Treating Chronic Lymphocytic Leukemia

Making treatment decisions

After the leukemia is found and staged, your cancer care team will discuss your treatment options with you. Because chronic lymphocytic leukemia often grows slowly, not everyone needs to be treated right away. When treatment is needed, the main treatments used are:

- Chemotherapy
- Monoclonal antibodies
- Targeted therapy
- Supportive care
- Stem cell transplant

Less often, leukapheresis, surgery, or radiation therapy may also be used.

It is important to take time and think about your possible choices. In choosing a treatment plan, the stage of the leukemia and other prognostic factors (see How is Chronic Lymphocytic Leukemia Staged?) are important. Other factors to consider include whether or not you are having symptoms, your age and overall health, and the likely benefits and side effects of treatment. See Typical Treatment of Chronic Lymphocytic Leukemia or Treating Hairy Cell Leukemia to learn about common treatment plans.

In considering your treatment options it is often a good idea to seek a second opinion, if possible. This could give you more information and help you feel more confident about the treatment plan you have chosen.

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 are 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. You can also call our clinical trials matching service at 1-800-303-5691 for a list of studies that meet your medical needs, or see the Clinical Trials section to learn more.

**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 dangerous.

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. See the Complementary and Alternative Medicine section to learn more.

**Help getting through cancer treatment**

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

The American Cancer Society also has programs and services – including rides to treatment, lodging, support groups, 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 on call 24 hours a day, every day.
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 into a muscle to destroy or control cancer cells. When given this way, these drugs enter the bloodstream and reach all areas of the body, so chemotherapy is useful for cancers such as leukemia that tend to spread throughout the body.

When treating certain types of leukemia, chemo may also be injected into the cerebrospinal fluid. Chemo given into the CSF is often the best way to treat leukemia in the area around the brain and spinal cord. This type of chemo, called *intrathecal chemotherapy*, is rarely needed to treat 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 often not recommended for patients in poor health, but advanced age by itself is not a barrier to getting chemo.

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

- **Purine analogs** include fludarabine (Fludara®), pentostatin (Nipent®), and cladribine (2-CdA, Leustatin®). Fludarabine is often one of the first drugs used against CLL. These drugs can have major side effects, including an increased risk of infection.

- **Alkylating agents**, which include chlorambucil (Leukeran®) and cyclophosphamide (Cytoxan®), have been around much longer. They are often used along with a purine analog, with other chemo drugs, with a corticosteroid, or with the monoclonal antibody rituximab (Rituxan®).

A newer drug called bendamustine (Treanda®) is an alkylating agent that has some properties of a purine analog.
Corticosteroids such as prednisone, methylprednisolone, and dexamethasone.

Other drugs sometimes used for CLL include doxorubicin (Adriamycin®), methotrexate, oxaliplatin, vincristine (Oncovin®), etoposide (VP-16), and cytarabine (ara-C).

Possible side effects

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

The side effects of chemotherapy 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

Chemo can affect bone marrow, leading to low blood cell counts. This can cause:

- Increased risk of infections (due to low white blood cell counts)
- Easy bruising or bleeding (due to low blood platelets)
- Fatigue (due to low red blood cells)

These side effects are usually short-term and go away once treatment is finished. There are often ways to lessen these side effects. For example, 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 effectively.

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 thus reduce the chance of infection.

For information on infections and how to avoid them, see Infections in People With Cancer.

Tumor lysis syndrome is another possible side effect of chemo. It is most common in
patients who had large numbers of leukemia cells in the body before treatment and occurs most often with the first cycle of chemo. When the 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 lead to 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, and rasburicase.

For more general information about chemotherapy, see the Chemotherapy section of our website.

- References
See all references for Chronic Lymphocytic Leukemia

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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 and destroy the cancer cells. Some monoclonal antibodies also fight cancer in other ways.

The monoclonal antibodies used to treat chronic lymphocytic leukemia (CLL) can be divided into groups based on which protein they target.

