



Understanding Hodgkin Lymphoma



A Guide for
Patients,
Survivors
and
Loved Ones

Third Edition

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This guide is an educational resource compiled by the Lymphoma Research Foundation providing general information on Hodgkin lymphoma. Publication of this information is not intended to take the place of medical care or the advice of your doctor. Patients are strongly encouraged to talk to their physicians for complete information on how their disease should be diagnosed, treated and followed. Before starting treatment, patients should discuss the potential benefits and side effects of cancer therapy.

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We hope those in the lymphoma community will now be better informed and have a better understanding of their illness because of the gracious efforts of those involved in the planning and execution of this comprehensive disease guide.

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TABLE OF CONTENTS

Part I: Learning the Basics

Chapter 1

Overview of Cancer	1
Hodgkin Lymphoma Overview	2
The Causes of Hodgkin Lymphoma	6
Types of Hodgkin Lymphoma	8

Chapter 2

Signs and Symptoms of Hodgkin Lymphoma	11
When to Seek Medical Attention	11
What the Doctor Looks for During a Physical Examination	12

Chapter 3

Getting a Diagnosis—What to Expect	13
Common Tests Used to Make a Diagnosis	14
Tumor Bulk	18
Cancer Staging and What It Means	18
Getting a Second Opinion	19
Choosing an Oncologist and Treatment Center	20

Part 2: Treating Hodgkin Lymphoma

Chapter 4

What You Should Know Before Starting Treatment	23
Treatments for Hodgkin Lymphoma	24
Communicating With Your Healthcare Team	25
How to Be a Self-Advocate	27
Factors Affecting Treatment Outcome	28
Terms Describing Possible Outcomes of Treatment	29

Chapter 5

Types of Treatment	31
Chemotherapy	32
Bone Marrow and Stem Cell Transplantation	36
Biologic Treatments	39
Radiation Therapy	40
Vaccines and Cell Therapies	41
Complementary and Alternative Remedies	41
Drug Costs: What to Do If Your Insurance Doesn't Pay	43

Part 3: Treatment Side Effects

Chapter 6

Coping With Common Treatment Side Effects	45
The Difference Between Long-Term Effects and Late Effects of Cancer Treatment	45
Side Effects Caused by Chemotherapy	46
Side Effects Caused by Radiation	53
Side Effects Caused by Bone Marrow Transplantation	56
Side Effects Caused by Steroids	56
When to See Your Doctor	56
Combating Side Effects	57

Chapter 7

Sexuality	59
Sexual Function During Treatment	59
When to Use Contraceptives	60

Chapter 8	
Fertility Risks	61
How to Protect Fertility During Treatment	61
Chapter 9	
Hodgkin Lymphoma During Pregnancy	63
Breast-Feeding During Treatment	64
Part 4: Children and Young Adults With Hodgkin Lymphoma	
Chapter 10	
General Information	65
Short-Term and Late Effects of Treatment	66
Chapter 11	
Special Concerns for Teenagers and Young Adults	69
Follow-Up Care	69
Developing Healthy Habits	71
Quality of Life Issues	71
Part 5: Living With Hodgkin Lymphoma	
Chapter 12	
Managing Your Life During and After Treatment	75
Coping Strategies	75
Life in Remission	76
Follow-up Care	77
Chapter 13	
Why Hodgkin Lymphoma Patients Relapse or Become Refractory	78
How Relapsed and Refractory Hodgkin Lymphoma Is Treated	79
Treatments Under Investigation	79
Part 6: Clinical Trials	
Chapter 14	
Overview of Clinical Trials	81
The Basics of Clinical Trials	81
Use of a Placebo in Phase III Trials	83
Participating in a Clinical Trial	84
Informed Consent	84
Cost of Being in a Clinical Trial	85
Finding a Clinical Trial	86
Chapter 15	
Therapies Under Investigation	87
Glossary of Medical Terms	89
About the Lymphoma Research Foundation	101
Resources for Patients, Survivors and Loved Ones	101
Resources for Children and Young Adults	103
How to Get Involved and Give Back	105
Donate Now	107

Part 1: Learning the Basics

Chapter 1 Overview of Cancer

Our bodies consist of millions of cells that grow and divide in an orderly fashion and work in harmony to support thousands of biological functions. The cells divide only when it is necessary to replace worn-out or dying cells to keep the body healthy. Cancer is a group of diseases that develop as the result of the uncontrolled growth and spread of abnormal cells. Cancer cells are different from normal cells because instead of dying, they continue to grow and divide, forming new abnormal cells.

Cancer cells develop when there is damage to the DNA, the hereditary material found in every cell, that is caused either by inherited DNA cell abnormalities or exposure to something in the environment, such as smoking, that causes cell damage. Usually the body is able to destroy these damaged cells, but when the body's natural defense systems do not work, these abnormal cells may grow in an uncontrollable fashion, eventually forming a cancerous tumor. According to the American Cancer Society, nearly 1,479,350 new cases of cancer are projected in 2009.

Hodgkin Lymphoma Overview

Lymphoma comprises more than 67 subtypes of two related cancers that affect the lymphatic system, Hodgkin lymphoma (HL) and non-Hodgkin lymphoma (NHL). There are six primary types of Hodgkin lymphoma and at least 61 types of non-Hodgkin lymphoma. Hodgkin lymphomas are different from non-Hodgkin lymphomas in the way they develop, spread and are treated. Lymphoma is the most common blood cancer in adults and the third most common cancer overall in children.

Lymphoma develops when a genetic error, or mutation, occurs in the way a lymphocyte is produced, causing the abnormal cell to duplicate faster than a normal cell or live longer than a normal lymphocyte. Lymphocytes are small white blood cells that play a large role in defending the body against disease. Like normal lymphocytes, cancerous lymphocytes can grow in many parts of the body, including the lymph nodes, spleen, bone marrow, blood or other organs. There are two types of lymphocytes: B lymphocytes, or B-cells, and T lymphocytes, or T-cells. Most cases of Hodgkin lymphoma start in the B-cells.

Named after Thomas Hodgkin, a British physician, who first identified the disease in 1832, Hodgkin lymphoma is a rare cancer, accounting for less than one percent of all cases of cancer in the United States. According to the American Cancer Society, approximately 8,500 new cases of Hodgkin lymphoma are projected each year. Although the cancer can occur in both children and adults, it is most commonly diagnosed in young adults between the ages of 15 and 35 and in older adults over age 50. Nearly 10 percent to 15 percent of all Hodgkin lymphomas are diagnosed in children and teenagers. The disease is more common in men than in women, although, according to the American Cancer Society, over the last 30 years incidence rates have decreased in men and slightly increased in women.

Hodgkin lymphoma has been studied more than any other type of lymphoma. The result of those studies has led to rapid advances in the diagnosis and treatment of the disease, and well over 80 percent of patients with Hodgkin lymphoma are cured.

Here is how the immune and lymphatic systems function and affect Hodgkin lymphoma:

The Immune System

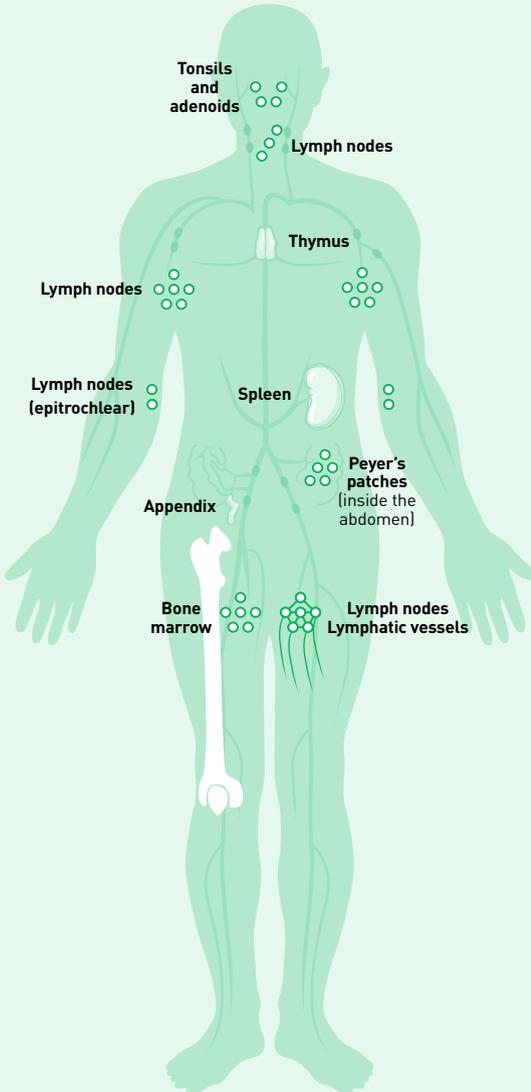
Hodgkin lymphoma is a cancer that starts in and affects the immune system. The immune system consists of a network of cells, tissues and organs that defend the body against “foreign” invaders (such as bacteria or viruses) or abnormal cells before or after they harm the body. Our ability to survive exposure to both external invaders and internal cell mutations largely depends on the immune system. The immune system is the body’s first defense against disease. It is made up of highly specialized cells and a circulatory system separate from blood vessels called lymphatics. They work together to rid the body of foreign invaders or abnormal cells before they can harm the body. These invading organisms and abnormal or cancerous cells are generally detected by the immune system through proteins called antigens that are located on the surface of all cells, whether they are normal or malignant. Special receptors located on the immune cells bind to these antigens. And just as a lock will only close with the right key, an antigen will only lock with a specific cell from the immune system. When an antigen and an immune cell lock together, the immune response begins, and the body acts to destroy, remove or wall off the foreign invaders or abnormal cells.

The Lymphatic System

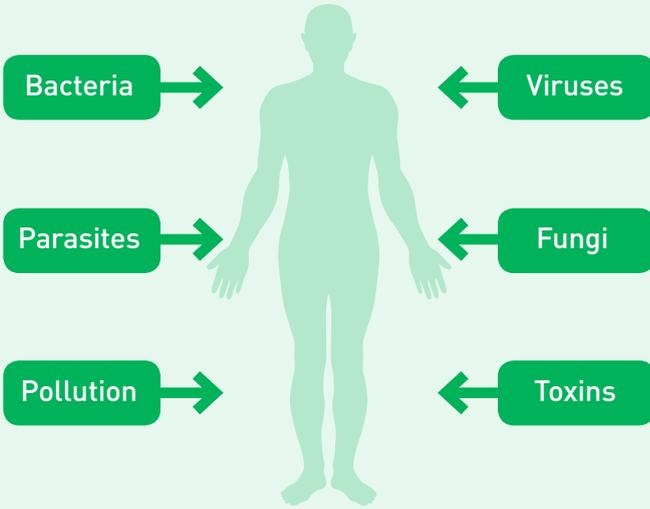
The lymphatic system is one of the most important parts of the immune system and protects the body from disease and infection. The lymphatic system is a circulatory system that is made up of a series of thin tubes called lymph vessels that branch like blood vessels into all tissues of the body (see page 4). Lymph vessels carry lymph, a fluid that contains white blood cells called lymphocytes. Within this vast network of vessels are groups of small, bean-shaped organs called lymph nodes. Thousands of lymph nodes are found in almost all places in the body, including the elbows, neck, under the arms and in the groin. Lymph flows through lymph nodes and specialized lymph tissues such as the spleen, tonsils, bone marrow and thymus gland.

ANATOMY OF THE IMMUNE SYSTEM

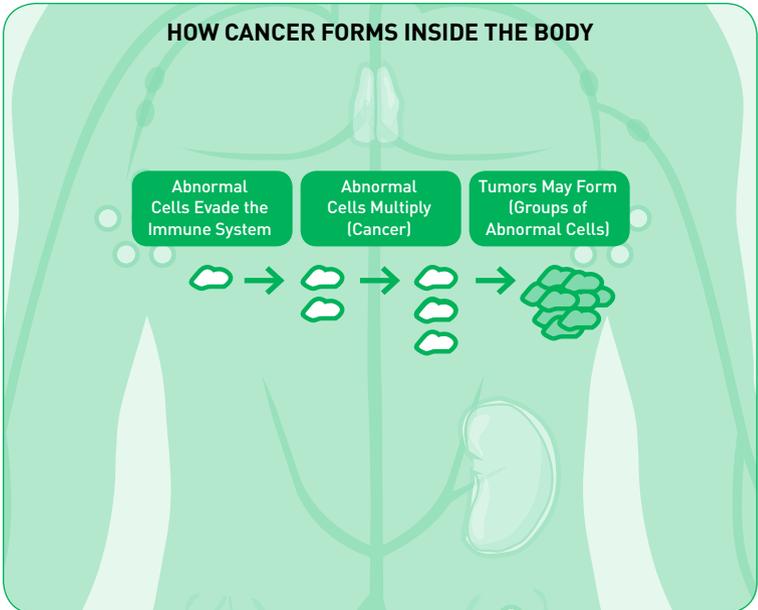
The immune system is the body's defense against outside invaders.



IMMUNE SYSTEM INVADERS



HOW CANCER FORMS INSIDE THE BODY



Lymph nodes filter lymph fluid, removing bacteria, viruses and other foreign substances from the body. If a large number of bacteria are filtered through a node or series of nodes, swelling may occur and the nodes may become tender to the touch. For example, if you have a sore throat, the lymph nodes under your jaw and in your neck may swell. Most swollen nodes are a reaction to infection and are not cancerous.

How Lymphocytes Work

Lymphocytes are a type of white blood cell that help the body fight infections. They are made in the bone marrow, spleen and lymph nodes, and circulate in the blood and lymph vessels. Lymphocytes recognize foreign cells and act quickly to destroy them. There are two main types of lymphocytes: B-lymphocytes and T-lymphocytes. B-lymphocytes develop into cells called plasma cells that make specific proteins called antibodies. Antibodies circulate in the blood and react with toxins, bacteria and some cancer cells and act like biologic guided missiles homing in on only that antigen target on the surface of the cell it has been programmed to attack. The body can then identify and remove these unwanted substances. However, some invaders can avoid B-lymphocytes by growing inside the body's own cells, and that is where T-lymphocytes play a role. They sense when the body's own cells have become infected and destroy them directly. T-lymphocytes help the body fight viral infections and destroy abnormal or cancerous cells (cellular immunity).

After an invader has been destroyed, surviving B-lymphocytes and T-lymphocytes develop into specialized memory cells that remain on watch in the lymph nodes, waiting to be reactivated if and when a particular antigen is encountered again. These memory cells act as guards that are always on the lookout to prevent specific invaders from controlling the body. The body has a complicated system of checks and balances to keep the number of lymphocytes in equilibrium.

The Causes of Hodgkin Lymphoma

Although the exact causes of Hodgkin lymphoma are unknown, research shows that certain risk factors may play a role in the development of the disease. For example, people who have been infected with certain viruses, such as the Epstein-Barr virus, which causes mononucleosis, or the human

immunodeficiency virus (HIV), may be at higher risk of developing Hodgkin lymphoma. A weakened immune system caused by either an inherited condition or the use of immunosuppressants to prevent organ transplant rejection has also been linked to the development of Hodgkin lymphoma, as has a family history of the disease, especially among first-degree relatives of a person with Hodgkin lymphoma, such as parents and siblings.

