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# Treating Non-Hodgkin Lymphoma in Children

If your child has been diagnosed with non-Hodgkin lymphoma (NHL), your child's treatment team will discuss the 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?

The types of treatment used for NHL can include:

- [Chemotherapy for Non-Hodgkin Lymphoma in Children](#)
- [Drugs Other Than Chemo for Non-Hodgkin Lymphoma in Children](#)
- [High-Dose Chemotherapy and Stem Cell Transplant for Non-Hodgkin Lymphoma in Children](#)
- [Radiation Therapy for Non-Hodgkin Lymphoma in Children](#)
- [Surgery for Non-Hodgkin Lymphoma in Children](#)

## Common treatment approaches

Chemotherapy (sometimes along with other drugs) is the main treatment for all children with NHL, because it can reach all parts of the body and kill lymphoma cells wherever they may be. Even if the lymphoma appears to be limited to a single swollen lymph node, NHL in a child has often spread by the time it is diagnosed. Lymphoma cells are probably in other organs, but these are too small to be felt by the doctor or seen on imaging tests.

Sometimes high-dose chemotherapy followed by a stem cell transplant might be needed if the lymphoma comes back after treatment.

- [Treatment of Non-Hodgkin Lymphoma in Children, by Type and Stage](#)

## Who treats non-Hodgkin lymphoma in children?

Children and teens with NHL and their families have special needs. These needs can be met best by cancer centers for children and teens, working closely with the child's primary care doctor. Being treated in these centers gives you the advantage of having teams of specialists who know the differences between cancers in adults and those in children and teens, as well as the unique needs of younger people with cancer.

For childhood lymphomas, this team is typically led by a pediatric oncologist, a doctor who uses chemotherapy and other medicines to treat children's cancers. Many other specialists may be involved in your child's care as well, including other doctors, physician assistants (PAs), nurse practitioners (NPs), nurses, psychologists, social workers, rehabilitation specialists, and other health professionals.

- [How to Find the Best Cancer Treatment for Your Child<sup>1</sup>](#)
- [Navigating the Health Care System When Your Child Has Cancer<sup>2</sup>](#)

## Making treatment decisions

Once lymphoma has been diagnosed and tests have been done to determine its stage, your child's cancer care team will discuss treatment options with you. The most important factors in choosing a treatment include the type and stage of the lymphoma, although other factors, such as where the lymphoma is in the body, can also play a role.

Intensive treatment for childhood lymphoma is often very effective, but it can possibly cause serious side effects. It's important to discuss all of your options as well as their possible side effects with your child's doctors so you can make an informed decision.

If time allows, getting a second opinion from another doctor experienced with your child's type of cancer is often a good idea. This can give you more information and help you feel more confident about the treatment plan you choose. If you aren't sure where to go for a second opinion, ask your doctor for help.

- [What Should You Ask Your Child's Doctor About Non-Hodgkin Lymphoma?<sup>3</sup>](#)
- [How to Talk to Your Child's Cancer Care Team<sup>4</sup>](#)
- [Seeking a Second Opinion<sup>5</sup>](#)

## Thinking about taking part in a clinical trial

Today, most children and teens with cancer are treated at specialized children's cancer centers. These centers offer the most up-to-date treatment by conducting clinical trials (studies of promising new therapies). Children's cancer centers often conduct many clinical trials at any one time, and in fact most children treated at these centers take part in a clinical trial as part of their treatment.

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 (although there is no guarantee that newer treatments will be better). They are also the best way for doctors to learn better methods to treat these cancers. Still, they might not be right for everyone.

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

- [Clinical Trials](#)<sup>6</sup>

### **Considering complementary and alternative methods**

You may hear about alternative or complementary methods that your doctor hasn't mentioned to treat your child's tumor 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* standard medical treatment. Although some of these methods might be helpful in relieving symptoms or helping people feel better, many have not been proven to work. Some might even be harmful.

