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## Treating Non-Hodgkin Lymphoma

If you've been diagnosed with non-Hodgkin lymphoma (NHL), your cancer care team will discuss your options with you. It's important to weigh the benefits of each treatment option against the possible risks and side effects.

### How is non-Hodgkin lymphoma treated?

Depending on the type and stage (extent) of the lymphoma and other factors, treatment options for people with NHL might include:

- [Chemotherapy for Non-Hodgkin Lymphoma](#)
  - [Immunotherapy for Non-Hodgkin Lymphoma](#)
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- [Palliative and Supportive Care for Non-Hodgkin Lymphoma](#)

## Who treats non-Hodgkin lymphoma?

You may have different types of doctors on your treatment team. These doctors could include:

- A **medical oncologist** or **hematologist**: a doctor who treats lymphoma with chemotherapy, immunotherapy, and targeted therapy
- A **radiation oncologist**: a doctor who treats cancer with radiation therapy
- A **bone marrow transplant doctor**: a doctor who specializes in treating cancer or other diseases with bone marrow or stem cell transplants

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

- [Health Professionals Who Are Part of a Cancer Care Team](#)

## 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. In choosing a treatment plan, consider your health and the type and stage of the lymphoma.

It's also very important to ask questions if there is 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 Non-Hodgkin Lymphoma](#)
- [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.

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 to relieve symptoms or treat your cancer that your doctors haven't mentioned. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

**Complementary** methods are treatments that are used **along with** your regular medical care. **Alternative** treatments are used **instead of** standard 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 Integrative 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 they 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 Cancer Knowledge Hub at 1-800-227-2345 and speak with one of our caring, trained cancer helpline specialists. Or, if you prefer, you can use our chat feature on cancer.org to connect with one of our specialists.

- [Palliative Care](#)
- [Programs & Services](#)

### **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 as 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](#)

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## **Chemotherapy for Non-Hodgkin Lymphoma**

vein (IV) or taken by mouth. Chemo enters the bloodstream and reaches almost all areas of the body, making this treatment very useful for lymphoma.

- [When might chemo be used?](#)
- [Which chemo drugs are used to treat non-Hodgkin lymphoma?](#)

## Cisplatin

Doctors give chemo in cycles, in which a period of treatment is followed by a period of rest to allow the body time to recover. Each chemo cycle generally lasts for several weeks. Most chemo treatments are given on an outpatient basis (in the doctor's office or clinic or hospital outpatient department), but some might require a hospital stay.

Sometimes a person may be switched to a different chemo combination if the first combination doesn't seem to be working.

## Intrathecal chemo

Most chemo drugs given systemically (IV or by mouth) can't reach the cerebrospinal fluid (CSF) and tissues around the brain and spinal cord. To treat lymphoma that might have reached these areas, chemo may also be given directly into the CSF. This is called **intrathecal chemo**. The chemo drugs most often used for intrathecal chemo are methotrexate and cytarabine.

## Possible side effects

Chemo drugs can cause side effects. These depend on the type and dose of drugs given and how long treatment lasts. Common side effects can include:

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Diarrhea or constipation
- Increased chance of infection (from a shortage of white blood cells)
- Bleeding or bruising after minor cuts or injuries (from a shortage of platelets)
- Fatigue and shortness of breath (from too few red blood cells)

These side effects usually go away after treatment ends. If serious side effects occur, the dose of chemo may be reduced or treatment may be delayed.

Certain chemo drugs can have other possible side effects. For example:

- Platinum drugs such as cisplatin can cause nerve damage (peripheral neuropathy), leading to numbness, tingling, or even pain in the hands and feet.
- Ifosfamide can damage the bladder. The risk of this can be lowered by giving it along with a drug called **mesna**.

- Doxorubicin can damage the heart. Your doctor may order a test of your heart function (like a MUGA scan or echocardiogram) before starting you on this drug.
- Bleomycin can damage the lungs. Doctors often test lung function before starting someone on this drug.
- Many chemo drugs can affect fertility (the ability to have children).
- Some chemo drugs can increase your risk of developing leukemia several years later.

**Tumor lysis syndrome** is a possible side effect when chemo is started, especially in people with large or fast-growing lymphomas. Killing the lymphoma cells releases their contents into the bloodstream. This can overwhelm the kidneys, which can't get rid of all of these substances at once. This can lead to the build-up of certain minerals in the blood and even kidney failure. The excess minerals can lead to heart and nervous system problems. Doctors lower the risk of this happening by giving the person extra fluids and certain drugs, such as sodium bicarbonate, allopurinol, and rasburicase.

Ask your cancer care team about what side effects you can expect based on the specific drugs you will receive. Be sure to tell your doctor or nurse if you do have side effects, as there are often ways to help with them. For example, drugs can be given to prevent or reduce nausea and vomiting.

## Other drugs used to treat lymphoma

Other types of drugs can also be useful in treating some types of lymphoma. These drugs work differently from standard chemo drugs. For example, [immunotherapy](#)<sup>3</sup> and [targeted therapy](#) drugs are helpful for some lymphomas.

Mucosa-associated lymphoid tissue (MALT) lymphoma, which usually starts in the stomach, is linked to infection with the bacterium *H. pylori*. Treatment of this infection can often make the lymphoma go away. This is most often done with a combination of **antibiotics** along with drugs called **proton pump inhibitors**, which lower stomach acid levels.

In a similar way, splenic marginal zone B-cell lymphoma is sometimes linked to infection with the hepatitis C virus. Treating the infection with **anti-viral drugs** can sometimes shrink these lymphomas, or even make them go away.

## More information about chemotherapy

For more general information about how chemotherapy is used to treat cancer,



see [Chemotherapy](#)<sup>4</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>5</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/types/non-hodgkin-lymphoma/about.html](http://www.cancer.org/cancer/types/non-hodgkin-lymphoma/about.html)
2. [www.cancer.org/cancer/types/non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html](http://www.cancer.org/cancer/types/non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html)
3. [www.cancer.org/cancer/managing-cancer/treatment-types/immunotherapy/what-is-immunotherapy.html](http://www.cancer.org/cancer/managing-cancer/treatment-types/immunotherapy/what-is-immunotherapy.html)
4. [www.cancer.org/cancer/managing-cancer/treatment-types/chemotherapy.html](http://www.cancer.org/cancer/managing-cancer/treatment-types/chemotherapy.html)
5. [www.cancer.org/cancer/managing-cancer/side-effects.html](http://www.cancer.org/cancer/managing-cancer/side-effects.html)

## References

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: B-Cell Lymphomas. Version 6.2023. Accessed at [https://www.nccn.org/professionals/physician\\_gls/pdf/b-cell.pdf](https://www.nccn.org/professionals/physician_gls/pdf/b-cell.pdf) on November 30, 2023.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma. Version 1.2024. Accessed at [https://www.nccn.org/professionals/physician\\_gls/pdf/cll.pdf](https://www.nccn.org/professionals/physician_gls/pdf/cll.pdf) on November 30, 2023.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: T-Cell Lymphomas. Version 1.2023. Accessed at [https://www.nccn.org/professionals/physician\\_gls/pdf/t-cell.pdf](https://www.nccn.org/professionals/physician_gls/pdf/t-cell.pdf) on November 30, 2023.