Targeting CD20

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

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

Rituximab is used mainly to treat certain kinds of non-Hodgkin lymphoma, but it has also become one of the main treatments for chronic lymphocytic leukemia (CLL). It is most often used along with chemotherapy, either as part of the initial treatment or as part of a second-line regimen, but it may also be used by itself.

Obinutuzumab can be used along with the chemo drug chlorambucil as a part of the initial treatment for CLL.

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).

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 or light headed, and feeling 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 is given as a shot under the skin. 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 by vein. It is approved for use in patients with follicular lymphoma, diffuse large B-cell lymphoma, and chronic lymphocytic leukemia. 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 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 is caused by a virus. It can lead to headache, high blood pressure, seizures, confusion, loss of vision, and even death.
Other side effects can occur depending on which drug is given. Ask your doctor what you can expect.

In rare cases of patients with very high white blood cell counts, some of these drugs may cause a condition called *tumor lysis syndrome* (this was discussed in detail in the *chemotherapy section*). 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 generally only occurs during the first course of treatment.

**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 chemotherapy treatments, but it can be used earlier in the disease. It may be especially useful in cases of CLL with a chromosome 17 deletion, which are often resistant to standard treatments, but it doesn’t seem to work as well in people whose lymph nodes are enlarged (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. 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 is 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. It may also cause low red blood cell and platelet counts.

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

- **References**

[See all references for Chronic Lymphocytic Leukemia](#)

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Targeted Therapy for Chronic Lymphocytic Leukemia

Researchers are developing newer drugs that specifically target the changes inside cells that cause them to become cancerous. Unlike standard chemotherapy drugs, which work by attacking rapidly growing cells in general (including cancer cells), these drugs attack one or more specific targets on or in cancer cells.

**Ibrutinib (Imbruvica)** is a targeted drug that can be used to treat chronic lymphocytic leukemia (CLL). It blocks the activity of a protein called a kinase that tells the leukemia cells to divide and helps them survive. This drug has been shown to help when CLL is hard to treat, for example, if there are chromosome 17 deletions or if CLL has come back after other treatments.

This drug is taken in pill form. 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. Other side effects can also be seen, so ask your doctor what you can expect.

**Idelalisib (Zydelig)** is another targeted drug for CLL. It blocks a kinase protein called PI3K. This drug has been shown to help treat CLL after other treatments have been tried. It is taken as a pill 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.

**Venetoclax (Venclexta)** is a drug that targets BCL-2, a protein in CLL cells that helps them survive longer than they should. This drug is used in patients whose CLL cells have a chromosome 17p deletion, typically after at least one other treatment has been tried. It is 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, and tumor lysis syndrome (in which many leukemia cells break open and spill their contents into the body).

For more information about targeted therapy, see [Targeted Therapy](#).

- **References**
  [See all references for Chronic Lymphocytic Leukemia](#)

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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 is rarely needed even to diagnose CLL, which can often be done with a blood sample. However, sometimes minor surgery is needed to remove a lymph node to aid in diagnosing or staging the cancer.

**Splenectomy**

In rare cases, the spleen may be removed (splenectomy). This is not expected to cure the leukemia, 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 symptoms. If [radiation](#) or [chemotherapy](#) does not 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 becomes 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 the risk for certain bacterial infections is increased. Doctors recommend certain vaccines for people before their spleen is removed. If your spleen has been removed, be sure to report any symptoms of infections promptly to your health care team.

* References
See all references for Chronic Lymphocytic Leukemia

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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 usually not part of the main treatment for people with chronic lymphocytic leukemia (CLL), but it is used in certain situations.

- Radiation therapy can be used to treat symptoms caused by swollen internal organs (such as an enlarged spleen) pressing on other organs. For instance, pressure against the stomach may affect appetite. If these symptoms are not improved by chemotherapy, radiation therapy to help shrink the organ is often a good option.
- 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 (see [Stem Cell Transplant for Chronic Lymphocytic Leukemia](https://www.cancer.org/cancer/chronic-lymphocytic-leukemia/stem-cell-transplant.html)).

