps **fluid** from leaking out of **blood vessels**. It also brings **nutrients** to **tissues**, and carries **hormones, vitamins, drugs**, and other substances, such as **calcium**, all through the body. In the blood of patients with **multiple myeloma**, the amount of beta-2-microglobulin is increased and the amount of albumin is decreased.

## The following stages are used for multiple myeloma:

### Stage I multiple myeloma

In **stage I multiple myeloma**, the **blood** levels are as follows:

- **beta-2-microglobulin** level is lower than 3.5 mg/L; and
- **albumin** level is 3.5 g/dL or higher.

### Stage II multiple myeloma

In **stage II multiple myeloma**, the **blood** levels are

in between the levels for stage I and stage III.

### Stage III multiple myeloma

In **stage III multiple myeloma**, the **blood** level of **beta-2-microglobulin** is 5.5 mg/L or higher and the patient also has one of the following:

- high levels of **lactate dehydrogenase** (LDH);  
or
- certain changes in the **chromosomes**.

## Refractory Plasma Cell Neoplasms

**Plasma cell neoplasms** are called **refractory** when the number of plasma cells keeps going up even though treatment is given.

## Treatment Option Overview

### KEY POINTS

- There are different types of treatment for patients with plasma cell neoplasms.
- Eight types of treatment are used:
  - Chemotherapy
  - Other drug therapy
  - Targeted therapy
  - High-dose chemotherapy with stem cell

transplant

- Biologic therapy
- Radiation therapy
- Surgery
- Watchful waiting
- New types of treatment are being tested in clinical trials.
  - New combinations of therapies
- Treatment for plasma cell neoplasms may cause side effects.
- Supportive care is given to lessen the problems caused by the disease or its treatment.
- Patients may want to think about taking part in a clinical trial.
- Patients can enter clinical trials before, during, or after starting their cancer treatment.
- Follow-up tests may be needed.

## There are different types of treatment for patients with plasma cell neoplasms.

Different types of treatments are available for patients with **plasma cell neoplasms**. Some treatments are **standard** (the currently used treatment), and some are being tested in **clinical trials**. A treatment

clinical trial is a **research study** meant to help improve current treatments or obtain information on new treatments for patients with **cancer**. When clinical trials show that a new treatment is better than the standard treatment, the new treatment may become the standard treatment. Patients may want to think about taking part in a clinical trial. Some clinical trials are open only to patients who have not started treatment.

## Eight types of treatment are used:

### Chemotherapy

**Chemotherapy** is a cancer treatment that uses **drugs** to stop the growth of cancer **cells**, either by killing the cells or by stopping them from dividing. When chemotherapy is taken by mouth or **injected** into a **vein** or muscle, the drugs enter the bloodstream and can reach cancer cells throughout the body (**systemic chemotherapy**). When chemotherapy is placed directly into the **cerebrospinal fluid**, an **organ**, or a body **cavity** such as the **abdomen**, the drugs mainly affect cancer cells in those areas (**regional chemotherapy**). The way the chemotherapy is given depends on the type and **stage** of the cancer being treated.

See Drugs Approved for Multiple Myeloma and Other Plasma Cell Neoplasms (**Link: [www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma](http://www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma)**) for more information.

## Other drug therapy

**Corticosteroids** are **steroids** that have **antitumor** effects in **multiple myeloma**.

## Targeted therapy

**Targeted therapy** is a treatment that uses drugs or other substances to identify and attack specific cancer cells without harming normal cells. Several types of targeted therapy may be used to treat multiple myeloma and other plasma cell neoplasms.

**Proteasome inhibitor therapy** is a cancer treatment that blocks the action of proteasomes in cancer cells. A proteasome is a **protein** that removes other proteins no longer needed by the cell. When the proteins are not removed from the cell, they build up and may cause the cancer cell to die. **Bortezomib**, **carfilzomib**, and **ixazomib** are proteasome inhibitors used in the treatment of multiple myeloma and other plasma cell neoplasms.

**Monoclonal antibody** therapy is a cancer treatment that uses **antibodies** made in the laboratory, from a single type of **immune system** cell. These antibodies can identify substances on cancer cells or normal substances that may help cancer cells grow. The antibodies attach to the substances and kill the cancer cells, block their growth, or keep them from spreading. Monoclonal antibodies are given by **infusion**. They may be used alone or to carry drugs, **toxins**, or **radioactive** material directly to cancer cells.

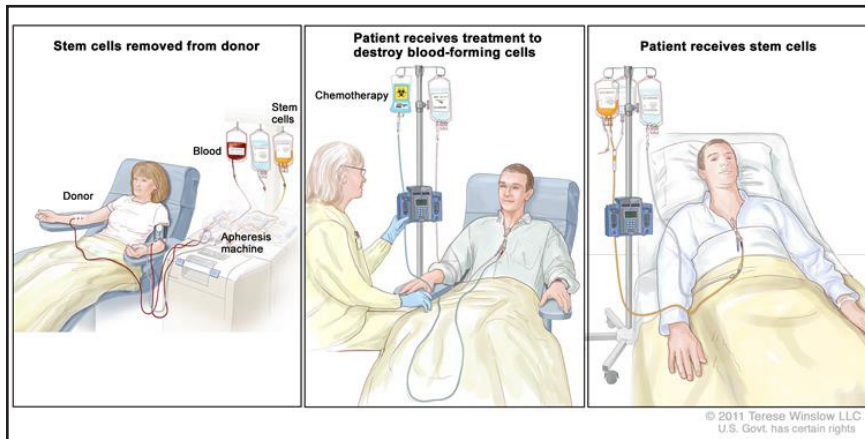
**Daratumumab** and **elotuzumab** are monoclonal antibodies used in the treatment of multiple myeloma and other plasma cell neoplasms.

**Histone deacetylase (HDAC) inhibitor** therapy is a type of targeted therapy that blocks **enzymes** needed for cell division and may stop the growth of cancer cells. **Panobinostat** is an HDAC inhibitor used in the treatment of multiple myeloma and other plasma cell neoplasms.

See Drugs Approved for Multiple Myeloma and Other Plasma Cell Neoplasms (**Link: [www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma](http://www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma)**) for more information.