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# Immunotherapy for Non-Hodgkin

# Lymphoma

Immunotherapy is treatment that either boosts a person's own immune system or uses man-made versions of the normal parts of the immune system to kill lymphoma cells or slow their growth.

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

There is also a form of rituximab called **rituximab and hyaluronidase injection (Rituxan Hycela)** 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 IV. It is approved for use in people 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 inactive hepatitis B infections to become active again,

typically once a week for the first 3 weeks, then once every 3 weeks.

These drugs can cause some of the same side effects as other antibodies that target CD20. For example, mosunetuzumab can cause infusion reactions (see above).

These drugs can also cause some other, more serious side effects, including:

**Cytokine release syndrome (CRS):** This side effect can occur when T cells in the body release chemicals (cytokines) into the blood that ramp up the immune system. This happens most often within the first day after treatment, and it can be serious or even life-threatening.

Symptoms of CRS can include high fever and chills, muscle weakness, trouble breathing, low blood pressure, a very fast heartbeat, headache, nausea or vomiting, and feeling dizzy, lightheaded, or confused.

Your cancer care team will watch you closely for possible signs of CRS, especially during and after the first few treatments. You may get medicines before these treatments to help lower your risk of CRS. Be sure to contact your cancer care team right away if you have any symptoms that might be from CRS.

**Nervous system problems:** These drugs might affect the nervous system, which could lead to symptoms such as headaches, numbness or tingling in the hands or feet, feeling dizzy or confused, trouble speaking or understanding things, memory loss, abnormal sleep patterns, tremors, or seizures.

**Serious infections:** Some people might get a serious infection while getting one of these drugs. Tell your cancer care team right away if you have a fever, cough, chest pain, shortness of breath, sore throat, rash, or pain when urinating.

**Low blood cell counts:** These drugs might lower your blood cell counts, which can increase your risk of infections or bleeding. Your doctor will check your blood cell counts regularly during your treatment.

**Tumor flare:** These drugs might cause your tumor to grow or cause more symptoms for a time, which is known as **tumor flare**. Tell your cancer care team if you notice tender or swollen lymph nodes, chest pain, cough, trouble breathing, or pain or swelling around a known tumor.

Other side effects can include feeling tired, muscle or bone pain, rash, fever, nausea, diarrhea, and headaches.

## Antibodies that target CD19

**Tafasitamab (Monjuvi)** is an antibody directed at the CD19 antigen, a protein on the surface of B lymphocytes. This drug can be used along with lenalidomide (see Immunomodulating drugs, below) to treat diffuse large B-cell lymphoma (DLBCL) that has come back or is no longer responding to other treatments, in people who can't have a [stem cell transplant](#) for some reason.

This drug is infused into a vein (IV), typically about once a week for the first few months, and then once every two weeks.

Some people have [infusion reactions](#)<sup>3</sup> while getting this drug, which can cause symptoms like chills, flushing, headache, or shortness of breath during the infusion. You'll likely get medicines before treatment to help lower this risk, but it's important to tell your cancer care team right away if you have any of these symptoms.

some cases of SLL/CLL and some types of peripheral T-cell lymphomas.

This drug is infused into a vein (IV), usually 3 times a week for up to 12 weeks.

The most common side effects are fever, chills, nausea, and rashes. It can also cause very low white blood cell counts, which increases the risk for serious infections. Antibiotic and antiviral medicines are given to help protect against them, but severe and even life-threatening infections can still occur. Rare but serious side effects can include strokes, as well as tears in the blood vessels in the head and neck.

## Immune checkpoint inhibitors

Immune system cells normally have substances that act as checkpoints to keep them from attacking other healthy cells in the body. Cancer cells sometimes take advantage of these checkpoints to avoid being attacked by the immune system.

Drugs such as **pembrolizumab (Keytruda)** work by blocking these checkpoints, which can boost the immune response against cancer cells. Pembrolizumab can be used to treat primary mediastinal large B-cell lymphoma (PMBCL) that has not responded to or has come back after other treatments.

This drug is infused into a vein (IV), typically every 3 or 6 weeks.

Side effects can include fatigue, cough, nausea, itching, skin rash, loss of appetite, constipation, joint pain, and diarrhea. Other, more serious side effects, such as infusion reactions and autoimmune reactions, occur less often.

To learn more, see [Immune Checkpoint Inhibitors and Their Side Effects](#)<sup>5</sup>.

## Immunomodulating drugs

Drugs such as **thalidomide (Thalomid)** and **lenalidomide (Revlimid)** are thought to work against certain cancers by affecting parts of the immune system, although exactly how they work isn't clear. They are sometimes used to help treat certain types of lymphoma, usually after other treatments have been tried. Lenalidomide can be given with or without rituximab, or along with tafasitamab (see above).

These drugs are taken daily as pills.

Side effects can include low white blood cell counts (with an increased risk of infection) and neuropathy (painful nerve damage), which can sometimes be severe and may not go away after treatment. There is also an increased risk of serious blood clots (that start in the leg and can travel to the lungs), especially with thalidomide. Thalidomide can also cause drowsiness, fatigue, and severe constipation.

These drugs can cause severe birth defects if taken during pregnancy. Given this risk, the company that makes these drugs puts restrictions on access to them to prevent women who are or might become pregnant from being exposed to them.

## Chimeric antigen receptor (CAR) T-cell therapy

In this treatment, immune cells called T cells are removed from the patient's blood and altered in the lab to have specific receptors (called **chimeric antigen receptors**, or CARs) on their surface. These receptors can attach to proteins on the surface of lymphoma cells. The T cells are then multiplied in the lab and given back into the patient's blood, where they can seek out the lymphoma cells and launch a precise immune attack against them.

**Axicabtagene ciloleucel (Yescarta, also known as axi-cel)** is a type of CAR T-cell therapy approved to treat people with:

- Large B-cell lymphoma (including diffuse large B-cell lymphoma, primary mediastinal large B-cell lymphoma, high grade B-cell lymphoma, and diffuse large B-cell lymphoma arising from follicular lymphoma) that hasn't responded to initial treatment with chemotherapy plus immunotherapy, or that comes back within a year of this treatment
- Follicular lymphoma, diffuse large B-cell lymphoma, primary mediastinal large B-cell lymphoma, high grade B-cell lymphoma, and diffuse large B-cell lymphoma arising from follicular lymphoma, after at least two other kinds of treatment have been tried

**Tisagenlecleucel (Kymriah, also known as tisa-cel)** is approved to treat people with diffuse large B-cell lymphoma, high grade B-cell lymphoma, and diffuse large B-cell lymphoma arising from follicular lymphoma, as well as follicular lymphoma that hasn't responded to or has come back after other therapies, after trying at least two other kinds of treatment.

