



Non-Hodgkin Lymphoma Treatment

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

Which treatments are used for non-Hodgkin lymphoma?

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

- [Chemotherapy](#)
- [Immunotherapy](#)
- [Targeted therapy](#)
- [Radiation therapy](#)
- [Stem cell transplant](#)
- [Surgery](#) (in rare cases)

Another important part of treatment for many people is [palliative or supportive care](#). This can help prevent or treat problems such as infections, low blood cell counts, or some symptoms caused by the lymphoma.

To learn about the most common approaches to treating different types of NHL, see:

- [Treating B-cell non-Hodgkin lymphomas](#)
- [Treating T-cell non-Hodgkin lymphomas](#)
- [Treating HIV-associated lymphoma](#)

What types of doctors treat non-Hodgkin lymphoma?

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

- A **hematologist**: a doctor who treats disorders of the blood, including lymphomas.
- A **medical oncologist**: a doctor who treats cancer with medicines.
- A **radiation oncologist**: a doctor who treats cancer with radiation therapy.

Many other specialists might be part of your treatment team as well, including physician assistants (PAs), nurse practitioners (NPs), nurses, nutrition specialists, social workers, and other health professionals. See [Health Professionals Associated With Cancer Care](#) for more on this.

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 best decision for you. 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 you're not sure about something. You can find some good questions to ask in [What Should You Ask Your Doctor About Non-Hodgkin Lymphom?](#)

Getting a second opinion

If time allows, you may also want to [get a second opinion](#). This can give you more information and help you feel more certain about the treatment plan you choose. If you aren't sure where to go for a second opinion, ask your doctor for help.

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. Sometimes 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 [Clinical Trials](#) 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 [Complementary and Alternative Medicine](#) 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 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, 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.

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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Chemotherapy for Non-Hodgkin Lymphoma

Chemotherapy (chemo) is the use of anti-cancer drugs that are usually injected into a vein (IV) or taken by mouth. These drugs enter the bloodstream and reach almost all areas of the body, making this treatment very useful for lymphoma.

When might chemo be used?

Chemo is the main treatment for most people with non-Hodgkin lymphoma (NHL). Depending on the [type](#) and the [stage](#) of the lymphoma, chemo may be used alone or combined with other treatments, such as [immunotherapy drugs](#) or [radiation therapy](#).

Which chemo drugs are used to treat non-Hodgkin lymphoma?

Many chemo drugs are useful in treating lymphoma. Often, several drugs are combined. The number of drugs, their doses, and the length of treatment depend on the type and

stage of the lymphoma. Here are some of the drugs more commonly used to treat lymphoma (divided into groups based on how they work):

Alkylating agents

- Cyclophosphamide
- Chlorambucil
- Bendamustine
- Ifosfamide

Corticosteroids

- Prednisone
- Dexamethasone

Platinum drugs

- Cisplatin
- Carboplatin
- Oxaliplatin

Purine analogs

- Fludarabine
- Pentostatin
- Cladribine (2-CdA)

Anti-metabolites

- Cytarabine (ara-C)
- Gemcitabine
- Methotrexate
- Pralatrexate

Others

- Vincristine

- Doxorubicin (Adriamycin)
- Mitoxantrone
- Etoposide (VP-16)
- Bleomycin

Often drugs from different groups are combined. One of the most common combinations is called CHOP. This includes the drugs cyclophosphamide, doxorubicin (also known as hydroxydaunorubicin), vincristine (Oncovin) and prednisone. Another common combination leaves out doxorubicin and is called CVP.

Chemo is often combined with an immunotherapy drug, especially rituximab (Rituxan).

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 may require a hospital stay.

Sometimes a patient may get one chemo combination for several cycles and later switch to a different one 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 may have reached these areas, chemo may also be given 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 is finished. If serious side effects occur, the dose of chemo may be reduced or treatment may be delayed.

There are often ways to lessen these side effects. For example, drugs can be given to prevent or reduce nausea and vomiting.

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

- Platinum drugs such as cisplatin can cause nerve damage ([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 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 raise your risk of developing leukemia several years later.

Tumor lysis syndrome is a possible side effect when chemo is started, especially in patients 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 work to prevent this by giving the patient extra fluids and certain drugs, such as sodium bicarbonate, allopurinol, and rasburicase.