## High-dose chemotherapy with stem cell transplant

High **doses** of chemotherapy are given to kill cancer cells. Healthy cells, including **blood-forming** cells, are also destroyed by the cancer treatment. **Stem cell transplant** is a treatment to replace the blood-forming cells. **Stem cells** (immature blood cells) are removed from the blood or **bone marrow** of the patient (**autologous**) or a **donor (allogeneic)** and are frozen and stored. After the patient completes chemotherapy, the stored stem cells are thawed and given back to the patient through an infusion. These reinfused stem cells grow into (and restore) the body's blood cells.



**Stem cell transplant. (Step 1):** Blood is taken from a vein in the arm of the donor. The patient or another person may be the donor. The blood flows through a machine that removes the stem cells. Then the blood is returned to the donor through a vein in the other arm. **(Step 2):** The patient receives chemotherapy to kill blood-forming cells. The patient may receive radiation therapy (not shown). **(Step 3):** The patient receives stem cells through a catheter placed into a blood vessel in the chest.

## Biologic therapy

**Biologic therapy** is a treatment that uses the patient's immune system to fight cancer. Substances made by the body or made in a laboratory are used to boost, direct, or restore the body's natural defenses against cancer. This type of cancer treatment is also called biotherapy or immunotherapy.

**Immunomodulators** are a type of biologic therapy. **Thalidomide**, **lenalidomide**, and **pomalidomide** are immunomodulators used to treat multiple myeloma and other plasma cell neoplasms.

**Interferon** is a type of biologic therapy. It affects the division of cancer cells and can slow tumor growth.

See Drugs Approved for Multiple Myeloma and Other Plasma Cell Neoplasms ([Link: www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma](http://www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma)) for more information.

## Radiation therapy

**Radiation therapy** is a cancer treatment that uses high-energy **x-rays** or other types of **radiation** to kill cancer cells or keep them from growing. There are two types of radiation therapy:

- **External radiation therapy** uses a machine outside the body to send radiation toward the cancer.
- **Internal radiation therapy** uses a radioactive substance sealed in needles, **seeds**, wires, or **catheters** that are placed directly into or near the cancer.

The way the radiation therapy is given depends on the type and stage of the cancer being treated. External radiation therapy is used to treat plasma cell neoplasms.

## Surgery

**Surgery** to remove the tumor may be done. After the doctor removes all the cancer that can be seen at the time of the surgery, some patients may be given

radiation therapy after surgery to kill any cancer cells that are left. Treatment given after the surgery, to lower the risk that the cancer will come back, is called **adjuvant therapy**.

## Watchful waiting

**Watchful waiting** is closely **monitoring** a patient's **condition** without giving any treatment until **signs** or symptoms appear or change.

## New types of treatment are being tested in clinical trials.

This summary section describes treatments that are being studied in clinical trials. It may not mention every new treatment being studied. Information about clinical trials is available from the NCI website ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials](http://www.cancer.gov/about-cancer/treatment/clinical-trials)).

## New combinations of therapies

Clinical trials are studying different combinations of biologic therapy, chemotherapy, **steroid therapy**, and drugs. New treatment **regimens** using thalidomide or lenalidomide are also being studied.

## Treatment for plasma cell neoplasms may cause side effects.

For information about **side effects** caused by treatment for cancer, see our Side Effects ([Link: www.cancer.gov/about-cancer/treatment/side-effects](http://www.cancer.gov/about-cancer/treatment/side-effects))

[cancer.gov/about-cancer/treatment/side-effects](http://www.cancer.gov/about-cancer/treatment/side-effects)) page.

## Supportive care is given to lessen the problems caused by the disease or its treatment.

This **therapy** controls problems or **side effects** caused by the disease or its treatment, and improves quality of life. **Supportive care** is given to treat problems caused by **multiple myeloma** and other **plasma cell neoplasms**.

Supportive care may include the following:

- **Plasmapheresis**: If the blood becomes thick with extra antibody **proteins** and interferes with **circulation**, plasmapheresis is done to remove extra **plasma** and antibody proteins from the blood. In this procedure blood is removed from the patient and sent through a machine that separates the plasma (the liquid part of the blood) from the blood cells. The patient's plasma contains the unneeded antibodies and is not returned to the patient. The normal blood cells are returned to the bloodstream along with donated plasma or a plasma replacement. Plasmapheresis does not keep new antibodies from forming.
- **High-dose chemotherapy** with **stem cell transplant**: If **amyloidosis** occurs, treatment may include high-dose chemotherapy followed by stem cell transplant using the

patient's own stem cells.

- **Biologic therapy:** Biologic therapy with **thalidomide**, **lenalidomide**, or **pomalidomide** is given to treat amyloidosis.
- **Targeted therapy:** Targeted therapy with **proteasome inhibitors** is given to decrease how much **immunoglobulin M** is in the **blood** and treat amyloidosis.
- **Radiation therapy:** Radiation therapy is given for bone **lesions** of the **spine**.
- **Chemotherapy:** Chemotherapy is given to reduce back pain from **osteoporosis** or **compression fractures** of the spine.
- **Bisphosphonate therapy:** Bisphosphonate therapy is given to slow bone loss and reduce bone pain. See the following **PDQ** summaries for more information on bisphosphonates and problems related to their use:
  - Cancer Pain (**Link: [www.cancer.gov/about-cancer/treatment/side-effects/pain/pain-pdq](http://www.cancer.gov/about-cancer/treatment/side-effects/pain/pain-pdq)**)
  - Oral Complications of Chemotherapy and Head/Neck Radiation (**Link: [www.cancer.gov/about-cancer/treatment/side-effects/mouth-throat/oral-complications-pdq](http://www.cancer.gov/about-cancer/treatment/side-effects/mouth-throat/oral-complications-pdq)**)

## Patients may want to think about taking part in a clinical trial.

For some patients, taking part in a **clinical trial** may be the best treatment choice. Clinical trials are part of the cancer research process. Clinical trials are done to find out if new cancer treatments are safe and effective or better than the **standard treatment**.

Many of today's standard treatments for cancer are based on earlier clinical trials. Patients who take part in a clinical trial may receive the standard treatment or be among the first to receive a new treatment.

Patients who take part in clinical trials also help improve the way cancer will be treated in the future. Even when clinical trials do not lead to effective new treatments, they often answer important questions and help move research forward.

## Patients can enter clinical trials before, during, or after starting their cancer treatment.

Some clinical trials only include patients who have not yet received treatment. Other trials test treatments for patients whose cancer has not gotten better. There are also clinical trials that test new ways to stop cancer from **recurring** (coming back) or reduce the **side effects** of cancer treatment.

