



**The Leukemia &
Lymphoma Society**[®]

Fighting Blood Cancers

Acute Lymphocytic Leukemia: A Guide for Patients and Families

LEUKEMIA

LYMPHOMA

MYELOMA



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About 3,970 Americans will be diagnosed with acute lymphocytic leukemia (**ALL**) this year.

People can get **ALL** at any age. It is the most common type of leukemia in children under age 15. The risk of getting **ALL** also increases in people ages 45 and older.

The risk of anyone getting **ALL** is small. Most children with **ALL** are cured after treatment.

This booklet is for patients with ALL and their families. It will help patients and families learn about **ALL** and how it is treated.

1 **Questions? Contact an Information Specialist at The Leukemia & Lymphoma Society at www.LLS.org or 800-955-4572.**

Part 1 answers the questions:

- What is **ALL**?
- Who gets **ALL**?
- How does the doctor find **ALL**?

Part 2 answers the questions:

- What is the treatment for **ALL**?
- What are the side effects of treatment?
- How do I get more information?

Some words in the booklet may be new to you. Check **Medical Terms** at the back of this booklet. Or call **The Leukemia & Lymphoma Society** at **1-800-955-4572**.

For more information on **ALL** order The Leukemia & Lymphoma Society's free booklet, *Acute Lymphocytic Leukemia*. The booklet gives more details on the disease and its treatment.

This booklet about ALL is from The Leukemia & Lymphoma Society. It is for information only. The Society does not give medical advice or medical services.

To order free booklets, contact **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

Part 1 – Understanding Acute Lymphocytic Leukemia

Acute lymphocytic leukemia (ALL) is a type of blood cancer.

Other names for **ALL** are **acute lymphoblastic leukemia** and **acute lymphoid leukemia**.

ALL starts with a change to a single cell in the bone marrow. Marrow is the spongy center inside the bones.

Doctors do not know what causes a healthy cell to change to an **ALL** cell.



3 **Questions? Contact an Information Specialist at The Leukemia & Lymphoma Society at www.LLS.org or 800-955-4572.**

A person with **ALL** may have:

- Aches in arms, legs, back
- Black-and-blue marks for no apparent reason
- Enlarged lymph nodes
- Fever without obvious cause
- Headaches
- Pale-looking skin
- Pinhead-size red spots under the skin
- Prolonged bleeding from minor cuts
- Shortness of breath during physical activity
- Tiredness
- Vomiting

These signs and symptoms for **ALL** are common to many illnesses.

Blood and **bone marrow** tests are done to look for leukemia cells.

A **bone marrow aspirate** and a **bone marrow biopsy** are two of the tests that are done. An aspirate is done to take a close look at the cells in the marrow. It shows what types of cells are in the marrow and what abnormalities the cells may have. The biopsy gives information about how much disease is in the marrow.

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A **bone marrow aspirate** is done by removing a sample of cells from the marrow with a special needle. First, medication is given to numb the part of the body that will be used for the sample. The sample is usually taken from the patient's hip bone. The marrow cells are looked at under a microscope.

The bone marrow aspirate is done to look for abnormal cells such as **leukemic blast cells**. It can also be used for **cytogenetic analysis, immunophenotyping** and other tests.

Cytogenetic analysis is a lab test to examine the **chromosomes** of the leukemic blast cells.

Each cell in the body has **chromosomes** that carry genes. Genes give the instructions that tell each cell what to do.

Immunophenotyping is used to find out if the patient's leukemia cells are B cells or T cells. Most people with **ALL** have the B-cell type. Most cases of the B-cell type are called precursor B-cell type.

5 **Questions?** Contact an **Information Specialist** at **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

A **bone marrow biopsy** is done by removing a very small amount of bone filled with marrow cells. This is done with a special needle. First, medication is given to numb the part of the body that will be used for the biopsy – this is usually the patient’s hip bone. The bone marrow sample is looked at under a microscope.

The bone marrow biopsy shows how much disease is in the bone marrow.

Bone marrow aspirate and biopsy may be done in the doctor’s office or in a hospital. The two tests are almost always done together. Both tests are also done to see if treatment is destroying leukemic blast cells.



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About Marrow, Blood and Blood Cells

Marrow is the spongy center inside of bones.

Blood cells are made in the marrow. Blood cells begin as stem cells. Stem cells become red cells, white cells and platelets in the marrow. Then the **red cells, white cells** and **platelets** enter the blood.