Ask your health 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.

To learn more about chemo, see the [Chemotherapy](#) section of our website.

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 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.

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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Immunotherapy for Non-Hodgkin Lymphoma

Immunotherapy is treatment that either boosts the patient'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.

Monoclonal antibodies

Antibodies are proteins made by your immune system to help fight infections. Man-made versions, called *monoclonal antibodies*, can be designed to attack a specific target, such as a substance on the surface of lymphocytes (the cells in which lymphomas start).

Several monoclonal antibodies are now used to treat non-Hodgkin lymphoma (NHL).

Antibodies that target CD20

A number of monoclonal antibodies target the CD20 antigen, a protein on the surface of B lymphocytes. These include:

- **Rituximab (Rituxan):** This drug is often used along with chemotherapy for some types of NHL, but it may also be used by itself.
- **Obinutuzumab (Gazyva):** This drug is often used along with chemo as a part of the treatment for small lymphocytic lymphoma/chronic lymphocytic leukemia (SLL/CLL). It might also be used along with chemo in treating follicular lymphoma after other treatments have been tried.
- **Ofatumumab (Arzerra):** This drug is used mainly in patients with SLL/CLL that is no longer responding to other treatments.
- **Ibritumomab tiuxetan (Zevalin):** This drug is made up of a monoclonal antibody that is attached to a radioactive molecule. The antibody brings radiation directly to the lymphoma cells.

These drugs are given into a vein (IV), often over several hours. They all can cause reactions during the infusion (while the drug is being given) or several hours afterward. These are usually mild, such as itching, chills, fever, nausea, rashes, fatigue, and headaches. More serious reactions can include chest pain, heart racing, swelling of the face and tongue, cough, trouble breathing, feeling dizzy or lightheaded, 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 inactive to become active again, which can lead to severe or life-threatening liver problems. Your doctor may

check your blood for signs of an old hepatitis B infection before you start treatment. These drugs can also increase your risk of certain serious infections for many months after the drug is stopped. Other side effects can depend on which drug is given. Ask your doctor what you can expect.

Antibodies targeting CD52

Alemtuzumab (Campath) is an antibody directed at the CD52 antigen. It is useful in 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.

Antibodies that target CD30

Brentuximab vedotin (Adcetris) is an anti-CD30 antibody attached to a chemotherapy drug. The antibody acts like a homing signal, bringing the chemo drug to lymphoma cells, where it enters the cells and kills them.

Brentuximab can be used to treat some types of lymphoma, especially if it has come back after other treatments. This drug is infused into a vein (IV), typically every 3 weeks. Common side effects can include nerve damage (neuropathy), low blood counts, fatigue, fever, nausea and vomiting, infections, diarrhea, and cough.

Interferon

Interferon is a chemical made by white blood cells that can help boost the immune system. Some studies have suggested that giving man-made interferon can make some types of lymphomas shrink or stop growing.

Common side effects of this treatment include fatigue, fever, chills, headaches, muscle and joint aches, and mood changes. Because of the side effects, interferon is not used very often. It might be given to some patients in addition to chemotherapy.

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.

These drugs are taken daily as pills. Side effects of 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.

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

For more on immunotherapy, see [Cancer Immunotherapy](#).

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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Targeted Therapy Drugs for Non-Hodgkin Lymphoma

As researchers have learned more about the changes in lymphoma cells that help them grow, they have developed newer drugs to specifically target these changes. These targeted drugs work differently from standard chemotherapy (chemo) drugs. Sometimes they work when standard chemo drugs don't, and they often have different (and less severe) side effects.

Proteasome inhibitors

These drugs work by stopping enzyme complexes (proteasomes) in cells from breaking down proteins important for keeping cell division under control. They are more often used to treat multiple myeloma, but 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 similar to those of standard chemo drugs, including low blood counts, nausea, loss of appetite, and nerve damage.

Histone deacetylase (HDAC) inhibitors

HDAC inhibitors are drugs that can affect what genes are active by interacting with proteins in chromosomes called *histones*.