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

- [Complementary and Alternative Medicine](#)<sup>7</sup>

### **Preparing for treatment**

Before treatment, the doctors and other members of the team will help you, as a parent, understand the tests that will need to be done. The team's social worker will also counsel you about the problems you and your child might have during and after treatments such as surgery, and might be able to help you find housing and financial aid if needed.

- [When Your Child Has Cancer](#)<sup>8</sup>

### Help getting through cancer treatment

Your child's 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 also be an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help. For children and teens with cancer and their families, other specialists can be an important part of care as well.

The American Cancer Society also has programs and services – including rides to treatment, lodging, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists.

- [Finding Help and Support When Your Child Has Cancer](#)<sup>9</sup>
- [Find Support Programs and Services in Your Area](#)<sup>10</sup>

*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.*

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## Chemotherapy for Non-Hodgkin Lymphoma in Children

Chemotherapy (chemo) is the main treatment for non-Hodgkin lymphoma (NHL) in children. Chemo uses anti-cancer drugs that are usually given into a vein (IV) or taken by mouth. These drugs enter the bloodstream and reach all areas of the body, making this treatment very useful for cancers that tend to spread widely, such as NHL in children. If the lymphoma may have reached the brain or spinal cord, chemo may also be given into the cerebrospinal fluid (known as *intrathecal* chemo).

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

Children with NHL get a combination of several chemo drugs over a period of time. The number of drugs, their doses, and the length of treatment depend on the [type](#)<sup>1</sup> and [stage](#)<sup>2</sup> of the lymphoma. Some of the chemo drugs commonly used to treat childhood lymphoma include:

- Cyclophosphamide (Cytosan)
- Vincristine (Oncovin)
- Doxorubicin (Adriamycin)
- Prednisone
- Dexamethasone
- Cytarabine, also known as ara-C (Cytosar)
- Methotrexate
- L-asparaginase (Elspar), PEG-L-asparaginase (pegaspargase, Oncaspar)
- Etoposide (VePesid, others)
- 6-mercaptopurine (Purinethol)
- Ifosfamide (Ifex)

Doctors give chemo in cycles, in which a period of treatment is followed by a rest period to allow the body time to recover. Each chemo cycle generally lasts for several weeks.

Most chemo treatments are given in an outpatient setting (in the doctor's office or clinic or hospital outpatient department), but some – especially at the start of treatment – may need to be given while the child stays in the hospital.

## Possible risks and 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
- Increased chance of infections (due to low white blood cell counts)
- Easy bruising or bleeding (due to low blood platelet counts)

- Fatigue (due to low red blood cell counts)

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 help prevent or reduce **nausea and vomiting**.
- **Infections** can be very serious in people getting chemo. Drugs known as growth factors can be given to keep the blood cell counts higher.
- **Tumor lysis syndrome** is a possible side effect of chemo in children who have large numbers of lymphoma cells in the body before treatment. It occurs most often with the first cycle of chemo. 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. Excess amounts of certain minerals may also lead to heart and nervous system problems. This can be prevented by making sure the child gets lots of fluids during treatment and by giving drugs such as bicarbonate, allopurinol, and rasburicase, which help the body get rid of these substances.

Some possible side effects occur only with certain drugs. For example, drugs such as doxorubicin can damage the heart. Your child's doctor may order heart function tests (like a MUGA scan or echocardiogram) if your child is getting one of these drugs.

Be sure to ask your child's doctor or nurse about any specific side effects you should watch for and about what you can do about them.

Along with the side effects listed above, there are possible long-term effects of chemo in children, such as possible effects on fertility later in life. These are described in [Late and Long-term Effects of Treatment for Non-Hodgkin Lymphoma in Children](#)<sup>3</sup>.

## 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/childhood-non-hodgkin-lymphoma/about/types-non-hodgkin-children.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/about/types-non-hodgkin-children.html)
2. [www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html)
3. [www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/after-treatment/long-term-effects.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/after-treatment/long-term-effects.html)
4. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html)
5. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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# Drugs Other Than Chemo for Non-Hodgkin Lymphoma in Children

In recent years, new drugs that target specific parts of cancer cells have been developed. These drugs work differently from standard [chemotherapy](#) (chemo) drugs. They sometimes work when chemo drugs don't, and they often have different side effects. Some of these drugs might be useful in certain cases of childhood non-Hodgkin lymphoma (NHL).