**Lisocabtagene maraleucel (Breyanzi, also known as liso-cel)** is approved to treat adults with diffuse large B-cell lymphoma, primary mediastinal large B-cell lymphoma, high grade B-cell lymphoma, follicular lymphoma, mantle cell lymphoma, and small lymphocytic lymphoma/chronic lymphocytic leukemia (SLL/CLL), after other kinds of treatment have been tried.

**Brexucabtagene autoleucel (Tecartus, also known as brexu-cel)** is approved to treat adults with mantle cell lymphoma that has come back or is no longer responding to other treatments.

### Side effects of CAR T-cell therapy

Because CAR T-cell therapy can have serious side effects, it is only given in medical centers that have special training with this treatment.



- These treatments can sometimes cause **cytokine release syndrome (CRS)**, in which immune cells in the body release large amounts of chemicals into the blood. Symptoms of this life-threatening syndrome can include fever, chills, headache, nausea and vomiting, trouble breathing, very low blood pressure, a very fast heart rate, swelling, diarrhea, feeling very tired or weak, and other problems.
- These treatments can also sometimes cause serious **neurological (nervous system) problems**, such as confusion, trouble speaking, seizures, tremors, or changes in consciousness.
- Other serious side effects of these treatments can include **severe infections, low blood cell counts**, and a **weakened immune system**.

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7. [www.cancer.org/cancer/managing-cancer/treatment-types/immunotherapy.html](http://www.cancer.org/cancer/managing-cancer/treatment-types/immunotherapy.html)
8. [www.cancer.org/cancer/managing-cancer/side-effects.html](http://www.cancer.org/cancer/managing-cancer/side-effects.html)

## References

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: B-

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# Targeted Drug Therapy for Non-Hodgkin Lymphoma

- [PI3K inhibitor](#)
- [EZH2 inhibitor](#)
- [Nuclear export inhibitor](#)
- [More information about targeted therapy](#)

## Proteasome inhibitor

These drugs work by stopping enzyme complexes (proteasomes) in cells from breaking down proteins that are important for keeping cell division under control. Proteasome inhibitors are more often used to treat multiple myeloma, but they can be helpful in treating some types of non-Hodgkin lymphoma (NHL) as well.

**Bortezomib (Velcade)** is a proteasome inhibitor used to treat some lymphomas, usually after other treatments have been tried. Bortezomib is given as an infusion into a vein (IV) or an injection under the skin (subcutaneous, or sub-q), typically twice a week for 2 weeks, followed by a rest period.

Side effects can be like those from standard chemo drugs, including low blood counts, nausea, loss of appetite, and nerve damage.

## Histone deacetylase (HDAC) inhibitor

HDAC inhibitors are drugs that can affect genes that are active inside cancer cells. They do this by affecting proteins called **histones**, which interact with chromosomes.

**Belinostat (Beleodaq)** can be used to treat peripheral T-cell lymphomas, usually after at least one other treatment has been tried.

This drug is given as an IV infusion, usually daily for 5 days in a row, repeated every 3 weeks.

Common side effects include nausea, vomiting, tiredness, and low red blood cell counts (anemia).

## BTK inhibitors

Bruton tyrosine kinase (BTK) is a protein that normally helps some lymphoma cells (B cells) grow and survive. Drugs that target this protein, known as **BTK inhibitors**, can be helpful in treating some types of B-cell non-Hodgkin lymphomas.

These drugs are taken by mouth as capsules or tablets, typically once or twice a day.

**Ibrutinib (Imbruvica)** can be used to treat some types of NHL, including chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL).

**Acalabrutinib (Calquence)** can be used to treat mantle cell lymphoma (typically after at least one other treatment has been tried), as well as chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL).

**Zanubrutinib (Brukinsa)** can be used to treat mantle cell lymphoma or marginal zone lymphoma, typically after at least one other treatment has been tried, as well as chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL) and Waldenström's macroglobulinemia (WM). Zanubrutinib is also given with obinutuzumab to treat follicular lymphoma, after at least two other treatments have been tried.

**Pirtobrutinib (Jaypirca)** can be used to treat some types of NHL, including mantle cell lymphoma and chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL), typically after at least 2 other treatments (including another BTK inhibitor) have been tried.

Common side effects of BTK inhibitors can include headache, diarrhea, bruising, feeling tired, muscle and joint pain, cough, rash, and low blood cell counts.

Less common but more serious side effects can include bleeding (hemorrhage), infections, and heart rhythm problems (such as atrial fibrillation).

These drugs may also increase the risk of skin or other cancers, so it's important to protect yourself from the sun when outside while taking one of these drugs.

## PI3K inhibitor

Phosphatidylinositol 3-kinases (PI3Ks) are a family of proteins that send signals in cellsca26 0 g /F2 1.

(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, and severe skin problems.

## EZH2 inhibitor

**Tazemetostat (Tazverik)** works by targeting EZH2, a protein known as a *methyltransferase* that normally helps some cancer cells grow. This drug can be used to treat follicular lymphomas with an *EZH2* gene mutation, after other treatments have been tried. Tazemetostat can also be used to treat follicular lymphomas without an *EZH2* mutation, if there are no other good treatment options available. This drug is taken as pills, typically twice a day.

The most common side effects of this drug include bone and muscle pain, feeling tired, nausea, belly pain, and cold-like symptoms. Tazemetostat can also increase the risk of developing some types of blood cancers.

## Nuclear export inhibitor

The nucleus of a cell holds most of what the cell needs to make the proteins so it can function and stay alive. A protein called XPO1 helps carry other proteins from the nucleus to other parts of the cell to keep it working.

**Selinexor (Xpovio)** is a drug known as a **nuclear export inhibitor**. It works by blocking the XPO1 protein. When a lymphoma cell can't move proteins outside of its nucleus, the cell dies.

This drug is used in people with diffuse large B-cell lymphoma (DLBCL) whose cancer has come back. It is also used in people with DLBCL who has been treated with and no longer responds to at least 2 other DLBCL drugs.

It is a pill that is taken on the first and third day of each week.

Common side effects include feeling tired, nausea, diarrhea, loss of appetite, weight loss, vomiting, constipation, and fever. Other more serious side effects can include low platelet counts, low white blood cell counts, low blood sodium levels, infection, dizziness, and more severe gastrointestinal symptoms.

## Therapy<sup>1</sup>.

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

## Hyperlinks

1. [www.cancer.org/cancer/managing-cancer/treatment-types/targeted-therapy.html](http://www.cancer.org/cancer/managing-cancer/treatment-types/targeted-therapy.html)
2. [www.cancer.org/cancer/managing-cancer/side-effects.html](http://www.cancer.org/cancer/managing-cancer/side-effects.html)

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# Radiation Therapy for Non-Hodgkin

# Lymphoma

Radiation therapy uses high-energy rays to kill cancer cells.