The blood is also made up of plasma. Plasma is mostly water. It also has some vitamins, minerals, proteins, hormones and other natural chemicals.

Platelets prevent bleeding and form plugs that help stop bleeding after an injury.

Red cells carry oxygen around the body. When the number of red cells is below normal it is called **anemia**. Anemia can make you tired, pale or short of breath.

White cells fight infection in the body. **Lymphocytes** are one type of white cell. Lymphocytes can be B lymphocytes, T lymphocytes or natural killer cells. All of these cell types help fight infection.

For more information about blood tests order the Society's free fact sheet, *Understanding Blood Counts*.

7 **Questions?** Contact an **Information Specialist** at **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

The doctor uses information from these tests to decide:

- The type of drug therapy a patient needs
- How long treatment will last.

To decide the best treatment for the patient, the doctor may also consider:

- The patient's age
- The number of **ALL** cells in the blood
- If the **ALL** has spread to the covering of the brain or spinal cord
- If there are certain chromosomal changes.



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Part 2 – Treatment

The goal of treatment for ALL is to cure the disease.

Children with **ALL** are likely to be cured of their disease. The number of adult patients who have remissions has increased. The length of remissions in adults has improved.

There are two parts of treatment for **ALL**, called **induction therapy** and **post-induction therapy**. Post-induction therapy is explained beginning on page 15.

Induction Therapy

Induction therapy is the term for the start of treatment with chemotherapy. During this time the patient may be given several drugs in combination.

The aim of induction therapy is to:

- Kill as many **ALL** cells as possible
- Get blood counts back to normal
- And to get rid of all signs of the disease for an extended period of time

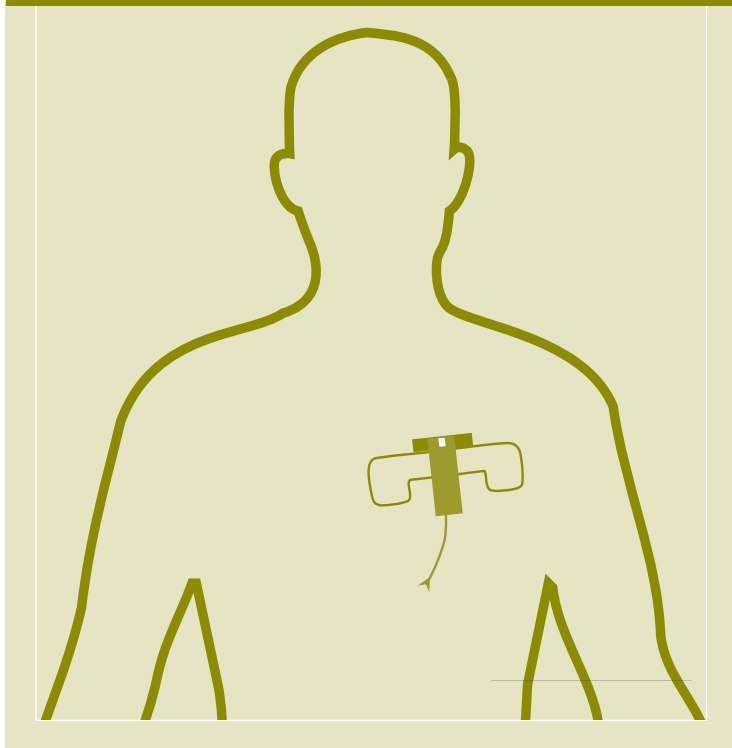
This is called a **remission**.

Patients with **ALL** need to start chemotherapy right away.

9 **Questions?** Contact an **Information Specialist** at **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

Chemotherapy is treatment with drugs that kill or damage cancer cells. Some drugs are given by mouth. Other drugs are given by placing a **catheter** in a vein – usually in the patient’s upper chest. Two or more drugs may be used together. Most patients are treated with more than one drug.

Ports and Central Lines



The catheter is sometimes called a central line, an indwelling catheter, a port, or a Port-a-cath®. The port or central line is used to give the patient chemotherapy and to remove blood samples.

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Some Drugs Used to Treat ALL

Many different drugs are used to kill leukemic cells.

Each drug type works in a different way to kill the cells.

Combining drug types can strengthen the effects of the drugs.

New drug combinations are being studied. Here are some drugs that may be used.