## Monoclonal antibodies

Antibodies are proteins normally made by the body's immune system to help fight infections. Man-made versions, called *monoclonal antibodies*, can be designed to attack a specific target, such as a protein on the surface of lymphoma cells.

Several monoclonal antibodies are now being used to treat lymphoma in adults. Some of these are now being studied or used in children as well.

**Rituximab (Rituxan):** This antibody attaches to a protein called CD20 on the surface of some types of lymphoma cells, which seems to cause the cells to die. Rituximab is being studied for use along with chemotherapy. The treatments are typically given as intravenous (IV) infusions in the doctor's office or clinic.

Common [side effects](#)<sup>1</sup> are usually mild but can include chills, fever, nausea, rashes, fatigue, and headaches during or after the infusion. Even if these symptoms occur with the first rituximab infusion, it is unusual for them to happen with later doses. Rituximab can also increase a person's risk of some types of infections.

**Brentuximab vedotin (Adcetris):** This is an anti-CD30 antibody attached to a chemotherapy drug. Some lymphoma cells have the CD30 protein on their surface. The antibody acts like a homing signal, bringing the chemo drug to the lymphoma cells, where it enters the cells and kills them when they try to divide into new cells.

Brentuximab can be used to treat anaplastic large cell lymphoma (ALCL) that has come back after other treatments. So far it has been used mainly in adults, but it's now being studied in children as well. It is given as an infusion into a vein (IV) every 3 weeks.

Common side effects include nerve damage (neuropathy), low blood counts, fatigue, fever, nausea and vomiting, infections, diarrhea, and cough.



## Other new drugs

Other drugs that target parts of lymphoma cells are now being studied for use in children as well.

For example, the *anaplastic lymphoma kinase (ALK)* gene is often abnormal in ALCL. Newer drugs called **ALK inhibitors**, such as crizotinib (Xalkori), target cells with an abnormal *ALK* gene. In early studies, these drugs have shown very promising results in children with ALCL that is no longer responding to other treatments. Doctors are now studying the use of these drugs along with chemotherapy or other drugs in treating ALCL.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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

High-dose chemotherapy and stem cell transplant is not used as the first treatment for non-Hodgkin lymphoma (NHL) in children, but a transplant may be an option if the first treatment does not work or if the lymphoma comes back after treatment.

The doses of chemotherapy (chemo) drugs normally are 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.

A stem cell transplant (also known as a bone marrow transplant) lets doctors give higher doses of [chemotherapy](#) (sometimes along with [radiation therapy](#)). This is because after getting high-dose chemo treatment, the child gets a transplant of blood-forming stem cells to restore the bone marrow. The blood-forming stem cells used for a transplant can come either from the blood or from the bone marrow.

## Types of transplants

There are 2 main types of stem cell transplants (SCTs), based on the source of the stem cells.

- In an **autologous stem cell transplant**, the child's own stem cells are used. They are collected several times in the weeks before treatment. The cells are frozen and stored while the child gets treatment (high-dose chemo and/or radiation), and then are given back into the child'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 another donor or even umbilical cord blood. The donor's tissue type (also known as the HLA type) needs to match the child'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 in children. Still, using the child's own stem cells may not be an option if the lymphoma

has spread to the bone marrow. If that occurs, it may be hard to get a stem cell sample that is free of lymphoma cells.

The use of allogeneic transplants is limited in treating lymphoma because they can have severe side effects that make them hard to tolerate. It can also be hard to find a matched donor.

A stem cell transplant is a complex treatment that can cause serious, possibly even life-threatening side effects. If your child's doctors think he or she might benefit from a transplant, it should be done at a center where the staff has experience with the procedure and with managing the recovery phase.

If your child's cancer care team suggests a stem cell transplant, be sure to talk to them beforehand to learn about possible long-term effects your child may have. More information on possible long-term effects can be found in [Late and Long-term Effects of Treatment for Non-Hodgkin Lymphoma in Children](#)<sup>1</sup>.