Romidepsin (Istodax) can be used to treat both peripheral and skin T-cell lymphomas. It is usually given after at least one other treatment has been tried. This drug is given as an IV infusion, usually once a week for 3 weeks in a row, followed by a week off. Side effects tend to be mild, but can include lowered blood cell counts and effects on heart rhythm.

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

Kinase inhibitors

These drugs block *kinases*, which are proteins in cells that normally relay signals (such as telling the cell to grow).

Ibrutinib (Imbruvica) blocks Bruton's tyrosine kinase (BTK), which normally helps some lymphoma cells grow and survive. This drug can be used to treat several types of NHL, including mantle cell lymphoma, marginal zone lymphoma, and small lymphocytic lymphoma. It's taken by mouth as capsules, once a day. Common side effects include diarrhea or constipation, nausea and vomiting, fatigue, swelling, decreased appetite, and low blood counts. This drug is currently approved for use after other treatments have been tried, and it's now being studied for use earlier in treatment.

Idelalisib (Zydelig) blocks a kinase called PI3K. This drug has been shown to help treat follicular lymphoma and small lymphocytic lymphoma after other treatments have been tried. It's taken as a pill twice a day. Common side effects include diarrhea, fever, fatigue, nausea, cough, pneumonia, belly pain, chills, rash and low blood counts. Less often, more serious side effects can also occur.

Copanlisib (Aliqopa) is another drug that blocks PI3K. It can be used to treat follicular lymphoma that comes back after other treatments have been tried. It's given as an infusion into a vein, typically once a week for 3 weeks, followed by a week off. Common side effects include high blood sugar levels, nausea, diarrhea, feeling weak, high blood pressure, low levels of white blood cells (with increased risk of infection), and low levels of blood platelets (with increased risk of bruising or bleeding). Less common side effects include infections, inflammation in the lungs, and severe skin reactions.

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

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at

www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

Wang ML, Rule S, Martin P, et al. Targeting BTK with ibrutinib in relapsed or refractory mantle-cell lymphoma. *N Engl J Med*. 2013;369:507-516.

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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?

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), because these tumors respond very well to radiation.
- 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 internal 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*.

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.

Radiation can also be given as a drug in some cases. (See [Immunotherapy for Non-Hodgkin Lymphoma](#) for more details.)

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.

Possible **long-term side effects** of radiation therapy can be more serious:

- Radiation to the chest might damage the lungs and lead to trouble breathing. It can also affect the heart, making you more likely to have 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. Radiation to the neck may also increase the risk of stroke many years later.
- Side effects of brain radiation therapy usually become most serious 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 smokers) and of breast cancer. This happens rarely.

To learn more about radiation therapy, see the [Radiation Therapy](#) section of our website.

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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

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

The doses of chemotherapy 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 afterwards.

Stem cell transplants are sometimes used to treat lymphoma patients who are in remission or who have a relapse during or after treatment. Although only a small number of people with lymphoma are treated with this therapy, this number is growing.

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 in the weeks before treatment. 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.
- 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 prevent 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 spread to the bone marrow or blood. If that happens, it may be 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.

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

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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Surgery for Non-Hodgkin Lymphoma

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

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.

For more information about treating cancer with surgery, see [Cancer Surgery](#).

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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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 patients can also often benefit from care aimed at 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 therapies may be needed as well.

Treatments to prevent infections

Antibiotics and anti-virals

Patients getting certain chemotherapy drugs (such as fludarabine and other purine analogs) and the antibody drug alemtuzumab (Campath) have a high risk of infections seen mainly in people with impaired immune systems, like infection with CMV (a virus) and Pneumocystis pneumonia (PCP, which is caused by a type of fungus). An anti-viral drug like acyclovir is often given to try to prevent CMV infections. To help prevent PCP, a sulfa antibiotic is often given (trimethoprim with sulfamethoxazole, which is also known by brand names such as Septra and Bactrim). Other treatments are available for people who are allergic to sulfa drugs.

Antibiotics and anti-viral drugs are also given to treat infections. Often, active infections require higher doses or different drugs than those used to prevent infections.

Intravenous immunoglobulin (IVIG)

Some people with NHL have low levels of antibodies (immunoglobulins) to fight infections. This can lead to lung and/or sinus infections that keep coming back. 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 help prevent infections. This is called *intravenous immunoglobulin* or *IVIG*. IVIG is often given once a month at first, but may be able to be given less often based on blood tests of antibody levels.