Antimetabolites

- clofarabine (Clolar®)
- cytarabine (cytosine arabinoside, Ara-C, Cytosar-U®)
- 6-mercaptopurine (Purithenol®)
- methotrexate
- 6-thioguanine (Thioguanine®)

Anti-tumor Antibiotics

- daunorubicin (daunomycin, rubidomycin, Cerubidine®)
- doxorubicin (Adriamycin®, Rubex®)
- mitoxantrone (Novantrone®)
- idarubicin (Idamycin®)

DNA Repair Enzyme Inhibitors

- etoposide (VP-16, VePesid®)
- teniposide (VM-26, Vumon®)

DNA Synthesis Inhibitor

- carboplatin (Paraplatin®)

DNA-damaging Agent

- cyclophosphamide (Cytosan®)

Drug That Prevents Cells from Dividing

- vincristine (Oncovin®)

Enzymes That Prevent Cells from Surviving

- L-asparaginase (Elspar®)
- PEG-L asparaginase (pegaspargase, Oncaspar®)

Molecularly Targeted Therapy

- Imatinib mesylate (Gleevec®)

Synthetic Hormones

- prednisone
- prednisolone
- dexamethasone

Information about **Side Effects** begins on page 19.

Patients with **ALL** often have leukemic cells in the lining of the spinal cord and brain. The procedure used to check the spinal fluid for leukemic cells is called a **spinal tap**. The cells cannot always be found in an exam of the spinal fluid.

To prevent leukemia in the central nervous system (CNS leukemia), all patients who are in remission have the lining of the spinal cord and brain treated. In some cases, treatment is needed for **ALL** that has affected the lining of the spinal cord and brain (CNS leukemia) and is causing problems such as headache, nausea and vomiting, and blurred vision.



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Parts of the body that aren't easily reached with chemotherapy given by mouth or IV – such as the lining of the spinal cord and brain – are treated by injection into the spinal fluid. Drugs such as methotrexate or cytarabine are injected into the spinal fluid either to prevent or treat CNS leukemia.

When the treatment is for CNS leukemia, a spinal tap is done. Then spinal fluid is removed and chemotherapy is injected into the spinal canal. Radiation therapy may be given to the spine or brain.

Spinal taps are done from time to time to check if leukemic cells are being killed and to give more doses of chemotherapy.

Sometimes both chemotherapy and radiation therapy are used.

Many **ALL** patients build up **uric acid** in their blood from their disease. Uric acid is a chemical made in the body. The use of chemotherapy also increases the uric acid. A high level of uric acid can cause kidney stones.

Patients with high uric acid levels may be given a drug called **allopurinol** (Aloprim®, Zylloprim®) by mouth or IV. Another drug used to treat high uric acid levels is called **rasburicase** (Elitek®).

It is important to get medical care in a center where doctors are experienced in treating patients with **ALL**

Some Induction Therapy Drugs for ALL

- Daunorubicin (Cerubidine®) by IV
- Asparaginase (Elspar®), PEG-L asparaginase (Oncaspar®) by injection
- Vincristine (Oncovin®) by IV
- Dexamethasone by mouth
- Methotrexate by injection into the spinal fluid
- Cytarabine (cytosine arabinoside, Ara-C, Cytosar-U®) by injection into the spinal fluid

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Ph-Positive ALL – Induction Therapy

About 1 out of 5 adults with **ALL** and a small number of children with **ALL** have a type called Ph-positive (or Philadelphia-positive) **ALL**.

Ph-positive **ALL** may be treated with imatinib mesylate, also called Gleevec® (or other related drugs) along with other chemotherapy drugs. Gleevec® is given by mouth. Doctors are studying how well this treatment works in patients with Ph-positive **ALL**. See page 17 for information on post-induction therapy for Ph-positive **ALL**.

Post-Induction Therapy

More treatment is needed even after a patient with **ALL** is in remission. This is called **post-induction therapy**. It is given in cycles for 2 to 3 years. Post-induction therapy is given because some **ALL** cells remain that are not found by common blood or marrow tests. For most people, the post-remission therapy drugs used are not the same drugs used during induction therapy.

The doctor considers many things to decide the kind of post-induction therapy a patient needs, such as:

- The patient's response to induction therapy.
- Whether the patient has certain chromosomal abnormalities.