To learn more about stem cell transplants, including how they are done and their potential side effects, see [Stem Cell Transplant for Cancer](#)<sup>2</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/after-treatment/long-term-effects.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/after-treatment/long-term-effects.html)
2. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/stem-cell-transplant.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/stem-cell-transplant.html)

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## Radiation Therapy for Non-Hodgkin Lymphoma in Children

Radiation therapy uses high-energy rays to kill cancer cells. This was once a very common treatment for children with non-Hodgkin lymphoma (NHL). But as doctors have developed more effective [chemotherapy](#) treatments, radiation therapy has been used less.

### How is radiation therapy given?

Radiation focused on a cancer from a source outside the body is called *external beam radiation*. This is the type of radiation therapy most often used to treat NHL.

Before treatment starts, the radiation team takes careful measurements to determine the correct angles for aiming the radiation beams and the proper dose of radiation. This planning session, called *simulation*, often includes getting [imaging tests](#)<sup>1</sup> such as CT or MRI scans.

The treatment itself is much like getting an x-ray, but the radiation is stronger. It is painless, but some younger children might still need to be sedated to help make sure they don't move during the treatment. Each treatment lasts only a few minutes, although the setup time – getting your child into place for treatment – usually takes longer. The number of treatments will depend on the reason they're being given.

## When would radiation therapy be used?

There are a few instances in which radiation therapy may be used.

- Sometimes it is used along with chemotherapy. This might be done if the lymphoma has reached the brain or spinal cord.
- It may be used as a form of urgent treatment in children with symptoms caused by large tumors in the chest.
- It may be used as part of treatment for children who are getting [high-dose chemotherapy and a stem cell transplant](#).
- It can be used to relieve symptoms from lymphoma, such as pain from a tumor that's pressing on nerves.

## Possible risks and side effects

**Short-term side effects** of radiation therapy depend on where it is aimed. For example:

- It may cause sunburn-like skin problems or hair loss in the area being treated.
- Radiation therapy that includes large parts of the body can cause fatigue.
- Radiation to the abdomen (belly) can sometimes cause nausea, vomiting, or diarrhea.

Often these effects go away after a short while.

Possible **long-term side effects** of radiation therapy in children can be more serious, and may occur after many years.

- **Radiation therapy to the chest** may damage the lungs or heart, which could raise the risk of lung or heart problems later in life. In the long term, radiation to the chest may also increase the risk of lung cancer (especially in smokers) and of breast cancer.
- **Radiation therapy to the brain** might cause headaches and problems such as memory loss, personality changes, and trouble learning at school.
- **Radiation to other parts of the body** may slow a child's growth or increase the risks for certain other cancers, such as those of muscle or bone (called sarcomas) or of the digestive tract.

Because of these possible long-term effects, doctors try to avoid using radiation therapy in children or limit the doses used whenever possible. For more on possible long-term effects, see [Late and Long-term Effects of Treatment for Non-Hodgkin Lymphoma in Children](#)<sup>2</sup>.

## More information about radiation therapy

To learn more about how radiation is used to treat cancer, see [Radiation Therapy](#)<sup>3</sup>.

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

## Hyperlinks

1. [www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html](http://www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html)
2. [www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/after-treatment/long-term-effects.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/after-treatment/long-term-effects.html)
3. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html)
4. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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## Surgery for Non-Hodgkin Lymphoma in Children

Surgery usually does not have much of a role in treating non-Hodgkin lymphoma (NHL) since it's unlikely to cure it by itself, and normal organs might be damaged in the process.

### When would surgery be used?

Surgery is sometimes used as the first treatment for early-stage Burkitt lymphoma that is in only one area (such as part of the intestine) to try to remove as much of the tumor as possible before [chemotherapy](#) (chemo). If the lymphoma can be removed completely, doctors might be able to give a less intensive chemo regimen.