Clinical trials are taking place in many parts of the



country. Information about clinical trials supported by NCI can be found on NCI's clinical trials search ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/search](http://www.cancer.gov/about-cancer/treatment/clinical-trials/search)) webpage. Clinical trials supported by other organizations can be found on the ClinicalTrials.gov ([Link: clinicaltrials.gov/](http://clinicaltrials.gov/)) website.

### Follow-up tests may be needed.

Some of the tests that were done to **diagnose** the cancer or to find out the **stage** of the cancer may be repeated. Some tests will be repeated in order to see how well the treatment is working. Decisions about whether to continue, change, or stop treatment may be based on the results of these tests.

Some of the tests will continue to be done from time to time after treatment has ended. The results of these tests can show if your **condition** has changed or if the cancer has **recurred** (come back). These tests are sometimes called **follow-up** tests or check-ups.

## Treatment Options for Plasma Cell Neoplasms

For information about the treatments listed below, see the Treatment Option Overview section.

## Monoclonal Gammopathy of Undetermined Significance

Treatment of **monoclonal gammopathy of undetermined significance** (MGUS) is usually **watchful waiting**. Regular **blood tests** to check the level of **M protein** in the **blood** and **physical exams** to check for **signs** or **symptoms** of **cancer** will be done.

Use our clinical trial search ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/search](http://www.cancer.gov/about-cancer/treatment/clinical-trials/search)) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. General information ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/](http://www.cancer.gov/about-cancer/treatment/clinical-trials/)) about clinical trials is also available.

## Isolated Plasmacytoma of Bone

Treatment of isolated **plasmacytoma** of bone is usually **radiation therapy** to the bone **lesion**.

Use our clinical trial search ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/search](http://www.cancer.gov/about-cancer/treatment/clinical-trials/search)) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. General information ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/](http://www.cancer.gov/about-cancer/treatment/clinical-trials/)) about clinical trials is also available.

## Extramedullary Plasmacytoma

Treatment of extramedullary **plasmacytoma** may include the following:

- **Radiation therapy** to the **tumor** and nearby **lymph nodes**.
- **Surgery**, usually followed by radiation therapy.
- **Watchful waiting** after **initial treatment**, followed by radiation therapy, surgery, or **chemotherapy** if the tumor grows or causes **signs** or **symptoms**.

Use our clinical trial search ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/search](http://www.cancer.gov/about-cancer/treatment/clinical-trials/search)) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. General information ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/](http://www.cancer.gov/about-cancer/treatment/clinical-trials/)) about clinical trials is also available.

## Multiple Myeloma

Patients without **signs** or **symptoms** may not need treatment. When signs or symptoms appear, the treatment of **multiple myeloma** may be done in phases:

**Induction therapy:** This is the first phase of treatment. Its goal is to reduce the amount of disease,

and may include one or more of the following:

- **Corticosteroid therapy**.
- **Biologic therapy** with **lenalidomide**, **pomalidomide**, or **thalidomide** therapy.
- **Targeted therapy** with **proteasome inhibitors** (**bortezomib**, **carfilzomib**, and **ixazomib**) or **monoclonal antibodies** (**daratumumab** and **elotuzumab**).
- **Chemotherapy**.
- **Histone deacetylase inhibitor** therapy with **panobinostat**.
- A **clinical trial** of different combinations of treatment.

**Consolidation chemotherapy:** This is the second phase of treatment. Treatment in the consolidation phase is to kill any remaining cancer cells. **High-dose chemotherapy** is followed by either:

- one **autologous stem cell transplant**, in which the patient's **stem cells** from the **blood** or **bone marrow** are used; or
- two autologous stem cell transplants followed by an autologous or **allogeneic stem cell transplant**, in which the patient receives stem cells from the blood or bone marrow of a **donor**; or
- one allogeneic stem cell transplant.

**Maintenance therapy:** After the **initial treatment**, maintenance therapy is often given to help keep the disease in **remission** for a longer time. Several types of treatment are being studied for this use, including the following:

- Chemotherapy.
- **Biologic therapy** with **interferon**.
- Corticosteroid therapy.
- Lenalidomide therapy.
- Targeted therapy with a proteasome inhibitor (bortezomib).

Use our clinical trial search ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/search](http://www.cancer.gov/about-cancer/treatment/clinical-trials/search)) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. General information ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/](http://www.cancer.gov/about-cancer/treatment/clinical-trials/)) about clinical trials is also available.

## Refractory Multiple Myeloma

Treatment of **refractory multiple myeloma** may include the following:

- **Watchful waiting** for patients whose disease is **stable**.
- A different treatment than treatment already given, for patients whose **tumor** kept grow-

ing during treatment. (See Multiple Myeloma treatment options.)

- A **clinical trial** of a new therapy.

Use our clinical trial search ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/search](http://www.cancer.gov/about-cancer/treatment/clinical-trials/search)) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. General information ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials/](http://www.cancer.gov/about-cancer/treatment/clinical-trials/)) about clinical trials is also available.

## To Learn More About Plasma Cell Neoplasms

For more information from the **National Cancer Institute** about multiple myeloma and other plasma cell neoplasms, see the following:

- Multiple Myeloma/Other Plasma Cell Neoplasms Home Page ([Link: www-new.cancer.gov/cancertopics/types/myeloma](http://www-new.cancer.gov/cancertopics/types/myeloma))
- Drugs Approved for Multiple Myeloma and Other Plasma Cell Neoplasms ([Link: www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma](http://www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma))
- Targeted Cancer Therapies ([Link: www-new.cancer.gov/cancertopics/treatment/types/targeted-therapies/targeted-therapies-fact-sheet](http://www-new.cancer.gov/cancertopics/treatment/types/targeted-therapies/targeted-therapies-fact-sheet))

- Blood-Forming Stem Cell Transplants (**Link: [www.cancer.gov/about-cancer/treatment/types/stem-cell-transplant/stem-cell-fact-sheet](http://www.cancer.gov/about-cancer/treatment/types/stem-cell-transplant/stem-cell-fact-sheet)**)
- Biological Therapies for Cancer (**Link: [www.cancer.gov/about-cancer/treatment/types/immunotherapy/bio-therapies-fact-sheet](http://www.cancer.gov/about-cancer/treatment/types/immunotherapy/bio-therapies-fact-sheet)**)

