

Long-Term and Late Effects of Treatment in Adults

No. 22 in a series providing the latest information for patients, caregivers and healthcare professionals

Highlights

- Treatments for adults with leukemia, lymphoma, myeloma, myelodysplastic syndromes and other blood cancers have led to increased survival rates. However, some treatments may cause significant long-term effects or late effects.
- Follow-up medical care to monitor survivors for possible long-term or late effects is important. Patients should discuss possible effects of treatment with their healthcare providers in order to plan treatment and follow-up care.
- Factors that determine the risk of long-term or late effects include the type and length of treatment, the person's age at the time of treatment, gender and overall health.
- Patients may need to educate family members and friends about the challenges of long-term and late effects.
- Long-term and late effects of treatment are important, ongoing areas of study for all therapies. Researchers are working to improve the understanding of long-term and late effects and to create guidelines on follow-up care. Data for many therapies are limited at present. Patients may be able to contribute to this important research by taking part in studies (clinical trials) to collect data on long-term or late effects, or by completing questionnaires about their health during maintenance therapy or after treatment ends.

This fact sheet is about long-term and late effects in adults treated for leukemia, lymphoma, myeloma, myelodysplastic syndromes and other blood cancers. Please see The Leukemia & Lymphoma Society (LLS) free fact sheet, ***Long-Term and Late Effects of Treatment for Childhood Leukemia or Lymphoma*** for additional information.

Introduction

Cure rates and remission periods for adults with leukemia, lymphoma, myeloma, myelodysplastic syndromes and other blood cancers are greatly improved because of

- New drugs
- New uses for existing drugs
- Improvements in radiation therapy and stem cell transplantation techniques.

Research to improve health outcomes for more patients is ongoing. Physicians are working to tailor therapies to decrease side effects and long-term and late effects.

Survivors of leukemia, lymphoma, myeloma, myelodysplastic syndromes or other blood cancers do not always have serious long-term or late effects of treatment. Effects can range from mild to severe. However, it is important to talk about possible long-term and late effects with your treatment team to plan treatment and follow-up care. The risk for developing long-term or late effects may be influenced by

- The type and duration of treatment
- The patient's age at the time of treatment
- The patient's gender
- The patient's overall health.

General Information About Long-Term and Late Effects of Treatment

Long-term effects of cancer therapy are medical problems that last for months or years after treatment ends. Fertility problems and treatment-related fatigue are examples of long-term effects.

Late effects are medical problems that do not show up or get noticed until years after treatment ends. Treatment-related cancer and heart disease are examples of late effects.

Long-term and late effects for survivors of leukemia, lymphoma, myeloma, myelodysplastic syndromes or other blood cancers may include

- Effects on thinking, learning and memory, called "cognitive effects"
- Physical effects
- Psychological effects.

Cognitive effects

Cancer treatments such as chemotherapy and radiation therapy can cause problems with mental functions, such as concentration, memory and the ability to multitask (to keep track of and do different tasks at the same time). These effects are sometimes referred to as "chemo brain" or "brain fog."

Physical effects

Depending on the type and duration of treatment and individual risk factors, including genetics and overall health, adults may be at risk for

- Heart or thyroid problems
- Hearing loss
- Secondary cancer
- Other conditions.

Psychological effects

Some individuals may experience long-term psychological effects after treatment ends, including depression or posttraumatic stress disorder.

The cognitive, physical and psychological effects of cancer treatment can affect the everyday activities of survivors. Support and help are available for cancer patients and survivors, who may face

- Job discrimination
- Difficulty getting health or life insurance
- Financial issues
- Relationship or social problems
- Lack of follow-up care.

Resources for cancer patients and survivors include

- **The Information Resource Center (IRC) at LLS.** Contact an Information Specialist, Monday-Friday, 9 AM-6 PM EST, at (800) 955-4572. Or go to our Web site at www.lls.org and click on Live Help (10 AM-5 PM), or email infocenter@LLS.org. LLS also offers free materials that provide information on these topics, including the booklets *Financial Health Matters* and *Coping: Support for People Living with Leukemia, Lymphoma and Myeloma*, and the fact sheet *Fatigue*.
- **Federal and state laws.** These laws, such as the Americans with Disabilities Act (ADA), protect qualified cancer survivors from job or insurance discrimination. For more information visit the ADA Web site at www.ada.gov and the Cancer Legal Resource Center at www.disabilityrightslegalcenter.org (open the “About DRLC” tab and select the Cancer Legal Resource Center from the menu).
- **Vocational rehabilitation.** Many states offer these services to qualified individuals. Eligibility and services vary by state. The Office of Special Education and Rehabilitative Services has a list of state offices at www.jan.wvu.edu/SBSES/VOCREHAB.HTM.
- **Community support groups.** These local groups offer support and networking opportunities. The National Cancer Institute has advice on finding community resources at www.cancer.gov/cancertopics/factsheet/Support/resources.
- **National advocacy organizations.** These organizations offer support, information and advice for cancer survivors. The contact information for some of these groups is listed under *Resources* beginning on page 9.