However, it is important to remember that even if you have one or more of these risk factors, it does not mean that you will get Hodgkin lymphoma. In fact, most people with risk factors never develop the disease, and many who are diagnosed have no known risk factors.

How Hodgkin Lymphoma Develops

Hodgkin lymphoma develops when a lymphocyte (usually a B-cell) becomes abnormal (cancerous). These abnormal cells are called Reed-Sternberg (R-S) cells, named after the two scientists, Dorothy Reed and Carl Sternberg, who discovered the cell. Most people with Hodgkin lymphoma have R-S cells, although other abnormal cell types may be present as well. Reed-Sternberg cells continually divide, making more and more abnormal cells, which do not die when they should. It is the buildup of these extra cells that forms into a mass of tissue called a tumor.

However, the presence of R-S cells alone is not conclusive proof that an individual has Hodgkin lymphoma. To confirm a Hodgkin diagnosis, in addition to the R-S cells, the lymphatic tissue sample must also include other cells and features that are characteristic of Hodgkin lymphoma. A pathologist (a doctor specializing in studying disease through microscopic evaluation of tissue and organs) may use immunological tests that look for cell surface markers (antigens) that identify specific cell types to help make the diagnosis.

Hodgkin lymphoma usually starts in the lymph nodes and may be first noticed in areas such as the neck, above the collarbone, under the arms or in the groin. And because lymph tissues all over the body are connected, abnormal (cancerous) lymphocytes can circulate in the lymphatic vessels, causing the lymphoma to spread from one lymph node to another

throughout the body. However, Hodgkin lymphoma can also spread to other areas and organs outside the lymph system. Unlike other lymphomas, Hodgkin lymphoma tends to spread more in sequence from one group of lymph nodes to the next, rarely skipping areas of lymph nodes, a pattern more commonly found in non-Hodgkin lymphoma.

Types of Hodgkin Lymphoma

Hodgkin lymphoma has been divided into two main classifications, classical Hodgkin lymphoma—which accounts for about 95 percent of all cases of Hodgkin lymphoma—and lymphocyte predominant Hodgkin lymphoma. There are four main subtypes of classical Hodgkin lymphoma and two subtypes of lymphocyte predominant Hodgkin lymphoma, which are determined by tumor type. The type of tumor a patient has may affect treatment choices. In each type of Hodgkin lymphoma, the tumor cells and the R-S cells are mixed with many normal cells. The abnormal cells are usually in the minority.

Classical Hodgkin Lymphoma

Nodular Sclerosis

This is the most common subtype of Hodgkin lymphoma, accounting for between 60 percent and 80 percent of all cases of the disease. In nodular sclerosis, the involved lymph nodes contain areas composed of R-S cells mixed with normal white blood cells. The lymph nodes often contain prominent scar tissue, hence the name nodular sclerosis (scarring). The disease is more common in women than men, and it usually affects adolescents and adults under 50. The great majority of patients are cured with current treatments.

Mixed Cellularity

This type of Hodgkin lymphoma accounts for about 15 percent to 30 percent of all cases of Hodgkin lymphoma and is found more commonly in men than women. The disease is characterized by the involved lymph nodes containing many R-S cells in addition to several other cell types. Scarring is not apparent. The development of mixed cellularity appears to be associated with HIV and the Epstein-Barr virus. Mixed cellularity primarily affects older adults. More extensive disease is usually present by the time this subtype is diagnosed.

Lymphocyte Depletion

This is the least common form of Hodgkin lymphoma, accounting for fewer than five percent of all cases, and is characterized by few normal lymphocytes but abundant R-S cells. Lymphocyte depletion is aggressive and usually not diagnosed until the disease is widespread.

Lymphocyte-Rich

This recently identified form of Hodgkin lymphoma is rare, accounting for less than five percent of all cases. The disease may be diffuse (spread out) or nodular (knotlike) in form and is characterized by the presence of numerous normal lymphocytes and very few abnormal cells and classical R-S cells. It is usually diagnosed at an early stage in adults and has a low relapse rate.

Lymphocyte Predominant Hodgkin Lymphoma

Nodular Lymphocyte Predominant

This type of Hodgkin lymphoma is rare, accounting for five percent to ten percent of all cases. It primarily affects more men than women and is usually diagnosed in people under 35. In nodular lymphocyte predominant, most of the lymphocytes found in the lymph nodes are normal (not cancerous). Typical R-S cells are usually not found in this subtype, but large, abnormal B cells with multi-lobulated nuclei, sometimes referred to as popcorn cells, can be seen, as well as reactive small B-cells, which may be distributed in a nodular pattern within the tissues. This subtype is usually diagnosed at an early stage and is not very aggressive. In many ways this form of Hodgkin lymphoma resembles low-grade (indolent) B-cell non-Hodgkin lymphoma.

Diffuse Lymphocyte Predominant

This type of Hodgkin lymphoma is extremely rare. The existence of this entity has been questioned. Most cases are in fact nodular LPHL (described above) with an ill-defined nodular pattern. Unlike nodular lymphocyte predominant Hodgkin lymphoma, less small benign B-cells are found. The lymphatic tissue is dominated instead by reactive, non-malignant T-cells. Disease recurrence is common in this subtype of Hodgkin lymphoma.

**Please refer to our website
for additional and updated information.**

[lymphoma.org](https://www.lymphoma.org)

Chapter 2

Signs and Symptoms of Hodgkin Lymphoma

A symptom is something a patient notices and states to their healthcare provider. A sign is something a provider detects on physical examination.

Because there are no symptoms specific to lymphomas and, in fact, many initial signs of the disease, such as fever, fatigue, coughing and night sweats, are found in many other illnesses, people often first see their doctor because they think they have a cold, the flu or some other lingering respiratory infection.

While the majority (75 percent) of people diagnosed with Hodgkin lymphoma have no symptoms, the most common warning sign of disease presence is a swelling of lymph nodes that may or may not be painful, most often occurring in the neck. Some people may also experience a swelling of lymph nodes in other parts of the body, such as the armpits and groin. Other symptoms of Hodgkin lymphoma may include unexplained intermittent fevers, weight loss (usually by more than ten percent of a person's normal weight), sweating (usually at night) or lack of energy. A less common symptom is persistent and unexplained itching that grows steadily more severe over time and usually affects the trunk, arms and legs, but it can also be more localized. Coughing, shortness of breath or chest discomfort may be signs of Hodgkin lymphoma in the chest. Usually there is no pain involved in Hodgkin lymphoma, especially in the early stages of the disease, although about five percent of patients may experience pain at the tumor site after drinking alcohol. The reason is unknown.

When to Seek Medical Attention

Most people who have these nonspecific symptoms do not have Hodgkin lymphoma. However, it is important that anyone who has *persistent symptoms* be seen by a doctor to make sure that lymphoma is not present. Serious illnesses are persistent. Seek medical attention if any of the above symptoms last longer than two weeks.

What the Doctor Looks for During a Physical Examination

There is no one specific test that allows physicians to routinely screen for lymphoma. If you have symptoms suggesting Hodgkin lymphoma, your doctor will take your medical history and perform a complete physical examination, checking for swollen lymph nodes under the chin, in the neck and tonsil area, above the shoulders, on the elbows, in the armpits and in the groin. The doctor will also examine other parts of your body to see whether there is swelling or fluid in your chest or abdomen that could be caused by swollen lymph nodes. Your abdomen will also be examined to see whether any internal organs are enlarged.

You will be asked about pain and examined for any weakness or paralysis that could be caused by an enlarged lymph node pressing against nerves or the spinal cord. If the doctor suspects lymphoma after reviewing your symptoms and performing a physical examination, he or she may order other tests to help confirm the diagnosis. These tests should include a biopsy and may also include blood tests, X-rays and other imaging tests, scans and a bone marrow evaluation.

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for additional and updated information.**

lymphoma.org

Chapter 3

Getting a Diagnosis— What to Expect

An accurate assessment of Hodgkin lymphoma requires a number of diagnostic tests. First, a pathologist (a doctor who studies tissues and cells to identify diseases) specializing in hematologic malignancies will examine the tumor tissue under the microscope for the characteristic features of R-S cells in the surrounding tissue and then confirm the diagnosis by analyzing the antigens or markers on the surface of the cells. In classical Hodgkin lymphoma, the cell markers (antigens) are CD30 positive and CD15 positive. In nodular lymphocyte predominate Hodgkin lymphoma, the immunophenotype, or diagnostic proteins, are CD30 negative, CD15 negative and CD20 positive (as seen with B-cell lymphomas).

Then examinations will be performed to determine how far the disease has spread (staging) and how well the body is functioning. Depending on your situation, your physician may use some or all of the following tests as well as your medical history and the results of your physical examination to assess the course of treatment that has the best chance of rendering either a remission or cure.

- Lymph node biopsy
- Blood tests
- Bone marrow examination
- Imaging tests:
 - Chest X-ray
 - CT (computerized tomography) scan
 - PET (positron emission tomography) scan
 - Gallium scan
- Cardiac Function Test
- Pulmonary Function Test

Common Tests Used to Make a Diagnosis

Biopsies and How They Are Performed

A biopsy is a procedure in which a piece of tissue from an area of suspected cancer is removed from the body and examined under a microscope. The information provided by this tissue sample is crucial to diagnosing and treating Hodgkin lymphoma.

Types of Biopsies

There are several types of biopsies. One is called a core needle biopsy, in which a needle is inserted into a lymph node suspected of being cancerous and a small tissue sample is removed. This type of biopsy can be done under local anesthesia, and stitches are usually not required. A core biopsy is more often used to confirm a relapse rather than an initial diagnosis because it often does not produce sufficient tissue to establish a true diagnosis. As a result, if a lymph node is readily accessible, many physicians recommend an open biopsy (also called a surgical biopsy), in which an entire swollen lymph node is usually removed. This procedure can often be done under local anesthesia, but a general (whole body) anesthetic is sometimes needed, and some stitches are often required.

When the only signs of lymphoma are in the abdomen or the pelvis, core needle biopsies are often performed. Laparoscopy (inserting a tube) or even abdominal surgery may be necessary to obtain a sufficient sample of the tumor for examination. After a tissue sample has been removed, it is examined by a pathologist to determine a diagnosis. Pathologists look at the tissue under a microscope and then provide the oncologist (a doctor specializing in cancer) with a detailed report. Information obtained from a biopsy indicates the type of Hodgkin lymphoma that is present. If the pathologist's interpretation of the biopsy is uncertain, the report should be reviewed by a hematopathologist, a pathologist who is an expert in lymphoma. A definitive pathological diagnosis is essential, and if there is any doubt, a second biopsy should be obtained.

Blood Tests

Blood tests are performed to determine whether different types of blood, including red blood cells, white blood cells and platelets are normal in

number and appearance when viewed under the microscope. Abnormalities in these blood cells may sometimes be the first sign of lymphoma. Certain blood tests can be used to determine whether a tumor is affecting the liver, kidneys or other parts of the body. Blood abnormalities can also help doctors determine potential treatment choices and predict outcomes.

If the lymphoma is circulating in the blood, tests can also be used to classify the tumors according to molecular markers (or antigens) on the surface of cancer cells. This process is called immunophenotyping and is also performed on tissue samples removed by biopsy or bone marrow extraction. This information can help distinguish among different types of lymphoma.

Bone Marrow Examination

Bone marrow is the spongy, soft material found inside our bones. Bone marrow contains immature cells called stem cells, which develop into three main types of cells found in the body: red blood cells that deliver oxygen to all parts of the body and take away the waste product carbon dioxide; white blood cells, including lymphocytes, that protect the body from infection; and platelets that help blood clot. Hodgkin lymphoma can spread to the bone marrow.

To determine whether cancer is present, doctors may examine part of the marrow by first numbing the area around the skin, tissue and surface of the bone with a local anesthetic, inserting a thin needle into the pelvis or another large bone and withdrawing a small tissue sample. The procedure can be painful at the moment when the marrow is withdrawn. Patients who are anxious about the test should talk with their doctor and nurse to see whether taking a calming medication before the procedure would be helpful. In some instances, evaluation of the bone marrow or blood may be sufficient to make a diagnosis.

Imaging Tests and How They Help Evaluate the Cancer

Physicians will often order imaging tests that provide pictures of inside the body. Most of these tests are painless and no anesthetic is required. Several types of imaging procedures may be needed to help best evaluate your cancer, including the following:

X-rays

X-rays use radiation to take pictures of areas inside the body. Findings on a chest X-ray may indicate whether the disease is bulky (see “Tumor Bulk,” on page 18). The amount of radiation used in most diagnostic tests is so small that it poses little risk to the patient.

CT or CAT (Computerized Axial Tomography) Scan

A CT scan takes X-rays from different angles around the body. The pictures obtained are then combined using a computer to give a detailed image. People with Hodgkin lymphoma often have CT scans of the neck, chest, abdomen and pelvis. These tests are useful in determining how many nodes are involved, how large they are and whether internal organs are affected by the disease.

MRI (Magnetic Resonance Imaging)

An MRI is similar to a CT scan, but it uses magnets and radio frequency waves instead of X-rays. An MRI can provide important information about tissues and organs, particularly the nervous system, that is not available from other imaging techniques. An MRI may be ordered when the physician wants to get clear images of the bones, brain and spinal cord to see whether the cancer has spread to these areas.

PET (Positron Emission Tomography) Scan

PET scans have now generally replaced gallium scans in many cancer centers because the technique is more convenient and more sensitive, particularly when used in the abdomen area. This test evaluates Hodgkin lymphoma activity in different parts of the body. To perform the test, a radioactive glucose (sugar) tracer substance is first injected into the body. A positron camera is then used to detect the radioactivity and produce cross-sectional images of the body. Unlike gallium scans, which are used primarily to detect response to treatment, PET scans are useful for both determining how much disease is present (staging) and how well it is responding to treatment. PET scans have become so accurate in detecting the level of disease present, treatment can be tailored to an individual patient’s needs.

Gallium (Radioisotope) Scan

Radioactive gallium is a chemical that collects in some tumors. Gallium scans are sometimes used when a patient is diagnosed with Hodgkin lymphoma. Gallium scans are performed by injecting a small amount of radioactive gallium into the body. The small amount of chemical used is not harmful. The body is then scanned from several angles to see whether the gallium has collected in a tumor. If the tumor attracts the chemical, the scan can be repeated after treatment is completed to help determine if the tumor has completely disappeared or become inactive. The test has largely been replaced by the PET scan which is more sensitive.

Heart Function Tests

A MUGA scan (multi gated acquisition scan) is an imaging test that assesses how well your heart ventricles are working. MUGA scans may be done when a patient is resting or exercising, depending on what the physician wants to assess. Patients who are going to receive adriamycin (doxorubicin) will most likely be required to have a MUGA scan before starting treatment to be sure that the heart is functioning normally because adriamycin, the “A” in ABVD, is associated with potential cardiac toxicity. A two-dimensional echocardiogram (2-D echo) is sometimes used in instead of the MUGA scan to test heart functioning.

Pulmonary Function Tests

Pulmonary function tests are conducted to help physicians assess how well your lungs work. These tests are commonly ordered for patients with Hodgkin lymphoma who are undergoing ABVD treatment since bleomycin (Blenoxane), the “B” in ABVD, has pulmonary toxicity. Your doctor may wish to order pulmonary function tests before you begin treatment and numerous times thereafter during treatment.