Other uses of surgery include:

- To get [biopsy](#)<sup>1</sup> samples for lab tests to determine the exact [type of NHL](#)<sup>2</sup> a child has, if non-surgical procedures (needle biopsy, bone marrow biopsy, etc.) could not get enough tissue.
- To insert a small plastic tube, called a [central venous catheter](#)<sup>3</sup> or *venous access device* (VAD), into a large blood vessel near the heart. The end of the tube stays just under the skin or sticks out in the chest area or upper arm. This is left in place during treatment to give intravenous (IV) drugs such as chemo and to take blood samples. This lowers the number of needle sticks needed during treatment.
- To relieve some emergency situations, such as if a lymphoma has blocked a child's intestines.

## Possible risks and side effects

Possible complications of surgery depend on the location and extent of the operation and the child's health beforehand. Serious complications, although rare, can include problems with anesthesia, bleeding, blood clots, wound infections, and pneumonia. Most children will have some pain for a while after the operation, although this can usually be helped with medicines if needed.

## More information about Surgery

For more general information about surgery as a treatment for cancer, see [Cancer Surgery](#)<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/childhood-non-hodgkin-lymphoma/detection-diagnosis-staging/how-diagnosed.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/detection-diagnosis-staging/how-diagnosed.html)
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5. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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## Treatment of Non-Hodgkin Lymphoma in Children, by Type and Stage

In general, all children with non-Hodgkin lymphoma (NHL) are treated with [chemotherapy](#) (chemo), but the exact treatment differs depending on the [type](#)<sup>1</sup> and [stage](#)<sup>2</sup> of the lymphoma. The treatment for NHL is intense and might cause serious side effects, so it's very important that it is given in a [children's cancer center](#)<sup>3</sup>, especially when it is first started.

Lymphomas in children (especially Burkitt lymphomas) tend to grow very quickly and may already be quite large by the time they're diagnosed, so it's important to start treatment as soon as possible. These lymphomas usually respond well to chemo, which can kill large numbers of lymphoma cells in a short period of time. A concern is that this can cause **tumor lysis syndrome**, a side effect in which the contents of the dead cells enter the blood and can cause problems with the kidneys and other organs. Doctors try to prevent this by making sure the child gets lots of fluids before and during treatment, and by giving certain drugs to help the body get rid of these substances.

Even children with early-stage (stage I or II) lymphomas are assumed to have more widespread disease than can be detected with exams or imaging tests. Because of this, local treatments such as [surgery](#) or [radiation therapy](#) alone are very unlikely to cure

them. Therefore, chemotherapy is an important part of treatment for all children with NHL.

## Treatment of lymphoblastic lymphoma (LBL)

**Stages I and II:** In general, treatment for early-stage LBL is similar to the treatment of [acute lymphoblastic leukemia \(ALL\)](#)<sup>4</sup>. Chemotherapy is given in 3 phases (induction, consolidation, and maintenance) using many chemo drugs. For example, the BFM regimen uses combinations of many different drugs for the first several months, followed by less intense treatment with methotrexate and 6-mercaptopurine in pill form for a total of about 2 years. Shorter and less intensive treatments, such as the chemotherapy combinations called CHOP (cyclophosphamide, doxorubicin, vincristine and prednisone) and COMP (cyclophosphamide, vincristine, methotrexate, and prednisone) have also been used.

Chemotherapy, usually with methotrexate, is also given into the spinal fluid (known as **intrathecal** chemo) for at least 4 doses, each separated by a week. This helps kill any lymphoma cells in the brain or spinal cord.

The total length of treatment may be as long as 2 years.

**Stages III and IV:** The treatment for children with advanced LBL is similar to that for earlier stage LBL, although it might be more intensive. It is given as 3 phases of chemotherapy (induction, consolidation, and maintenance) using many drugs, and it lasts for about 2 years. This is very similar to the treatment of high-risk acute lymphoblastic leukemia (ALL). For more information, see [Treating Childhood Leukemia](#)<sup>5</sup>.

Intrathecal chemo is also given into the spinal fluid to kill any lymphoma cells that may have reached the brain or spinal cord. In some cases, radiation therapy may be given to the brain and spinal cord as well.