For more information on infections, see [Infections in People With Cancer](#).

Treatments for low blood counts

Low white blood cell count: White blood cells, especially a certain kind of white blood

cell called *neutrophils*, are needed to fight infection. Having too few neutrophils (neutropenia) can lead to serious or even life threatening infections. If you become neutropenic from chemotherapy (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 lowers the risk of serious infections and can allow chemo to continue on time. 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 platelet counts get 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*. 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 because the antibodies just destroy the new platelets, too. This can be treated by drugs that affect the immune system, like corticosteroids and IVIG. Another option is to remove the spleen, since after the antibodies stick to the platelets, they are actually destroyed in the spleen. A third option is treatment with a drug that tells the body to make more platelets, like eltrombopag (Promacta) or romiplostim (Nplate).

Low red blood cell count: Some people develop low red blood cell counts (anemia) from NHL or its treatment. 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 can also be used, but these are linked to worse outcomes, and so are generally only used for people who refuse to have transfusions.

In 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 the patient is being treated with the chemo drug fludarabine (Fludara) when the AIHA develops, the drug may be the cause, and so the fludarabine will 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*, can be given along with cancer treatment as well as [if cancer treatment is no longer working](#).

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. You might also be given pain medicines, ranging from ibuprofen and similar drugs to more potent medicines such as opioids (like morphine).

Nausea and loss of appetite can be treated with drugs and high-calorie food supplements. If the lymphoma has spread to the lungs, you may get short of breath. Oxygen may be used to help treat this.

It's important that you tell your health care team about any symptoms you have, including any side effects from treatment. There are often ways to help control or lessen these symptoms. This is an important part of your overall treatment plan.

For more information on palliative care and getting help with side effects, see the [Palliative or Supportive Care](#) section of our website.

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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Treating B-Cell Non-Hodgkin Lymphoma

Non-Hodgkin lymphoma (NHL) is generally divided into main 2 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](#) and the [stage \(extent\) of the disease](#), but many other factors can be important as well.

Diffuse large B-cell lymphoma

Diffuse large B-cell lymphoma (DLBCL) tends to grow quickly. Most often, the treatment is chemotherapy (chemo), usually with a regimen of 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. Because this regimen contains the drug doxorubicin, which can damage the heart, it may not be suitable for patients with heart problems, so other chemo regimens may be used instead.

Stage I or II

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, which might be followed by radiation therapy to the affected lymph node areas.

Stage III or IV

Most doctors will give 6 cycles of R-CHOP as first-line treatment. After several cycles, doctors may get imaging tests such as a PET/CT scan to see how well treatment is working. People who have a higher risk of the lymphoma coming back later in the tissues around the brain and spinal cord may be treated with chemo injected into the spinal fluid (called *intrathecal chemotherapy*). Another option is to give high doses of methotrexate intravenously. (This drug can pass into the spinal fluid.)

For younger patients with a higher risk of the lymphoma coming back (based on the International Prognostic Index [IPI] score), high-dose chemo followed by a stem cell transplant might be an option. But it's not yet clear if transplants are better as the initial treatment. Most doctors feel that if a transplant is done as part of the first treatment, it

should be done in a clinical trial.

If the lymphoma doesn't go away completely with treatment or if it recurs (comes back) after treatment, doctors will usually suggest another chemo regimen. Several different regimens can be used, and they may or may not include rituximab. If the lymphoma shrinks with this treatment, it might be followed by a stem cell transplant if possible, as it offers the best chance of curing the lymphoma. Stem cell transplants are not effective unless the lymphoma responds to chemo. Unfortunately, not everyone is healthy enough for a stem cell transplant. Clinical trials of new treatments may be another good option for some people.

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. Patients with lower stages have better survival rates, as do patients with lower IPI scores.

Primary mediastinal B-cell lymphoma

This lymphoma, which starts in the space between the lungs (the mediastinum), is treated like early stage diffuse large B-cell lymphoma. The main treatment is usually about 6 courses of CHOP chemo plus rituximab (R-CHOP). This may be followed by radiation to the mediastinum. 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 is positive (shows possible active lymphoma), radiation may be needed. Often, the doctor will order a biopsy of the chest tumor to confirm that lymphoma is still present before starting radiation.