INTERPRETING DIAGNOSTIC REPORTS

It is important to be aware that no one test is definitive. Tests can be reported as “normal” even though lymphoma may be present. Tests may also be reported as abnormal even though no lymphoma is present. Other conditions may mimic Hodgkin lymphoma. The interpretation of tests such as imaging scans can be difficult in some situations and needs to be made in the context of the disease and the patient. Oftentimes, follow-up tests are needed to determine the true significance of previous results. In fact, biopsies occasionally are needed to clarify the results. Some patients like to review their written scan reports. When doing so, it is important to carefully review the findings with the physician.

Tumor Bulk

While the term “tumor” refers to any swelling or lump—either benign or malignant—that forms in the body, most doctors and patients use the term to refer to a lump formed by a cancer, such as Hodgkin lymphoma. Tumor bulk refers to how much Hodgkin lymphoma is present. A low-bulk tumor, for instance, is a single mass of tumor tissue in the chest below ten centimeters in largest diameter; a single mass of tumor tissue in the chest above ten centimeters is considered a high-bulk or bulky tumor. In general, the smaller the tumor, the better the chances that it will be completely eliminated by treatment, but even large tumors can be cured. Patients with small tumors (called non-bulky disease) generally have a better prognosis than those with large tumors (bulky disease). Often, but not always, radiation is incorporated in the treatment of bulky tumors.

Cancer Staging and What It Means

“Stage” is the term used to describe the extent of tumor spread in the body. Hodgkin lymphoma is divided into four stages, depending on how far the disease has spread. Stages I and II are localized, while stages III and IV are considered advanced, widespread or disseminated. Stage is an important piece of information that helps to predict outcome, or prognosis, and determine approaches to treatment. However, it is important to remember that unlike an advanced stage III or IV diagnosis in solid tumor cancers in which the primary cancer has spread to other sites and may be more difficult to treat, advanced stages of Hodgkin lymphoma can be successfully treated and still have a favorable outcome.

The Four Stages of Hodgkin Lymphoma

Stage I (early disease): The cancer is found only in a single lymph node or region.

Stage II (locally advanced disease): The cancer is found in two or more lymph node regions on one side of the diaphragm (the breathing muscle that separates the abdomen from the chest).

Stage III (advanced disease): The disease involves lymph nodes both above and below the diaphragm.

Stage IV (widespread disease): The lymphoma is outside the lymph nodes and spleen *and* has spread to one or more organs such as bone, bone marrow, lung or liver.

The Meaning of the Letters A, B or E After the Stage

Each stage of Hodgkin lymphoma is further divided into “A” and “B” categories, depending on the symptoms patients have when they are diagnosed. Some patients have symptoms that affect their entire body (called systemic symptoms). Some examples include fever, night sweats and weight loss. Patients who have these symptoms will have the letter “B” after the stage of their disease. The “A” category is used to designate a person with no systemic symptoms.

The category “E” is used when Hodgkin lymphoma spreads locally from a lymph node into the closely surrounding tissue.

Getting a Second Opinion

Before you start therapy, you may want to consider getting a second opinion to confirm the diagnosis and treatment plan, particularly if some aspects of your illness seem complicated or uncertain. Some insurance programs require second opinions; others may cover it if a patient or doctor requests it.

If you decide to seek a second opinion, remember that it is best to request a complete copy of your medical records and to provide original X-rays, pathology materials, scans and reports requested by the consulting doctor. Make copies of these medical records—one for yourself and one that you deliver to the consulting physician, preferably before your appointment.

A second opinion is not considered adequate unless another pathologist, preferably one well versed in lymphoma, reviews the tumor sample. Your referring doctor or your healthcare plan can often recommend an oncologist you can visit to get a second opinion.

Choosing an Oncologist and Treatment Center

Your primary care doctor will probably have referred you to a specialist—likely a medical oncologist, hematologist or hematologic oncologist. Oncologists are physicians who specialize in diagnosing and treating cancer. Hematologists are physicians who specialize in diagnosing and treating disorders of the blood and lymphatic system.

Before agreeing to treatment by a doctor or clinic, be certain that your medical and personal needs will be met. Take time to check your doctor's credentials, the other members of your medical team, as well as the credentials of the hospital or cancer center.

Keep in mind that if you are in a managed care program, your choices may be limited. However, if you are not entirely satisfied with your first consultation, you have the right to choose another healthcare team. Ask your primary care doctor for another referral, or ask other patients with lymphoma for their suggestions. It is important that you feel comfortable with your healthcare team and the quality of care you are receiving.

QUESTIONS TO ASK WHEN CHOOSING A DOCTOR AND TREATMENT CENTER

Before beginning treatment, ask these basic questions:

- How much experience does this doctor (or clinic) have in treating cancer in general and lymphoma in particular? How many patients with lymphoma are being treated here now?
- Is the doctor board certified as an oncologist or hematologist? Has he or she passed qualifying examinations by the American Board of Internal Medicine that certify his or her competency in these specialties?
- How does the doctor or clinic stay up-to-date on the latest treatments for lymphoma?
- Do the oncologists or hematologists in the clinic participate in clinical trials?
- Does this center have state-of-the-art surgical facilities and diagnostic equipment?
- Is the doctor or clinic professionally affiliated with any major medical centers or medical schools?
- What arrangements are made for medical coverage after hours and on weekends in case of an emergency?

**Please refer to our website
for additional and updated information.**

[lymphoma.org](https://www.lymphoma.org)

Part 2: Treating Hodgkin Lymphoma

Chapter 4

What You Should Know Before Starting Treatment

Getting a cancer diagnosis is frightening, and patients are naturally concerned about what their future may hold. Oftentimes, patients will ask their doctor about their outlook, or prognosis—the medical term used to describe how the disease will progress and the likelihood of recovery. To be an educated healthcare consumer, it is important to understand the nature of cancer and what to expect from treatments, including any possible effects on quality of life, such as lifestyle, emotions and financial issues.

Prognosis is usually based on information gathered from hundreds or thousands of other patients who have had the same disease. This statistical information provides physicians with a general idea of what to expect when a patient is diagnosed with a specific type of lymphoma and also gives guidance on the kinds of treatments that have been most successful in treating that cancer. *However, no two patients are alike and statistics from large groups of people do not necessarily accurately predict what*

will happen to a particular patient. The doctor most familiar with your situation is in the best position to help interpret these statistics and determine how they apply to you.

Treatments for Hodgkin Lymphoma

Hodgkin lymphoma patients should take comfort in the fact that this type of cancer is highly curable. More than 80 percent of all patients with Hodgkin lymphoma will be cured of their disease—that number rises to more than 90 percent in patients with early-stage disease. Most people with Hodgkin lymphoma will receive combination chemotherapy with or without radiation. Other treatments may include stem cell or bone marrow transplantation. Advances in how chemotherapy and radiation are administered and a reduction in the amount of doses given are expected to result in a decrease in the long-term and late effects of treatment.

Currently, there are many major research efforts under way to investigate the effectiveness of new medications and novel combinations of established therapies, as well as efforts to determine the best ways to minimize the short- and long-term toxicities of these treatments. The science of treating Hodgkin lymphoma is advancing very rapidly, and many new treatments are on the horizon. (See “Therapies Under Investigation,” on page 87).

When to Consider a Clinical Trial

Contrary to what many cancer patients believe, participating in a clinical trial is not an indication that they have run out of standard treatment options and that it is their last chance for survival. The purpose of a clinical trial is to monitor the effects of new drugs, drug combinations or new techniques to identify the most effective way to treat Hodgkin lymphoma. Participation in a clinical trial is especially crucial for lymphoma patients: Hodgkin lymphoma comprises a group of rare diseases, and it is often difficult to find sufficient numbers of patients to enroll in the studies. Clinical trials are the standard of care in the treatment of children with cancer, and more than 80 percent of children with cancer are enrolled in clinical trials. If you are interested in participating in a clinical study, ask your doctor if there is an appropriate trial for you and what the potential risks and benefits may be. (See “Clinical Trials,” on page 81.)

Communicating With Your Healthcare Team

People diagnosed with lymphoma are often anxious to learn all they can about their disease and treatment choices so they can play an active role in decisions about their care. For many people, getting a cancer diagnosis is shocking, and it is normal to feel a lot of physical and emotional stress following diagnosis. Some people are uncertain about how to talk with doctors, and the combination of stress and uncertainty may make it difficult to know what to say or what questions to ask.

Patients can ease their anxieties by establishing an open and honest dialogue with their physician and nurse regarding their diagnosis, and learning about the prescribed treatment regimen, how it works, what tests are involved and what side effects and complications may be associated with it. To help you through the course of your illness, a good first step is to write down all of the questions that come to mind, because eventually you, your family and friends are going to want answers. Before meeting with your doctor or nurse, whether for the first time or for follow-up visits, organize and write out your questions. Put the two or three most important questions at the top of your list, since time with your doctors or nurses may be limited.

Also, it is helpful to have a member of your family or a close friend accompany you to the doctor's office or clinic to help you ask questions and understand and remember answers. It can also be helpful to write down the answers to your questions. Some patients bring a tape recorder to record the answers. Check with your doctor first, though, to make sure he or she does not mind if you tape record the conversation. In general, questions about chemotherapy should be directed to the medical oncologist, and questions about radiotherapy should be directed to the radiation oncologist. Most oncology nurses are also very well informed about cancer treatments, and are a wonderful source of information on a wide range of topics relating to your care.

Although family members are often very concerned about their loved one and want information concerning his or her care, strengthened confidentiality rules prohibit physicians from giving out information to anyone without the patient's expressed permission. For efficiency, it is suggested that one

family member be designated as the family contact to the physician. You, however, must inform your physician who this individual will be.

Writing an Advance Healthcare Directive

TIPS ON COMMUNICATING WITH YOUR DOCTOR

- Keep a journal of your symptoms to help you remember the details you want to discuss with your doctor during your office visit and then bring a list of your questions to your appointment.
- During your office visit, take notes or tape record your conversation to help you accurately review the information afterward. Bringing along a family member or friend for support and to take notes for you is also helpful.
- Do not be afraid to ask questions when you do not understand something. Doctors want to know how best to explain information to you.
- Before leaving the doctor's office, make sure you understand the next step in your care and ask if there is written information you can take home.

And Appointing a Healthcare Proxy

Writing down your wishes for your critical medical care in an advance healthcare directive is a way to inform your physician, family members and friends about your healthcare preferences and what special treatment you want or do not want at the end of life. Besides stating your medical care instructions, your advance healthcare directive should also include the name of your healthcare proxy, or decision maker—someone you have chosen whom you believe will carry out your wishes if you are unable to do so, including do not resuscitate (DNR) instructions. Before writing an advance healthcare directive, it is important to understand your rights and the laws regarding advance healthcare directives in your state. Consulting an attorney can provide the legal information you need, but you do not have to use an attorney to write an advance directive. Some things to consider when writing an advance healthcare directive:

- Specific instructions on your medical care, including the types of special treatment you want or do not want such as cardiopulmonary resuscitation (CPR), artificial respiration, drugs to make your heart function, kidney dialysis, artificial feeding and certain surgical procedures.
- Your choice for your healthcare proxy.

How to Be a Self-Advocate

Being a self-advocate and an active participant in your healthcare can be a positive experience and may help restore a sense of control that was lost following your diagnosis. It is important to remember that you are a partner in your treatment plan, and many patients feel better when they actively participate in their care. The first steps in participating in your treatment are to ask questions, learn about your options and work closely with your doctor. You must be comfortable with your physician and the approach that he or she takes. If you are not, openly discuss your concerns. Remember, confidence in your medical team often leads to confidence in your treatment. If it becomes apparent that you and your team are not a good match, ask for a referral.

Your questions will likely vary depending on the purpose of your meeting with your oncologist, e.g., the initial visit to discuss your diagnosis as opposed to a routine visit to monitor a remission. Ask about the timing of office visits, treatments and tests. Your doctor can help explain what the tests will look for, define the possible responses and the options for further care, depending on treatment response.

Although each person is different and each response to therapy is unique, knowing someone who has been through the same treatment and who may have had similar concerns can be a source of great comfort. If you are interested in talking to and learning from people who have had similar experiences, ask your oncologist, hematologist, oncology nurse or the oncology social worker about support groups in your area. Consider joining the *Lymphoma Support Network*, a nationwide buddy program that matches patients or caregivers. This program offers the opportunity to share experiences and information and offer support and encouragement. For more information about this program, call (800) 500-9976 or email helpline@lymphoma.org.

Before any tests are performed, be sure to check with your healthcare team to determine which costs are covered by your insurance company and which costs you might be required to pay. And do not be afraid to broach nonmedical issues, such as transportation, finances, insurance and childcare, with your healthcare team.

TIPS ON SELF-ADVOCACY

- Do not be afraid to ask your doctor or nurses questions about your care.
- Learn more about your lymphoma from reliable websites, such as the Lymphoma Research Foundation at lymphoma.org. Or ask your doctor for information specific to your type of Hodgkin lymphoma.
- Take advantage of other services offered at your doctor's office, cancer center or hospital, such as counseling, support groups, nutritional counseling and fitness classes.
- Consider joining the *Lymphoma Support Network*, a nationwide buddy program that matches patients or caregivers. For more information about the program, call (800) 500-9976 or email helpline@lymphoma.org.

Factors Affecting Treatment Outcome

In addition to the type of Hodgkin lymphoma a patient has, many other factors affect how an individual patient responds to therapy.

Age

Younger people generally have better outcomes than those who are older. Younger patients may be better able to tolerate the effects of therapy because they generally have fewer health problems, such as heart or lung disease that could limit the type or dose of therapy.

Performance Status

Performance status is used to describe a person's ability to follow a typical lifestyle. Those with good performance status (people who are active) tend to respond better than those with poor performance status (people with chronic health problems or those so ill that they are confined to bed), because they can tolerate more intensive therapy. Performance status is ranked on a scale from 0 to 4.

Extranodal Disease (disease outside the lymph nodes)

When Hodgkin lymphoma has spread outside the lymph nodes into the lung, liver, bone or bone marrow, it is referred to as extranodal disease. Hodgkin lymphoma patients with extranodal disease tend to have a lower cure rate compared with those whose disease has not spread.

Stage of Disease

Stage refers to the extent of the spread of the lymphoma. Stages I and II are used to describe localized disease found in an area either above or below the diaphragm (the muscle separating the chest from the abdomen), while stages III and IV refer to more widespread or advanced disease involving lymph nodes and other organs on both sides of the diaphragm. Patients with stage III or IV disease may have a lower cure rate than those with stage I or II disease. However, the majority of these patients are also cured.

Tumor Bulk

Patients with bulky (large) tumors generally have a lower cure rate than those with non-bulky disease.

Other Factors

A patient's sex, level of albumin (serum proteins) in the blood, hemoglobin level, white blood count and the number of lymphocytes circulating in the bloodstream may also affect prognosis and treatment options.

Terms Describing Possible Outcomes of Treatment

Primary Therapy—This is the first therapy that a patient receives.

The choice of primary therapies depends on the pathologic characteristics of the disease and the factors described in the previous section.

Complete Remission (CR)—This term is used when all signs of the lymphoma have disappeared after treatment. Although this does not mean that the cancer is completely cured, the symptoms have disappeared and the lymphoma cannot be detected using current tests. If this response is maintained for a long period, it is called a durable remission. The longer a patient is in remission the better the prognosis or outcome and the likelihood of cure. However, as with other cancers, it is possible that Hodgkin lymphoma could recur and, as a result, long-term follow-up medical care is necessary.