- [When might radiation therapy be used for non-Hodgkin lymphoma?](#)
- [How is radiation therapy given?](#)
- [Possible side effects](#)
- [More information about radiation therapy](#)

## When might radiation therapy be used for non-Hodgkin lymphoma?

Radiation might be used to treat non-Hodgkin lymphoma (NHL) in some different situations:

- It can be used as the main treatment for some types of NHL if they are found early (stage I or II).
- For more advanced lymphomas and for some lymphomas that are more aggressive, radiation is sometimes used along with [chemotherapy](#).
- People who are getting a [stem cell transplant](#) may get radiation to the whole body along with high-dose chemotherapy, to try to kill lymphoma cells throughout the body.
- Radiation therapy can be used to ease (palliate) symptoms caused by lymphoma that has spread to organs such as the brain or spinal cord, or when a tumor is causing pain because it's pressing on nerves.

## How is radiation therapy given?

When radiation is used to treat NHL, it's most often done with a carefully focused beam of radiation, delivered from a machine outside the body. This is known as external beam radiation. External beam radiation treatment for NHL might include beams made of photons (most common), protons, or electrons depending on the situation.

Before your treatment starts, your radiation team will take careful measurements to find the correct angles for aiming the radiation beams and the proper dose of radiation. This planning session, called simulation, usually includes getting imaging tests such as CT or MRI scans.

Most often, radiation treatments are given 5 days a week for several weeks. The treatment is much like getting an x-ray, but the radiation is stronger. 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.

## **Possible side effects**

The side effects of radiation therapy depend on where the radiation is aimed.

**Common side effects** include:

- Skin changes in areas getting radiation, ranging from redness to blistering and peeling
- Feeling tired
- Nausea
- Diarrhea

Nausea and diarrhea are more common if the abdomen (belly) is treated with radiation.

Radiation given to several areas, especially after chemotherapy, can lower blood cell counts and increase the risk of infections.

Radiation to the head and neck area can lead to mouth sores and trouble swallowing. Some people later have problems with dry mouth.

Often these effects go away shortly after treatment is finished.

Side effects tend to be worse if radiation and chemotherapy are given together.

**Long-term serious side effects** are possible:

- Radiation to the chest might damage the lungs and lead to trouble breathing. It can also affect the heart, and it may increase the chance of a heart attack later on.
- Radiation to the neck can lead to thyroid problems later in life. This can lead to fatigue and weight gain.
- Side effects of brain radiation therapy may become serious about 1 or 2 years after treatment and may include headaches and problems, such as memory loss, personality changes, and trouble concentrating.
- Other types of cancer can form in the area that received radiation. For example,



radiation to the chest may increase the risk of lung cancer (especially in people who smoke) and of breast cancer, but this is rare.

## More information about radiation therapy

To learn more about how radiation is used to treat cancer, see [Radiation Therapy](#)<sup>1</sup>.

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

## Hyperlinks

1. [www.cancer.org/cancer/managing-cancer/treatment-types/radiation.html](http://www.cancer.org/cancer/managing-cancer/treatment-types/radiation.html)
2. [www.cancer.org/cancer/managing-cancer/side-effects.html](http://www.cancer.org/cancer/managing-cancer/side-effects.html)

## References

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# High-Dose Chemotherapy and Stem Cell Transplant for Non-Hodgkin Lymphoma

Stem cell transplants are sometimes used to treat people with lymphoma that is in remission or that has relapsed during or after treatment.

- [What is a stem cell transplant?](#)
- [Types of stem cell transplants](#)
- [More information about stem cell transplant](#)

## What is a stem cell transplant?

A stem cell transplant (also known as a **bone marrow transplant**) lets doctors give higher doses of [chemotherapy](#) (chemo), sometimes along with [radiation therapy](#).

The doses of chemo drugs are normally limited by the side effects these drugs can cause. Higher doses can't be used, even if they might kill more cancer cells, because they would severely damage the bone marrow, where new blood cells are made.

But with a stem cell transplant, doctors can give high doses of chemo because the patient receives a transplant of blood-forming stem cells to restore the bone marrow afterward.

## Types of stem cell transplants

There are 2 main types of stem cell transplants (SCTs) based on where the stem cells come from.

- In an **autologous stem cell transplant**, the patient's own stem cells are used. They are collected several times a few weeks before treatment begins. The cells are frozen and stored while the person gets treatment (high-dose chemo and/or radiation) and then are given back into the patient's blood by an IV (catheter in the vein).
- In an **allogeneic stem cell transplant**, the stem cells come from someone else (a

donor). Usually, this is a brother or sister, although the source may be an unrelated donor or umbilical cord blood. The donor's tissue type (also known as the HLA type) needs to match the patient's tissue type as closely as possible to help lower the risk of major problems with the transplant. Regardless of the source, the stem cells are frozen and stored until they are needed for the transplant.

Autologous SCTs are used more often than allogeneic SCTs to treat lymphoma. Still, using the patient's own cells may not be an option if the lymphoma has already spread to the bone marrow or blood, because it may make it hard to get a stem cell sample that is free of lymphoma cells.

Allogeneic transplants are used less often for lymphoma because they can have severe side effects that make them hard to tolerate, especially for patients who are older or who have other medical problems. It can also be hard to find a matched donor.

A stem cell transplant is a complex treatment that can cause life-threatening side effects. If the doctors think a person might benefit from a transplant, it should be done at a cancer center where the staff has experience with the procedure and with managing the recovery phase.

## More information about stem cell transplant

To learn more about stem cell transplants, including how they are done and their potential side effects, see [Stem Cell Transplant for Cancer](#)<sup>1</sup>.

For more general information about side effects and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>2</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/managing-cancer/treatment-types/stem-cell-transplant.html](http://www.cancer.org/cancer/managing-cancer/treatment-types/stem-cell-transplant.html)
2. [www.cancer.org/cancer/managing-cancer/side-effects.html](http://www.cancer.org/cancer/managing-cancer/side-effects.html)

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## Surgery for Non-Hodgkin Lymphoma

Surgery is often used to get a biopsy sample to diagnose and classify non-Hodgkin lymphoma, but it's rarely used as a form of treatment.

- [When is surgery used to treat non-Hodgkin lymphoma?](#)
- [More information about Surgery](#)

### When is surgery used to treat non-Hodgkin lymphoma?

Rarely, surgery may be used to treat lymphomas that start in the spleen or in certain organs outside the lymph system, such as the thyroid or stomach, and that have not spread beyond these organs. But for treating lymphoma that's completely confined to one area, [radiation therapy](#) is usually preferred over surgery.

### More information about Surgery

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## Hyperlinks

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

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# Palliative and Supportive Care for Non-Hodgkin Lymphoma

For most people with non-Hodgkin lymphoma (NHL), treatment of the lymphoma itself is

the main concern. But people can also often benefit from care focused on helping with problems related to the NHL and its treatment. For example, some people with NHL have problems with infections or low blood counts. Although treating the NHL may help these problems over time, other treatments may be needed as well.

## Treatments for low blood counts

Chemotherapy (chemo) and some other lymphoma treatments can affect the bone marrow, which is where new blood cells are made. This can lead to low levels of some types of blood cells.

### Low white blood cell count

White blood cells, especially certain white blood cells called neutrophils, are needed to fight infection. Having too few neutrophils (neutropenia) can lead to serious or even life-threatening infections.

