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Treating Chronic Lymphocytic Leukemia

Main treatments

Because CLL often grows slowly, not everyone needs to be treated right away. When treatment is needed, the main treatments used are:

- [Chemotherapy for Chronic Lymphocytic Leukemia](#)
- [Monoclonal Antibodies for Chronic Lymphocytic Leukemia](#)
- [Targeted Therapy Drugs for Chronic Lymphocytic Leukemia](#)
- [Supportive Care for Chronic Lymphocytic Leukemia](#)
- [Stem Cell Transplant for Chronic Lymphocytic Leukemia](#)

Other treatments

Less often, the following treatments might be used to treat CLL:

- [Leukapheresis for Chronic Lymphocytic Leukemia](#)
- [Surgery for Chronic Lymphocytic Leukemia](#)
- [Radiation Therapy for Chronic Lymphocytic Leukemia](#)

Common treatment approaches

It's important to take time and think about your choices. Because CLL often grows slowly, not everyone needs to be treated right away. In choosing a treatment plan, the [stage of the leukemia and other prognostic factors](#) are important. Other factors to consider include whether or not you're having symptoms, your age and overall health, and the likely benefits and side effects of treatment.

- [Typical Treatment of Chronic Lymphocytic Leukemia](#)

- [Treating Hairy Cell Leukemia](#)

Who treats CLL?

Based on your treatment options, you might have different types of doctors on your treatment team. These doctors could include:

- A **hematologist**: a doctor who treats blood disorders.
- A **radiation oncologist**: a doctor who treats cancer with radiation therapy
- A **medical oncologist**: a doctor who treats cancer with medicines such as chemotherapy
- A **surgical oncologist (oncologic surgeon)**: a doctor who uses surgery to treat cancer

You might have many other specialists on your treatment team as well, including physician assistants, nurse practitioners, nurses, nutrition specialists, social workers, and other health professionals.

- [Health Professionals Associated With Cancer Care](#)

Making treatment decisions

It's important to discuss all of your treatment options, including their goals and possible side effects, with your doctors to help make the decision that best fits your needs. It's also very important to ask questions if there's anything you're not sure about.

If time permits, it is often a good idea to seek a second opinion. A second opinion can give you more information and help you feel more confident about the treatment plan you choose.

- [Questions to Ask About Chronic Lymphocytic Leukemia](#)
- [Seeking a Second Opinion](#)

Thinking about taking part in a clinical trial

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

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

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

- [Clinical Trials](#)

Considering complementary and alternative methods

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

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

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

- [Complementary and Alternative Medicine](#)

Help getting through cancer treatment

People with cancer need support and information, no matter what stage of illness they may be in. Knowing all of your options and finding the resources you need will help you make informed decisions about your care.

Whether you are thinking about treatment, getting treatment, or not being treated at all, you can still get supportive care to help with pain or other symptoms. Communicating with your cancer care team is important so you understand your diagnosis, what treatment is recommended, and ways to maintain or improve your quality of life.

Different types of programs and support services may be helpful, and can be an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

The American Cancer Society also has programs and services – including rides to

treatment, lodging, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists.

- [Palliative Care](#)
- [Find Support Programs and Services in Your Area](#)

Choosing to stop treatment or choosing no treatment at all

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

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

- [If Cancer Treatments Stop Working](#)

The treatment information given here is not official policy of the American Cancer Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor. Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

Chemotherapy for Chronic Lymphocytic Leukemia

Chemotherapy (chemo) uses anti-cancer drugs that are taken by mouth or injected into a vein or muscle to kill or control cancer cells. When given this way, these drugs enter the bloodstream and reach all parts of the body, so chemo is useful for cancers that

tend to spread throughout the body, like chronic lymphocytic leukemia (CLL).

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

Chemo drugs used for CLL

The major types of chemo drugs most commonly used to treat CLL include:

Purine analogs: fludarabine (Fludara[®]), pentostatin (Nipent[®]), and cladribine (2-CdA, Leustatin[®]). Fludarabine is often one of the first drugs used against CLL. (It's given along with cyclophosphamide and rituximab. This combination may be called FCR.)

Alkylating agents: chlorambucil (Leukeran[®]), bendamustine (Treanda[®]), and cyclophosphamide (Cytosan[®]). They're often given along with a monoclonal antibody.

Corticosteroids such as prednisone, methylprednisolone, and dexamethasone.

Possible side effects

Chemo drugs work by attacking cells that are dividing quickly, which is why they work against cancer cells. But other cells like those in the bone marrow, the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are also likely to be affected by chemo, which can lead to side effects.