Cure—When there are no signs of the lymphoma reappearing after many years of continuous, complete remission, doctors may cautiously begin using the word “cure” for Hodgkin lymphoma.

QUESTIONS TO ASK BEFORE TREATMENT BEGINS

- What is my exact diagnosis?
- What is the stage of my Hodgkin lymphoma?
- What are my treatment options? Which do you recommend for me? Why?
- What are the risks and possible side effects of each treatment?
- What side effects should I report to you?
- Are there any late- or long-term side effects I should be aware of?
- How long will the treatment last?
- What are the chances that the treatment will be successful?
- How will the treatment affect my normal activities?
- Are new treatments being studied? Would a clinical trial be appropriate for me?
- What is the treatment likely to cost? Does my insurance cover it?

Disease Progression—If the disease worsens or the tumor grows during therapy, it is called disease progression (this is also referred to as treatment resistance).

Partial Remission (PR)—This term is used if the Hodgkin lymphoma is treated and the tumor shrinks to less than one-half of its original size.

Improvement—This term is used if the tumor shrinks following therapy but is still more than one-half of its original size.

Stable Disease—The disease does not get better or worse following therapy but stays about the same.

Refractory Disease—A cancer that is resistant to treatment.

Relapse—The disease reappears or grows after a period of remission.

Chapter 5

Types of Treatment

There were two important advances over the last 25 years that have dramatically changed the way Hodgkin lymphoma is treated. One was the elimination of surgical staging laparotomies, in which a patient's spleen was removed to evaluate the extent of disease. This was replaced with the practice of noninvasive clinical staging, in which imaging technology like computerized tomography (CT) and positron emission tomography (PET) scans are used to capture detailed images of internal organs and spot enlarged lymph nodes. The second advancement was the reduction in both the amount of radiation therapy given to treat Hodgkin lymphoma patients and a reduction in the field of radiation (the amount of body radiated).

There is great concern about the late toxicities associated with radiation therapy, and for that reason, more and more patients receive chemotherapy only as their first-line treatment. To reduce the amount of radiation exposure in patients, involved-field radiation is limited to the sites containing cancerous lymph nodes and leaves uninvolved sites alone. Although it is too early to know for certain, researchers suspect that less exposure to radiation may result in fewer late health effects, such as secondary cancers like breast cancer, lung cancer, leukemia and heart disease. However, because it can take many years for late side effects to manifest, it may be decades before there is scientific proof about the long-term health benefits of involved-field radiation.

Changes in both the combinations of chemotherapy drugs used and the number of cycles of chemotherapy given are having a positive impact on the quality of life for many Hodgkin lymphoma patients by reducing—or even eliminating—some long-term side effects from the treatment, such as infertility in men and women.

Most people treated for Hodgkin lymphoma will receive some form of chemotherapy and sometimes radiation therapy as their frontline treatment. The addition of biologic agents to chemotherapy is also currently under

investigation in clinical trials. Bone marrow or stem cell transplantation is typically used in the relapsed or refractory setting. Surgery may also be an option under special circumstances, but it is used primarily to obtain a biopsy for diagnostic purposes. Since no two patients are exactly alike, treatment is tailored for each patient's unique situation.

Although the cure rate in Hodgkin lymphoma is already high, research continues to look for ways to treat the small minority of patients who are less resistant (refractory) to treatment. For the small number of patients who relapse, alternative therapies, such as stem cell transplantation, may cure the cancer. Ongoing research also continues to find ways to refine currently available treatments both to limit their levels of toxicity and their potential for causing secondary illnesses and improve long-term survival. Better-targeted drugs that do not cause such damaging side effects are also being pursued.

Here is a look at current standard therapies to treat Hodgkin lymphoma and what may be available in the future.

Chemotherapy

Chemotherapy (“chemo”) is treatment with drugs (as opposed to radiation, for example). Many different medications are used to either kill cancer cells or prevent them from growing. Because of how they work, chemotherapy drugs may also have a similar effect on rapidly dividing normal cells such as hair, nails and the cells in your mouth.

Combining Chemotherapy Drugs

Chemotherapy for Hodgkin lymphoma often consists of giving multiple drugs together (combination chemotherapy) in a defined way (schedule), called a treatment regimen. Drug combinations are used because different medications damage or kill cancer cells in different ways, making them more vulnerable to the treatment. Combining chemotherapy drugs provides a more effective way to kill more tumor cells, because using the drugs together greatly augments the impact of the drug over its use individually or additively. Also, drugs added together in lower doses help reduce the likelihood of side effects without reducing the overall amount of effective chemotherapy. For example, the combination regimen ABVD (adriamycin, bleomycin, vinblastine, dacarbazine) is currently considered

Common Drug Regimens Used to Treat Hodgkin Lymphoma

(brand names in parentheses)

Regimen Abbreviation	Drugs
ABVD	Doxorubicin (Adriamycin, Rubex) Bleomycin (Blenoxane) Vinblastine (Velban, Velsar) Dacarbazine (DTIC)
Stanford V	Mechlorethamine (Mustargen) Doxorubicin (Adriamycin, Rubex) Vinblastine (Velban, Velsar) Bleomycin (Blenoxane) Etoposide (VP-16, VePesid) Prednisone (Deltasone) Involved Field radiation
BEACOPP	Bleomycin (Blenoxane) Etoposide (VP-16, Vepesid) Doxorubicin (Adriamycin, Rubex) Cyclophosphamide (Cytoxan) Vincristine (Oncovin) Procarbazine (Matulane) Prednisone (Deltasone)
MOPP	Mechlorethamine (Mustargen) Vincristine (Oncovin) Procarbazine hydrochloride (Matulane) Prednisone (Deltasone)

standard therapy: It has less toxicity while sustaining a full capacity to destroy Hodgkin lymphoma cells.

Another reason for using combination chemotherapy is to prevent drug resistance. A chemotherapy regimen is a combination of anticancer drugs given at a certain dose in specific sequence according to a strict schedule. This schedule should be maintained whenever possible.

Clinical investigators often use the first initials of the drugs in a particular treatment regimen to communicate among themselves as a shorthand reference to the treatment. Some of the most common regimens used for Hodgkin lymphoma are outlined on the prior page. Many other combinations are being tested in clinical trials.

Chemotherapy Cycles

A single dose of chemotherapy kills only a percentage of the cancer cells, therefore, multiple doses are necessary to kill all the cancer cells. Chemotherapy is scheduled as frequently as possible to minimize tumor growth, prevent the development of resistant cancer cells and achieve the best outcome.

Chemotherapy is usually given in cycles, meaning each treatment is followed by several weeks of rest and recovery, during which time no treatment is given. The medicines are usually given according to a schedule that includes a defined number of days between each cycle.

Clinical trials have determined how often chemotherapy should be given to kill the most tumor cells while minimizing side effects. Chemotherapy for Hodgkin lymphoma may require as few as two or as many as eight or more cycles of treatment, depending on factors such as the type and stage of the disease, the kind of drugs used, the level of response achieved and the nature and severity of the side effects.

How Chemotherapy Is Given

Depending on the chemotherapy regimen, you may receive drugs in pill form, as an injection or as an intravenous drip. If you are going to receive intravenous drugs (ones that are given through a vein) for multiple cycles, your doctor may recommend having a catheter inserted. An intravenous catheter is a device that is put into a vein to make it easier to give drugs. Catheters may be left in place temporarily or permanently.

There are several types of catheters. One type, called a Hickman-Broviac catheter, consists of one to three tubes inserted through the chest wall into a vein. Six to twelve inches of tubing remain outside the skin. The main advantage of this type of catheter is that blood can be drawn for tests and drugs given without having to pierce the skin. Disadvantages include the

possibility of infection if the catheter is not cared for properly and the fact that the tubes on the outside of the body make it more obvious that a catheter is in place. If you have this type of catheter, your healthcare team will show you what needs to be done each day to care for it and to make sure it stays clean.

A second type of intravenous catheter, called an Infusa-Port or Portacath catheter, is placed under the skin and appears only as a bump on the chest. The advantage of this catheter is that it is easier for patient care—it only needs to be maintained by a nurse once a month (called “flushing”). However, it also has disadvantages. Each time this type of device is used, an injection through the skin is required, and it may not always be convenient to draw blood samples. These devices may also occasionally clot.

Another type of intravenous catheter is a peripherally inserted central catheter, or PICC line, which uses a thin, soft plastic tube to deliver medicines and fluids through a large vein in the arm. The PICC line can be kept in place for months and is a good option for patients who need to have many short infusions or continuous infusions given in a hospital or at home with a portable pump.

If you need a catheter, discuss the pros and cons of the different types with your doctor. Your situation and personal preferences will be considered in making this decision.

The Importance of Maintaining Chemotherapy Dosing and Scheduling

“Dose intensity” is a term used to describe giving preplanned doses of chemotherapy over a specific period of time, while maintaining an acceptable level of side effects. This approach has been shown to be very effective in curing some cancers, including some aggressive lymphomas. Studies have suggested that reducing the dose or delaying chemotherapy may decrease both the chance for a cure and long-term survival in some types of lymphomas.

Patients should know that changing the regimen to reduce short-term side effects may actually be harmful in the long run. Some side effects may be unpleasant but tolerable (See “Coping With Common Treatment Side

Effects,” on page 45). Others may be serious but can often be anticipated and prevented. It is very important that chemotherapy doses and schedules be maintained to the greatest extent possible.

Bone Marrow and Stem Cell Transplantation

Hodgkin lymphoma patients who fail to achieve complete remission following frontline therapy or who relapse after achieving complete remission are often treated with second-line chemotherapy regimens, followed by a bone marrow or stem cell transplant. (See “Why Hodgkin Lymphoma Patients Relapse or Become Refractory,” on page 78.)

Bone marrow, the spongy material found inside our bones, contains immature “stem” cells. Stem cells develop into three types of cellular elements found in the blood: red blood cells, which deliver oxygen to all parts of the body and take away the waste product carbon dioxide; white blood cells, which protect the body from infection; and platelets, which help blood clot. In the past, stem cells were collected directly from the bone marrow, but they are now usually collected from the peripheral (circulating) blood by timing their collection with the use of growth factors and sometimes chemotherapy that increase their production. The peripheral blood is then washed of stem cells by a machine.

Because very high doses of chemotherapy or radiation are used to destroy cancer cells, healthy bone marrow cells are also destroyed. Therefore, a transplant of bone marrow or stem cells is needed to restore healthy bone marrow. Since transplants place great strain on the body, it is not a treatment option for everyone. Among the things to consider are age, medical history, cancer stage, response to previous therapy and chances for a successful transplant.

Sources of Bone Marrow or Stem Cells

A key to the success of a transplant is the availability of stem cells. There are two main types of stem cell transplants: allogeneic, in which patients receive bone marrow or peripheral stem cells donated by another person, often a sibling; and autologous, in which patients receive their own cells. Autologous bone marrow transplantation is far more common than allogeneic, because it is much less toxic.

HOW TRANSPLANTS ARE DONE

Bone marrow or peripheral blood stem cell transplants are performed in four steps:

Step 1: Harvesting stem cells or bone marrow

Stem cells are usually filtered from the blood in a process called apheresis; the other components of the blood are then returned immediately to the patient. Bone marrow (which contains stem cells) is usually harvested from bones in the hip.

Step 2: Processing or preserving the stem cells or bone marrow

Machines are sometimes used to purge any malignant cells, filter out unwanted substances and freeze and store the pure transplant material, including cells.

Step 3: Administering therapy

High-dose chemotherapy is then administered, with or without radiation, to eliminate the cancer cells. This high-dose treatment also wipes out healthy blood and immune cells. The type of chemotherapy given will depend on the stage and type of disease, whether it is a recurrence, the condition of the patient and the treatment facility's preferences and experiences.

Step 4: Reinfusing harvested stem cells or bone marrow

As the harvested stem cells or marrow are returned to the body (transplanted), they travel through the circulatory system to the bone marrow, where they implant themselves and slowly begin to make healthy new cells. Over time, the bone marrow produces enough healthy cells to completely repopulate the blood and immune systems. In the period before these new cells are created, patients are more susceptible to infection.

Allogeneic Transplantation

Finding a compatible donor is important. Your body will reject stem cells if they are too unlike your own, or the new cells may react against your own cells, a condition called graft-versus-host disease (GVHD). Several different blood tests may be used to see if someone is a suitable transplant donor. The best candidates are siblings. One potential advantage of an allogeneic transplant is that the donor's immune cells may fight against and destroy the lymphoma cells.

Autologous Transplantation

In this procedure, a patient's own stem cells are removed, known as harvesting (see above), and stored before he or she receives high-dose

chemotherapy or radiation treatment. Then the stem cells are reinfused into the patient's blood. The advantage to this type of transplant is that there is no danger that the body will reject the bone marrow or stem cells, or that the stem cells will react against the body.

Harvesting Stem Cells

In this procedure, stem cells are obtained from the bone marrow or blood to repopulate the body's cells after high-dose chemotherapy. The cells used in autologous transplantation can be obtained either by harvesting bone marrow or stem cells. A bone marrow harvest involves removing bone marrow, which is a thick red liquid, from the hipbone with a needle. This procedure is done in an operating room and requires general anesthesia for comfort. Once the bone marrow is harvested, it is purified and stored until the day of the transplant. Multiple needle insertions are required to harvest enough bone marrow. This procedure is performed less commonly now but was frequently performed in the past.

Although the greatest number of stem cells is found in the bone marrow, these cells are also present in the circulating blood, especially when mobilized by chemotherapy or growth factors. Today, the more common way to collect cells for a transplant is by harvesting them from the blood. This method is often preferred over harvesting from bone marrow because it can be done on an outpatient basis. It involves the withdrawal of blood in a process called apheresis (which means to remove or take away). In this case, stem cells are removed, and the rest of the blood is returned to the patient.

Mini-Bone Marrow or Mini-Stem (Non-Myeloablative/Reduced Intensity) Cell Transplant

Mini-bone marrow or mini-stem cell transplants are procedures in which bone marrow or stem cells are received from an allogeneic donor. Unlike the usual allogeneic bone marrow or stem cell transplant, in which high-dose chemotherapy is administered, in these procedures the patient receives lower doses of chemotherapy, just enough to allow the body to accept the new cells. This approach is used to take advantage of the graft-versus-disease effect, in which the transplanted cells recognize the tumor as a foreign entity and activate T-cells to destroy the cancer. Patients who experience a graft-versus-disease effect may remain in

remission for a longer period. Also, because patients receive lower doses of chemotherapy, they may avoid some of the toxicities seen with higher-dose chemotherapy. However, graft-versus-host-disease is a frequent and sometimes serious side effect and is a potentially serious complication of allogeneic bone marrow transplantation.

Biologic Treatments

Biologic therapies (including immunotherapy) differ from chemotherapy because they use naturally occurring substances found in the body to treat cancer. These therapies can boost, direct or restore the natural defenses against disease. Examples of biologic therapies directed against tumors include monoclonal antibodies, radioimmunotherapies, interferons, vaccines, antiangiogenesis therapies and genes. Other biologic therapies may improve or restore the white or red cell count. At this time, biologic therapies are only in the investigative stage to treat Hodgkin lymphoma.