Managing Long-Term and Late Effects

Cancer survivors may need to educate family members, friends, and healthcare providers about long-term and late effects.

Here are some suggestions for patients and survivors:

- Keep a record of any physical or emotional symptoms that you experience and discuss them with your treatment team.
- Keep all medical records, including dates and locations of cancer treatment; drugs and supportive therapies (e.g., blood transfusions) and dosages; and specific sites and amounts of radiation therapy, if applicable. Keep a copy of blood, marrow and imaging test results (MRIs, CT scans, x-rays).
- Follow a health plan that includes being active, using sun protection and eating healthy foods. Do not smoke or use tobacco products. If you do, get help from healthcare professionals with quitting.
- Keep medical follow-up appointments.
- Stay informed. Ask your treatment team for the latest information on long-term and late effects of cancer treatment or contact the Information Resource Center at LLS.

Follow-up care

Medical follow-up care gives doctors the chance to

- Monitor disease response to current or past treatments over a period of time
- Identify recurrence of the disease, if any
- Detect long-term or late effects.

Cancer survivors should see their primary care physicians for general health and physical examinations yearly or more often, as needed.

They should see their oncologists for follow-up cancer care. Regular examinations may include screening for cancer recurrence, for the development of secondary cancer or for other late effects of treatment.

Coordination between oncologists and primary care physicians is important to provide the best care possible.

Some treatment centers have follow-up cancer care clinics, which provide a complete, multidisciplinary approach for cancer survivors. Most follow-up clinics specialize in helping pediatric cancer survivors, but some deal with adult cancer survivors. The National Coalition for Cancer Survivorship maintains a list of cancer long-term survival clinics (go to www.canceradvocacy.org and enter “clinic” in the search box).

Clinical Trials

Clinical trials explore new drugs, new treatment combinations or new uses for approved drugs for blood cancers and other diseases. New drugs and new combinations of therapies are needed to improve outcomes and find cures.

In addition, research to develop better treatments to reduce the long-term and late effects associated with certain cancer therapies is ongoing. Current research is also seeking to understand how aging, income and education status may contribute to long-term and late effects.

Another important research objective is to collect data on the long-term and late effects of specific cancer therapies. These data are limited, especially for therapies introduced in the last decade. Following patients over an extended period of time and documenting long-term or late effects will help physicians and patients make treatment decisions. The data will also help create better survivor follow-up guidelines.

Patients may be able to contribute to this important research by

- Participating in studies (clinical trials) designed to collect data on long-term or late effects
- Completing follow-up questionnaires that address these issues.

Information about possible long-term and late-effect studies is available from the Information Resource Center at (800) 955-4572 or from the National Cancer Institute at (800) 4-CANCER [422 6237].

Examples of Long-Term and Late Effects

Possible long-term or late effects of treatment are described below. Talk to your doctor about the actual risks for you.

Treatment for leukemia, lymphoma, myeloma, myelodysplastic syndromes or other blood cancers usually includes chemotherapy and/or other drug therapies. Patients may receive radiation therapy, stem cell transplantation or splenectomy. Certain risks for long-term and late effects are common to all of these treatments. Please see the free LLS booklet, *Blood and Marrow Stem Cell Transplantation* for more information about long-term and late effects.

Drug therapy

A number of chemotherapy and other drugs are used to treat leukemia, lymphoma, myeloma, myelodysplastic syndromes and other blood cancers.

Alkylating drugs have been associated with heart and lung problems, risk for secondary cancers, low testosterone levels and sperm counts in men and premature ovarian failure (POF) or premature menopause in women. The combination of alkylating drugs and radiation therapy increases the risk of fertility problems.

Examples of alkylating drugs are

- **Cyclophosphamide** (Cytoxan®), which can increase the risk for chronic heart failure, myelodysplastic syndromes and acute myelogenous leukemia.
- **Procarbazine** (Matulane®), **nitrogen mustard** (Mustargen®), and **ifosfamide** (Ifex®), which can increase the risk for myelodysplastic syndromes and acute myelogenous leukemia.
- **Carmustine** (BiCNU®) and **busulfan** (Myleran®), which can increase the risk for scarring and inflammation of the lungs.
- **Carboplatin** (Paraplatin®) and **cisplatin** (Platinol®), which can increase the risk for hearing loss and peripheral neuropathy or contribute to heart damage.