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, sometimes it might be years before treatment is needed.

Stage I and early-stage II

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*). Other choices include treatment with [rituximab \(Rituxan\)](#), [chemo](#), or both, 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 rituximab combined with chemo. The chemo can be a single drug (such as bendamustine or fludarabine) or a combination of drugs, such as the CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CVP (cyclophosphamide, vincristine, prednisone) regimens. If the lymphoma shrinks, a total of 6 cycles of chemo plus rituximab is usually given.

Other options for initial treatment include rituximab alone or chemo alone (either one or several drugs). 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.

The radioactive [monoclonal antibody](#) ibritumomab (Zevalin) is also an option for initial treatment, although this is more often used as a second-line treatment.

For patients who may not be able to tolerate more intensive 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 either rituximab for up to 2 years or treatment with ibritumomab. Further treatment may lower the chance that the lymphoma will come back later and may help some patients 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](#), [monoclonal antibodies](#), 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 3 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. For these lymphomas, the treatment is the same as for DLBCL (see above).

Small lymphocytic lymphoma (and chronic lymphocytic leukemia)

Small lymphocytic lymphoma (SLL) and chronic lymphocytic leukemia (CLL) are considered different versions of the same disease. The main difference is where the cancer cells are (the blood and bone marrow for CLL, and the lymph nodes and spleen for SLL). CLL and SLL tend to grow slowly, but are very hard to cure.

Treatment for SLL is similar to that of CLL, which is described in detail in [Treating Chronic Lymphocytic Leukemia](#).

If the lymphoma isn't growing quickly or causing any problems, it can be watched closely without treatment for a time. If treatment is needed, it depends on the stage.

When the lymphoma is only in one lymph node or lymph node area (stage I), it may be treated with radiation therapy alone.

For more advanced disease, the treatment is often the same as what is used for CLL. (See [Treating Chronic Lymphocytic Leukemia](#).) Chemo, with or without rituximab or obinutuzumab (Gazyva) is one option for first-line treatment. Chlorambucil, fludarabine, or bendamustine are some of the chemo drugs that are used. The targeted drug ibrutinib (Imbruvica) is another option, as is rituximab alone (without chemo). Which treatment is used depends on a person's age and health, as well as on whether the cancer cells have certain chromosome changes.

If the lymphoma doesn't respond or comes back after initial treatment, different chemo drugs, targeted drugs, and/or other monoclonal antibodies may be used as second-line treatment.

Mantle cell lymphoma

This type of lymphoma has often spread widely when it's first found. Although it doesn't usually grow as quickly as some other fast-growing lymphomas, it often doesn't respond as well to treatment, either. Because current treatments for this type of lymphoma are very unlikely to cure it, patients might want to consider taking part in a [clinical trial](#).

If the lymphoma has only spread to 1 lymph node group or to 2 nearby groups on the same side of the diaphragm (stage I and some stage II), which is rare, it can sometimes be treated with radiation therapy. Another option is to treat with chemo plus rituximab. Mantle cell lymphomas that have spread more widely when they are first diagnosed are

treated with chemo plus rituximab.

When possible, the chemo treatment is intense, using regimens such as:

- Hyper-CVAD: cyclophosphamide, vincristine, doxorubicin (Adriamycin), and dexamethasone, alternating with high-dose methotrexate plus cytarabine)
- “Dose-intensified” R-CHOP (rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone), alternating with rituximab and cytarabine
- R-CHOP followed by rituximab plus ifosfamide, carboplatin, and etoposide (known as RICE)

Less intense chemo regimens may be used for people who are older or who have other health issues.

If the lymphoma responds well to initial treatment, a stem cell transplant may be a good option.

For mantle cell lymphomas that don't respond or that come back after initial treatment, chemo with drugs such as bendamustine, bortezomib (Velcade), cladribine, fludarabine, or lenalidomide (Revlimid) may be used, sometimes along with other chemo drugs or with rituximab. Another option is the targeted drug ibrutinib (Imbruvica). Other targeted drugs such as venetoclax (Venclexta) and idelalisib (Zydelig) have also shown promising results in some early studies. Still, because second-line treatment is not always helpful, patients might want to consider entering a [clinical trial](#).