Monoclonal Antibodies and How They Work

Plasma cells, the most mature B-cells in the body, are white blood cells that specialize in making antibodies. Each plasma cell is responsible for one antibody, otherwise known as a monoclonal antibody (MAb). Each MAb acts specifically against a particular antigen, which is like a beacon that attracts antibodies and immune cells (such as lymphocytes). Using new technologies, scientists can now produce large amounts of antibodies that can be directed to a single antigen on the cell's surface. A MAb is similar to a guided missile that homes in on an antigen on the lymphoma cell and destroys the cell.

A number of strategies involving the use of MAbs to treat cancer are being studied, including (a) MAbs that react with specific types of cancer cells, thereby enhancing a patient's immune response to the cancer; (b) MAbs that are combined with other anticancer drugs, toxins or radioisotopes, allowing the delivery of these drugs directly to the tumor and bypassing toxicity to most normal cells; and (c) MAbs that are used to help purge and destroy cancer cells before a patient's stem cells are reinfused in autologous bone marrow transplantation.

Monoclonal Antibodies as Possible Treatment for Hodgkin Lymphoma

Rituximab (Rituxan) was the first monoclonal antibody approved for the treatment of CD20 positive, B-cell non-Hodgkin lymphoma and is currently in clinical trials in the treatment of both the classical form of Hodgkin lymphoma and in the rarer type, lymphocyte predominate Hodgkin lymphoma, which has the CD20 antigen.

Rituximab (Rituxan) targets the CD20 antigen found on almost all B-cells, killing both cancerous and many of the normal B-cells but sparing all other cells and tissues. Researchers believe that this therapy works in part via the body's immune system response triggered by the MAb's attachment to cancer cells. Because the youngest B-cells in the body (precursor cells that will become B-cells) do not yet have the CD20 antigen, they are not affected. As a result, after treatment the body can replenish its B-cell supply from these young cells.

Other monoclonal antibodies are also being investigated in the treatment of Hodgkin lymphoma to target CD30, CD40, CD80 and CD52 antigens. A description of these and other biologic therapies as well as vaccine therapies, histone deacetylase inhibitors, mTOR inhibitors and JAK-2 inhibitors that are currently being tested in the treatment of Hodgkin lymphoma can be found in "Therapies Under Investigation," on page 87.

Radiation Therapy

Radiation therapy (also called radiotherapy) uses high-energy X-rays to kill cancer cells and shrink tumors. Radiation may be combined with chemotherapy.

The term "radiation field" is used to describe the part of the body selected to receive radiation therapy. Hodgkin lymphoma generally spreads predictably from one lymph node to another. When the lymphoma is confined to a specific area of the body, for example, the neck, involved-field radiation may be given, meaning the therapy is limited to a small area. When radiation therapy is given more broadly to larger common areas, it is called extended-field radiation.

To prepare for radiation therapy, the skin is marked with tiny ink dots called "tattoos," so the exact same area will be treated every time. Before

the first treatment, the healthcare team devotes a substantial amount of time marking the body to make sure that specific areas receive radiation. Normal tissues around the radiation field are shielded by lead, which blocks the path of stray radiation beams. Patients lie still on a table beneath a large machine that delivers the radiation. Props and supports with plastic forms, pillows and rolled blankets help keep patients in position. Once the preparations have been made, it takes only a few minutes to deliver the prescribed dose. The total dose of radiation is usually divided and given over one to six weeks.

In Hodgkin lymphoma, the common areas of the body that are radiated include lymph nodes in the neck, chest and armpit (mantle field); lymph nodes in the abdomen and possibly spleen; lymph nodes in the pelvis and groin; and in certain circumstances, extended-field radiation to both the mantle and upper abdominal fields. Rarely, total body radiation may be recommended.

Vaccines and Cell Therapies

Vaccines are not yet available for the treatment of Hodgkin lymphoma. However, evidence suggests that the Epstein-Barr virus (EBV) may contribute to the development of Hodgkin lymphoma in some people, and testing is under way to determine whether targeting EBV in Hodgkin lymphoma tumor cells with specialized immune cells will be effective against this cancer. In clinical trials, the immune cells of patients with EBV are being collected, processed and then reinfused into the patient in an effort to kill the cancer cells.

Complementary and Alternative Remedies

The concept of holistic medicine to treat the mind, body and spirit became popular in the 1970s and is commonly known today as complementary and alternative medicine, but the terms have distinctly different meanings. Alternative therapy refers to unproven or disproven treatments that are used instead of standard or proven therapy. Complementary therapy is used in addition to standard medicine to help improve a patient's quality of life and to relieve the effects of chemotherapy, radiation and surgery. Currently, there are no viable alternative therapies to conventional cancer care, and Hodgkin lymphoma patients should never use alternative remedies in lieu of standard care.

Complementary, also known as integrative, medicine includes a vast array of mind/body therapies such as meditation, guided imagery, self-hypnosis, tai chi and yoga; touch therapies such as massage, reflexology and Reiki; acupuncture; and nutrition. However, because even some complementary practices, such as ingesting certain herbs or botanicals, may negatively impact cancer treatment, Hodgkin lymphoma patients should consult with their healthcare team before embarking on any integrative medicine plan.

How Integrative Medicine Helps

Acupuncture

Some studies show that acupuncture can relieve pain, nausea, fatigue, hot flashes and neuropathy (numbness and tingling in the feet and hands) associated with chemotherapy. Using new ultrathin needles applied to specific points on the body, acupuncture is safe and painless. Needles used should be disposable and only used once.

Mind/Body Techniques

Meditation, guided imagery and self-hypnosis are all methods used to manage stress. Yoga and tai chi minimize stress and improve balance and flexibility.

Touch Therapies

Massage, reflexology (foot massage) and Reiki involve applying therapeutic pressure to the body to restore a sense of harmony, relaxation and well-being. Massage therapy may reduce patients' pain levels.

Nutrition

Eating a healthy, well-balanced diet that contains five to seven servings of fruits and vegetables a day, having fish or poultry and whole grains and limiting red meat and fat intake and reducing daily alcohol consumption are recommended for patients undergoing treatment.

What to Avoid

Dietary supplements such as multivitamins; high doses of vitamins like C, E and folic acid; and antioxidant-rich drinks like green tea, cranberry and pomegranate juice can interfere with cancer treatment and may actually increase the growth of cancer cells. Botanicals and herbs, like ginkgo

biloba, may increase bleeding disorders and either increase or reduce the effectiveness of chemotherapy drugs.

Drug Costs: What to Do If Your Insurance Does Not Pay

Many cancer patients today face the problem of how to pay for soaring healthcare costs. Cancer organizations like the Patient Advocate Foundation (patientadvocate.org) and CancerCare (cancercare.org) offer limited financial assistance to patients who qualify. And most pharmaceutical and biotech companies have patient-assistance programs in place that provide drugs for free to qualifying patients. If you are in need of financial assistance, talk with your doctor about available options and how to enroll in an appropriate program.

**Please refer to our website
for additional and updated information.**

[lymphoma.org](https://www.lymphoma.org)

Part 3: Treatment Side Effects

CHAPTER 6

Coping With Common Treatment Side Effects

Hodgkin lymphoma patients may experience a range of side effects, also called toxicity, from the cancer treatment they receive. The various treatments, including chemotherapy, radiation and steroids, cause different side effects. Fortunately, there are many effective ways to make them more tolerable. Ask your healthcare team about possible side effects from your treatment regimen and be sure to tell your doctor if you experience any of them. In many cases, side effects can be lessened with medications or lifestyle changes.

The Difference Between Long-Term Effects and Late Effects of Cancer Treatment

Long-term effects are defined as toxicities that happen during cancer treatment and continue for months or several years, such as fatigue, menopausal symptoms and cardiovascular problems. Late effects are side effects of cancer treatment that become apparent only after treatment has

ended and may arise many months, years or even decades after treatment is completed, such as infertility, osteoporosis and secondary cancers.

In general, chemotherapy tends to cause more long-term side effects than late effects in Hodgkin lymphoma survivors, and radiation usually causes more late effects. There is evidence, however, that the combination of doxorubicin (Adriamycin) and radiation, especially when the radiation is directed to the chest area, may result in late effects to the heart, causing a decrease in cardiac function and accelerated atherosclerosis, in which plaque builds up on the inside of the arteries (see “Cardiotoxicity,” below).

SOME COMMON SIDE EFFECTS CAUSED BY CHEMOTHERAPY

- Cardiotoxicity
- Pulmonary Toxicity
- Changes in taste
- Decreased blood cell production
- Diarrhea
- Fatigue
- Hair loss
- Mouth sores
- Nausea/vomiting
- Sexual dysfunction
- Sterility

Side Effects Caused by Chemotherapy

Chemotherapy is generally most effective at killing cells that are dividing rapidly, such as cancer cells. However, chemotherapy drugs are not selective, and they can also kill or damage normal healthy cells, especially cells that are fast growing, such as hair cells and those in the mouth, the gastrointestinal tract and the bone marrow. Some chemotherapy drugs may also damage heart cells. Side effects of chemotherapy can vary widely depending on the types of drugs that are given and an individual patient’s response. Side effects can be mild or serious. Some of the most common side effects caused by chemotherapy include the following:

Cardiotoxicity

Cardiotoxicity (the occurrence of heart muscle damage) from the use of a class of chemotherapy drugs called anthracyclines, including doxorubicin (Adriamycin), in the treatment of both non-Hodgkin and Hodgkin

lymphomas is well documented. Anthracyclines can weaken the heart muscle, causing it to work harder to pump blood. If the damage becomes severe, it can lead to congestive heart failure. Lifestyle choices can also impact a patient's risk for cardiotoxicity. For example, smoking, obesity, lack of exercise, high cholesterol and high blood pressure may all contribute to chemotherapy-related cardiotoxicity. Careful monitoring by your healthcare team can reduce your chances for developing cardiotoxicity. Most doctors will prescribe a MUGA (multiple gated acquisition) scan, which measures cardiac function, before chemotherapy begins to ensure that chemotherapy is safe.

Pulmonary Toxicity

A serious side effect of ABVD may be pulmonary toxicity. It is important to report any change in lung function, such as cough, chest pain or shortness of breath to your doctor. Your doctor may wish to follow your lung status by performing serial or intermittent pulmonary function studies.

Changes in Taste

Some patients will experience a change in the way foods or beverages taste. Familiar foods sometimes taste differently (called dysgeusia) or the flavors of foods are not as strong (called hypogeusia). Some patients may also feel that foods have a metallic taste. These side effects are temporary and typically disappear after chemotherapy is completed.

Decreased Blood Cell Production

Red blood cells, white blood cells and platelets are constantly being produced in the bone marrow. Chemotherapy treatment may temporarily interfere with the ability of the bone marrow to produce adequate numbers of blood cells. When this occurs it is called myelosuppression.

Anemia is the term used when myelosuppression causes a reduction in the number of red blood cells and hemoglobin (contained in the red blood cells). Anemia can cause people to feel very tired. Mild or moderate anemia is common with many chemotherapy regimens, and treatment for the anemia may be necessary.

Neutropenia is the term used when myelosuppression causes a decrease in neutrophils—the primary type of white blood cells found in the blood. Because neutrophils play a very important role in fighting infection, a low count may cause patients to develop serious or even life-threatening infections that require hospitalization or antibiotic therapy. Also, if the absolute neutrophil count is too low, your doctor may have to reduce your chemotherapy dosage or delay treatment rather than risk infection. Infection is often accompanied by fever. Other symptoms of infection may include chills and night sweats.

To prevent and control neutropenia, your doctor will check your white blood cell and neutrophil counts before and during each chemotherapy cycle. When neutropenia threatens your ability to receive the planned dose of chemotherapy, drugs such as filgrastim (Neupogen), pegfilgrastim (Neulasta) or sargramostim (Leukine) can be given after chemotherapy to reduce the duration and severity of neutropenia. These drugs can sometimes cause bone pain and, if in the chest, may make patients think they are having a heart attack. Nonsteroidals may relieve pain rapidly. By keeping the white blood count from dipping too low, these medications can help keep your chemotherapy doses on schedule. Occasionally, oral antibiotics are given to help prevent infection when neutrophil counts are low.

Thrombocytopenia is the term used when myelosuppression depletes the number of platelets in your blood. Platelets help start the clotting process when you bleed; if your platelet count is low, you may bruise easily. A low platelet count may also cause prolonged or excessive bleeding from cuts, nosebleeds, bleeding from the gums or bleeding without a previous injury. A platelet transfusion may also be needed in some cases.

TIPS FOR DETECTING INFECTION DUE TO LOW BLOOD CELL PRODUCTION

Report these symptoms immediately to your healthcare team:

- Fever (greater than 100.5°F)
- Sore throat
- Rash
- Diarrhea
- Redness, swelling or pain around a wound
- Cough

TIPS FOR AVOIDING DEHYDRATION FROM DIARRHEA OR VOMITING

- Drink plenty of liquids (eight glasses a day).
- Look for signs of dehydration, including dry mouth or skin, decreased urine and dizziness or lightheadedness when you stand up.
- Avoid milk products, which can worsen diarrhea.
- Avoid hard-to-digest foods, such as those high in fiber, which can worsen diarrhea.
- Eat plenty of bananas and other high-potassium foods (check with your physician or dietitian to make sure these foods will not interfere with your chemotherapy or other medications you are taking).
- Take the medicines that your doctor recommends to control diarrhea (notify your healthcare team if diarrhea occurs).

TIPS FOR COPING WITH FATIGUE

- Keep a diary to help you identify when you have the most energy and what activities make you feel fatigued or give you energy. This can help you plan your activities for the times when you have the most energy.
- Ask for help. This may be difficult for many people. Accept help if someone offers to assist you or if you need something you do not have the energy to do for yourself. Many family members or friends are happy to give assistance.
- Exercise if your doctor says it is okay to do so. But do not overdo it. Simple stretching, range-of-motion exercises or a short walk may give you more energy and not decrease the energy you have. Begin slowly and build up to the level that is right for you. Your doctor, nurse or physical therapist can help you create a personal exercise plan.
- Rest and sleep during therapy are very important, but try not to rest more than necessary, because it may decrease your energy level. Many patients find that taking an afternoon nap leaves them feeling less fatigued for the rest of the day, but others find that napping causes less restful nighttime sleep. If you are having trouble sleeping, talk to your healthcare team to determine the reason and what you can do about it.

Diarrhea

Diarrhea can be a side effect of chemotherapy. While most patients do not experience severe diarrhea, the most important thing to remember is to avoid dehydration (a loss of body fluids). Report any bloody diarrhea or fever with diarrhea to your healthcare team.

Fatigue

Fatigue is a common side effect of many types of chemotherapy. Fatigue should go away after treatments are over, but it can take weeks or months until it is completely gone. Extreme fatigue may be a sign of anemia. Certain medications may stimulate red blood cell growth.

Hair Loss

For many Hodgkin lymphoma patients, hair loss (also called alopecia) is one of the most distressing side effects of chemotherapy. Thinning or loss of hair can occur at any place on the body, including the scalp, eyebrows, eyelashes, arms, legs and pelvis. The hair loss may be variable. All of your scalp hair may fall out, or you may just notice overall thinning.