Anthracyclines, which have been associated with heart damage (e.g., heart muscle injury, chronic heart failure). Heart muscle damage is usually related to the cumulative dosage of anthracyclines, many of which are used to treat acute myelogenous leukemia. Anthracyclines include **doxorubicin** (Adriamycin®), **idarubicin** (Idamycin®), and **daunomycin** (Cerubidine®).

Anthracycline drugs may also increase the risk of developing a secondary cancer, such as acute myelogenous leukemia or myelodysplastic syndromes.

Bleomycin (Blenoxane®) is an antitumor antibiotic drug therapy commonly used to treat germ cell tumors and lymphoma that, when used in high dosages, can potentially result in acute respiratory distress syndrome and lung failure.

Bortezomib (Velcade®) is a proteasome inhibitor used to treat persons with myeloma. It has been associated with peripheral neuropathy.

Corticosteroids, which have been associated with osteoporosis and cataracts. High dosages of corticosteroids may be associated with avascular necrosis. Corticosteroids have been used to treat individuals with leukemia, lymphoma and myeloma. **Prednisone** and **dexamethasone** are examples of corticosteroids.

DNA repair enzyme inhibitors, which are derived from toxins found in certain plants, can cause acute myelogenous leukemia and myelodysplastic syndromes. **Etoposide** (Etopophos®) and **teniposide** (Vumon®) are examples of this class of drugs.

Drugs that prevent the cells from dividing by blocking mitosis, such as **vincristine** (Oncovin®) and **vinblastine** (Velban®), have been associated with peripheral neuropathy.

Immunomodulators modify or influence the functions of the immune system. **Thalidomide** (Thalomid®) and **lenalidomide** (Revlimid®), which are used to treat persons with myeloma, have been associated with peripheral neuropathy.

Methotrexate is used to treat leukemia and lymphoma; it has been associated with osteoporosis and lung damage. Intrathecal and intravenous methotrexate can cause cognitive impairment.

Radiation therapy

Radiation therapy is the use of ionizing radiation to kill cancer cells. For some individuals, radiation therapy to the head and neck may lead to

- Problems with thinking, learning or memory, called “cognitive effects”
- Brain or thyroid cancer
- Hypothyroidism or hyperthyroidism
- Dental abnormalities such as dry mouth or cavities
- Hearing loss
- Vision problems such as cataracts or glaucoma
- Osteoporosis.

Radiation therapy to the chest can cause

- Lung damage (scarring, inflammation, breathing difficulties)
- Heart damage (scarring, inflammation, coronary heart disease)
- Osteosarcoma
- Breast or thyroid cancer
- Hypothyroidism or hyperthyroidism.

Total body irradiation for individuals undergoing a hematopoietic stem cell transplant can potentially cause gonadal failure and fertility issues.

High-dose radiation to the spleen can increase the risk that survivors will develop repeated bacterial infections.

Radiation therapy may also have effects on fertility.

Splenectomy

Surgical removal of the spleen (splenectomy) may be used to treat certain individuals with leukemia or lymphoma. A splenectomy may result in impaired immune system functions, increasing a person's susceptibility to bacterial infections and other conditions.

Examples of cancer treatment effects

Avascular necrosis

A condition in which the blood vessels that nourish the bones die, causing parts of the bone to weaken or collapse.

Chemo brain

This term is used to explain a condition of confusion, forgetfulness or memory loss that many survivors describe. Patients who experience cognitive effects should be evaluated. Chemo brain is not the same as depression or fatigue. All three conditions may produce some of the same effects, but these three conditions may require different treatments.

Fatigue

For some patients, fatigue, or tiredness, that lasts and does not improve with rest can continue for months or years following treatment. Fatigue can make it hard to do daily tasks or to concentrate. For more information, see the free LLS fact sheet, *Fatigue*.

Fertility and sexuality

“Fertility” refers to the ability to become pregnant or father a child. Survivors of leukemia or lymphoma treated with modern conventional therapy are at relatively low risk for fertility problems. Most go on to have normal fertility and healthy offspring. However, a small number of survivors are unable to have children. Certain drugs can harm sperm production; however, production may resume months or years after treatment.

Both men and women may have some sexual effects during and after treatment. Men may experience difficulty maintaining an erection, have low sperm counts or become sterile. Women may fail to ovulate or conceive, have irregular periods, experience painful intercourse, and develop early menopausal signs such as hot flashes, insomnia and increased irritability.