For general **cancer** information and other resources from the National Cancer Institute, see the following:

- About Cancer (**Link: [www.cancer.gov/about-cancer](http://www.cancer.gov/about-cancer)**)
- Staging (**Link: [www.cancer.gov/about-cancer/diagnosis-staging/staging](http://www.cancer.gov/about-cancer/diagnosis-staging/staging)**)
- Chemotherapy and You: Support for People With Cancer (**Link: [www.cancer.gov/publications/patient-education/chemo-and-you](http://www.cancer.gov/publications/patient-education/chemo-and-you)**)
- Radiation Therapy and You: Support for People With Cancer (**Link: [www.cancer.gov/publications/patient-education/radiation-therapy-and-you](http://www.cancer.gov/publications/patient-education/radiation-therapy-and-you)**)
- Coping with Cancer (**Link: [www.cancer.gov/about-cancer/coping](http://www.cancer.gov/about-cancer/coping)**)
- Questions to Ask Your Doctor about Cancer (**Link: [www.cancer.gov/about-cancer/coping/questions](http://www.cancer.gov/about-cancer/coping/questions)**)

- For Survivors and Caregivers (**Link: [cancer-control.cancer.gov/ocs/resources/survivors.html](http://cancer-control.cancer.gov/ocs/resources/survivors.html)**)

## About This PDQ Summary

### About PDQ

Physician Data Query (PDQ) is the National Cancer Institute's (NCI's) comprehensive cancer information database. The PDQ database contains summaries of the latest published information on cancer prevention, detection, genetics, treatment, supportive care, and complementary and alternative medicine. Most summaries come in two versions. The health professional versions have detailed information written in technical language. The patient versions are written in easy-to-understand, nontechnical language. Both versions have cancer information that is accurate and up to date and most versions are also available in Spanish (**Link: [www.cancer.gov/espanol/publicaciones/pdq](http://www.cancer.gov/espanol/publicaciones/pdq)**).

PDQ is a service of the NCI. The NCI is part of the National Institutes of Health (NIH). NIH is the federal government's center of biomedical research. The PDQ summaries are based on an independent review of the medical literature. They are not policy statements of the NCI or the NIH.

## Purpose of This Summary

This PDQ cancer information summary has current information about treatment of plasma cell neoplasms (including multiple myeloma). It is meant to inform and help patients, families, and caregivers. It does not give formal guidelines or recommendations for making decisions about health care.

## Reviewers and Updates

Editorial Boards write the PDQ cancer information summaries and keep them up to date. These Boards are made up of experts in cancer treatment and other specialties related to cancer. The summaries are reviewed regularly and changes are made when there is new information. The date on each summary ("Updated") is the date of the most recent change.

The information in this patient summary was taken from the health professional version, which is reviewed regularly and updated as needed, by the PDQ Adult Treatment Editorial Board ([Link: www.cancer.gov/publications/pdq/editorial-boards/adult-treatment](http://www.cancer.gov/publications/pdq/editorial-boards/adult-treatment)).

## Clinical Trial Information

A clinical trial is a study to answer a scientific question, such as whether one treatment is better than another. Trials are based on past studies and what has been learned in the laboratory. Each trial answers certain scientific questions in order to find

new and better ways to help cancer patients. During treatment clinical trials, information is collected about the effects of a new treatment and how well it works. If a clinical trial shows that a new treatment is better than one currently being used, the new treatment may become "standard." Patients may want to think about taking part in a clinical trial. Some clinical trials are open only to patients who have not started treatment.

Clinical trials can be found online at NCI's website ([Link: www.cancer.gov/about-cancer/treatment/clinical-trials](http://www.cancer.gov/about-cancer/treatment/clinical-trials)). For more information, call the Cancer Information Service ([Link: www.cancer.gov/contact/contact-center](http://www.cancer.gov/contact/contact-center)) (CIS), NCI's contact center, at 1-800-4-CANCER (1-800-422-6237).

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## Disclaimer

The information in these summaries should not be used to make decisions about insurance reimbursement. More information on insurance coverage is available on Cancer.gov on the Managing Cancer Care (Link: [www.cancer.gov/about-cancer/managing-care](https://www.cancer.gov/about-cancer/managing-care)) page.

## Contact Us

More information about contacting us or receiving help with the Cancer.gov website can be found on our Contact Us for Help (Link: [www.cancer.gov/contact](https://www.cancer.gov/contact)) page. Questions can also be submitted to

Cancer.gov through the website's E-mail Us (Link: [www.cancer.gov/contact/email-us](https://www.cancer.gov/contact/email-us)).

Date this NCI Patient Education Statement was updated: 2019-04-09.

## Words to Know

### albumin (SEER-um al-BYOO-min)

The main protein in blood plasma. Low levels of serum albumin occur in people with malnutrition, inflammation, and serious liver and kidney disease.

### allogeneic (A-loh-jeh-NAY-ik)

Taken from different individuals of the same species. Also called allogenic.

### allogeneic stem cell transplant (A-loh-jeh-NAY-ik stem sel tranz-plan-TAY-shun)

A procedure in which a person receives blood-forming stem cells (cells from which all blood cells develop) from a genetically similar, but not identical, donor. This is often a sister or brother, but could be an unrelated donor.

### amyloidosis (A-muh-loy-DOH-sis)

A group of diseases in which protein builds up in certain organs (localized amyloidosis) or throughout the body (systemic amyloidosis). Amyloidosis may be either primary (with no known cause), secondary (caused by another disease, including some types of cancer, such as multiple myeloma), or hereditary (passed down from parents to children). Many organs are affected by amyloidosis. The organs affected may depend on whether the amyloidosis is the primary, secondary, or hereditary form.

### antitumor (AN-tee-TOO-mer)

Having to do with stopping abnormal cell growth.

### **autologous (aw-TAH-luh-gus)**

Taken from an individual's own tissues, cells, or DNA.

### **autologous stem cell transplant (aw-TAH-luh-gus ... tranz-plan-TAY-shun)**

A procedure in which blood-forming stem cells (cells from which all blood cells develop) are removed, stored, and later given back to the same person.

### **B cells (... sel)**

A type of white blood cell that makes antibodies. B cells are part of the immune system and develop from stem cells in the bone marrow. Also called B lymphocyte.

### **B lymphocytes (... LIM-foh-site)**

A type of white blood cell that makes antibodies. B lymphocytes are part of the immune system and develop from stem cells in the bone marrow. Also called B cell.