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

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

Stages I and II gastric lymphoma in people who test positive for *H. pylori*

Early-stage gastric MALT lymphomas are treated with antibiotics combined with drugs that block acid secretion by the stomach (called *proton pump inhibitors*). Usually the drugs are given for 10 to 14 days. This may be repeated after a couple of weeks. Examination of the stomach lining using upper endoscopy (where a flexible tube with a

viewing lens is passed down the throat and into the stomach) is then repeated at certain intervals to see if the *H. pylori* is gone and if the lymphoma has shrunk. About 2 out of 3 of these lymphomas go away completely with antibiotic treatment, but it can sometimes take several months to be effective. In cases where symptoms need to be relieved before the antibiotics take effect or where antibiotics don't shrink the lymphoma, radiation therapy to the area is often the preferred treatment. The monoclonal antibody rituximab may be another option.

Stages I and II gastric lymphoma in people who test negative for *H. pylori*

For these early-stage gastric MALT lymphomas, treatment is usually either radiation therapy to the stomach or rituximab.

Stage III or IV gastric lymphoma

For more advanced gastric MALT lymphomas, which are rare, treatment is often similar to that for follicular lymphoma (see above). Lymphomas that are not growing quickly may be watched and not treated right away. If the lymphoma is large, is causing symptoms, or is growing, it can be treated with radiation therapy to the stomach, rituximab, chemo, chemo plus rituximab, or the targeted drug ibrutinib (Imbruvica). The chemo drugs used are the same as those used for follicular lymphoma, and may include single agents such as chlorambucil or fludarabine or combinations such as CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CVP (cyclophosphamide, vincristine, prednisone).

Non-gastric MALT lymphoma

For MALT lymphomas that start in sites other than the stomach (non-gastric 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, or thyroid), surgery may be an option. For more advanced disease (stage III or IV), treatment is generally the same as for stage III and IV 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*). Other choices include treatment with rituximab (Rituxan), chemo, or both, 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 rituximab combined with chemo. The chemo can be a single chemo drug (such as bendamustine or fludarabine) or a combination of drugs, such as the CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CVP (cyclophosphamide, vincristine, prednisone) regimens. If the lymphoma shrinks, a total of 6 cycles of chemo plus rituximab is usually given.

Other options for initial treatment include rituximab alone or chemo alone (either one or several drugs). 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.

The radioactive monoclonal antibody ibritumomab tiuxetan (Zevalin) is also an option for initial treatment, although this is more often used as a second treatment.

For patients who may not be able to tolerate more intensive (stronger) 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 either rituximab for up to 2 years or treatment with ibritumomab tiuxetan. Further treatment may lower the chance that the lymphoma will come back later and may help some patients 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, monoclonal antibodies, 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 go into remission.

If that doesn't work, or if a person isn't infected with HCV, surgery to remove the spleen can sometimes lead to a long-term remission. This can be very helpful in relieving symptoms if the spleen is enlarged. Treatment with rituximab may be another option.

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 the targeted drug ibrutinib (Imbruvica).

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

Burkitt lymphoma

This is a very fast-growing lymphoma that is similar to a type of acute lymphocytic leukemia. It is usually treated in the hospital with intensive chemo, which usually includes at least 5 chemo drugs. Rituximab may also be added. Some examples of chemo regimens used for this lymphoma include:

- **Hyper-CVAD** (cyclophosphamide, vincristine, doxorubicin (Adriamycin), and dexamethasone), alternating with methotrexate and cytarabine (ara-C)
- **CODOX-M** (cyclophosphamide, vincristine (Oncovin), doxorubicin, and high-dose methotrexate), alternating with **IVAC** (ifosfamide, etoposide (VP-16), and cytarabine (ara-C)).
- **EPOCH** (etoposide, prednisone, vincristine (Oncovin), cyclophosphamide, and doxorubicin)

Because this lymphoma tends to invade the area around the brain and spinal cord, the

chemo drug methotrexate is often given into the spinal fluid (called *intrathecal therapy*). This may not be needed if high-dose methotrexate is given as a part of the main chemotherapy regimen.