If you become (or are likely to become) neutropenic from chemo, you may be treated with injections of a white blood cell growth factor, such as filgrastim (Neupogen) or pegfilgrastim (Neulasta), to boost your neutrophil count. This can lower the risk of serious infections and help lower the chances that chemo treatments might need to be delayed.

If you are neutropenic and have signs or symptoms of infection (like a fever), you will be treated with antibiotics.

### Low platelet count

Platelets help blood to clot, which stops bleeding. If your platelet count gets very low, it can lead to serious bleeding. Transfusions of platelets can often help prevent this.

In NHL, low platelet counts can also be caused by the cells being destroyed by abnormal antibodies. This is called **immune thrombocytopenia (ITP)**. Before diagnosing this, the doctor often needs to check your bone marrow to make sure that there isn't another cause for the low platelet counts. In ITP, giving platelet transfusions

This can lead to feeling tired, lightheaded, or short of breath.

Anemia that is causing symptoms can be treated with red blood cell transfusions. Drugs that boost red blood cell production such as epoetin alfa can also be used, but these are linked to worse outcomes, so they are generally only used for people who decline blood transfusions.

In some people with NHL, abnormal antibodies can also lower red blood cell counts. This is called **autoimmune hemolytic anemia (AIHA)**. It can be treated with drugs that affect the immune system, like corticosteroids and IVIG. Removing the spleen is also an option. If a person is being treated with the chemo drug fludarabine (Fludara) when the AIHA develops, the drug may be the cause, so the fludarabine may be stopped.

## Palliative care

Whether your lymphoma is being treated or not, it's important to have treatment to relieve your symptoms. This type of treatment, sometimes called **palliative care** or **supportive care**, can be given along with cancer treatment as well as [if cancer treatment stops working](#)<sup>2</sup>.

Sometimes, the treatments you get to control your symptoms are similar to the treatments used to treat cancer. For example, when lymph nodes become enlarged, they may press on nerves and cause pain. Radiation therapy to these areas may help relieve the pain.



symptoms caused by cancer, see [Palliative Care](#)<sup>3</sup>.

To learn about some of the side effects of cancer or treatment and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>4</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/managing-cancer/side-effects/infections.html](http://www.cancer.org/cancer/managing-cancer/side-effects/infections.html)
2. [www.cancer.org/cancer/managing-cancer/making-treatment-decisions/if-cancer-treatments-stop-working.html](http://www.cancer.org/cancer/managing-cancer/making-treatment-decisions/if-cancer-treatments-stop-working.html)
3. [www.cancer.org/cancer/managing-cancer/palliative-care.html](http://www.cancer.org/cancer/managing-cancer/palliative-care.html)
4. [www.cancer.org/cancer/managing-cancer/side-effects.html](http://www.cancer.org/cancer/managing-cancer/side-effects.html)

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# Treating B-Cell Non-Hodgkin Lymphoma

Non-Hodgkin lymphoma (NHL) is generally divided into 2 main types, based on whether it starts in B lymphocytes (B cells) or T lymphocytes (T cells).

There are many different types of B-cell lymphomas. Treatment usually depends both on the [type of lymphoma](#)<sup>1</sup> and the [stage \(extent\) of the disease](#)<sup>2</sup>, but many other factors can be important as well.

- [Diffuse large B-cell lymphoma](#)
- [Primary mediastinal B-cell lymphoma](#)
- [Follicular lymphoma](#)
- [Small lymphocytic lymphoma \(and chronic lymphocytic leukemia\)](#)
- [Mantle cell lymphoma](#)
- [Extranodal marginal zone B-cell lymphoma – mucosa-associated lymphoid tissue \(MALT\) lymphoma](#)
- [Non-gastric MALT lymphoma](#)
- [Nodal marginal zone B-cell lymphoma](#)
- [Splenic marginal zone B-cell lymphoma](#)
- [Burkitt lymphoma](#)
- [Lymphoplasmacytic lymphoma \(Waldenstrom macroglobulinemia\)](#)
- [Hairy cell leukemia](#)
- [Primary central nervous system \(CNS\) lymphoma](#)
- [Primary intraocular lymphoma \(lymphoma of the eye\)](#)

## Diffuse large B-cell lymphoma

Diffuse large B-cell lymphoma (DLBCL) tends to grow quickly.

Most often, the treatment is [chemotherapy](#) (chemo), usually with 4 drugs known as CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone), plus the [monoclonal antibody](#) rituximab (Rituxan). This regimen, known as **R-CHOP**, is most often given in cycles 3 weeks apart.

## Stage I and most stage II lymphomas

For DLBCL that is only in 1 or 2 lymph node groups on the same side of the diaphragm (the thin muscle that separates the chest from the abdomen), R-CHOP is often given for 3 to 6 cycles. This might be followed by radiation therapy to the affected lymph node areas, especially if the lymphoma is [bulky](#)<sup>3</sup>.

## Stages III, IV, and more advanced stage II lymphomas

First-line treatment options for these lymphomas include **R-CHOP** and **Pola-R-CHP**, which is a combination of the monoclonal antibodies polatuzumab vedotin and rituximab

DLBCL can be cured in about half of all patients, but the stage of the disease and the IPI score can have a large effect on this. People with lower-stage DLBCL and with lower IPI scores tend to have better survival rates.

## Primary mediastinal B-cell lymphoma

This lymphoma starts in the space between the lungs (the mediastinum).

A common treatment is 4 to 6 courses of the CHOP [chemo](#) regimen plus [rituximab](#) (**R-CHOP**). This may be followed by [radiation](#) to the mediastinum. Another option is 6 cycles of chemo with dose-adjusted etoposide, doxorubicin and cyclophosphamide with vincristine, prednisone and rituximab (**DA-EPOCH-R**), which typically does not require any radiation.

Often a PET/CT scan is done after the chemo to see if there's any lymphoma remaining in the chest. If no active lymphoma is seen on the PET/CT, the patient may be observed without further treatment. If the PET/CT scan still shows possible active lymphoma, radiation may be needed. Sometimes, the doctor might order a biopsy of the chest tumor to confirm that lymphoma is still present before starting radiation.

If the lymphoma comes back or does not respond to chemo, another chemo regimen (possibly with a [stem cell transplant](#)) or some type of [immunotherapy](#) such as CAR T-cell therapy or an immune checkpoint inhibitor may be an option.

## Follicular lymphoma

This type of lymphoma often grows slowly and responds well to treatment, but it is very hard to cure. It often comes back after treatment, although it can take many years to do so. It's not always clear if the lymphoma needs to be treated right away, especially if the lymphoma isn't causing problems other than mildly swollen lymph nodes. Some people may never need treatment at all. For those who do, it might be years before treatment is needed.

### Stage I and early-stage II lymphomas

If treatment is needed for follicular lymphoma that is only in 1 lymph node group or in 2 nearby groups that are both above or below the diaphragm (the thin muscle separating the chest from the abdomen), the preferred treatment is [radiation therapy](#) to the lymph node areas affected by lymphoma (called **involved site radiation therapy**, or **ISRT**). Other choices include treatment with [chemo](#) plus a [monoclonal antibody](#) such as

rituximab or obinutuzumab, or rituximab alone, which might be followed by radiation therapy.