High-risk types of **ALL** – such as **T-cell ALL**, **infant ALL** and **adult ALL** – are usually treated with higher doses of drugs during induction and post-induction therapy. One treatment plan is to use higher doses of drugs and give them for a longer time.

Allogeneic stem cell transplant may be a good treatment for some high-risk **ALL** patients. Allogeneic stem cell transplants are explained beginning on page 17.

Some Post-Induction Therapies

- Vincristine (Oncovin®) by IV
- Prednisone or dexamethasone by mouth
- 6-mercaptopurine (Purinethol®) by mouth
- Methotrexate by mouth, IV or injection into the spinal fluid
- Cytarabine (cytosine arabinoside, Ara-C, Cytosar-U®) by IV or injection into the spinal fluid
- Asparaginase (Elspar®), PEG-L asparaginase (Oncaspar®) by injection
- Etoposide (VePesid®) or teniposide (Vumon®)
- Cyclophosphamide (Cytoxan®)
- Doxorubicin (Adriamycin®)
- 6-thioguanine (Thioguanine®)
- Hydrocortisone by injection into the spinal column
- Radiation therapy to the head

To order free booklets, contact **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

Gleevec® is the drug given to most Ph-positive **ALL** patients for induction therapy. During post-induction therapy Gleevec® is given with other drugs. Usually people with Ph-positive **ALL** stay on Gleevec® after post-induction therapy is completed.

Allogeneic Stem Cell Transplant

Allogeneic stem cell transplant is a treatment used for some patients with **ALL**.

The main purpose of doing the transplant is to give strong doses of chemotherapy or radiation therapy to kill the **ALL** cells.

This will also kill the healthy stem cells in the marrow. With an allogeneic stem cell transplant, stem cells are taken from a donor and injected into the patient's blood after chemotherapy and/or radiation ends. The donor can be a brother or a sister. Or the donor can be another person with stem cells that “match” the patient's.

The transplanted stem cells go from the patient's blood to the marrow and help start a new supply of red cells, white cells and platelets.

Allogeneic stem cell transplant is a high-risk procedure.

For this reason, it may not be a good treatment for some **ALL** patients.

Allogeneic stem cell transplant may be a choice for adult **ALL** patients if:

- They are not doing well with other treatments.
- The expected benefits of stem cell transplant exceed the risks.
- There is a donor.

Stem cell transplant is usually not considered for a child unless:

- Doctors have determined that the child's type of **ALL** is not likely to respond well to chemotherapy.
- Chemotherapy has not worked well.
- The **ALL** has returned (a relapse).



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Side Effects of Treatment for ALL

The aim of treatment for **ALL** is to kill leukemia cells.

The term **side effect** is used to describe how treatment affects healthy cells.

These are some possible side effects of treatment for ALL:

- The number of red cells may decrease (called anemia). Transfusions of red cells (blood cells that are donated and given to the patient) may be needed to increase red cells.
- Patients also may have a drop in the number of platelets. If a patient's platelet count is very low he or she may need a platelet transfusion to prevent bleeding.
- A big drop in white cells may lead to an infection. Such infections are usually treated with antibiotics, until the white cell count goes up and the infection clears up.

Fever or chills may be the only signs of infection.

Patients with an infection may also have:

- Coughing
- Sore throat
- Pain when urinating
- Frequent loose bowel movements

For adults, **growth factors** are sometimes given to increase white cells. **G-CSF** (Neupogen®) and **GM-CSF** (Leukine®) are drugs that increase the number of white cells.

Your doctor may talk about the **absolute neutrophil count** or **ANC**, which is the number of neutrophils, a type of white cell a person has to fight an infection.

To lower the risk of infection:

- The patient, the patient's visitors and medical staff need to wash their hands well.
- The patient's central line must be kept clean.
- Patients on chemotherapy should take good care of their teeth and gums.

To order free booklets, contact **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

Some other chemotherapy side effects:

- Mouth sores
- Diarrhea
- Hair loss
- Skin rashes
- Nausea
- Vomiting

Drugs can be given to **prevent** or **treat** nausea or vomiting. Not all patients have these side effects.

Chemotherapy affects the parts of the body where new cells form quickly. This includes the inside of mouth and bowel, and the skin and hair. That is why mouth sores, diarrhea, skin rashes and hair loss are common during chemotherapy.

For more information on chemotherapy and its side effects, order The Leukemia & Lymphoma Society's free booklet, *Understanding Drug Therapy and Managing Side Effects*.