An important part of the initial treatment of this disease is making sure a person gets plenty of fluids, as well as drugs like allopurinol, to help prevent tumor lysis syndrome (described in [Chemotherapy for Non-Hodgkin Lymphoma](#)).

If the lymphoma doesn't go away or if it comes back after treatment, another chemo regimen might be tried. If the lymphoma goes into remission, the doctor might suggest a stem cell transplant.

Lymphoplasmacytic lymphoma (Waldenstrom macroglobulinemia)

The main treatment for this lymphoma is usually chemo or rituximab. For more detailed information see [Treating Waldenstrom Macroglobulinemia](#).

Hairy cell leukemia

This is a slow-growing lymphoma that tends to invade the spleen and lymph nodes as well as the blood. Patients 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. For more detailed information, see [Treating Chronic Lymphocytic Leukemia](#).

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 AIDS or drugs given to keep transplanted organs from being rejected.

Most patients are treated with chemo and/or radiation. One problem with treating this disease is that most chemo drugs commonly used to treat lymphoma don't reach the brain when given intravenously (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 cytarabine, may be added. Rituximab may be

added as well. For those who aren't able to tolerate this treatment, other, less intensive chemo regimens or radiation therapy alone may be tried.

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

If CNS lymphoma keeps growing or 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.

Treatment of lymphoma of the eye (primary intraocular lymphoma) is discussed in [Treating Eye Cancer](#).

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.

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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Treating T-Cell Non-Hodgkin Lymphomas

Non-Hodgkin lymphoma (NHL) is generally divided into main 2 types, based on whether it starts in B lymphocytes (B cells) or T lymphocytes (T cells). There are many different types of T-cell lymphomas, and treatment can vary based on [which type you have](#).

Precursor T-lymphoblastic lymphoma/leukemia

This disease can occur in both children and adults, and it can be considered either a lymphoma or a type of [acute lymphoblastic leukemia \(ALL\)](#), depending on how much of the bone marrow is involved. (Leukemias have more bone marrow involvement.)

Regardless of whether it's labeled as a lymphoma or a leukemia, this is a fast-growing disease that's treated with intensive chemo, when possible.

Combinations of many drugs are used. These can include cyclophosphamide, doxorubicin (Adriamycin), vincristine, L-asparaginase, methotrexate, prednisone, and, sometimes, cytarabine (ara-C). Because of the risk of spread to the brain and spinal cord, a chemo drug such as methotrexate is also given into the spinal fluid. Some doctors suggest maintenance chemo for up to 2 years after the initial treatment to reduce the risk of recurrence. High-dose chemo followed by a stem cell transplant may be another option.

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.

For more details on treatment, see [Treating Acute Lymphocytic Leukemia \(Adults\)](#) and [Treating Childhood Leukemia](#).

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 once it has spread to the bone marrow.

Peripheral T-cell lymphomas

Cutaneous T-cell lymphomas (mycosis fungoides, Sezary syndrome, and others)

Treatment of these skin lymphomas is discussed in [Treating Lymphoma of the Skin](#).

Adult T-cell leukemia/lymphoma

This lymphoma is linked to infection with the HTLV-1 virus. There are 4 subtypes, and treatment depends on which subtype you have.

- The **smoldering and chronic subtypes** grow slowly. Like other slow-growing lymphomas (such as follicular lymphoma and small lymphocytic lymphoma), these subtypes are often watched without treatment 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. Another option is chemo, using the CHOP regimen (cyclophosphamide, doxorubicin, vincristine, and prednisone) or other combinations.
- The **acute subtype** also can be treated with either anti-viral drugs or chemo (typically the CHOP regimen). 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. It can also involve 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.

Because there is no clear standard treatment for this disease, patients might want to consider enrolling in a [clinical trial](#), if one is available.

Angioimmunoblastic T-cell lymphoma

This fast-growing lymphoma might be treated first with steroids (such as prednisone or dexamethasone) alone, especially in older patients who might have trouble tolerating chemo. This treatment can reduce fever and weight loss, but the effect is often temporary. If chemo is needed, combinations such as CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) may be used. If the lymphoma is only in one area, radiation therapy may be an option.

Standard doses of chemo rarely produce long-term remissions, so a stem cell transplant is often suggested after initial chemotherapy if a person can tolerate it.