### **Stages III, IV, and most stage II bulky lymphomas**

If treatment is needed, the most common option is a monoclonal antibody (rituximab or obinutuzumab) combined with chemo. The chemo can be a single drug (such as bendamustine) or a combination of drugs, such as the CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CVP (cyclophosphamide, vincristine, prednisone) regimens. Another option might be the immunotherapy drug lenalidomide, plus a monoclonal antibody.

If some lymph nodes are very large from the lymphoma, radiation may be used to reduce symptoms. This is most often used for patients who are too sick to be treated with chemo.

For patients who may not be able to tolerate more intensive chemo regimens, rituximab alone or rituximab with milder chemo drugs (such as chlorambucil or cyclophosphamide) may be good options.

If the lymphoma shrinks or goes away with the initial treatment, doctors may advise either close follow-up or further treatment. This might include continuing the monoclonal antibody (rituximab or obinutuzumab) for up to 2 years. Further treatment may lower the chance that the lymphoma will come back later and may help some people live longer, but it can also have side effects.

If follicular lymphoma doesn't respond to the initial treatment or if it comes back later, it may be treated with different chemo drugs, [targeted drugs](#), [immunotherapy](#) (such as CAR T-cell therapy or a monoclonal antibody), or some combination of these. If the lymphoma responds to this treatment, a [stem cell transplant](#) may be an option.

A small portion of follicular lymphomas, known as **grade 3B lymphomas**, tend to grow quickly, more like diffuse large B-cell lymphoma (DLBCL). Some follicular lymphomas can also change (transform) into or return as DLBCL. These lymphomas are typically treated like DLBCL (see above). Your doctor will review any treatments you've already had to determine which treatment options might be best for you.



MCL that has spread more widely when first diagnosed is usually treated with a combination of chemo drugs plus an [immunotherapy](#) drug (most often rituximab). When possible, the chemo treatment is intense and includes several drugs. Sometimes the treatment includes alternating between different sets of chemo drugs. Some of the more common treatment regimens go by names such as:

- The LyMA regimen
- The NORDIC regimen
- The TRIANGLE regimen
- Hyper-CVAD

If your doctor recommends one of these regimens, ask them to explain which drugs it includes and how and when they will be given.

If the lymphoma responds well to the initial treatment, a [stem cell transplant](#) may be a good option. This is often followed by a targeted drug (a BTK inhibitor) plus rituximab for several years.

Less intense chemo regimens, such as the chemo drug bendamustine with rituximab, may be used for people who are older or who have other health issues. Sometimes another type of drug, such as the [targeted drug](#) bortezomib (Velcade) or the immunotherapy drug lenalidomide (Revlimid) might be included in the initial treatment.

### Later lines of treatment for MCL

If the lymphoma doesn't respond or if it comes back after initial treatment, options might include:

A **targeted drug**, such as acalabrutinib (Calquence), zanubrutinib (Brukinsa), pirtobrutinib (Jaypirca), bortezomib (Velcade), or venetoclax (Venclexta).

Sometimes a combination of 2 targeted drugs might be used, or a targeted drug might be combined with rituximab.

considering entering a [clinical trial](#)<sup>8</sup>.

## **Extranodal marginal zone B-cell lymphoma – mucosa-associated lymphoid tissue (MALT) lymphoma**

Gastric (stomach) MALT lymphoma often occurs as a result of a chronic infection with the bacterium *H. pylori*, and it often responds to treating the infection. Because of this, gastric lymphomas are treated differently from other lymphomas in this group.



The chemo drugs used may include single agents such as bendamustine, chlorambucil, or cyclophosphamide, or combinations such as CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CVP (cyclophosphamide, vincristine, prednisone). Another treatment option might be [radiation therapy](#) to the stomach.

## Non-gastric MALT lymphoma

For extranodal MALT lymphomas that start in parts of the body other than the stomach (non-gastric MALT lymphomas), treatment depends on the location of the lymphoma and how much it has spread.

Early-stage lymphomas can often be treated with [radiation](#) to the area containing the lymphoma. In certain sites (such as the lungs, breast, thyroid, or intestines), surgery may be an option.

For more advanced disease (stage IV), treatment is generally the same as for advanced-stage gastric MALT lymphoma and follicular lymphoma (see above).

## Nodal marginal zone B-cell lymphoma

This rare type of lymphoma is generally slow-growing (indolent), and it often doesn't need to be treated right away. If it does need treatment, it is usually treated the same way as follicular lymphoma (which also tends to grow slowly).

### Stage I and early-stage II

If treatment is needed for lymphoma that is only in 1 lymph node group or in 2 nearby groups on the same side of the diaphragm (the thin muscle separating the chest from the abdomen), the preferred treatment is [radiation therapy](#) to the lymph node areas affected by lymphoma (called involved site radiation therapy, or ISRT). Other options might include treatment with [rituximab](#), either with or without [chemo](#), or obinutuzumab, plus chemo. Either of these might be followed by radiation therapy.

### Stages III, IV, and most stage II bulky lymphomas

If treatment is needed for these more advanced lymphomas, the most common option is rituximab combined with chemo. The chemo can be a single chemo drug (such as bendamustine) or a combination of drugs, such as the CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CVP (cyclophosphamide, vincristine, prednisone) regimens.

Other options for initial treatment include rituximab alone or along with the immunotherapy drug lenalidomide. If some lymph nodes are very large from the lymphoma, radiation may be used to reduce symptoms. This is most often used for people who are too sick to be treated with chemo.

For people who may not be able to tolerate more intense chemo regimens, rituximab alone, milder chemo drugs (such as chlorambucil or cyclophosphamide), or both may be good options.

If the lymphoma shrinks or goes away with the initial treatment, doctors may advise either close follow-up or further treatment. This might include rituximab for up to 2 years. Further treatment may lower the chance that the lymphoma will come back later and may help some people live longer, but it can also have side effects.

If the lymphoma doesn't respond to the initial treatment or if it comes back later, it may be treated with different chemo drugs, [immunotherapy](#), [targeted drugs](#), or some combination of these. If the lymphoma responds to this treatment, a [stem cell transplant](#) may be an option.

Nodal marginal zone B-cell lymphoma can also change into a fast-growing diffuse large B-cell lymphoma (DLBCL), which would require more aggressive chemotherapy (see above).

## Splenic marginal zone B-cell lymphoma

This is typically a slow-growing lymphoma. If it is not causing symptoms, it is often watched closely without treating it right away.

About 1 in 3 people with this type of lymphoma have chronic hepatitis C virus (HCV) infection. Treating the infection with anti-viral drugs can often cause these lymphomas to shrink or go away.

If that doesn't work, or if a person isn't infected with HCV, treatment with [rituximab](#) is usually the preferred option. Another option might be [surgery](#) to remove the spleen. This can be very helpful in relieving symptoms if the spleen is enlarged.