Patients who have finished all of their therapy still need to go to their doctor for regular checkups. Children should be checked for treatment effects that may not take place right away, such as effects on growth or learning. Some children will need special help with schoolwork during and after treatment. Contact the Society for more information.

Most children with ALL are cured of their disease. But some children or adults with **ALL** may still have **ALL** cells in the marrow even after treatment. This is called **refractory leukemia**. Other patients have a remission of leukemia after treatment but then **ALL** cells return later – this is called a **relapse**.

In refractory leukemia, drugs that were not used to treat the patient's **ALL** in the first round of treatment may be given. Allogeneic stem cell transplantation also may be used.

For patients who relapse, the same or different drugs may be given, or allogeneic stem cell transplantation may be used.

A drug called clofarabine (Clolar®) is being used to treat some children (ages 1 to 21) with relapsed and refractory **ALL**.

For more information, order The Leukemia & Lymphoma Society's free fact sheet, *Long-Term and Late Effects of Treatment for Blood Cancers*.

To order free booklets, contact **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

Clinical Trials

Clinical trials are used to study new drugs, new treatments or new uses for approved drugs or treatments.

Call The Leukemia & Lymphoma Society's Information Resource Center at 800-955-4572 to learn how you and your doctor can find out if participating in a **clinical trial** is right for you.

These are some of the types of trials under way:

Leukemia-specific therapy, based on a patient's specific type of leukemia – such as the type of chromosome changes – is being studied.

The **ALL** cells of some patients are not as easily killed by drugs as those of other patients. This is called **drug resistance**. Scientists are trying to understand why some **ALL** cells are resistant to the effects of chemotherapy. This will help them develop better treatments.

Scientists are studying ways to boost the body's natural defenses, called **immunotherapy**. The goal is to kill or prevent the growth of **ALL** cells.

Cytokines are natural substances made by cells. They can also be made in the lab. Today, **growth factor cytokines** can be used to help restore normal blood cells during treatment. In the future, **immune cell cytokines** may be used to treat **ALL**.

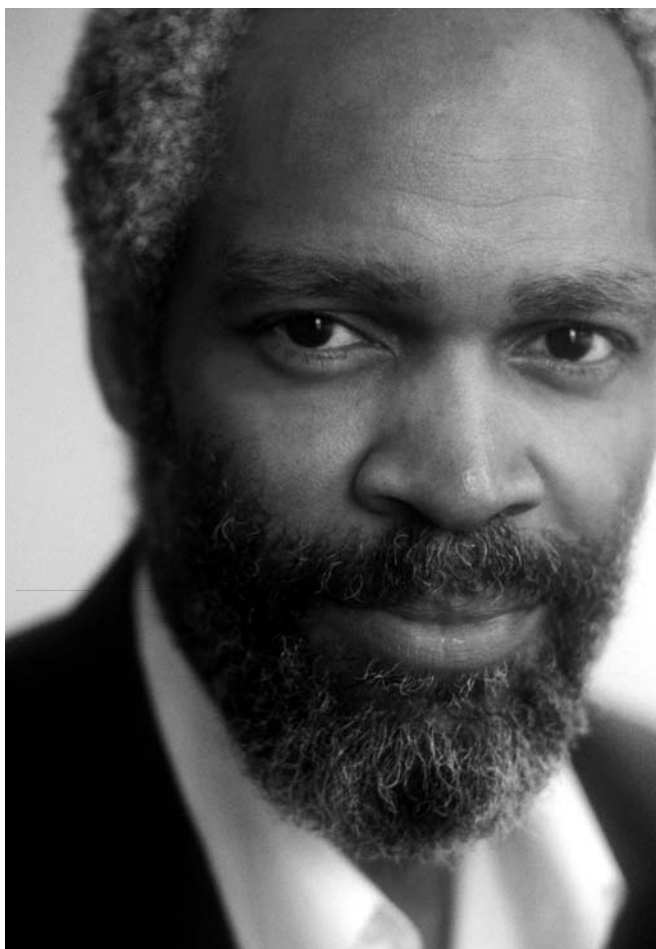
Scientists are studying the exact genetic changes that cause a normal cell to become an **ALL** cell. This research is leading to the development of new treatments. These treatments could block the effects of cancer-causing genes called **oncogenes**.