When hair loss occurs, it often starts about two or three weeks after the first chemotherapy treatment. Remember that hair loss due to chemotherapy is usually temporary, and your hair will probably grow back when the chemotherapy regimen is over. Typically, hair will start to grow back within a few weeks after treatment ends. At first, the new hair growing in may be a slightly different texture or color than it was before treatment, but it usually returns to normal.

Mouth Sores

The membranes of your mouth may become red, sore or irritated during chemotherapy, which is referred to as mucositis. Infections of the mouth and throat caused by viruses or fungi may also occur. If your throat is persistently sore, tell your healthcare team. They will need to look at your throat and may recommend a throat swab (called a culture) to check for infection. If an infection is present, several medications are available to treat it. To help reduce the risk of mouth infections, consider seeing a dentist and have a complete checkup and cleaning before receiving chemotherapy.

TIPS FOR CARING FOR HAIR LOSS

These steps can help alleviate chemotherapy-induced hair loss:

- Pat your hair dry rather than rub it with a towel after shampooing.
- Use a soft-bristle brush and a wide-tooth comb when grooming your hair.
- Avoid curlers and hair dryers.
- Avoid coloring your hair or using chemicals on it.
- Consider using a wig, scarf, turban or soft cotton hat or head wrap. Some health insurance companies cover the cost of wigs with a prescription from your doctor. Check your policy to see if you are covered.
- Use a hat or scarf to protect your scalp when out in the sun.

TIPS FOR PREVENTING OR CARING FOR MOUTH SORES

- Keep your mouth clean. Use a soft-bristle toothbrush, nonabrasive toothpaste and lip moisturizer.
- Avoid mouthwashes that contain alcohol. Your physician or nurse may recommend a swish-and-swallow mouth rinse.
- Avoid citrus fruits and juices.
- Avoid spicy foods.
- Eat soft foods while you are taking chemotherapy to avoid bruising the membranes in your mouth.
- Avoid flossing your teeth if your blood counts are low.

Nausea or Vomiting

Chemotherapy can cause nausea or vomiting. Drugs that prevent vomiting (called antiemetics) include aprepitant (Emend), ondansetron (Zofran), granisetron (Kytril), metoclopramide (Reglan) and dolasetron (Anzemet), prochlorperazine (Compazine); and a variety of corticosteroids, such as prednisone (Deltasone). Nausea most frequently occurs on the day you receive chemotherapy, but it can also start one or two days later.

Your doctor may prescribe an antiemetic before chemotherapy to prevent nausea. In most cases, antiemetics can partially or completely prevent nausea and vomiting.

TIPS FOR CONTROLLING OR MINIMIZING NAUSEA AND VOMITING

- Consume a liquid diet before chemotherapy such as broth, consommé or water. Avoid milk.
- Avoid foods that are too hot or too cold and too sweet or too spicy.
- Eat smaller and more frequent meals rather than a few large meals each day.
- Avoid strong or offensive odors. Get plenty of fresh air.
- Take prescribed antiemetics **before** chemotherapy to prevent nausea.
- If vomiting occurs, be careful to avoid dehydration (loss of body fluids).

Sexual Dysfunction

Chemotherapy can cause a drop in libido (sex drive). Usually, a normal libido returns after treatment is finished. (See “Sexuality,” on page 59.)

Sterility

Chemotherapy (and radiation) can sometimes cause either temporary or permanent sterility (the ability to have children) in both men and women, because the treatment may damage sperm and egg cells. The specific dose of treatment, whether the patient has received one or several therapies and the patient’s age at the time of treatment are all contributing factors to infertility.

Talk with your doctor before starting treatment about what you can do to protect your fertility during treatment. (See “Fertility Risks,” on page 61.)

Other Possible Side Effects

Some of the other possible side effects of chemotherapy include cough, a decrease in lung function, skin rashes, an increased risk of secondary cancers and general weakness. Some drugs may also cause damage to the nervous system called peripheral neuropathy. Nerve damage can cause side effects such as constipation or a tingling sensation in the fingers and toes. Patients are sometimes at increased risk for viral infections, particularly shingles (herpes zoster). Be sure to immediately report any painful local rash (which sometimes may be accompanied by blisters) to your doctor.

Other possible side effects include sore throat pain and a loss of balance or coordination. Although many of these effects are temporary, some may last for an extended period of time.

Side Effects Caused by Radiation

Radiation therapy (or radiotherapy) uses an invisible ray or beam of high-energy particles aimed at tumor sites to kill cancer cells. Radiation is painless and will not make you radioactive. However, there are side effects associated with radiation therapy. The consequences of radiation therapy depend on the treatment dose, the part of the body being treated (usually side effects occur only in the specific area of the body being radiated) and the age of the patient. Some common side effects caused by radiation:

- Dry mouth
- Fatigue
- Hair loss
- Loss of appetite and taste
- Nausea
- Secondary cancers
- Skin reactions
- Throat irritation

Radiation may also cause a drop in the number of white blood cells, which help protect the body against infection. Your healthcare team will monitor your white blood count during treatment.

Dry Mouth

A temporary decrease in the production of saliva during radiation therapy may cause patients to experience dry mouth, a condition known as xerostomia, which may result in difficulty in swallowing foods or thick liquids. Dry mouth may also cause food particles to stick to the teeth and gums. And because saliva helps prevent cavities, patients may be advised to visit the dentist before radiation therapy begins to receive fluoride treatments.

Fatigue

The likelihood that you will experience fatigue depends on your illness, the frequency of radiation treatments and the specifics of your radiation therapy. See page 50 for tips on overcoming fatigue.

Hair Loss

Unlike the hair loss that is caused by chemotherapy, hair loss caused by radiation occurs only on the specific area of the body that was treated. The hair loss is usually temporary, but it may be permanent (especially with higher doses of radiation). See page 50 for tips to cope with hair loss.

Loss of Appetite and Taste

Foods you once found appealing may no longer be appetizing to you during radiation treatments. The good news is that the loss of appetite and taste are usually short-term problems. Remember that eating well helps your body heal and boosts energy levels. Eating four or five small meals during the day may be more comfortable than eating two or three larger ones. Your healthcare team can provide information to help you maintain good nutrition during treatment.

Nausea

Nausea may occur after the first radiation treatment, especially in patients who have radiation to the abdomen. Some people can avoid nausea if they avoid eating (especially sweet, spicy or fatty foods) a few hours before radiation treatment. Patients may also want to schedule radiation visits for the end of the day so they can be home if they start to feel nauseous. If nausea becomes a problem, ask your doctor about taking a medication that prevents nausea (an antiemetic) before each radiation therapy session. See page 51 for additional tips to help you cope with nausea and vomiting.

Secondary Cancers

The risk for developing secondary cancers from radiation therapy depends on a number of factors, including the amount of radiation given and the part of the body treated. For example, Hodgkin lymphoma patients treated for limited disease in the chest area are at greater risk for developing breast, lung or thyroid cancer. Patients with more extensive disease in lymph node groups below the diaphragm are at greater risk for developing gastrointestinal

cancers such as colon cancer. Less common secondary cancers include basal cell skin cancer and sarcomas of the bone and soft tissue.

Skin Reactions

Radiation can cause a slight to moderate reddening of the skin and is often accompanied by discomfort, itching and flaking. Moist areas, such as around the mouth, may be more prone to irritation (your doctor may recommend zinc oxide ointment for these areas). These skin changes usually diminish and disappear over a few weeks. Your skin could look and feel as if it were sunburned, and it may eventually peel.

During radiation treatment you can take steps to protect your skin:

- Avoid exposing areas of the skin that are receiving radiation to the sun. These areas will *always* need extra protection, well after treatment is completed.
- Wear a T-shirt or hat and use plenty of sunscreen (with a high SPF) when out in the sun.

Throat Irritation

Receiving radiation to the neck, throat or chest may result in a sore throat, dry mouth, nausea or cough. You may have difficulty eating and swallowing, especially toward the end of your treatment program. Let your doctor know if you have difficulty swallowing. There are treatments that can help with the discomfort. Difficulty in swallowing will usually go away a few weeks after treatment.

There are things you can do to ease throat irritation during radiation therapy:

- Eat bland foods that are soft and smooth and easily digestible, such as pudding, yogurt and milk shakes, as well as commercial dietary supplements. Patients sometimes find these to be too sweet. Mixing them with milk or other liquids are often helpful.
- Take small bites and swallow each bite completely before taking another.
- Try drinking thicker liquids, such as fruit that has been puréed in a blender; they are easier to swallow than thin liquids, but avoid citrus fruits, especially juices.

Side Effects Caused by Bone Marrow Transplantation

Patients receiving high doses of chemotherapy and radiation before undergoing a bone marrow transplant may be at increased risk for developing infection, bleeding and other side effects. In addition, patients receiving bone marrow from a donor are at risk for developing graft-versus-host disease (GVHD), in which the donated marrow attacks the patient's tissues. Graft-versus-host disease can occur at any time after the transplant. Drugs may be given to reduce the risk of developing GVHD or to treat the problem once it develops.

Side Effects Caused by Steroids

Steroid drugs such as glucocorticosteroids (cortisone, hydrocortisone, dexamethasone, methylprednisone and prednisone) may cause a variety of side effects, including insomnia (the inability to fall asleep), increased appetite, mood or personality changes such as euphoria (an overwhelming sense of bliss) and anger, high blood pressure and weight gain. Prednisone may also trigger diabetes in patients prone to that disease or make the diabetes worse in patients who already have the disease. Steroids for extended periods of time may also cause osteoporosis in at-risk patients. Patients are advised to alert family and friends that personality changes may occur. Patients should avoid making hasty decisions. If personality changes occur, the doctor should be informed—the dose may need to be reduced. (See “The Difference Between Long-Term Effects and Late Effects of Cancer Treatment,” on page 45.)

When to See Your Doctor

Your doctor or a member of your healthcare team will discuss possible treatment side effects with you prior to initiating therapy. If you experience a symptom that is not expected or if your symptoms are prolonged, see your doctor. If you experience a medical problem that cannot wait for a regularly scheduled appointment, such as high fever, shortness of breath, unremitting nausea and vomiting, chest pains and dizziness, call your physician, who will evaluate your situation and decide your next course of action. If you cannot reach your physician or a member of your medical team, go to your hospital emergency room for a medical assessment and place another call to your doctor.

Combating Side Effects

Pain Management

Hodgkin lymphoma patients may experience pain, which can be caused by the lymphoma tumor itself when it presses on bones, nerves or body organs. Pain may occur as the result of treatment, procedures or tests (such as a bone marrow biopsy). Pain may be acute (sudden and lasting for a short period of time) or chronic (over a long period of time). If pain continues without treatment, it often leads to irritation, depression and a lack of energy.

It is important to know that you do not have to live in pain and that your medical team, which may include a specialist in pain control, can help relieve your discomfort. Many medical advances have been made in the treatment of pain, including an improved understanding of how medication works to relieve it. Other techniques such as relaxation, guided imagery and biofeedback may also relieve pain. Keeping a journal of when pain occurs, what it feels like (sharp, throbbing, etc.), how strong it is and how long it lasts will help you and your doctor develop the right plan to treat your pain.

Exercise

Regular physical activity helps keep the cardiovascular system strong and body muscles flexible. Exercise can also help alleviate breathing problems, constipation, poor appetite and mild depression. It also helps reduce stress and fatigue. Several types of exercise are particularly helpful:

- General physical activity such as swimming, dancing, mowing the lawn
- Aerobic activity to improve cardiovascular fitness, including walking, jogging, bicycling
- Resistance training to strengthen muscles, protect joints and help remedy osteoporosis by building bone mass, including lifting weights or using resistance-training equipment, push-ups, carrying and lifting
- Flexibility practices such as stretching and yoga improve range of motion, balance and stability

Before starting any exercise program, talk with your doctor about how much exercise is safe for you, and then gradually increase your physical

activity level. Do not push yourself beyond your limits. It is not necessary to overdo. There is nothing to prove.

Diet

Eating a healthy diet is more important than ever when you are going through cancer treatment and can help you keep up your strength and energy, better tolerate treatment-related side effects, decrease your risk of infection and heal and recover quickly. Aim for a diet high in fruits and vegetables (five to seven servings a day), protein (poultry, fish and eggs) and whole grains. Your healthcare team can help you put together an eating plan that suits you. All your daily nutrients should come from food and not dietary supplements such as multivitamins or individual vitamin supplements, because they may interfere with treatment.

See “Complementary and Alternative Remedies,” on page 41 for more tips on coping with Hodgkin lymphoma and treatment side effects.

Chapter 7

Sexuality

3

Sexual Function During Treatment

The causes of sexual dysfunction experienced by men and women during and after a cancer diagnosis are varied. Psychological factors, such as fear about your illness, altered body image due to hair loss and depression, and the physical side effects of treatment can all conspire to reduce sexual desire (libido) and function. Besides fatigue, some chemotherapy treatments can interfere with testosterone levels in men, resulting in low libido. In women, decreased estrogen production may cause vaginal dryness, hot flashes and other menopausal symptoms. In women, radiation therapy to the pelvis can cause a narrowing of the vagina, painful intercourse and ovarian failure, resulting in infertility (see “Fertility Risks,” on page 61). Some antidepressants and over-the-counter medications also lower sexual desire, as do certain lifestyle choices such as smoking and drinking.

Be assured that the lack of sexual desire and function due to treatment is usually temporary. Although many people are often too embarrassed to raise the issue of sexual function with their physician, it is important to recognize that sexuality is an integral part of life and that there is no reason to be uncomfortable discussing your concerns with your doctor. The doctor may order tests to track hormone levels and make recommendations to see a specialist and/or prescribe medications to restore erectile function in men and hormone therapy to alleviate vaginal dryness and other menopausal symptoms in women.

QUESTIONS TO ASK YOUR DOCTOR ABOUT SEXUAL FUNCTION

- How will my treatment affect my sexuality?
- Will sexual function be restored after my treatment is completed?
- How long will it take for sexual function to be restored?
- Are there successful treatments for my sexual dysfunction?
- What can I do to restore sexual desire and function?

When to Use Contraceptives

Lymphoma is not a contagious disease, and it cannot be caused by or transferred through sexual intercourse. Condoms should be used for two reasons. Small quantities of chemotherapy may be found in semen or vaginal fluid of people undergoing treatment. Also, getting pregnant during treatment of either the man or the woman is not advisable. It is also recommended that people who have undergone bone marrow or stem cell transplants use condoms to reduce their risk for contracting cytomegalovirus and other infections due to a compromised immune system. To further reduce your risk of infection, avoid sexual intercourse if your blood counts (hemoglobin, white blood cells and platelets) are low. Low blood counts could also cause bleeding. Ask your doctor when it is safe for you to resume sexual intimacy.

Chapter 8

Fertility Risks

Treatment for Hodgkin lymphoma, such as certain types of chemotherapy, especially alkylating agents, and radiation therapy, can interfere with fertility in several ways. In addition to killing cancer cells, these treatments can also affect healthy cells and reproductive organs like the ovaries and testes, which produce the eggs and sperm crucial to fertility. Whether the infertility is temporary or permanent depends on a number of factors, including the patient's sex, age at the time of treatment, the specific type and dose of radiation therapy and/or chemotherapy used and treatment duration. Although the chemotherapy regimen ABVD (doxorubicin, bleomycin, vinblastine, dacarbazine) commonly used to treat Hodgkin lymphoma contains the alkylating agent decarbazine, it does not appear to affect fertility as much as other regimens containing alkylating agents such as MOPP.