If the disease is more advanced or progresses, it's usually treated with [chemo](#) with or without [rituximab](#) (similar to what is used for advanced-stage follicular lymphoma, which is described above). Another option might be a [targeted drug](#) such as zanubrutinib (Brukinsa), or rituximab with lenalidomide.

Sometimes this lymphoma can transform into an aggressive large-cell lymphoma, which would then require more intensive chemo.

## Burkitt lymphoma

This is a very fast-growing lymphoma. Treatment depends to some extent on if the lymphoma is considered low risk or high risk and on a person's age.

For some low-risk lymphomas in the abdomen (belly), surgery might be done first to remove the tumor.

Chemotherapy (chemo) is the main treatment for Burkitt lymphoma, and it's often intense enough to require that it be given in the hospital. The monoclonal antibody rituximab is often part of treatment as well. Some examples of chemo regimens used for Burkitt lymphoma include:

- **Hyper-CVAD** (cyclophosphamide, vincristine, doxorubicin [Adriamycin], and dexamethasone), alternating with methotrexate and cytarabine (ara-C), plus rituximab
- **CODOX-M** (cyclophosphamide, vincristine [Oncovin], doxorubicin, and high-dose methotrexate), sometimes alternating with

Options to treat this lymphoma might include chemotherapy and/or the monoclonal antibody rituximab, or a targeted drug such as zanubrutinib.

To learn more, see [Treating Waldenstrom Macroglobulinemia](#)<sup>9</sup>.

## Hairy cell leukemia

This is a slow-growing lymphoma that tends to invade the spleen and lymph nodes as well as the blood. People without symptoms often don't need to be treated right away.

When treatment is needed, most often the chemo drugs cladribine (2-CdA) or pentostatin are used.

To learn more, see [Treating Hairy Cell Leukemia](#)<sup>10</sup>.

## Primary central nervous system (CNS) lymphoma

This lymphoma begins in the brain or spinal cord. It often develops in older people or those with immune system problems caused by HIV infection or by medicines given to keep transplanted organs from being rejected. Treatment usually includes 2 phases, known as **induction** and **consolidation**.

**Induction:** Most people are treated first with [chemotherapy \(chemo\)](#) and/or [radiation](#). One problem with using chemo to treat this disease is that most chemo drugs used to treat lymphoma don't reach the brain when given into a vein (IV). For people in reasonably good health, high IV doses of the drug methotrexate have been shown to be the most effective treatment. This is given along with the drug leucovorin and IV fluids, which help limit serious side effects. Other chemo drugs, such as temozolomide or cytarabine, may be given as well, and [rituximab](#) is also often part of treatment.

For those who can't tolerate high-dose methotrexate, other, less intensive chemo regimens or radiation therapy alone may be tried.

An issue with radiation therapy to the brain, especially in older people, is that it can often cause mental changes. Doctors limit the dose of radiation to try to lessen this problem.

**Consolidation:** A second round of treatment, known as consolidation, is often given to try to get rid of any remaining lymphoma cells in the body. If the lymphoma appears to be gone (known as a complete response), high-dose chemo followed by a [stem cell transplant](#) might be an option. Other options (even if some lymphoma remains) might

include chemo, radiation, or some combination of these.

**Treatment of lymphoma that doesn't go away:** If CNS lymphoma keeps growing or if it comes back after treatment, further options may include chemo (using different drugs), radiation therapy, or a [stem cell transplant](#) if the person is healthy enough. The options will depend on which treatments a person has had before and how well the lymphoma responded to them.

## Primary intraocular lymphoma (lymphoma of the eye)

Most often doctors treat these cancers with radiation therapy, chemotherapy (chemo), or a combination of the two.

[External beam radiation therapy](#) is typically given if the cancer is only in the eye. Radiation to both eyes may be recommended if lymphoma is found in both eyes. Because these lymphomas are commonly linked with lymphoma of the brain (CNS lymphoma), they have sometimes already spread outside the eye or to the brain when the cancer is first diagnosed. If this is the case, radiation therapy to the brain and spinal cord may be included because it can help prevent the lymphoma from spreading there or help destroy cancer cells that are there but haven't been seen by imaging. Problems with thinking, concentration, and memory are possible side effects from radiation to the brain and spinal cord.

Depending on the type of lymphoma, [chemo](#) may be used alone or with radiation therapy, especially if it has grown outside the eye or spread to other places in the body. Chemo can be given into a vein (systemic chemo), directly into the cerebrospinal fluid (intrathecal chemo), or directly into the eye (intraocular chemo). Intraocular chemo gets higher doses of the drug to the tumor without causing severe side effects in other parts of the body. Methotrexate is the most common drug used, but others can be used as well. [Monoclonal antibodies](#) such as rituximab may also be given directly into the eye. Sometimes systemic chemo may be given along with therapy given directly to the eye such as external radiation or intraocular chemo.

If the lymphoma doesn't respond to treatment or if it comes back (recurs), [high-dose chemotherapy followed by a stem cell transplant](#) may be an option for some people.

## Hyperlinks

1. [www.cancer.org/cancer/types/non-hodgkin-lymphoma/about/b-cell-lymphoma.html](http://www.cancer.org/cancer/types/non-hodgkin-lymphoma/about/b-cell-lymphoma.html)
2. [www.cancer.org/cancer/types/non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html](http://www.cancer.org/cancer/types/non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html)
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10. [www.cancer.org/cancer/types/chronic-lymphocytic-leukemia/treating/hairy-cell-leukemia.html](http://www.cancer.org/cancer/types/chronic-lymphocytic-leukemia/treating/hairy-cell-leukemia.html)

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# Treating T-Cell Non-Hodgkin Lymphoma

Treatment is typically given in the hospital at first. During this time, patients are at risk for tumor lysis syndrome (described in [Chemotherapy for Non-Hodgkin Lymphoma](#)), so they are given plenty of fluids and drugs like allopurinol to prevent uric acid build up.

For more details on treatment, see [Treating Acute Lymphocytic Leukemia \(Adults\)](#)<sup>3</sup> and [Treating Childhood Leukemia](#)<sup>4</sup>.

Although this lymphoma is fast-growing, if it hasn't spread to the bone marrow when it's first diagnosed, the chance of cure with chemo is quite good. But it is harder to cure if it has spread to the bone marrow.

## Peripheral T-cell lymphomas (PTCLs)

### Cutaneous T-cell lymphomas (mycosis fungoides, Sezary syndrome, and other skin lymphomas)

Treatment of these skin lymphomas is discussed in [Treating Lymphoma of the Skin](#)<sup>5</sup>.

### Adult T-cell leukemia/lymphoma

Adult T-cell leukemia/lymphoma (ATLL) is linked to infection with the HTLV-1 virus. Treatment depends on which subtype of ATLL you have.

The **smoldering and chronic subtypes** grow slowly. Like other slow-growing lymphomas (such as follicular lymphoma and small lymphocytic lymphoma), these subtypes can often be watched without treating them right away, as long as they aren't causing problems other than mildly swollen lymph nodes. If treatment is needed, one option is interferon and the anti-viral drug zidovudine to fight the HTLV-1 infection. If the lymphoma is affecting the skin, it may be treated with radiation or other treatments aimed at the skin. Another option might be chemo (see below) or other combinations.