Gene profiling will be used more in the future to design more specific treatments for the different types of leukemia.

New targeted treatments are being developed for **Ph-positive ALL**. These treatments, known as AMN107 and dasatinib, may help some patients who are not helped by imatinib (Gleevec®).

Other treatment plans using many of the therapies on page 16 are being studied in clinical trials for **Ph-positive ALL** and other high-risk types of **ALL**. **T-cell ALL**, **infant ALL** and **adult ALL** are other high-risk types of **ALL**.

Doctors are studying a type of **stem cell transplant**, called a nonmyeloablative stem cell transplant (or “mini transplant”). A nonmyeloablative stem cell transplant does not begin with harsh chemotherapy treatment. The patient takes special drugs so that his or her immune system does not reject the transplanted stem cells. Over a long time, the donated stem cells replace the patient’s blood and immune system cells. The donated cells also attack the **ALL** cells.



What Should I Ask the Doctor?

Talk with the doctor about acute lymphocytic leukemia and how the doctor plans to treat the disease. This will help you to know more about the disease and treatment. It will help you to be involved and make decisions.

Some questions to ask your doctor are:

- What do the blood and marrow tests show? How do these results compare to “normal?”
- Will you send updates to my family doctor?
- What kind of treatment do you think is needed?
- How often and how long will I (or my child) need treatment/follow-up visits?
- Will I (or my child) be treated using an oncology group protocol? An **oncology group protocol** is a National Institute of Health clinical trial for cancer research.
- What side effects should be expected from treatment?
- What can be done to help deal with side effects?
- Will I (or my child) need to change our daily routine or avoid any activities?
- Does this hospital have experience treating **ALL** patients?
- Will the treatment be paid for by my health plan?

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It may be helpful to write down the answers to your questions and review them later. You may want to bring a family member or friend with you to the doctor. The person can listen, take notes and offer support. Some patients find it easier to tape-record information from the doctor and listen to the tape at home.

It is important to get treatment for **ALL** at a hospital that has considerable experience treating this disease.

Patients with ALL should talk with their family and friends about how they feel. They can share what they know about the disease. When family and friends know about **ALL** and its treatment they may worry less.

Here are more ways patients or parents of children with ALL can take good care:

- Keep all appointments with the doctor.
- Take all medicines as instructed by the doctor.
- Follow the doctor's advice for preventing infection, such as washing hands.
- Eat healthy foods each day. It is okay for patients to eat 4 or 5 smaller meals instead of 3 larger meals.
- Ask your treatment team for nutrition tips for patients who don't feel like eating.
- Don't smoke – patients who smoke should get help to quit.
- Get enough rest and exercise. Talk with the doctor before starting an exercise program.



To order free booklets, contact **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

Coping with ALL

The news that you or your child has leukemia and needs treatment brings up many feelings. People dealing with **ALL** face unknowns about what comes next. Together, you and your family can talk about your concerns with your healthcare team. First you may want to focus on learning what you need to know about the **ALL** and its treatment. Then you can then look ahead to the prospect of remission and recovery.

The process of making treatment choices can cause a great deal of stress. The time and money for medical care may place extra burdens on the family. It is important to



ask the healthcare team for help and guidance. Talking about any medical questions will help in making choices. The team can also give emotional support and refer you to other sources of help.

Family and friends can also help you cope with what lies ahead. A friend or family member can go with you to treatments. Also, patients with **ALL** often get to know one another, and these friendships help too.

For more information, see the Society's free booklet, *Coping: Support for People Living with Leukemia, Lymphoma or Myeloma*.

Helping Children Cope

Like adults with cancer, children with cancer may feel scared and helpless. But they may be too young to understand their illness and treatment.

Children with **ALL** may have to deal with missing school, friends and favorite activities. They may feel angry at doctors and nurses for "hurting them." They may be angry at their parents – they may believe their parents let them get sick. Or they may be angry at their parents for making them have tests and treatment.

To order free booklets, contact **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

The best way to help children feel better about the changes in their lives is to have them take part in “normal” activities as soon as they can.

Brothers and sisters of children with ALL also need special attention. They may be afraid of getting the disease. They may feel bad that their brother or sister is sick. They may be sad or angry that their parents are not around as much.

Parents of a child with **ALL** may want to talk about how to find enough time for everything, how to pay for treatment, how to best support their children. To help answer these and other questions order The Leukemia & Lymphoma Society’s free booklets, *Emotional Aspects of Childhood Blood Cancers* and *Financial Health Matters*.