### **bacteria (bak-TEER-ee-uh)**

A large group of single-cell microorganisms. Some cause infections and disease in animals and humans. The singular of bacteria is bacterium.

### **beta-2-microglobulin (BAY-tuh-2-MY-kroh-GLAH-byoo-lin)**

A small protein normally found on the surface of many cells, including lymphocytes, and in small amounts in the blood and urine. An increased amount in the blood or urine may be a sign of certain diseases, including some types of cancer, such as multiple myeloma or lymphoma.

### **blood tests (blud test)**

A test done on a sample of blood to measure the amount of certain substances in the blood or to count different types of blood cells. Blood tests may be done to look for signs of disease or agents that cause disease, to check for antibodies or tumor markers, or to see how well treatments are working.

### **bone density (...DEN-sih-tee)**

A measure of the amount of minerals (mostly calcium and phosphorus) contained in a certain volume of bone. Bone density measurements are used to diagnose osteoporosis (a condition marked by decreased bone mass), to see how well osteoporosis treatments are working, and to predict how likely the bones are to break. Low bone density can occur in patients treated for cancer. Also called BMD, bone mass, and bone mineral density.

### **Bortezomib (bor-TEH-zoh-mib)**

A drug used to treat multiple myeloma. It is also used to treat mantle cell lymphoma in patients who have already received at least one other type of treatment and is being studied in the treatment of other types of cancer. Bortezomib blocks several molecular pathways in a cell and may cause cancer cells to die. It is a type of proteasome inhibitor and a type of dipeptidyl boronic acid. Also called PS-341 and Velcade.

### **calcium (KAL-see-um)**

A mineral needed for healthy teeth, bones, and other body tissues. It is the most common mineral in the body. A deposit of calcium in body tissues, such as breast tissue, may be a sign of disease.

### **carfilzomib (kar-FIL-zoh-mib)**

A drug used alone or with other drugs to treat multiple myeloma that has gotten worse or came back after treatment with other anticancer therapy. It is also being studied in the treatment of other types of cancer. Carfilzomib blocks the action of enzymes called proteasomes, which may help keep cancer cells from growing and may kill them. It is a type of proteasome inhibitor. Also called Kyprolis.

### **chemicals (KEH-mih-kul)**

A substance made up of elements, such as hydrogen or sodium.

### **chromosomes (KROH-muh-some)**

Part of a cell that contains genetic information. Except for sperm and eggs, all human cells contain 46 chromosomes.

### **chronic lymphocytic leukemia (KRAH-nik LIM-foh-SIH-tik loo-KEE-mee-uh)**

An indolent (slow-growing) cancer in which too many immature lymphocytes (white blood cells) are found mostly in the blood and bone marrow. Sometimes, in later stages of the disease, cancer cells are found in the lymph nodes and the disease is called small lymphocytic lymphoma. Also called CLL.

### **circulation (ser-kyoo-LAY-shun)**

In the body, the flow of blood through the heart and blood vessels, and the flow of lymph through the lymph vessels.

### **Complete blood count (CBC) with differential (... dih-feh-REN-shul)**

A measure of the number of red blood cells, white blood cells, and platelets in the blood, including the different types of white blood cells (neutrophils, lymphocytes, monocytes, basophils, and eosinophils). The amount of hemoglobin (substance in the blood that carries oxygen) and the hematocrit (the amount of whole blood that is made up of red blood cells) are also measured. A CBC with differential is used to help diagnose and monitor many different conditions, including anemia and infection. Also called blood cell count with differential.

### **compression fractures (kum-PREH-shun FRAK-sheer)**

A type of break in a bone caused by pressure and in which the bone collapses. Compression fractures usually occur in the spine (backbone) and in bones made weak by cancer or by osteoporosis (a decrease in bone mass and density).

### **Confusion (kun-FYOO-zhun)**

A mental state in which one is not thinking clearly.

### **Consolidation chemotherapy (kun-SAH-lih-DAY-shun THAYR-uh-pee)**

Treatment that is given after cancer has disappeared following the initial therapy. Consolidation therapy is used to kill any cancer cells that may be left in the body. It may include radiation therapy, a stem cell transplant, or treatment with drugs that kill cancer

cells. Also called intensification therapy and postremission therapy.

### **Corticosteroid (KOR-tih-koh-STAYR-oyd)**

Any steroid hormone made in the adrenal cortex (the outer part of the adrenal gland). They are also made in the laboratory. Corticosteroids have many different effects in the body, and are used to treat many different conditions. They may be used as hormone replacement, to suppress the immune system, and to treat some side effects of cancer and its treatment. Corticosteroids are also used to treat certain lymphomas and lymphoid leukemias.

### **Cytogenetic analysis (SY-toh-jeh-NEH-tix)**

The study of chromosomes, which are long strands of DNA and protein that contain most of the genetic information in a cell. Cytogenetics involves testing samples of tissue, blood, or bone marrow in a laboratory to look for changes in chromosomes, including broken, missing, or extra chromosomes. Changes in certain chromosomes may be a sign of a genetic disease or condition or some types of cancer. Cytogenetics may be used to help diagnose a disease or condition, plan treatment, or find out how well treatment is working.

### **Daratumumab (DAYR-uh-TOOM-yoo-mab)**

A drug used to treat multiple myeloma. It is used with dexamethasone and lenalidomide or bortezomib in patients whose cancer was treated with at least one anticancer therapy. It is used alone in patients whose cancer was treated with at least three anticancer therapies, including a proteasome inhibitor and an immunomodulating agent. It is also being studied in the treatment of other types of cancer. Daratumumab binds to a protein called CD38, which is found on some types of immune cells and cancer cells, including myeloma cells. Daratumumab may block CD38 and help the immune system kill cancer cells. It is a type of monoclonal antibody. Also called Darzalex.



### **digestive tract (dy-JES-tiv trakt)**

The organs through which food and liquids pass when they are swallowed, digested, and eliminated. These organs are the mouth, esophagus, stomach, small and large intestines, and rectum and anus.

### **elotuzumab (EH-loh-TOO-zoo-mab)**

A drug used with lenalidomide and dexamethasone to treat multiple myeloma. It is used in patients whose cancer was treated with one to three anticancer therapies. Elotuzumab binds to a protein called CS1, which is found on myeloma cells and some types of immune cells. Elotuzumab may block CS1 and help the immune system kill cancer cells. It is a type of monoclonal antibody. Also called Emlpiciti and HuLuc63.