Chemotherapy side effects depend on the type and dose of drugs given and the length of time they are taken. Common side effects include:

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

Low blood cell counts can cause:

- Increased risk of infections (low white blood cell counts)
- Easy bruising or bleeding (low blood platelets)

- Fatigue (low red blood cells)

These side effects are usually short-term and go away once treatment is finished. There are often ways to lessen or even prevent these side effects. For instance, there are drugs to help prevent or reduce nausea and vomiting. Be sure to ask your doctor or nurse about medicines to help reduce side effects, and let him or her know when you do have side effects so they can be managed before they get worse.

Drugs known as growth factors (such as G-CSF/Neupogen[®], pegfilgrastim/Neulasta[®], and GM-CSF/sargramostim) are sometimes given to increase the white blood cell counts and help reduce the chance of infection, see [Infections in People With Cancer](#)¹.

Tumor lysis syndrome is another possible side effect of certain types of chemo. It's most common in patients who had large numbers of leukemia cells in the body before treatment. (This may be called bulky disease.) It most often happens with the first cycle of chemo. When the CLL cells are killed, they break open and release their contents into the bloodstream. This can overwhelm the kidneys, which cannot get rid of all of these substances at once. This can lead to build up of excess amounts of certain minerals in the blood and even kidney failure. The excess minerals can cause problems with the heart and nervous system. Doctors work to prevent these problems by giving the patient extra fluids and certain drugs, such as sodium bicarbonate, allopurinol, febuxostat, and rasburicase.

More information about chemotherapy

For more general information about how chemotherapy is used to treat cancer, see [Chemotherapy](#)².

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)³.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/low-blood-counts/infections/infections-in-people-with-cancer.html
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

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O'Reilly A, Murphy J, Rawe S, Garvey M. Chronic Lymphocytic Leukemia: A Review of Front-line Treatment Options, With a Focus on Elderly CLL Patients. *Clin Lymphoma Myeloma Leuk*. 2018;18(4):249-256.

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Monoclonal Antibodies for Chronic Lymphocytic Leukemia

Monoclonal antibodies are man-made versions of immune system proteins (antibodies) that are designed to attach to a specific target (in this case, proteins on the surface of cancer cells). These drugs can help your immune system react to and destroy the cancer cells. Some monoclonal antibodies also fight cancer in other ways.

Chemo given along with a monoclonal antibody is a standard treatment for chronic lymphocytic leukemia (CLL).

The monoclonal antibodies used to treat CLL can be divided into groups based on which protein they target.

Targeting CD20

CD20 is a protein found on the surface of B lymphocytes. A number of monoclonal antibody drugs used to treat CLL target the CD20 antigen. These drugs include:

- Rituximab (Rituxan)
- Obinutuzumab (Gazyva)
- Ofatumumab (Arzerra)

Rituximab has become one of the main treatments for CLL. It's most often used along with chemotherapy or a [targeted drug](#), either as part of the initial treatment or as part of a second-line treatment, but it may also be used by itself for people too sick to get chemo.

Obinutuzumab can be used along with the chemo drug chlorambucil or the targeted drug ibrutinib (Imbruvica) as a part of the initial treatment for CLL. It can also be used alone for CLL that comes back after treatment or doesn't respond to other treatments.

Ofatumumab is used mainly if CLL is no longer responding to other treatments such as chemotherapy or other monoclonal antibodies such as alemtuzumab (discussed below). It can be given by itself.

Side effects

These drugs are given by infusion into a vein (IV), which can take up to several hours depending on the drug. They all can cause side effects during the infusion (while the drug is being given) or several hours afterwards. These can be mild, such as itching, chills, fever, nausea, rashes, fatigue, and headaches. More **serious side effects** can also occur during the infusion, including:

- Chest pain
- Heart racing
- Swelling of the face and tongue
- Cough
- Trouble breathing
- Feeling dizzy, lightheaded, or faint

Because of these kinds of reactions, drugs to help prevent them are given before each infusion.

There is also a form of rituximab that's given as a shot under the skin (although the first dose must be given IV). It can take 5-7 minutes to inject the drug, but this is much shorter than the time it normally takes to give the drug IV. Possible side effects include local skin reactions, like redness, where the drug is injected, infections, low white blood cell counts, nausea, fatigue, and constipation.

All of these drugs can cause **hepatitis B infections** that were dormant (inactive) to become active again, which can lead to severe liver problems or even death. For that reason, your doctor may check your blood for signs of an old hepatitis infection before starting this drug. If your blood shows signs of an old hepatitis B infection, the doctor will check your blood during treatment to see if the virus becomes active again. If it does, the drug will need to be stopped.