Extranodal natural killer/T-cell lymphoma, nasal type

This rare lymphoma is often confined to the nasal passages. Patients with stage I or II disease who are not fit for chemotherapy may be treated with radiation therapy alone. Most other patients are treated with chemoradiation (chemo and radiation given together) or chemo followed by radiation. Several different chemo combinations can be used.

If the lymphoma doesn't go away completely, a stem cell transplant may be done if possible.

Enteropathy-associated T-cell lymphoma

This lymphoma generally develops in the small intestine or colon. Intensive chemo using several drugs is usually the main treatment. Often CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) is the chemo used. If the lymphoma is only in one area, radiation therapy may be used as well. But if these treatments work, a hole (perforation) can 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 and is treated with chemo regimens such as CHOP (cyclophosphamide, doxorubicin, vincristine, prednisone) or CHOEP (cyclophosphamide, doxorubicin, vincristine, etoposide, and prednisone). Doctors might recommend radiation therapy as well for some patients.

This lymphoma often responds well to treatment, and long-term survival is common, especially if the lymphoma cells have too much of the ALK protein. If the cells lack the ALK protein or if the lymphoma returns after initial treatment, a stem cell transplant may be an option. Another option for lymphomas that no longer respond to initial treatment is the monoclonal antibody brentuximab vedotin (Adcetris).

For anaplastic large cell lymphoma associated with a breast implant, experts typically

recommend removing the implant and the capsule surrounding it (that contains the lymphoma). Additional treatment might include chemo, sometimes with radiation.

Peripheral T-cell lymphoma, unspecified

These lymphomas are generally treated the same way as diffuse large B-cell lymphoma (DLBCL). Chemo with CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone) or other drug combinations is used. For early-stage disease, radiation therapy may be added. Stem cell transplants may be recommended when possible.

If other treatments are no longer working, newer chemo drugs such as pralatrexate (Folotyn), targeted drugs such as bortezomib (Velcade), belinostat (Beleodaq), or romidepsin (Istodax), or immunotherapy drugs such as alemtuzumab (Campath) and denileukin diftitox (Ontak) may be tried.

The outlook for these lymphomas is usually not as good as in DLBCL, so taking part in a [clinical trial](#) of newer treatments is often a good option.

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.

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Rizvi MA, Evens AM, Tallman MS, et al. T-cell non-Hodgkin lymphoma. *Blood*. 2006;107:1255-1264.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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Treating HIV-Associated Lymphoma

People with [HIV infections](#) 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, 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 patients to better tolerate treatments such as chemo and immunotherapy.

A major problem in the past was that patients with HIV infection tended to have low blood cell counts to begin with, which made it hard to treat them with full doses of chemo. This problem has been relieved somewhat by the use of HAART and by the use of drugs to help the patient's body make new blood cells. Still, doctors give chemo cautiously and monitor blood counts closely. HIV can lower the number of white blood cells known as CD4-positive cells. People with low CD4 counts can have more problems when treated with rituximab, so some experts don't use this drug for patients who have low CD4 counts.

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 patients with AIDS, so the outlook for patients who develop lymphoma has improved.

The treatment of the lymphoma itself depends on the specific type of lymphoma.

- [References](#)

Freedman AS, Jacobson CA, Mauch P, Aster JC. Chapter 103: Non-Hodgkin's lymphoma. In: DeVita VT, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's Cancer: Principles and Practice of Oncology*. 10th ed. Philadelphia, Pa:

Lippincott Williams & Wilkins; 2015.

National Cancer Institute. Physician Data Query (PDQ). Adult Non-Hodgkin Lymphoma Treatment. 2016. Accessed at www.cancer.gov/types/lymphoma/hp/adult-nhl-treatment-pdq on May 15, 2016.

National Comprehensive Cancer Network (NCCN). Practice Guidelines in Oncology: Non-Hodgkin's Lymphomas. Version 3.2016. Accessed at www.nccn.org/professionals/physician_gls/pdf/nhl.pdf on May 11, 2016.

Roschewski MJ, Wilson WH. Chapter 106: Non-Hodgkin Lymphoma. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 5th ed. Philadelphia, Pa: Elsevier; 2014.

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