### **enzymes (EN-zime)**

A protein that speeds up chemical reactions in the body.

### **Fever (FEE-ver)**

An increase in body temperature above normal (98.6 degrees F), usually caused by disease.

### **flow cytometry (floh sy-TAH-meh-tree)**

A method of measuring the number of cells in a sample, the percentage of live cells in a sample, and certain characteristics of cells, such as size, shape, and the presence of tumor markers on the cell surface. The cells are stained with a light-sensitive dye, placed in a fluid, and passed in a stream before a laser or other type of light. The measurements are based on how the light-sensitive dye reacts to the light.

### **fluorescence in situ hybridization (floor-EH-sents in SY-too HY-brih-dih-ZAY-shun)**

A laboratory technique used to look at genes or chromosomes in cells and tissues. Pieces of DNA that contain a fluorescent dye are made in the laboratory and added to cells or tissues on a glass slide. When these pieces of DNA bind to specific genes or areas of chromosomes on the slide, they light up when viewed under a microscope with a special light. Also called FISH.

### **genetic (jeh-NEH-tik)**

Having to do with genes. Most genes are sequences of DNA that contain information for making specific RNA molecules or proteins that perform important functions in a cell. The information in genes is passed down from parent to child. Sometimes, certain changes in genes can affect a person's risk of disease, such as cancer. These changes may be inherited or they may occur with age or exposure to environmental factors, such as diet, exercise, drugs, and chemicals.

### **Histone deacetylase (HDAC) inhibitor (HIS-tone dee-uh-SEH-tih-lays in-HIH-bih-ter)**

A substance that causes a chemical change that stops tumor cells from dividing. Histone deacetylase inhibitors are being studied in the treatment of cancer. Also called HDAC inhibitor.

### **Histone deacetylase inhibitor (HIS-tone dee-uh-SEH-tih-lays in-HIH-bih-ter)**

A substance that causes a chemical change that stops tumor cells from dividing. Histone deacetylase inhibitors are being studied in the treatment of cancer. Also called HDAC inhibitor.

### **hypercalcemia (HY-per-kal-SEE-mee-uh)**

Higher than normal levels of calcium in the blood. Some types of cancer increase the risk of hypercalcemia.

### **immunoglobulin (IH-myoo-noh-GLAH-byoo-lin)**

A protein that is made by B cells and plasma cells (types of white blood cells) and helps the body fight infection. Some immunoglobulins may be found in higher than normal amounts in patients with certain conditions or certain types of cancer, including multiple myeloma and Waldenstrom macroglobulinemia. Measuring the amount of specific immunoglobulins in the blood and urine may help diagnose cancer or find out how well treatment is working or if cancer has come back. Some immunoglobulins may be used as tumor markers. Also called Ig.

## **Immunomodulators (IH-myoo-noh-MOD-yoo-lay-ting AY-jent)**

A substance that stimulates or suppresses the immune system and may help the body fight cancer, infection, or other diseases. Specific immunomodulating agents, such as monoclonal antibodies, cytokines, and vaccines, affect specific parts of the immune system. Nonspecific immunomodulating agents, such as BCG and levamisole, affect the immune system in a general way.

## **Induction therapy (in-DUK-shun THAYR-uh-pee)**

The first treatment given for a disease. It is often part of a standard set of treatments, such as surgery followed by chemotherapy and radiation. When used by itself, induction therapy is the one accepted as the best treatment. If it doesn't cure the disease or it causes severe side effects, other treatment may be added or used instead. Also called first-line therapy, primary therapy, and primary treatment.

## **initial treatment (PRY-mayr-ee TREET-ment)**

The first treatment given for a disease. It is often part of a standard set of treatments, such as surgery followed by chemotherapy and radiation. When used by itself, primary treatment is the one accepted as the best treatment. If it doesn't cure the disease or it causes severe side effects, other treatment may be added or used instead. Also called first-line therapy, induction therapy, and primary therapy.

## **Interferon (in-ter-FEER-on)**

A natural substance that helps the body's immune system fight infection and other diseases, such as cancer. Interferons are made in the body by white blood cells and other cells, but they can also be made in the laboratory to use as treatments for different diseases. In cancer therapy, interferons may help keep cancer cells from growing and may help kill cancer cells. There are three main types of interferons: interferon-alfa, interferon-beta, and interferon-gamma. An interferon is a type of cytokine and type of immunomodulating agent.

## **ixazomib (ik-SA-zoh-mib SIH-trayt)**

A drug used with lenalidomide and dexamethasone to treat

multiple myeloma. It is used in patients who received at least one other anticancer treatment. It is also being studied in the treatment of other types of cancer. Ixazomib citrate blocks enzymes called proteasomes, which may help keep cancer cells from growing and may kill them. It is a type of proteasome inhibitor. Also called Ninlaro.

## **kidney failure (KID-nee FAYL-yer)**

A condition in which the kidneys stop working and are not able to remove waste and extra water from the blood or keep body chemicals in balance. Acute or severe kidney failure happens suddenly (for example, after an injury) and may be treated and cured. Chronic kidney failure develops over many years, may be caused by conditions like high blood pressure or diabetes, and cannot be cured. Chronic kidney failure may lead to total and long-lasting kidney failure, called end-stage renal disease (ESRD). A person in ESRD needs dialysis (the process of cleaning the blood by passing it through a membrane or filter) or a kidney transplant. Also called renal failure.

## **lactate dehydrogenase (LAK-tayt dee-hy-DRAH-jeh-nays)**

One of a group of enzymes found in the blood and other body tissues and involved in energy production in cells. An increased amount of lactate dehydrogenase in the blood may be a sign of tissue damage and some types of cancer or other diseases. Also called lactic acid dehydrogenase and LDH.

## **lenalidomide (leh-nuh-LIH-doh-mide)**

A drug that is similar to thalidomide, and is used to treat multiple myeloma and certain types of anemia. It is also used to treat mantle cell lymphoma that has come back or has not gotten better after other treatment. It is being studied in the treatment of other conditions and types of cancer. Lenalidomide may help the immune system kill abnormal blood cells or cancer cells. It may also prevent the growth of new blood vessels that tumors need to grow. It is a type of antiangiogenesis agent and a type of immunomodulating agent. Also called CC-5013 and Revlimid.