External beam radiation therapy, in which a machine delivers 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 much like getting an x-ray, but the radiation is more intense. The
procedure itself is painless. Each treatment lasts only a few minutes, although the setup time getting you into place for treatment usually takes longer.

Common short-term side effects of radiation therapy include:

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

Ask your doctor what side effects you can expect.

You can learn more about radiation treatments in the Radiation Therapy section of our website.

- References

See all references for Chronic Lymphocytic Leukemia

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Leukapheresis for Chronic Lymphocytic Leukemia

Sometimes very high numbers of leukemia cells in the blood cause problems with normal circulation. Chemotherapy may not lower the number of cells until a few days after the first dose. In the meantime, leukapheresis may be used before chemotherapy. In this procedure, your blood is passed through a special machine that removes white blood cells (including leukemia cells) and returns the rest of the blood cells and plasma back into the bloodstream.

For this procedure, you can lie in bed or sit in a reclining chair. Two IV lines are required the blood is removed through one IV, and then is returned to the body through the other IV. Sometimes, a single large catheter is placed in 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 in. Leukapheresis is not painful, but it can be hard to stay sitting or lying down in the same place for 2 or 3 hours. Also, sometimes calcium levels can drop during the process, causing numbness and tingling (especially in the hands and feet and around the mouth) and sometimes painful muscle spasms. This can be treated easily with calcium.

Leukapheresis works quickly to get the number of leukemia cells down. However, without further treatment (like chemotherapy, monoclonal antibodies, or targeted therapy) to kill the cancer cells, the cell count will go back up again.

- References
  See all references for Chronic Lymphocytic Leukemia

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. For example, some people with CLL have problems with infections or low blood counts. Although treating the CLL may help these over time, other therapies may be needed as well.

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. The level of antibodies in the blood can be checked with a blood test, and if it is low, antibodies from donors can be given into a vein (IV) to raise the levels and help prevent infections. This is called intravenous immunoglobulin or IVIG. IVIG is often given once a month at first, but may be needed less often based on blood tests of antibody levels.
Antibiotics and anti-virals

Certain chemotherapy 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 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.

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

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

Vaccines that contain live viruses, such as the shingles vaccine (herpes zoster vaccine) should be avoided.

For more information on infections, including vaccines, see Infections in People With Cancer.

Treatments for low blood counts

CLL or its treatment can cause low red blood cell counts (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. These are often given on an outpatient basis.

If platelet counts get very low, it can lead to serious bleeding. Transfusing platelets 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 is called immune thrombocytopenia. 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 immune thrombocytopenia, 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 are actually destroyed in the spleen. Another option is a drug that tells the body to make more platelets, like eltrombopag (Promacta®) or romiplostim (Nplate®).

When antibodies cause low red blood cell counts, it is 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 also an option. If you develop AIHA while taking fludarabine (Fludara), the drug may be the cause, and so the fludarabine will be stopped.

- **References**

See all references for Chronic Lymphocytic Leukemia

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Stem Cell Transplant for Chronic Lymphocytic Leukemia

The usual doses of chemotherapy drugs can reduce the number of leukemia cells in chronic lymphocytic leukemia and improve symptoms, but even if signs of leukemia go away, the disease often comes back later. Higher doses of these drugs might be more effective, but they often cannot be given because they could severely damage bone marrow, which is where new blood cells are formed. This could lead to life-threatening infections, bleeding, and other problems because of low blood cell counts.

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

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

It’s not yet clear how helpful stem cell transplants are in patients with chronic lymphocytic leukemia (CLL). When these treatments are used, it is most often in clinical trials looking to test their effectiveness.

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 the blood or bone marrow and then given back after treatment. The problem with that 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 complications, the donor needs to “match” the patient in terms of tissue type. Often, a close relative, such as 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 used more often in the treatment of CLL than autologous. Still, this type of transplant can cause severe or even life-threatening complications and side effects, and it is often not be a good option in people who are older or have other health problems.

For more information on stem cell transplants, see Stem Cell Transplant (Peripheral Blood, Bone Marrow, and Cord Blood Transplants).