These drugs may also increase a person's risk of certain serious [infections](#)¹ for many months after the drug is stopped. For example, rituximab has been linked to a rare brain disease known as **progressive multifocal leukoencephalopathy (PML)** that's caused by a virus. It can lead to headache, high blood pressure, seizures, confusion, loss of vision, and even death.

In rare cases of patients with very high white blood cell counts, some of these drugs (especially obinutuzumab) may cause a condition called **tumor lysis syndrome**. This happens when the drug kills the cancer cells so quickly that the body has trouble getting rid of the breakdown products of the dead cells. It most often happens during the first course of treatment. When the CLL cells are killed, they break open and release their contents into the bloodstream. This can overwhelm the kidneys, so they can't get rid of all of these substances fast enough. This can lead to build up of excess amounts of certain minerals in the blood and even kidney failure. The excess minerals can cause problems with the heart and nervous system. Doctors try to keep this from happening by giving the patient extra fluids and certain drugs, such as sodium bicarbonate, allopurinol, febuxostat, and rasburicase.

Other side effects can occur depending on which drug is given. Ask your doctor what you can expect.

Targeting CD52

Alemtuzumab (Campath) is a monoclonal antibody that targets the CD52 antigen,

which is found on the surface of CLL cells and many T lymphocytes. It is used mainly if CLL is no longer responding to standard treatments, but it can be used earlier in the disease. It may be especially useful for people who have CLL with a chromosome 17 deletion, which is often resistant to standard treatments. In this case, it may be the first treatment used, given along with rituximab. Alemtuzumab doesn't seem to work as well in people with enlarged lymph nodes (2 inches across or larger).

Alemtuzumab is given by injection into a vein (intravenous or IV), usually several times a week. In studies, it has also been given as an injection under the skin (subcutaneously), but giving it this way is not approved by the Food and Drug Administration (FDA).

Side effects

The most common side effects are fever, chills, nausea, and rashes during the injection, but these effects seem to be less of a problem when it's given under the skin. It can also cause very low white blood cell counts, which increases the risk for severe bacterial and viral infections. Antibiotic and antiviral medicines are given to help protect against some of these infections, but severe and even life-threatening infections can still occur. As discussed above, old (dormant) infections can also become active again while taking this drug. It may cause low red blood cell and platelet counts, too. Your doctor will watch for these problems. Rare but serious side effects can include strokes, as well as tears in the blood vessels in the head and neck.

Targeting CD22 (to treat hairy cell leukemia)

CD22 is another protein found on B lymphocytes. **Lumoxiti (moxetumomab pasudotox)** is a type of drug known as an *antibody-drug conjugate*. It's made up of an antibody that targets the CD22 antigen, linked to a toxin that can kill cancer cells. The antibody acts like a homing device, bringing the toxin directly to the leukemia cells.

This drug is used to [treat hairy cell leukemia \(HCL\)](#), typically after other treatments have been tried.

Side effects

Like other monoclonal antibodies, this drug can cause side effects during the infusion (while the drug is being given) or several hours afterwards. These are usually mild, such as itching chills, fever, nausea, rashes, fatigue, and headaches, but sometimes they can be more serious. You might be given medicines before each infusion to help prevent these problems.

Other side effects can include:

- Swelling (edema) caused by excess fluid in body tissue
- Nausea
- Feeling tired
- Headache
- Fever
- Constipation
- Diarrhea
- Low levels of red blood cells (anemia)
- Changes in levels of electrolytes in the blood

Other, more serious side effects are also possible:

Capillary leak syndrome is a condition in which fluid and proteins leak out of tiny blood vessels and into surrounding tissues. Symptoms can include:

- Trouble breathing
- Cough
- Weight gain
- Low blood pressure, which might make you feel dizzy or faint
- Swelling in the arms, legs, or face

This condition can be life-threatening if not treated, so it's important to call your doctor right away if you have any of these symptoms.

Hemolytic uremic syndrome is a condition caused by the destruction of red blood cells. It can result in low levels of red blood cells, kidney damage, and damage to some other organs. Symptoms can include:

- Peeing less often and having dark-colored urine
- Bleeding or bruising easily
- Belly pain
- Vomiting
- Fever
- Shortness of breath
- Feeling tired or confused

You will be told to drink a lot of fluids during treatment to help prevent this problem. This condition can be life-threatening if not treated, so it's important to call your doctor right away if you have any of these symptoms.

You can learn more about monoclonal antibodies in [Immunotherapy](#)².