The **acute subtype** also can be treated with either anti-viral drugs or chemo (see below). If it responds well to treatment, a [stem cell transplant](#) might be considered.

Anti-viral therapy is not helpful for the **lymphoma subtype**, so it is typically treated with chemotherapy (see below). It can also invade the tissues around the brain and spinal cord, so chemo is given into the spinal fluid (intrathecal chemo) as well. Treatment after chemo may include a stem cell transplant.

Common chemo regimens for ATLL (regardless of the subtype) include:



- EPOCH (etoposide, prednisone, vincristine, cyclophosphamide, and doxorubicin)
- CHP (cyclophosphamide, doxorubicin, and prednisone), plus the [antibody-drug conjugate](#) brentuximab vedotin (Adcetris), if the lymphoma cells have the CD30 protein
- HyperCVAD (cyclophosphamide, vincristine, doxorubicin, and dexamethasone) alternating with high-dose methotrexate and cytarabine (ara-C)

If these treatments aren't effective or if the lymphoma comes back, other chemo or immunotherapy drugs might still be helpful.

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If the lymphoma doesn't go away completely, or if it was initially stage IV, a [stem cell transplant](#) may be done if possible.

## Enteropathy-associated T-cell lymphoma

This lymphoma generally develops in the small intestine or colon in people with celiac disease.

Intensive [chemo](#) using several drugs is usually the main treatment. Commonly used combinations include CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) or CHOEP (CHOP plus etoposide). Another option might be the combination of the chemo drugs cyclophosphamide, doxorubicin, and prednisone (CHP), along with the [monoclonal antibody](#) brentuximab vedotin (Adcetris), if the lymphoma cells have the CD30 protein.

For people who can't tolerate intense chemo, a single chemo or immunotherapy drug might be an option. If the lymphoma is only in one area, [radiation therapy](#) may be an option.

A concern if these treatments work is that a hole (perforation) might develop in the intestines (as the lymphoma cells die), so surgery might be done first to remove the part of the intestines containing the lymphoma. Surgery may also be needed before chemo or radiation if a person is diagnosed with this lymphoma because it caused a perforation or intestinal blockage (obstruction).

A [stem cell transplant](#) may be an option if the lymphoma responds to chemo.

## Anaplastic large cell lymphoma (ALCL)

This fast-growing lymphoma mainly affects lymph nodes.

Treatment typically includes intense [chemotherapy](#) (chemo) using a combination of several drugs, sometimes along with [radiation therapy](#) if the lymphoma is confined to one or few areas.

Common chemo regimens for ALCL include CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CHOEP (CHOP plus etoposide). Another option might be CHP (cyclophosphamide, doxorubicin, and prednisone) along with the [monoclonal antibody](#) brentuximab vedotin (Adcetris).

ALCL often responds well to treatment, especially if the lymphoma cells have too much

of the ALK protein.

If the lymphoma returns after initial treatment, other chemo drugs (or other types of drugs) might be options, either alone or in combination. The options will depend to some extent on if the plan is for the person to eventually get a [stem cell transplant](#).

### Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL)

For ALCL that develops in the capsule (scar tissue) that forms around a breast implant, doctors typically remove the implant and the capsule surrounding it. If not all of the lymphoma can be removed with surgery, [radiation therapy](#) might be given to the area. Additional treatment might include chemo, typically with one of the same regimens listed above for ALCL (CHOP, CHOEP, CHP plus brentuximab vedotin, or brentuximab vedotin alone), and sometimes with radiation.

### Peripheral T-cell lymphoma, not otherwise specified

This type of lymphoma is typically treated with intense [chemotherapy](#) (chemo), using a combination of drugs such as CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) or CHOEP (CHOP plus etoposide). Another option might be the combination of the chemo drugs cyclophosphamide, doxorubicin, and prednisone (CHP), along with the [monoclonal antibody](#) brentuximab vedotin (Adcetris), if the lymphoma cells have the CD30 protein. For early-stage disease, [radiation therapy](#) may be given to the site of the lymphoma as well.


For people who can't tolerate intense chemo, a single chemo, immunotherapy, or [targeted drug](#) might be an option. If the lymphoma is only in one area, radiation therapy may be an option.

If the lymphoma responds to treatment, a [stem cell transplant](#) may be recommended when possible.

If treatments above are no longer working, other chemo, immunotherapy, or targeted drugs, either alone or in combination, can often be tried. The options will depend to some extent on if the plan is for the person to eventually get a stem cell transplant.

Because these lymphomas can often be hard to treat, taking part in a [clinical trial](#)<sup>7</sup> of newer treatments is often a good option.

## Hyperlinks

1. [www.cancer.org/cancer/types/non-hodgkin-lymphoma/about/t-cell-lymphoma.html](http://www.cancer.org/cancer/types/non-hodgkin-lymphoma/about/t-cell-lymphoma.html)
  2. [www.cancer.org/cancer/types/acute-lymphocytic-leukemia.html](http://www.cancer.org/cancer/types/acute-lymphocytic-leukemia.html)
  3. [www.cancer.org/cancer/types/acute-lymphocytic-leukemia/treating.html](http://www.cancer.org/cancer/types/acute-lymphocytic-leukemia/treating.html)
  4. [www.cancer.org/cancer/types/leukemia-in-children/treating.html](http://www.cancer.org/cancer/types/leukemia-in-children/treating.html)  
[www.cancer.org/cancer/types/skin-lymphoma/a-in-children/treating.html](http://www.cancer.org/cancer/types/skin-lymphoma/a-in-children/treating.html)
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# Treating HIV-Associated Lymphoma

People with [HIV infections](#)<sup>1</sup> are at increased risk for non-Hodgkin lymphoma.

Although people with HIV tend to get more aggressive forms of lymphoma, such as diffuse large B-cell lymphoma (DLBCL), primary CNS lymphoma, or Burkitt lymphoma, their outlook has improved a great deal in recent years. The use of highly active anti-retroviral therapy (HAART) to treat HIV has helped people better tolerate treatments such as chemotherapy (chemo) and immunotherapy.

A major problem in the past was that people with HIV infections tended to have low blood cell counts to begin with, which made it hard to treat them with full doses of chemo. This issue has been relieved somewhat by the use of HAART and the use of drugs to help the person's body make new blood cells. Still, doctors give chemo cautiously and monitor blood counts closely.

Most experts believe that the prognosis (outlook) for a person with HIV-associated lymphoma relates at least as much to the HIV infection as to the lymphoma. Modern anti-HIV therapy can often control the immune deficiency in people with AIDS, so the outlook for people who develop lymphoma has improved.

The treatment of the lymphoma itself depends on the specific type of lymphoma. (For more on how specific types of non-Hodgkin lymphoma are treated, see [Treating B-cell Non-Hodgkin Lymphomas](#).)

## Hyperlinks

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