The Leukemia & Lymphoma Society is Here to Help

The Leukemia & Lymphoma Society has chapters around the nation. The Society's chapters offer support groups and also can arrange for an **ALL** patient to talk with another person who has **ALL**. **To find the Society's chapter in your area, call (800) 955-4572.** Or go to www.LLS.org, the Society's Web site.



To order free booklets, contact **The Leukemia & Lymphoma Society** at www.LLS.org or **800-955-4572**.

The Leukemia & Lymphoma Society has free booklets:

Acute Lymphocytic Leukemia gives more detailed information about **ALL** for patients and their families.

Blood and Marrow Stem Cell Transplantation is about stem cell transplantation.

Blood Transfusion provides information about blood transfusion for patients with leukemia, lymphoma or myeloma (blood cancers) and their families.

Emotional Aspects of Childhood Blood Cancers is written for parents of young children and adolescents with leukemia or lymphoma who seek support in facing and dealing with a difficult illness.

Financial Health Matters is about financial aid, insurance and ways to manage money.

Coping: Support for People Living with Leukemia, Lymphoma or Myeloma is for patients and families dealing with blood cancers.

Long-Term and Late Effects of Treatment for Blood Cancers Fact Sheet describes some of the long-term and late risks associated with chemotherapy and radiation therapy.

The Stem Cell Transplant Coloring Book supports children and helps them to express themselves throughout their treatment.

Immunotherapy Fact Sheet provides information about the different types of immunotherapies and their roles in the treatment of blood cancers.

Understanding Drug Therapy and Managing Side Effects is about many cancer drugs and common side effects.

Understanding Blood Counts, Choosing and Communicating with a Cancer Specialist and *Choosing a Treatment Facility* are fact sheets that may help you to know more about your healthcare.



To order free booklets, contact **The Leukemia & Lymphoma Society** at **www.LLS.org** or **800-955-4572**.

Medical Terms

Antibiotics

Drugs that are used to treat infections. Penicillin is one type of antibiotic.

Antibodies

Proteins that help to fight infection in the body.

Central line

Special tubing the doctor puts into a large vein in the upper chest to prepare a patient for chemotherapy treatment. The central line is used to give the patient chemotherapy drugs and blood cells, and to remove blood samples. Also called an indwelling catheter.

Central nervous system prophylaxis

Treatment directed to the lining of the spinal cord and brain, where acute lymphocytic leukemia cells often collect.

Chemotherapy

Treatment with drugs or medicines to kill leukemia cells.

Clinical trials

Studies that use volunteers to test new drugs, treatments or new uses for approved drugs or treatments.

Medical Terms

Cytokines

Natural substances made by cells. They can also be made in the lab. Today, growth factor cytokines can be used to help restore normal blood cells during treatment. In the future, immune cell cytokines may be used to treat **ALL**.

Immune system

Cells and proteins that defend the body against infection.

Immunophenotyping

A lab test that can be used to find out if the patient's **ALL** cells are B-cells or T-cells.

Leukemia

A cancer of the marrow and blood.

Lymph nodes

Small bean-shaped organs around the body that are part of the body's immune system.

Marrow

The spongy material in the center of bones where blood cells are made.

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Medical Terms

Natural Killer Cell

A type of lymphocyte (a white cell). Also called NK cells. NK cells attack and kill tumor cells. They also help the body to fight infection.

Post-induction therapy

Added treatment given to a patient even after the cancer is in remission. It usually includes chemotherapy drugs not used during induction treatment.

Relapse or recurrence

When disease comes back after it has been successfully treated.

Remission

No sign of the disease and/or a long time span when the disease is not causing any health problems for the patient.

Stem cell

A type of cell found in marrow that makes red cells, white cells and platelets.

Call Our Information Resource Center

The Society's Information Resource Center (IRC) provides patients, families and healthcare professionals with the latest information on leukemia, lymphoma and myeloma. Our information specialists – professional social workers and nurses – are available by phone (800.955.4572) Monday through Friday, 9 am to 6 pm (ET); via email (infocenter@LLS.org); or chat online at www.LLS.org (click on "Live Help").

Call 800.955.4572 for a complete directory of our patient services programs.



**The Leukemia &
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Fighting Blood Cancers

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