Hypothyroidism

This term refers to lower-than-normal activity of the thyroid gland. The symptoms may include increased sensitivity to the cold, weight gain, painful joints, muscle aches, and pale, dry skin. Hypothyroidism is more common than hyperthyroidism.

Hyperthyroidism

This term refers to higher-than-normal activity of the thyroid gland. The symptoms include nervousness, sudden weight loss, rapid heartbeat, fatigue and an increased sensitivity to heat.

Osteoporosis

Osteoporosis is a condition of decreased bone density that leads to thin bones and increased risk for fractures.

Peripheral neuropathy

This condition causes numbness, tingling or pain in the hands and feet. It may last for months or years following treatment with certain drugs that harm the nerves. The peripheral nerves are found outside the central nervous system (brain and spinal cord).

Premature ovarian failure (POF)

The term “premature ovarian failure” describes a stop in normal ovarian functions in a woman younger than age 40. Unlike menopause, this is not a natural occurrence. When POF is caused by cancer treatment, it is unlikely that a girl or woman will have menstrual periods or have the ability to become pregnant. Generally, POF is managed with hormone replacement therapy, including estrogen and progesterone and sometimes also testosterone. Girls and women with POF are encouraged to eat a healthy diet and exercise regularly (aerobics and weight training) to decrease health risks of osteoporosis and heart disease. Supplements or medications for bone health may be prescribed. At this point, there is no treatment to restore fertility for someone diagnosed with POF. Medications can be prescribed to assist with managing POF and regulating hormones.

Second cancers

Certain cancer survivors treated with chemotherapy or radiation therapy are at somewhat higher risk for developing a second cancer compared to the general population. The risk is greater for younger patients and increases with higher total dosage of radiation. Cancer treatment may not be the only reason that some survivors develop second cancers. Genes or gene-environment interactions may also be factors for increased risk in some patients. Examples of second cancers are

- *Acute myelogenous leukemia and myelodysplastic syndromes* – Treatment-related acute myelogenous leukemia/myelodysplastic syndromes may occur in some people who received treatment with alkylating drugs or DNA-repair-enzyme inhibitors.
- *Brain tumors* – Treatment with cranial radiation can increase the risk of developing a brain tumor.
- *Breast cancer* – Women who have received mantle radiation therapy for Hodgkin lymphoma have an increased risk for breast cancer. Women treated before the age of 21 years have a significantly greater risk than adult women. Younger women should receive annual mammograms and biannual breast exams, starting at 10 years after receiving treatment.
- *Osteosarcoma* – Patients who have received mantle radiation therapy for Hodgkin lymphoma have an increased risk for osteosarcoma, the most common type of bone cancer. The risk for osteosarcoma depends on the dosage of radiation and whether individuals were concurrently treated with alkylating drugs.

Resources

The Leukemia & Lymphoma Society (LLS)

LLS is the world's largest voluntary health organization dedicated to funding blood cancer research, education, and patient services. LLS has a national Information Resource Center (IRC) and chapters throughout the country and in Canada.

Callers may speak directly with an Information Specialist at the IRC, Monday-Friday, 9 AM- 6 PM EST, at (800) 955-4572. To contact an Information Specialist, click on Live Help on our Web site at www.lls.org (10 AM-5 PM EST) or email us at infocenter@LLS.org. Information specialists can answer general questions about diagnosis and treatment options, offer guidance and support, and assist with clinical trial searches for leukemia, lymphoma, myeloma, myelodysplastic syndromes and myeloproliferative diseases. The LLS Web site has information about how to find a clinical trial, including a link to TrialCheck®, a clinical trials search service provided by LLS.

To find the chapter nearest you, visit our Web site at www.LLS.org or contact

The Leukemia & Lymphoma Society
1311 Mamaroneck Ave.
White Plains, NY 10605
Information Resource Center
(800) 955-4572
www.LLS.org

LLS provides fact sheets and booklets that can be ordered via the 800 number or through the Free Materials section at www.LLS.org.

Cancer Survivorship Home of the Centers for Disease Control and Prevention (CDC)

www.cdc.gov/cancer/survivorship

The Lance Armstrong Foundation offers

- The Livestrong SurvivorCare Program, which provides assistance to all cancer survivors.
www.livestrong.org/survivorcare
- A list of NCI-designated Comprehensive Cancer Centers which are members of the Livestrong Survivorship Center of Excellence Network.
www.livestrong.org/site/c.khLXK1PxHmF/b.2662091/

Office of Cancer Survivorship of the National Cancer Institute

dccps.nci.nih.gov/ocs

People Living With Cancer provides oncologist-approved information to help individuals and families make informed healthcare decisions.

www.plwc.org

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