### **Lymphoplasmacytic lymphoma (LIM-foh-plaz-muh-SIH-tik lim-FOH-muh)**

An indolent (slow-growing) type of non-Hodgkin lymphoma marked by abnormal levels of IgM antibodies in the blood and an enlarged liver, spleen, or lymph nodes. Also called Waldenström macroglobulinemia.

### **M protein (... PROH-teen)**

An antibody found in unusually large amounts in the blood or urine of people with multiple myeloma and other types of plasma cell tumors. Also called monoclonal protein.

### **MGUS (YOOR-ih-NA-lih-sis)**

A benign condition in which there is a higher-than-normal level of a protein called M protein in the blood. Patients with MGUS are at an increased risk of developing cancer. Also called monoclonal gammopathy of undetermined significance.

### **Monoclonal gammopathy of undetermined significance (MAH-noh-KLOH-nul ga-MAH-puh-thee ... UN-deh-TER-mind sig-NIH-fih-kunts)**

A benign condition in which there is a higher-than-normal level of a protein called M protein in the blood. Patients with monoclonal gammopathy of undetermined significance are at an increased risk of developing cancer. Also called MGUS.

### **Multiple myeloma (MUL-tih-pul MY-eh-LOH-muh)**

A type of cancer that begins in plasma cells (white blood cells that produce antibodies). Also called Kahler disease, myelomatosis, and plasma cell myeloma.

### **myeloma (MY-eh-LOH-muh)**

Cancer that arises in plasma cells, a type of white blood cell.

### **neoplasm (NEE-oh-PLA-zum)**

An abnormal mass of tissue that results when cells divide more than they should or do not die when they should. Neoplasms may be benign (not cancer), or malignant (cancer). Also called tumor.

### **osteoporosis (OS-tee-oh-puh-ROH-sis)**

A condition in which there is a decrease in the amount and thickness of bone tissue. This causes the bones to become weak and break more easily. Osteoporosis may be caused by older age, hormone changes, taking certain medicines, and not eating enough foods with calcium and vitamin D. It may also be caused by certain types of cancer and cancer treatment. It is most common in white and Asian women.

### **Panobinostat (PA-noh-BIH-noh-stat)**

A drug used with bortezomib and dexamethasone to treat multiple myeloma. It is used in patients who have already been treated with bortezomib and an immunomodulating agent. It is also being studied in the treatment of other types of cancer. Panobinostat blocks certain enzymes needed for cells to grow and divide and may kill cancer cells. It may also prevent the growth of new blood vessels that tumors need to grow. It is a type of histone deacetylase inhibitor and a type of antiangiogenesis agent. Also called Farydak and LBH589.

### **paranasal sinuses (PAYR-uh-NAY-zul SY-nus)**

One of many small hollow spaces in the bones around the nose. Paranasal sinuses are named after the bones that contain them: frontal (the lower forehead), maxillary (cheekbones), ethmoid (beside the upper nose), and sphenoid (behind the nose). The paranasal sinuses open into the nasal cavity (space inside the nose) and are lined with cells that make mucus to keep the nose from drying out during breathing.

### **PET-CT scan (... skan)**

A procedure that combines the pictures from a positron emission tomography (PET) scan and a computed tomography (CT) scan. The PET and CT scans are done at the same time with the same machine. The combined scans give more detailed pictures of areas inside the body than either scan gives by itself. A PET-CT scan may be used to help diagnose disease, such as cancer, plan treatment, or find out how well treatment is working. Also called positron emission tomography-computed tomography scan.

**physical exams (FIH-zih-kul eg-ZA-mih-NAY-shun)**

An exam of the body to check for general signs of disease.

**plasma (PLAZ-muh)**

The clear, yellowish, fluid part of the blood that carries the blood cells. The proteins that form blood clots are in plasma.

**plasma cell (PLAZ-muh sel)**

A type of immune cell that makes large amounts of a specific antibody. Plasma cells develop from B cells that have been activated. A plasma cell is a type of white blood cell. Also called plasmacyte.

**plasma cell tumor (PLAZ-muh sel TOO-mer)**

A tumor that begins in plasma cells (white blood cells that produce antibodies). Multiple myeloma, monoclonal gammopathy of undetermined significance (MGUS), and plasmacytoma are types of plasma cell tumors.

**Plasmacytoma (PLAZ-muh-sy-TOH-muh)**

A type of cancer that begins in plasma cells (white blood cells that produce antibodies). A plasmacytoma may turn into multiple myeloma.

**Plasmapheresis (PLAZ-muh-feh-REE-sis)**

The process of separating certain cells from the plasma in the blood by a machine; only the cells are returned to the person. Plasmapheresis can be used to remove excess antibodies from the blood. Also called plasma exchange.

**pomalidomide (PAH-muh-LIH-doh-mide)**

A drug that is a form of thalidomide, and is used to treat multiple myeloma that has not gotten better with other anticancer drugs. It is also being studied in the treatment of other types of cancer. Pomalidomide may help the immune system kill cancer cells. It may also prevent the growth of new blood vessels that tumors need to grow. It is a type of immunomodulating agent and a type of antiangiogenesis agent. Also called CC-4047 and Pomalyst.

**Proteasome inhibitor (PROH-tee-uh-some in-HIH-bih-ter)**

A drug that blocks the action of proteasomes. A proteasome is a large protein complex that helps destroy other cellular proteins when they are no longer needed. Proteasome inhibitors are being studied in the treatment of cancer.

**refractory (reh-FRAK-tor-ee)**

In medicine, describes a disease or condition that does not respond to treatment.

**remission (reh-MIH-shun)**

A decrease in or disappearance of signs and symptoms of cancer. In partial remission, some, but not all, signs and symptoms of cancer have disappeared. In complete remission, all signs and symptoms of cancer have disappeared, although cancer still may be in the body.

**responds (reh-SPONTS)**

In medicine, an improvement related to treatment.

**Skeletal (SKEH-leh-tul)**

Having to do with the skeleton (bones of the body).

**smoldering multiple myeloma (SMOLE-der-ing MY-eh-LOH-muh)**

A very slow-growing type of myeloma in which abnormal plasma cells (a type of white blood cell) make too much of a single type of monoclonal antibody (a protein). This protein builds up in the blood or is passed in the urine. Patients with smoldering myeloma usually have no symptoms, but need to be checked often for signs of progression to fully developed multiple myeloma.