If you are considering having children in the future, it is very important to talk to your doctor before treatment begins about how your treatment may affect your fertility. Your doctor will be able to recommend a counselor or fertility specialist who can discuss your individual options.

How to Protect Fertility During Treatment

Men

Infertility occurs in men when the testes stop producing normal sperm cells. Currently, preserving fertility in men is much easier and more effective than preserving fertility in women. It involves collecting semen and then freezing and storing it in a process known as sperm banking. The sperm can later be thawed and used for intrauterine insemination or in vitro fertilization. For men with low sperm counts, a procedure called testicular sperm extraction (TESE) can be performed in which testicular tissue is removed and the tissue and/or the sperm extracted can then be frozen and stored for later use.

Some men who lose fertility immediately following treatment may regain fertility in the future, although the chance of recovering fertility depends on several factors, such as age (younger people are more likely to get their fertility back than older people), the presence of fevers and the amount and duration of radiation and chemotherapy treatments.

Women

Cancer treatment may cause women to enter early menopause or may result in other damage that does not allow for a successful pregnancy. Although preserving fertility in women is more difficult than it is in men, the emerging field of oncofertility—a melding of two medical specialties, oncology and assisted reproduction—is providing new hope for lymphoma survivors concerned about their ability to conceive following treatment.

To date, the most widely available and successful way of preserving fertility before cancer treatment begins is by removing eggs, fertilizing them in vitro with the sperm of a spouse or donor and then freezing and storing the embryos for future use (embryo banking). Eggs may also be stored unfertilized (egg banking). Banking and using unfertilized eggs is more difficult, but is a technique that has been recently developed. Because both of these techniques require a number of weeks of treatment to complete, they may not be advisable for women needing immediate treatment of their lymphoma.

Fertility preservation method under investigation is ovarian tissue cryopreservation (OTC), in which an ovarian tissue is removed laparoscopically and frozen. Eggs from the tissue follicles are then fertilized and implanted.

Giving injections of the drug leuprolid (Lupron) to halt production of hormonal function before chemotherapy begins may limit ovarian exposure to the treatment, thereby protecting the quality of the eggs, although the drug's use is highly controversial. Before treatment begins, all women of childbearing age should talk to their doctor and a fertility preservation expert about the options available to them.

These websites are good resources to find the latest information on fertility preservation techniques:

- Fertile Hope (fertilehope.org)
- Institute for Fertility Preservation (fertilitypreservation.org)
- Myoncofertility.org

Chapter 9

Hodgkin Lymphoma During Pregnancy

Hodgkin lymphoma diagnosed in women who are pregnant is the same disease found in nonpregnant women of childbearing age, although treatment for pregnant women is different. The tests used to diagnose Hodgkin lymphoma during pregnancy may include the following:

- Physical exam and personal and family history
- Complete blood count
- Blood chemistry studies to measure the amounts of certain substances released into the blood by organs and tissues in the body
- Lymph node biopsy
- Immunophenotyping to determine whether malignant cells began from the B lymphocytes or the T lymphocytes

Following a diagnosis of Hodgkin lymphoma, staging of the disease is done to determine whether cancer cells are limited to the lymph system or have spread to other parts of the body (see “Cancer Staging and What it Means” on page 18). To protect the fetus from the harm of radiation, tests that do not use radiation are performed, including MRI and ultrasound, which uses high-energy sound waves to detect enlarged lymph nodes or organs such as the liver or spleen.

Once the staging is completed, treatment will be chosen based on the woman’s wishes, the stage of her Hodgkin lymphoma, how fast the cancer is growing and the age of the fetus. While lymphoma diagnosed during pregnancy is problematic, often treatment can be prescribed that is less likely to harm the fetus. Treatments used during the first trimester of pregnancy may include the following:

- Watchful waiting, if the cancer is above the diaphragm and slow growing
- Radiation therapy, if the lymphoma is above the diaphragm, with the fetus shielded
- Systemic chemotherapy using drugs least harmful to the fetus

Most Hodgkin lymphoma patients diagnosed during the second half of pregnancy, can delay treatment until after the baby is born. Treatment at this time may include the following:

- Watchful waiting, with plans to induce delivery when the fetus is 32 to 36 weeks old
- Systemic chemotherapy
- Steroid therapy
- Radiation therapy to relieve breathing problems caused by a large chest tumor

Breast-Feeding During Treatment

Breast-feeding is generally not recommended when a woman is undergoing treatment for lymphoma because of the possibility that the chemotherapy drugs may be passed to the child through the mother's milk. Women of childbearing age should discuss these issues and all possible options with their doctor.

Part 4: Children and Young Adults With Hodgkin Lymphoma

Chapter 10 General Information

Hodgkin lymphoma most commonly affects three age groups: children 14 years old and younger; young adults ages 15 to 34; and older adults ages 55 to 74. Although Hodgkin lymphoma accounts for nearly 4 percent of all cancers in children from birth to age 14 in the United States, it is the most common cancer among teens ages 15 to 19. With modern treatment, Hodgkin lymphoma in children and young adults has a cure rate of about 95 percent.

Childhood Hodgkin lymphoma can start in nearly any part of the body and spread to other organs. Some symptoms of Hodgkin lymphoma in children include the following:

- Painless swelling of the lymph nodes in the neck, underarm or groin that does not go away in a few weeks
- Unexplained fever
- Weight loss
- Weakness and fatigue
- Coughing, trouble breathing or chest pain
- Itchy skin
- Drenching night sweats

Although most children with these complaints do not have lymphoma, those with persistent symptoms should see their doctor to make certain that Hodgkin disease is not present. The same tests and procedures performed on adults suspected of having Hodgkin lymphoma are given to children and may include a physical exam, biopsy, chest X-ray and CT or PET scan. While the causes of Hodgkin lymphoma are unknown, the following may increase the risk of childhood or adolescent Hodgkin lymphoma:

- Family history (especially siblings of a person diagnosed with lymphoma, although no firm hereditary pattern has been established)
- Autoimmune disease
- Immunodeficiency
- Receipt of an organ transplant
- Exposure to chemicals such as pesticides, fertilizers or solvents
- Infection with viruses such as Epstein-Barr
- Infection with the human immunodeficiency virus (HIV)

Short-Term and Late Effects of Treatment

Although children and young adults with Hodgkin lymphoma are treated with lower doses of chemotherapy and radiation therapies than adults with the disease, they still have a significant risk of developing both short-term (temporary), long-term (begin during treatment and continue for months or years after) and late (begin after treatment ends) effects. In fact, according to a report in the *New England Journal of Medicine*, as many as two-thirds of childhood cancer survivors experience at least one late health effect of treatment. Some factors that impact an individual's risk for short- and long-term health consequences include gender, type and duration of treatment, age at the time of treatment and overall health. During chemotherapy and radiation treatments, children and adolescents, like adults, may experience these effects:

- Anemia (low red blood cell count)
- Bleeding and easy bruising
- Decreased white blood cell production (resulting in infections)
- Diarrhea
- Fatigue
- Hair loss
- Loss of appetite
- Low platelet count
- Nausea and vomiting

Because the brains and bodies of children and young adults are still developing when they receive treatment, the potential for late health effects, which may develop months, years or even decades after treatment is completed, is increased. For example, alkylating chemotherapy agents, such as cyclophosphamide and dacarbazine, have been linked with secondary cancers, including acute myeloid leukemia, thyroid disease (hypothyroid, hyperthyroid, thyroid nodules) and pulmonary toxicity. Steroids, such as prednisone, can cause osteonecrosis, which is the death of bone tissue, due to lack of blood supply, resulting in tiny breaks in the bone. Radiation therapy can lead to thyroid dysfunction, lung cancer and breast cancer in women. The National Cancer Institute and the Children's Oncology Group is studying whether radiation therapy can be eliminated in children with Hodgkin lymphoma who respond rapidly to chemotherapy alone, thus avoiding putting girls at an increased risk for breast cancer.

Other potential late effects from chemotherapy, alone or in combination with radiation therapy, include the following:

- Gonadal (testicular) dysfunction, which may result in delayed or arrested puberty
- Hypogonadism, in which the testes in boys and the ovaries in girls fail to produce hormones and eggs or sperm
- Infertility, the inability to have children (See “Fertility Risks,” on page 61.)
- Premature menopause
- Cardiotoxicity
- Dental abnormalities, including missing teeth and the thinning of root and tooth enamel

Short-term and late effects of treatment are not limited to physical problems. Psychological, emotional or social problems, including social withdrawal, depression and anxiety may also develop. These problems can strain relationships with friends, family members and romantic partners. Supportive counseling with a medical professional (psychiatrist, social worker, psychologist, counselor or clergy) and/or medication can help alleviate the symptoms of these disorders. Getting involved in a support group of other teens or young adults with cancer can also help.

Your medical team can suggest hospital-sponsored support groups. Many young adults find online support communities such as GroupLoop (grouploop.com) for teenagers or Planet Cancer (planetcancer.org) for young adults very beneficial.

QUESTIONS TO ASK ABOUT TREATMENT

- Is the treatment you are recommending for my child/adolescent designed for this age group rather than for adult patients?
- What are the short- and long-term side effects of the treatment?
- Are there other treatment regimens that are as effective with fewer risks?
- When should sperm banking be considered?
- Can fertility be preserved in girls undergoing pelvic radiation therapy?

**Please refer to our website
for additional and updated information.**

lymphoma.org

Chapter 11

Special Concerns for Teenagers and Young Adults

The potentially emotionally debilitating side effects of Hodgkin lymphoma treatment, such as hair loss, may make it difficult for teenagers and young adults to adhere to treatment protocols, but the possibility for long-term disease remission and even cure makes it imperative that they do so. Adherence to follow-up medical care is also important for long-term cancer survivorship in order to identify changes in health and to help in the prevention and early detection of secondary cancers, to address the late effects of treatment and to spot other physical or psychosocial problems that may develop months or years after treatment is completed.

Follow-up Care

How frequently to schedule follow-up medical visits depends on the type of Hodgkin lymphoma, the treatment received and the state of overall health. Generally, people see their doctor every three to four months for two to three years following treatment and afterward every six months to a year. Because children and young adult Hodgkin lymphoma survivors will have to have regular follow-up medical care for the rest of their lives, it is important that survivors keep a detailed record of their tests and treatments, so that doctors caring for them over their lifetime will have a complete history of their medical care.

Many cancer centers now have childhood survivor specialty clinics that provide a comprehensive evaluation of late health effects and recommended screening guidelines. Data show that young adult cancer survivors who have ongoing follow-up care by both oncologists and primary care physicians have the highest rate of adherence to health screening recommendations. Ask your medical team if your cancer center has a childhood survivor clinic.

At your follow-up appointment, be sure to tell your doctor about

- Any symptoms you are experiencing that may signal a cancer recurrence
- Pain
- Physical problems that interfere with daily life, such as fatigue
- Cognitive concerns, such as memory changes or difficulty concentrating
- Feelings of sadness, depression or anxiety that will not go away
- Sleep problems
- Weight gain or loss

Depending on medical problems you may be having and your general health, your doctor may recommend tests to check for Hodgkin lymphoma recurrence or screen for secondary cancers. Based on the type of treatment you received, your doctor may also suggest that certain health screenings, such as mammography, begin at an earlier age than what is recommended for the general population. According to the American Cancer Society and Children's Oncology Group guidelines, women who received radiation to the chest between the ages of 10 and 30 should have yearly mammogram and MRI screenings beginning at age 25 or eight years after completion of radiation therapy, whichever occurs first. Ask your doctor, as you age, what other early health screenings you should have, such as Pap tests, colorectal screenings, prostate exams and bone density tests, and when to schedule them.

QUESTIONS TO ASK YOUR DOCTOR ABOUT FOLLOW-UP CARE

- What treatments and drugs have I had?
- What are some common long-term and late effects of the treatment I received?
- What symptoms should I watch for?
- How often should I schedule routine visits?
- What follow-up tests should I have?
- What health screenings should I have and when?
- What should I do to maximize my health and well-being?
- Will I have trouble getting health insurance because of my cancer?

Developing Healthy Habits

Eliminating risky behaviors like smoking or excessive alcohol consumption and maintaining a healthy lifestyle throughout your life can lower your risk for developing secondary illnesses as you age. Ask your doctor if he has any specific dietary and exercise recommendations to help reduce your risks for disease.

TIPS FOR HEALTHY LIVING

- Do not smoke or use any form of smokeless tobacco.
- Eat a balanced diet that includes five or more servings of fruit and vegetables each day; protein (poultry, fish and eggs); and whole grains.
- Maintain a regular exercise program that includes at least 30 minutes of some form of aerobic exercise (walking, bicycling or swimming) several days a week. Check with your doctor about a specific exercise plan for you.
- Use sunscreen.

Quality of Life Issues

Anxiety and Depression

Although most children and adolescents treated for cancer adjust well to the emotional upheaval brought on by the diagnosis, a small number of young cancer patients will develop psychological problems, including depression, anxiety, insomnia and relationship difficulties. The signs of depression in children are different than those found in adults. Talk to your healthcare team about having your child assessed for depression if he or she exhibits one or more of the following symptoms for longer than two weeks:

- Aggressive behavior
- Inactivity
- Changes in appetite
- Crying
- Hyperactivity
- Fear of death
- Feelings of sadness or hopelessness
- Refusal to go to school
- Learning problems
- Fatigue
- Inability to concentrate
- Constant thoughts of death or suicide

Treatment for childhood depression may include group or individual psychological counseling and/or a prescription for an antidepressant or other medications.

Dating and New Relationships

The experience of learning you have Hodgkin lymphoma and going through treatment can impact how you feel physically and emotionally and may alter your approach to dating and other personal relationships. Some Hodgkin survivors find dating after a diagnosis more difficult because they feel unattractive or worry about how potential partners may react to their diagnosis, while others find dating easier because they feel stronger having survived cancer and they have a greater appreciation of the importance of cultivating personal relationships.

Deciding when to tell a potential romantic partner that you are a cancer survivor is an individual choice and should be done when you feel comfortable discussing your personal history with another person. If you are having difficulty dating or discussing your cancer with a romantic partner, talking to a therapist or counselor may help. Websites such as Planet Cancer (planetcancer.org) and I'm Too Young For This (i2Y.com) can also provide a helpful forum to discuss these concerns with other young cancer survivors.

Employment

Many young Hodgkin lymphoma patients worry that their cancer diagnosis may sideline their career or put their employment in jeopardy. But employment experts say that decisions about how much to reveal to employers about your lymphoma and when and who to tell should be based more on your comfort level, workplace environment and what you may require in terms of time off for treatment rather than on fear of losing your job.

However, before telling anyone at your workplace about your diagnosis, including coworkers, an immediate supervisor or someone in the human resources department, learn what your rights are by reading your employee manual regarding sick time, medical leave and disability benefits. It may also be helpful to familiarize yourself with the laws and agencies that protect against workplace discrimination and allow for medical leave, including the Americans With Disabilities Act (ada.gov); the Family and Medical Leave Act (dol.gov/esa/whd/fmla); and the Equal Employment Opportunity Commission (eeoc.gov). When you are ready

to talk to your employer about your diagnosis, be sure to have on hand the information from your doctor regarding your treatment plan and how it may affect your work schedule.