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/low-blood-counts/infections.html
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html

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O'Reilly A, Murphy J, Rawe S, Garvey M. Chronic Lymphocytic Leukemia: A Review of Front-line Treatment Options, With a Focus on Elderly CLL Patients. *Clin Lymphoma Myeloma Leuk*. 2018;18(4):249-256.

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Targeted Therapy Drugs for Chronic

Lymphocytic Leukemia

Targeted therapies are drugs that specifically target the changes inside cells that cause them to become cancer. Unlike standard [chemotherapy](#) drugs, which work by attacking rapidly growing cells in general (including cancer cells), these drugs target one or more specific proteins on or in chronic lymphocytic leukemia (CLL) cells. When treatment is needed for CLL, a targeted drug is often part of the first line of treatment.

Kinase inhibitors

These drugs block *kinases*, which are proteins in cells that normally relay signals (such as telling the cell to grow). Many different types of kinases exist, and there are two that are targeted by specific drugs used to treat CLL: Bruton's tyrosine kinase (BTK) and PI3K.

Bruton's tyrosine kinase (BTK) inhibitors

BTK is a protein that normally helps some CLL cells to grow and survive.

Ibrutinib (Imbruvica)

This targeted drug blocks the activity of BTK in CLL cells. Ibrutinib can be used in the initial treatment of CLL. It has also been shown to help when CLL is hard to treat, for instance, if there are chromosome 17 deletions or if CLL has [come back](#)¹ after other treatments. This drug is taken as a pill.

Side effects tend to be mild, but can include diarrhea, nausea, constipation, fatigue, shortness of breath, swelling of the feet and hands, body aches, and rash. Low blood counts, including low red blood cell counts (anemia), low levels of certain white blood cells (neutropenia), and platelet counts (thrombocytopenia), are also common side effects. Some people treated with this drug get infections which can be serious. There are other side effects, too, so ask your doctor what you can expect.

Acalabrutinib (Calquence)

This targeted drug also blocks the activity of BTK. Acalabrutinib can be used in the initial treatment of CLL, or after other treatments have been tried. It might be used alone or along with other drugs. This drug is taken by mouth as capsules, typically twice a day.

Side effects can include headache, diarrhea, bruising, fatigue, muscle and joint pain, cough, rash, and low blood counts, including low red blood cell counts (anemia), low levels of certain white blood cells (neutropenia), and platelet counts (thrombocytopenia). More serious side effects can include bleeding (hemorrhage), serious infections, and irregular heartbeat (atrial fibrillation). Some people taking this drug have developed skin or other cancers, so it's important to use sun protection when outside while taking this drug.

PI3K inhibitors

PI3K is a protein that sends signals in cells and controls cell growth.

Idelalisib (Zydelig)

Idelalisib blocks a kinase protein called PI3K-delta. It's been shown to help treat CLL after other treatments have been tried. It's a pill taken twice a day.

Common side effects include diarrhea, fever, fatigue, nausea, cough, pneumonia, belly pain, chills, and rash. Low blood counts, including low red blood cell counts (anemia), low levels of certain white blood cells (neutropenia), and platelet counts (thrombocytopenia), are also common. Less often, more serious side effects can occur, such as liver damage, severe diarrhea, lung inflammation (pneumonitis), serious allergic reactions, severe skin problems, and holes (perforations) in the intestines.

Old (dormant) **infections** (like hepatitis) may become active again while taking this drug. You may be given preventive (prophylaxis) anti-infectives to help keep this from happening. Your cancer care team will also watch you closely for signs of infection.

Duvelisib (Copiktra)

Duvelisib blocks two kinase proteins called PI3K-delta and PI3K-gamma. It's been shown to help treat CLL after other treatments have been tried. It's a pill taken twice a day.

Common side effects include diarrhea, fever, fatigue, nausea, cough, pneumonia, belly pain, joint/muscle pain and rash. Low blood counts, including low red blood cell counts (anemia) and low levels of certain white blood cells (neutropenia) are also common. Less often, more serious side effects can occur, such as liver damage, severe diarrhea, lung inflammation (pneumonitis), serious allergic reactions, severe skin problems.

Venetoclax (Venclexta)

Venetoclax targets BCL-2, a protein in CLL cells that helps them survive longer than they should. This drug can be used alone or along with a [monoclonal antibody](#), such as rituximab. It's taken as a pill once a day.

Side effects can include low levels of certain white blood cells (neutropenia), low red blood cell counts (anemia), diarrhea, nausea, respiratory infections (such as colds), low platelet counts (thrombocytopenia), and feeling tired. Less common but more serious side effects can include **pneumonia** and other **serious infections**.