## Treatment of Burkitt lymphoma/Burkitt-like lymphoma and diffuse large B-cell lymphoma (DLBCL)

[Chemotherapy](#) (chemo) is the main form of treatment for these lymphomas. Studies are now being done to determine whether adding a [monoclonal antibody](#) such as rituximab to chemotherapy will make treatment more effective.

**Stages I and II:** While chemo is the main treatment of these lymphomas, [surgery](#) may be done before chemo if the tumor is in only one area, such as a large abdominal (belly)

tumor.

Several different chemo drugs are used. The length of treatment ranges from about 9 weeks to 6 months. Most pediatric oncologists feel that the 9-week treatment is adequate if all of the tumor is removed with surgery first.

Chemotherapy into the spinal fluid is needed only if the lymphoma is growing around the head or neck.

**Stages III and IV:** Children with more advanced lymphomas need more intensive chemotherapy. Because these lymphomas tend to grow quickly, the chemo cycles are short, with little rest between courses of treatment.

For example, a treatment plan known as the French LMB protocol regimen alternates between different combinations of drugs every 3 to 4 weeks for a total of about 6 to 8 months. Other similar treatment regimens are the German BFM protocol and the St. Jude Total B regimen.

Chemotherapy must also be given into the spinal fluid.

## Treatment of anaplastic large cell lymphoma (ALCL)

[Chemotherapy](#) is the main form of treatment for these lymphomas. Studies are being done to determine whether adding [other drugs](#) to chemotherapy might make treatment more effective.

**Stages I and II:** Treatment for these lymphomas usually consists of chemotherapy with 4 or more drugs given for about 3 to 6 months. The usual chemotherapy regimen contains a 4-drug combination of cyclophosphamide, vincristine, prednisone, and either doxorubicin or methotrexate. (These are known as the CHOP or COMP regimens.)

Chemotherapy is given into the spinal fluid only if the lymphoma is near the head or neck.

**Stages III and IV:** ALCL doesn't often reach the bone marrow or spinal fluid, but if it does, it requires more intensive treatment. Chemotherapy includes several drugs given over 9 to 12 months.

Intrathecal chemotherapy is given into the spinal fluid as well.

Current [clinical trials](#)<sup>6</sup> are focusing on the length of chemotherapy and which drugs are

important in treating ALCL. [Newer drugs](#), such as brentuximab vedotin (Adcetris) and crizotinib (Xalkori), are now being studied.

## Treatment of recurrent lymphoma

Generally, if the lymphoma comes back (recurs) after the first therapy, it is much harder to treat. When possible, more intensive chemotherapy, usually including a [stem cell transplant](#), is recommended. This is often done as part of a [clinical trial](#)<sup>7</sup>. Clinical trials of newer forms of treatment may also be an option.

## More treatment information about non-Hodgkin lymphoma in children

For more details on treatment options – including some that may not be addressed here – the National Cancer Institute (NCI) and the Children’s Oncology Group (COG) are good sources of information.

The NCI provides information by phone (1-800-4-CANCER) and on its website ([www.cancer.gov](http://www.cancer.gov)<sup>8</sup>). Detailed information intended for use by cancer care professionals is also available at [www.cancer.gov](http://www.cancer.gov)<sup>9</sup>.

The COG is the world’s largest organization devoted to childhood cancer research. The COG website, [www.childrensoncologygroup.org](http://www.childrensoncologygroup.org)<sup>10</sup>, provides information to help support children and their families from diagnosis, through treatment, and beyond.

## Hyperlinks

1. [www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/about/types-non-hodgkin-children.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/about/types-non-hodgkin-children.html)
2. [www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html](http://www.cancer.org/cancer/childhood-non-hodgkin-lymphoma/detection-diagnosis-staging/staging.html)
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5. [www.cancer.org/cancer/leukemia-in-children/treating.html](http://www.cancer.org/cancer/leukemia-in-children/treating.html)
6. [www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html](http://www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html)
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8. <http://www.cancer.gov>
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