**stable (STAY-bul dih-ZEEZ)**

Cancer that is neither decreasing nor increasing in extent or severity.

### **stage I multiple myeloma (... MUL-tih-pul MY-eh-LOH-muh)**

Relatively few cancer cells have spread throughout the body. There may be no symptoms of disease.

### **stage II multiple myeloma (... MUL-tih-pul MY-eh-LOH-muh)**

Cancer in which a moderate number of cancer cells have spread throughout the body.

### **stage III multiple myeloma (... MUL-tih-pul MY-eh-LOH-muh)**

A relatively large number of cancer cells have spread throughout the body. There may be one or more of the following: 1) a decrease in the number of red blood cells, causing anemia; 2) the amount of calcium in the blood is very high, because the bones are being damaged; 3) more than three bone tumors (plasmacytomas) are found; or 4) high levels of M protein are found in the blood or urine.

### **steroid therapy (STAYR-oyd THAYR-uh-pee)**

Treatment with corticosteroid drugs to reduce swelling, pain, and other symptoms of inflammation.

### **steroids (STAYR-oyd ...)**

A type of drug used to relieve swelling and inflammation. Some steroid drugs may also have antitumor effects.

### **Thalidomide (thuh-LIH-doh-mide)**

A drug used with another drug to treat multiple myeloma in patients who have just been diagnosed. It is also used to treat a painful skin disease related to leprosy. It is being studied in the treatment of other types of cancer. Thalidomide may help the immune system kill cancer cells. It may also prevent the growth of new blood vessels that tumors need to grow. It is a type of anti-angiogenesis agent and a type of immunomodulating agent. Also called Thalomid.

### **tonsil (TON-sil)**

One of two small masses of lymphoid tissue on either side of the throat.

### **urination (YOOR-in)**

Fluid containing water and waste products. Urine is made by the kidneys, stored in the bladder, and leaves the body through the urethra.

### **urine test (YOOR-ih-NA-lih-sis)**

A test that determines the content of the urine.

### **viruses (VY-rus)**

In medicine, a very simple microorganism that infects cells and may cause disease. Because viruses can multiply only inside infected cells, they are not considered to be alive.

### **white blood cell (hwhite blud sel)**

A type of blood cell that is made in the bone marrow and found in the blood and lymph tissue. White blood cells are part of the body's immune system. They help the body fight infection and other diseases. Types of white blood cells are granulocytes (neutrophils, eosinophils, and basophils), monocytes, and lymphocytes (T cells and B cells). Checking the number of white blood cells in the blood is usually part of a complete blood cell (CBC) test. It may be used to look for conditions such as infection, inflammation, allergies, and leukemia. Also called leukocyte and WBC.

## Links to Cancer-Related Websites

### Adult Non-Hodgkin Lymphoma Treatment

[www.cancer.gov/types/lymphoma/patient/adult-nhl-treatment-pdq](http://www.cancer.gov/types/lymphoma/patient/adult-nhl-treatment-pdq)

### Biological Therapies for Cancer

[www.cancer.gov/about-cancer/treatment/types/immunotherapy/bio-therapies-fact-sheet](http://www.cancer.gov/about-cancer/treatment/types/immunotherapy/bio-therapies-fact-sheet)

### Cancer Pain

[www.cancer.gov/about-cancer/treatment/side-effects/pain/pain-pdq](http://www.cancer.gov/about-cancer/treatment/side-effects/pain/pain-pdq)

### Clinical Trials General Information

[www.cancer.gov/about-cancer/treatment/clinical-trials](http://www.cancer.gov/about-cancer/treatment/clinical-trials)

### Clinical Trial Search

[www.cancer.gov/about-cancer/treatment/clinical-trials/search](http://www.cancer.gov/about-cancer/treatment/clinical-trials/search)

### Clinical Trials Supported by other Organizations

[clinicaltrials.gov/](http://clinicaltrials.gov/)

### Drugs Approved for Multiple Myeloma and Other Plasma Cell Neoplasms

[www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma](http://www.cancer.gov/about-cancer/treatment/drugs/multiple-myeloma)

### E-mail Us

[www.cancer.gov/contact/email-us](http://www.cancer.gov/contact/email-us)

### Managing Cancer Care

[www.cancer.gov/about-cancer/managing-care](http://www.cancer.gov/about-cancer/managing-care)

### Multiple Myeloma

[www.cancer.gov/types/myeloma/patient/myeloma-treatment-pdq](http://www.cancer.gov/types/myeloma/patient/myeloma-treatment-pdq)

### Multiple Myeloma/Other Plasma Cell Neoplasms Home Page

[www-new.cancer.gov/cancertopics/types/myeloma](http://www-new.cancer.gov/cancertopics/types/myeloma)

### Oral Complications of Chemotherapy and Head/Neck Radiation

[www.cancer.gov/about-cancer/treatment/side-effects/mouth-throat/oral-complications-pdq](http://www.cancer.gov/about-cancer/treatment/side-effects/mouth-throat/oral-complications-pdq)

### Questions to Ask Your Doctor about Cancer

[www.cancer.gov/about-cancer/coping/questions](http://www.cancer.gov/about-cancer/coping/questions)

### Radiation Therapy and You: Support for People With Cancer

[www.cancer.gov/publications/patient-education/radiation-therapy-and-you](http://www.cancer.gov/publications/patient-education/radiation-therapy-and-you)

### Spanish

[www.cancer.gov/espanol/publicaciones/pdq](http://www.cancer.gov/espanol/publicaciones/pdq)

### Staging

[www.cancer.gov/about-cancer/diagnosis-staging/staging](http://www.cancer.gov/about-cancer/diagnosis-staging/staging)

### Targeted Cancer Therapies

[ww-new.cancer.gov/cancertopics/treatment/types/targeted-therapies/targeted-therapies-fact-sheet](http://www-new.cancer.gov/cancertopics/treatment/types/targeted-therapies/targeted-therapies-fact-sheet)

## Notes

Access the AdventHealth Cancer Institute's  
CancerHelp Online Website with your Smartphone or  
Tablet by scanning this QR Code:



CancerHelp Online is a patient education program of  
The CancerHelp Institute, an official Content  
Distribution Partner of the National Cancer Institute.  
Funding is provided in part by the  
AdventHealth Foundation.

[www.cancerhelpadventhealth.com](http://www.cancerhelpadventhealth.com)