Tumor lysis syndrome (TLS) is another possible side effect of this drug. It's more common in patients who have large numbers of leukemia cells in their body when treatment starts. (This may be called bulky disease.) When the CLL cells are killed, they break open and release their contents into the bloodstream. This can overwhelm the kidneys to the point that they can't get rid of all of these substances fast enough. This can lead to build up of excess amounts of certain minerals in the blood and even kidney failure. The excess minerals can cause problems with the heart and nervous system. To help keep this from happening, you may start at a very low dose and then slowly increase it over about 5 weeks. Your treatment team will do blood tests and also watch for signs of TLS.

More information about targeted therapy

To learn more about how targeted drugs are used to treat cancer, see [Targeted Cancer Therapy](#)².

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)³.

Hyperlinks

1. www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html

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Surgery for Chronic Lymphocytic Leukemia

Surgery has a very limited role in treating chronic lymphocytic leukemia (CLL). Because CLL cells tend to spread widely throughout the bone marrow and to many organs, surgery cannot cure this type of cancer. It's rarely needed even to diagnose CLL, which can often be done with blood tests. Sometimes minor surgery is needed to remove a lymph node to help diagnose or stage the cancer.

Splenectomy

In rare cases, the spleen may be removed (splenectomy). This isn't expected to cure the CLL, but it can help improve some of the symptoms. Sometimes CLL can make the spleen grow so large that it presses on nearby organs and causes problems. If radiation or chemotherapy doesn't help shrink the spleen and reduce symptoms, splenectomy may be an option.

Splenectomy may also improve blood cell counts and lower the need for blood product transfusions. One of the spleen's normal functions is to remove worn-out blood cells from the bloodstream. If the spleen gets too large, it may become too active in removing

blood cells, leading to a shortage of red blood cells or platelets. When this happens, taking out the spleen can help improve blood counts. This is done much more often for patients with hairy cell leukemia than for those with regular CLL.

Most people have no problem living without a spleen, but they're at higher risk for certain bacterial infections. Doctors recommend certain vaccines for people before their spleen is removed. If your spleen has been removed, be sure to report any signs of infection to your health care team right away.

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Radiation Therapy for Chronic Lymphocytic Leukemia

Radiation therapy is treatment with high-energy rays or particles to destroy cancer cells. Radiation therapy is seldom part of the main treatment for people with chronic lymphocytic leukemia (CLL), but it may be used in certain situations.

- Radiation therapy can be used to treat symptoms caused by swollen internal organs (like an enlarged spleen) pressing on other organs. For instance, pressure against the stomach may make it hard to eat. If these symptoms are not improved by chemotherapy, radiation therapy may help shrink the organ.
- Radiation therapy can also be useful in treating pain from bone damage caused by leukemia cells growing in the bone marrow.
- Radiation therapy is sometimes given in low doses to the whole body, just before a stem cell transplant.

External beam radiation therapy, in which a machine sends a beam of radiation to a specific part of the body, is the type of radiation used most often for CLL. Before your treatment starts, the radiation team will take careful measurements to determine the correct angles for aiming the radiation beams and the proper dose of radiation. Radiation therapy is a lot like getting an x-ray, but the radiation is more intense. The procedure itself is painless. Each treatment lasts only a few minutes, but the setup time getting you into place for treatment usually takes longer.

Common short-term [side effects](#)¹ of radiation therapy include:

- Skin changes in the treated area, which can vary from mild redness to what looks and feels like a burn
- Fatigue
- Low blood cell counts, increasing the risk of infection
- Nausea and vomiting (which is more common with radiation to the belly)
- Diarrhea (which is more common with radiation to the belly)

Ask your doctor what side effects you can expect.

Learn more in [Radiation Therapy](#)².

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html

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Leukapheresis for Chronic Lymphocytic Leukemia

Though it's quite rare, sometimes chronic lymphocytic leukemia (CLL) is diagnosed when very, very high numbers of WBCs thicken the blood and cause problems.

Very high numbers of leukemia cells in the blood can cause problems with normal circulation, which can lead to heart failure and breathing problems. Chemotherapy may not lower the number of cells until a few days after the first dose. Because of this time delay, leukapheresis may be used right away before chemotherapy. In this procedure, your blood is passed through a special machine that takes out the white blood cells (including leukemia cells) and returns the rest of the blood cells and plasma back into your bloodstream.