- References

See all references for Chronic Lymphocytic Leukemia

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**Typical Treatment of Chronic Lymphocytic Leukemia**
Treatment options for chronic lymphocytic leukemia (CLL) vary greatly, depending on the person’s age, the disease risk group, and the reason for treating (for example, which symptoms it is causing). Many people live a long time with CLL, but in general it is very difficult to cure, and early treatment hasn't been shown to help people live longer. Because of this and because treatment can cause side effects, 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, general health, and prognostic factors such as the presence of chromosome 17 or chromosome 11 deletions or high levels of ZAP-70 and CD38.

**Initial treatment**

Patients who might not be able to tolerate the side effects of strong chemotherapy (chemo) are often treated with chlorambucil alone or with a monoclonal antibody like rituximab (Rituxan) or obinutuzumab (Gazyva). Other options include ibrutinib (Imbruvica), rituximab alone, or a corticosteroid like prednisone.

In stronger and healthier patients, there are many options for treatment. Commonly used treatments include:

- FCR: fludarabine (Fludara), cyclophosphamide (Cytoxan), and rituximab
- Bendamustine (sometimes with rituximab)
- FR: fludarabine and rituximab
- CVP: cyclophosphamide, vincristine, and prednisone (sometimes with rituximab)
- CHOP: cyclophosphamide, doxorubicin, vincristine (Oncovin), and prednisone
- Chlorambucil combined with prednisone, rituximab, obinutuzumab, or ofatumumab
- PCR: pentostatin (Nipent), cyclophosphamide, and rituximab
- Alemtuzumab (Campath)
- Fludarabine (alone)
- Ibrutinib (alone)

Other drugs or combinations of drugs may also be also used.

If the only problem is an enlarged spleen or swollen lymph nodes in one region 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.

Sometimes very high numbers of leukemia 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 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*).

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, another type of treatment may help. If the initial response to the treatment lasted a long time (usually at least a few years), the same treatment can often be used again. If the initial response wasn't long-lasting, using the same treatment again 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 health.

Many of the drugs and combinations listed above may be options as second-line treatments. For many people who have already had fludarabine, alemtuzumab seems to be helpful as second-line treatment, but it carries an increased risk of infections. Other purine analog drugs, such as pentostatin or cladribine (2-CdA), may also be tried. Newer drugs such as ofatumumab, ibrutinib, idelalisib (Zydelig), and venetoclax (Venclexta) may be other options.

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 called diffuse
large cell lymphoma. This happens in about 5% of CLL cases, and is known as Richter syndrome. Treatment is often the same as it would be for lymphoma (see Non-Hodgkin Lymphoma for more information), and may include stem cell transplant, as these cases are often hard to treat.

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

In rare cases, patients with CLL may have their leukemia transform into acute lymphocytic leukemia (ALL). If this happens, treatment is likely to be similar to that used for patients with ALL.

Acute myeloid leukemia (AML) 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 cancerous, leading to AML, which is very aggressive and often hard to treat.

CLL can cause problems with low blood counts and infections. Treatment of these problems is discussed in Supportive Care in Chronic Lymphocytic Leukemia.

References
See all references for Chronic Lymphocytic Leukemia

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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 have careful follow-up exams. These are done every few months to check for disease progression and appearance of symptoms. Some patients with HCL live for many years without having any symptoms or receiving any 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 one of the purine analog drugs -- either cladribine (2-CdA) or pentostatin. Up to 80% to 90% of patients respond to these drugs, and the responses last more than 5 years in most patients.

If the leukemia comes back again, 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 leukemia stayed in remission for a long time. Sometimes the monoclonal antibody rituximab (Rituxan) will be given as well.

In rare cases, HCL may not respond to chemotherapy. Rituximab or interferon-alfa, a type of biologic therapy, may be helpful. If a patient is uncomfortable because of an enlarged spleen, removing the spleen by surgery (splenectomy) can often help relieve pain or other symptoms.

- References
  See all references for Chronic Lymphocytic Leukemia

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