For this procedure, you can lie in bed or sit in a reclining chair for a few hours. Two intravenous (IV) lines are needed the blood is removed through one IV, and then returned to your body through the other IV. Sometimes, a single large [catheter](#)¹ is put in near the neck or under the collar bone for the pheresis instead of using IV lines in the arms. This type of catheter is called a **central line** and has both IVs built into it.

Leukapheresis is not painful, but sometimes calcium levels can drop during the process. This can cause numbness and tingling (especially in the hands and feet and around the mouth) and, rarely, muscle spasms. This can be treated easily with calcium.

Leukapheresis works quickly to get the number of leukemia cells down. Still, without

more treatment (like chemotherapy , monoclonal antibodies , or targeted therapy) to kill the cancer cells, the cell count will go back up again over time.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/planning-managing/tubes-lines-ports-catheters.html

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Supportive Care for Chronic Lymphocytic Leukemia

Supportive care for chronic lymphocytic leukemia (CLL) is aimed at helping with problems related to the cancer and its treatment. It's not treatment for the CLL itself. For instance, some people with CLL have problems with infections or low blood counts. Although treating the CLL may help these over time, other treatments may be needed in the meantime.

Treatments to prevent infections

Intravenous immunoglobulin (IVIG)

Some people with CLL don't have enough antibodies (immunoglobulins) to fight

infection. This can lead to repeated lung and/or sinus infections. Antibody levels can be checked with a blood test, and if they're low, antibodies from donors can be given into a vein (IV) to raise the levels and help prevent infections. These donated antibodies are called intravenous immunoglobulin or IVIG. IVIG is often given once a month at first, but can also be given as needed based on blood tests of antibody levels.

Antibiotics and anti-virals

Certain chemo drugs (such as purine analogs see the chemotherapy section for details) and the antibody drug alemtuzumab (Campath) can raise your risk of certain infections such as CMV (a virus) and pneumonia caused by *Pneumocystis jiroveci*. You might be given an anti-viral drug like acyclovir or valacyclovir (Valtrex) to help lower the risk of CMV infections. To help prevent *Pneumocystis pneumonia*, a sulfa antibiotic is often given (trimethoprim with sulfamethoxazole, which is often known by the brand names Septra or Bactrim). Other treatments are available for people who are allergic to sulfa drugs.

Some drugs used to treat CLL can also cause dormant viruses to become active. For instance, if you already carry the hepatitis virus or CMV, treatment may allow them to grow and cause problems. Blood tests will be done to watch virus levels. Drugs may be used to help keep these viruses under control.

Using drugs to help prevent infections this way may be called anti-infective prophylaxis. Antibiotics and anti-viral drugs are also used to treat infections. Often, active infections require higher doses or different drugs than are used to prevent infections.

Vaccines

It's best for people with CLL to speak to their health care provider before getting any vaccine.

Experts recommend that people with CLL get the pneumonia vaccine every 5 years. They also recommend a yearly flu shot (influenza vaccine).

Avoid vaccines that contain live viruses.

For more information on vaccines, see [Vaccination During Cancer Treatment](#)¹.

Treatments for low blood counts

CLL or its treatment can cause low blood cell counts. Low red blood counts cause

anemia. Anemia can make you feel tired, light headed, or short of breath from walking. If anemia is causing symptoms, it can be treated with [transfusions](#)². These are often given in an outpatient clinic. If platelet counts get very low, it can lead to serious bleeding. Platelet transfusions can help prevent this.

In CLL, low red blood and platelet counts can also be caused by the cells being destroyed by abnormal antibodies. When antibodies cause low numbers of platelets, it's called **immune thrombocytopenic purpura** or ITP. Before diagnosing this, the doctor often needs to check the bone marrow to make sure that there isn't another cause for the low platelet counts. In ITP, giving platelet transfusions doesn't usually help increase the platelet counts much, if at all, because the antibodies just destroy the new platelets, too. This can be treated by drugs that affect the immune system, like corticosteroids, IVIG, and the antibody drug rituximab (Rituxan). Another option is to remove the spleen, since after the antibodies stick to the platelets, they're actually destroyed in the spleen. Another option is a drug that tells the body to make more platelets, like eltrombopag (Promactac) or romiplostim (Nplate).

When antibodies cause low red blood cell counts, it's called **autoimmune hemolytic anemia** (AIHA). This also can be treated with drugs that affect the immune system, like corticosteroids, IVIG, and rituximab (Rituxan). Removing the spleen is another option. If you develop AIHA while taking fludarabine (Fludara), the drug may be the cause so it will be stopped.

Hyperlinks

1. </content/cancer/en/treatment/treatments-and-side-effects/physical-side-effects/infections/vaccination-during-cancer-treatment.html>
2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/blood-transfusion-and-donation.html

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Stem Cell Transplant for Chronic Lymphocytic Leukemia

In most cases, chemotherapy, immunotherapy, and/or targeted therapy can reduce the number of leukemia cells in chronic lymphocytic leukemia (CLL) and improve symptoms. These treatments can often control CLL for a long time. But even if all signs of leukemia go away, the disease often comes back later. This is especially true of the types of CLL that are harder to treat, such as those with chromosome 17 deletions and TP53 mutations, as well as CLL that doesn't respond to standard treatments. Higher doses of chemo might work better, but they often can't be used because they could severely damage bone marrow, where new blood cells are made. This could lead to life-threatening [infections](#)¹, bleeding, and other problems linked to low blood cell counts.

A stem cell transplant (SCT) allows doctors to use higher doses of chemo, sometimes along with radiation therapy, to treat CLL. After these treatments, the patient receives a transplant of blood-forming stem cells to restore the bone marrow.

Blood-forming stem cells used for a transplant come either from the blood (for a peripheral blood stem cell transplant, or PBSCT), from the bone marrow (for a bone marrow transplant, or BMT), or from umbilical cord blood. Bone marrow transplant was common in the past, but today it has largely been replaced by PBSCT.

It's not yet clear how helpful stem cell transplants are in patients with CLL. When transplant is done, it's most often as part of a [clinical trial](#)².

Types of transplant

The 2 main types of stem cell transplants are allogeneic and autologous.

- For an **autologous transplant**, the patient's own stem cells are collected from their blood or bone marrow and then given back after treatment. The problem with this is that leukemia cells may be collected with the stem cells.
- In an **allogeneic transplant**, the stem cells come from someone else (a donor). To lower the chance of problems, the donor needs to “match” the patient in terms of tissue type. Often, a close relative, like a brother or sister is a good match. Less often, a matched unrelated donor may be found.

Because collecting the patient's stem cells can also collect leukemia cells, allogeneic transplants are most often used for CLL. This type of transplant can cause severe or even life-threatening complications and side effects, and it's often not a good option in people who are older or have other health problems.

To learn more, see [Stem Cell Transplant \(Peripheral Blood, Bone Marrow, and Cord Blood Transplants\)](#)³.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/low-blood-counts/infections/infections-in-people-with-cancer.html
2. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html
3. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/stem-cell-transplant.html

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Typical Treatment of Chronic Lymphocytic Leukemia

Treatment options for chronic lymphocytic leukemia (CLL) can vary greatly.

Many people live a long time with CLL, but in general it is very hard to cure, and early treatment hasn't been shown to help people live longer. Because of this and because treatment can cause [side effects](#),¹ doctors often advise waiting until the disease is progressing or bothersome symptoms appear, before starting treatment.

If treatment is needed, factors that should be taken into account include the patient's age and overall health, and [prognostic factors](#)² such as the presence of deletions in chromosomes 17 or 11, or high levels of ZAP-70 and CD38.

Initial treatment of CLL

Drugs that may be used

Many different drugs and drug combinations can be used as the first treatment for CLL. The options include [monoclonal antibodies](#), other [targeted drugs](#), [chemotherapy](#), and different combinations of these.

Some of the more commonly used treatments include:

- Ibrutinib (Imbruvica), alone or with rituximab (Rituxan)
- Acalabrutinib (Calquence), alone or with obinutuzumab (Gazyva)
- Venetoclax (Venclexta) and obinutuzumab
- Venetoclax alone, or with rituximab
- Bendamustine and rituximab (or another monoclonal antibody)
- High-dose prednisone and rituximab
- FCR: fludarabine, cyclophosphamide, and rituximab
- PCR: pentostatin, cyclophosphamide, and rituximab
- Chlorambucil and rituximab (or another monoclonal antibody)
- Obinutuzumab
- Ibrutinib and obinutuzumab
- Alemtuzumab (Campath), alone or with rituximab

Other drugs or combinations of drugs may also be used.

Radiation or surgery

If the only problem is an enlarged spleen or swollen lymph nodes in one part of the body, localized treatment with low-dose radiation therapy may be used. Splenectomy (surgery to remove the spleen) is another option if the enlarged spleen is causing symptoms.

Leukapheresis

Sometimes very high numbers of CLL cells in the blood cause problems with normal circulation. This is called **leukostasis**. Chemo may not lower the number of cells until a few days after the first dose, so before the chemo is given, some of the cells may need to be removed from the blood with a procedure called **leukapheresis**. This treatment lowers blood counts right away. The effect lasts only for a short time, but it may help until the chemo has a chance to work. Leukapheresis is also sometimes used before chemo if there are very high numbers of leukemia cells (even when they aren't causing problems) to prevent tumor lysis syndrome. (This was discussed in the chemotherapy section.)

Stem cell transplant

Some people who have very high-risk disease (based on prognostic factors) may be referred for possible stem cell transplant (SCT) early in treatment.

Second-line treatment of CLL

If the initial treatment is no longer working or the disease [comes back](#)³, another type of treatment often helps. If the initial response to the treatment lasted a long time (usually at least a few years), the same treatment might be used again. If the initial response wasn't long-lasting, using the same treatment isn't as likely to be helpful. The options will depend on what the first-line treatment was and how well it worked, as well as the person's overall health.

Many of the drugs and combinations listed above (as well as others) may be options as second-line treatments, too. Targeted therapy and monoclonal antibody drugs are commonly used, alone or in combination. Other chemo drugs may also be tried.

If the leukemia responds, stem cell transplant may be an option for some patients.

Some people may have a good response to first-line treatment (such as fludarabine) but may still have some evidence of a small number of leukemia cells in the blood, bone marrow, or lymph nodes. This is known as **minimal residual disease**. CLL can't be cured, so doctors aren't sure if further treatment right away will be helpful. Some small studies have shown that alemtuzumab can sometimes help get rid of these remaining cells, but it's not yet clear if this improves survival.

Treating complications of CLL

One of the most serious complications of CLL is a change (transformation) of the leukemia to a high-grade or aggressive type of [non-Hodgkin lymphoma](#)⁴ (NHL) called diffuse large B-cell lymphoma (DLBCL) or to [Hodgkin lymphoma](#).⁵ This happens in 2% to 10% of CLL cases, and is known as **Richter's transformation**. Treatment is often the same as it would be for lymphoma and might include stem cell transplant, because these cases are often hard to treat.

Less often, CLL may progress to prolymphocytic leukemia. As with Richter syndrome, this, too, can be hard to treat. Some studies have suggested that certain drugs such as cladribine (2-CdA) and alemtuzumab may be helpful.

In rare patients with CLL, the leukemia transforms into [acute lymphocytic leukemia \(ALL\)](#)⁶. If this happens, treatment is likely to be similar to that used for patients with ALL.

[Acute myeloid leukemia \(AML\)](#)⁷ is another rare complication in patients who have been treated for CLL. Drugs such as chlorambucil and cyclophosphamide can damage the DNA of blood-forming cells. These damaged cells may go on to become cancer, leading to AML, which is very aggressive and often hard to treat.

CLL can cause problems with low blood counts and infections. These are discussed in [Supportive Care in Chronic Lymphocytic Leukemia](#).

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html
2. www.cancer.org/cancer/chronic-lymphocytic-leukemia/detection-diagnosis-staging/staging.html
3. www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html
4. www.cancer.org/cancer/non-hodgkin-lymphoma.html

5. www.cancer.org/cancer/hodgkin-lymphoma.html
6. www.cancer.org/cancer/acute-lymphocytic-leukemia.html
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Treating Hairy Cell Leukemia

Hairy cell leukemia (HCL) tends to be slow growing. Patients without symptoms often don't need to be treated right away, but they do need to be watched carefully. Doctor visits are done every few months to check for signs that the HCL is growing and to see

if it's causing any problems (like low blood counts, fatigue, or an enlarged spleen). Some people with HCL live for many years without having symptoms or getting treatment.

Treatment may be advised for HCL patients with low blood cell counts, recurrent infections, or an enlarged spleen or lymph nodes. Treatment is most often with [chemo](#) using one of the purine analog drugs -- either cladribine (2-CdA) or pentostatin. Most patients get a good response with these drugs, and the responses often last more than 5 years.

If the leukemia comes back, it will most be often treated with a purine analog again. Often the same drug will be used as was given the first time, especially if the HCL stayed in remission for a long time. Sometimes the [monoclonal antibody](#) rituximab (Rituxan[®]) is given along with chemo.

In rare cases, HCL may not respond to chemo. Rituximab or interferon-alfa, a type of biologic therapy, may be helpful.

Another option if other treatments have already been tried is the monoclonal antibody moxetumomab pasudotox (Lumoxiti).

If a patient is uncomfortable because of an enlarged spleen, [surgery](#) to remove the spleen (splenectomy) can often help relieve pain.

Like chronic lymphocytic leukemia, HCL can cause problems with low blood counts and infections. Treatment of these problems is discussed in [Supportive Care in Chronic Lymphocytic Leukemia](#).

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