Before meeting with your supervisor or human resources manager, prepare a list of questions to discuss, including the following:

- What is the company's policy on medical leave?
- How can my workload be adjusted to accommodate the time off I may need for treatment?
- How much of the cost of my treatment is covered by my health insurance and how much will I be responsible for covering?

Health Insurance

Medical costs, including health insurance, are of paramount concern to patients coping with cancer, and although health insurance premiums do tend to go up after a cancer diagnosis, the increase is usually absorbed by the employer if there is a group health plan. If not, the increase may be passed to the individual policyholder. There are also laws, such as the Consolidated Omnibus Budget Reconciliation Act (COBRA) and the Health Insurance Portability and Accountability Act (HIPAA), to protect you from losing your health care coverage if you change or lose your job. To learn more about HIPAA provisions, visit the U.S. Department of Labor website at dol.gov/dol/topic/health-plans/portability.htm.

Other resources like the Cancer Legal Resource Center (cancerlegalresourcecenter.org; (866) 843-2572) can provide information on a variety of legal issues, including health insurance coverage and employment discrimination.

**Please refer to our website
for additional and updated information.**

[lymphoma.org](https://www.lymphoma.org)

Part 5: Living With Hodgkin Lymphoma

Chapter 12

Managing Your Life During and After Treatment

Coping Strategies

Each person's experience with cancer is different, and how you cope with the physical and emotional impact of having Hodgkin lymphoma is unique. However, there are some general issues, such as the ones below, that many patients encounter.

Talking About Your Fears

It is important to communicate your fears and concerns about having Hodgkin lymphoma with your loved ones, friends, doctors or counselors. Writing down your fears in a journal may also help.

Overcoming Depression

It is not unusual for people living with cancer to feel sad or depressed. Being diagnosed with Hodgkin lymphoma and undergoing treatment can be challenging both physically and emotionally. Signs of sadness or

depression include sleeping more or less than usual, lack of energy, crying and an inability to concentrate. In addition to challenging life circumstances, depression may also be caused by certain medications. If you are feeling depressed, be assured that help is available. Tell your doctor or members of your healthcare team about your feelings. They will be able to refer you to a professional individual (psychiatrist, social worker, psychologist or counselor) who will help you overcome sad feelings through talk therapy, medication or both. Support groups may also provide you with the comfort of being with others who have had similar experiences.

Dealing With Physical Changes

Hair loss and other changes in appearance caused by treatment may make many people feel unattractive. Ask your doctor what changes you can expect, and plan ahead to buy a wig or head coverings if hair loss is a possibility. Getting advice from a makeup artist may also be beneficial in improving your appearance. Also, ask your healthcare team for advice on how to manage temporary changes such as dry skin, brittle nails and a blotchy complexion.

Maintaining a Healthy Lifestyle

Eating a healthy diet, engaging in regular physical exercise and getting sufficient rest can help combat the stress and fatigue of Hodgkin lymphoma and its treatment (see “Combating Side Effects,” on page 57).

Life in Remission

Although finishing cancer treatment and becoming a cancer survivor is a time to celebrate, it is normal to experience lingering feelings of anxiety and worry about a relapse. This is also a time when many people find it useful to take stock of their life and review goals and priorities, perhaps even making career and lifestyle changes. Adjusting to the “new” normal routines of life after cancer may take a few weeks or months. Developing a wellness plan in conjunction with advice from your medical team that includes ways you can take better care of your physical, emotional, social and spiritual needs can help you regain a sense of control and well-being.

Some changes to consider making:

- Quit smoking and reduce alcohol consumption
- Exercise (walking, biking, swimming) for about 30 minutes on most days can reduce anxiety, depression and fatigue and improve mood
- Eat a healthy diet that includes fruits, vegetables, protein and whole grains (see “Combating Side Effects,” on page 57)

Follow-up Care

At your first visit with your doctor following the completion of your treatment, ask him or her about your follow-up care schedule, which is different for each Hodgkin lymphoma survivor based on his or her disease type, age and general health. Although Hodgkin lymphoma is highly curable—between 80 percent and 90 percent of patients are cured of their disease—it is still very important to adhere to your follow-up healthcare plan to determine whether the lymphoma has recurred and to detect health problems resulting from treatment. During these visits your doctor will ask about any medical changes since the last appointment; give you a physical examination; and may prescribe imaging, blood, molecular diagnostic or other laboratory tests.

To stay proactive in your healthcare, be sure to get the following information from your healthcare team:

- Copies of your medical records and a written summary of your treatment in case you switch oncologists or need to see a primary care physician for routine medical care
- A list of signs of disease recurrence and late effects from treatment

At your follow-up care appointments, be sure to tell your doctor about:

- Any new symptoms
- Pain
- Physical problems that disrupt your daily life such as fatigue, insomnia, sexual dysfunction, weight gain or loss
- Any new problems such as heart disease, diabetes, high blood pressure
- Any new medications or vitamins you are be taking
- Emotional problems such as anxiety or depression

Chapter 13

Why Hodgkin Lymphoma Patients Relapse or Become Refractory

Hodgkin lymphoma has been studied more than any other type of lymphoma. These studies have contributed to rapid advances in the diagnosis and treatment of the disease. The vast majority of Hodgkin lymphoma patients—over 80 percent—will be cured of their cancer with first-line treatment. And even for those patients who relapse (the lymphoma returns following a remission) or become refractory (the lymphoma is resistant to primary treatment), secondary therapies are often successful in providing another remission and may even cure the Hodgkin lymphoma. For classical Hodgkin lymphoma, most relapses typically occur within the first three years following diagnosis, although some relapses occur much later.

Exactly why an individual patient relapses is not known, although there are a number of clinical and laboratory factors that are associated with an increased risk of relapse. The International Prognostic Score includes seven factors that predict which Hodgkin lymphoma patients are at high risk for relapse. They include:

- Late stage disease
- Age
- Sex (men are at greater risk for relapse)
- Hemoglobin level
- Albumin level
- White cell count
- Lymphocyte level

These additional prognostic markers are used to predict early-stage disease patients at high risk for relapse:

- Advanced age
- Bulky-mass tumors
- Multiple nodal sites

- Serologic markers, such as elevations of Interleukin 10 and Interleukin 6 and soluble CD30

How Relapsed and Refractory Hodgkin Lymphoma Is Treated

There are a number of treatment options available for patients with relapsed or refractory Hodgkin lymphoma. It is important to remember that secondary therapies are often successful in providing a second remission and may even be curative. Exactly what type of treatment is prescribed for individual patients depends on several factors, including when the relapse occurs, the patient's age, the extent of disease, overall health and previous therapies received.

The usual secondary treatment for the majority of patients consists of a chemotherapy regimen that is different from the initial therapy. An autologous stem cell transplant (using a patient's own stem cells) usually follows. There are a number of secondary treatments available for patients with relapsed or refractory Hodgkin lymphoma. These treatment options are designed for use prior to transplant or to be used in patients who are not eligible for transplant and include:

- ESHAP (etoposide, methylprednisone, cisplatin, cytarabine)
- DHAP (dexamethasone, cisplatin, cytosine arabinoside)
- DICE (dexamethasone, ifosfamide, cisplatin, etoposide)
- GND (gemcitabine, vinorelbine, liposomal doxorubicin)
- ICE (ifosfamide, carboplatin, etoposide)
- IGEV (ifosfamide, gemcitabine, vinblastine)

Treatments Under Investigation

In addition to conventional chemotherapies, there are a number of new agents to treat relapsed or refractory patients. For example, bendamustine (Treanda), a novel alkylating agent, which is already approved for relapsed chronic lymphocytic leukemia and relapsed follicular lymphoma, is being studied for relapsed and refractory Hodgkin lymphoma in clinical trials. There are also monoclonal antibodies for CD30-positive relapsed/refractory Hodgkin lymphoma, other biologic therapies, and also immunomodulatory drugs (IMiD). See page 87 for a complete listing.

The monoclonal antibody rituximab (Rituxan) may also have a role in the treatment of relapsed/refractory Hodgkin lymphoma. Although rituximab (Rituxan) targets the CD20 antigen, which is not usually expressed on R-S cells, it is expressed in nearly all cases of lymphocyte predominate Hodgkin lymphoma and may also be present on classical Hodgkin lymphoma lymphocytes. Clinical trials are underway to study the effectiveness of rituximab (Rituxan) in combination with ABVD (doxorubicin, bleomycin, vinblastine, dacarbazine) in the treatment of classical Hodgkin lymphoma.

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for additional and updated information.**

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Part 6: Clinical Trials

Chapter 14

Overview of Clinical Trials

A clinical trial is a research study designed to answer basic questions about a new treatment or a new way of using an old treatment. There are hundreds of lymphoma clinical trials now under way in hospitals, cancer centers and doctors' offices around the country. The government, pharmaceutical and biotech companies, universities and physician groups often sponsor clinical trials. The Food and Drug Administration (FDA) and the review board of participating hospitals must approve each phase in a clinical trial.

The Basics of Clinical Trials

Clinical trials are done to study new drugs and treatment strategies. Examples of what clinical trials might investigate include the following:

- A novel drug that is not approved by the FDA nor proven effective as treatment
- A new indication (use) for a drug already approved by the FDA as a treatment for a different disease

- Comparison of a new treatment with a standard treatment to determine which one is more effective or has fewer side effects
- Determining how lifestyle changes can help cancer patients
- Looking for ways to prevent cancer from occurring

New drugs must pass through a rigorous approval process governed by the FDA before becoming a therapy for use in hospitals and clinics. The trials used to assess these drugs are typically divided into three types, called phases, each of which is designed to determine certain information. Phase I tries to determine the tolerability of a potential treatment; phase II tests the drug's effectiveness in a small group of patients; and phase III tests the drug's effectiveness compared to standard therapies or other available treatments in a large, varied group of patients with a specific cancer. Patients may be eligible to take part in different stages depending on their condition, type and stage of Hodgkin lymphoma and the type of treatment, if any, previously given.

Phase I

This often involves the “first in human” studies. Phase I studies are designed to determine the dose of the drug that will be subsequently studied and the drug's toxicities. The drugs are first tested in laboratory animals to determine an approximate dose for use in humans and what toxicities might be seen. Once ready for human testing, a much lower dose than what was used in the laboratory animals is selected as the starting dose for the phase I study. This first dose level of a drug is then tested in a few patients, typically three to six, to make sure that the drug is tolerated at that dose. These patients are treated one at a time to minimize the number of patients exposed to a potentially harmful drug should unexpected toxicities arise. If none of the patients at the first dose level experience any toxicities, then a higher dose is tried. The dose is slowly escalated in this manner until toxicities develop or the desired treatment effect is achieved.

Phase II

Once the therapy dose is determined and shown to be safe in a phase I trial, it is then ready to be tested in a phase II study. Phase II studies aim to establish whether the therapies have any evidence of effectiveness. In a typical phase II study, 20 to 40 patients with similar or the same disease

are all treated in the same manner. The investigators determine a response rate for the drug in the disease. Based upon the response rate obtained, the decision is made as to whether the drug should be further developed for the disease.

Phase II studies might be used to generate preliminary data on a drug or to confirm data to obtain FDA approval. Phase II studies are also done to investigate whether a therapy already approved for one type of disease is an effective treatment for another.

Phase III

Phase III trials are performed to determine whether the treatments developed in phase I and II studies are better than what is currently considered the “standard of care.” Phase III studies often require a large number of patients. Once a patient elects to enroll in a phase III study, he or she is assigned to one of two groups in a process called “randomization.” In randomization, a computer assigns the treatment the patient is to receive. One group receives the standard therapy and the other group receives the experimental treatment. It is important to remember that this randomization process is done so that each treatment arm will have patients with similar characteristics and be free of bias. Additionally, no one knows which of the treatments being studied is better or if there is even a difference. This is why the study is being done, to learn if there is a difference. Besides testing for drug effectiveness and safety, phase III studies also try to determine if the new treatment extends life or provides patients with a better quality of life.

Use of a Placebo in Phase III Trials

A placebo, or sugar pill, is an inactive ingredient that is used in some types of clinical trials to ensure that the test results are unbiased. It is important to note that clinical trial participants will never receive a placebo in phase III trials if, as with Hodgkin lymphoma, standard therapy exists. Patients would only potentially receive a placebo if there were no standard therapies for comparison. Placebo-controlled trials are never done in a manner to deny patients an effective therapy. They are often done to add a new therapy to what might be the standard therapy.

Clinical trials are closely monitored. If it is determined that one arm (group) of patients are statistically doing better than the other, the treatment may be stopped. Trial participants may be placed on the superior treatment.

Participating in a Clinical Trial

Clinical trials should not be considered a “last resort” by patients. Hodgkin lymphoma patients can often benefit from participation in clinical trials in both the frontline treatment setting and in the relapsed treatment setting. Clinical trials offer patients therapies that are not otherwise available to all patients and are monitored very closely.

However, as explained above, being part of some trials might mean that you receive the standard therapy. If you receive the new treatment, it may or may not be more effective than the standard one, and it may or may not be more hazardous. Generally, patients benefit from participating in clinical trials because they are monitored closely.

The healthcare team studying the new treatment will explain to you all of the possible risks and benefits of a specific trial.

Informed Consent

Informed consent is the process in which you learn about all of the expected risks and benefits of a clinical trial. After the healthcare team has answered all your questions, you will be given an informed consent form to sign. The form lists, in writing, everything known about the risks and benefits of the study. Once you sign the consent form, you will be enrolled in the trial. However, you can leave a clinical trial at any time. If you decide to leave, your doctor will discuss other treatment options available to you.

Cost of Being in a Clinical Trial

Clinical trials are very expensive undertakings for the study sponsor. Patient costs vary depending on the study, who is sponsoring the trial and what portion of the trial-related expenses the sponsor will cover. Some health insurance and managed healthcare providers will pay for the basic medical procedures associated with the trial, such as lab tests, scans and hospitalization when required, while others may define clinical trials as “experimental” or “investigational” and not cover some of the routine costs such as doctor visits, tests or treatments. The costs vary depending on the study and the health plan. Medicare provides coverage for patient care associated with government-sponsored clinical trials.

If a patient is taking part in a National Cancer Institute (NCI) trial being conducted at the National Institutes of Health (NIH) campus, located in Bethesda, Maryland, the NCI will pay for the study drug and the costs related to the study. A stipend to assist with travel, food and lodging expenses is also provided.

Some cancer centers or hospitals provide financial assistance or discounted rates for room and board facilities and have special research units that will pay for study-related costs. (See “Drug Costs: What to Do If Your Insurance Does Not Pay,” on page 43.)

QUESTIONS TO ASK YOUR DOCTOR

- What is the purpose of this clinical trial?
- Who is sponsoring the trial (National Cancer Institute, a cancer center, a pharmaceutical company)?
- How long does the study last?
- What are the risks involved?
- Will I be in any discomfort or pain?
- What kinds of tests, procedures or treatments will be performed; how many and how often?
- Will I be able to see my own doctor during the trial?
- What costs will I be responsible for?

Finding a Clinical Trial

Ask your doctor if you could benefit from participation in a clinical trial and if there is one available locally. Here are some additional ways to find clinical trials:

- Contact the *Lymphoma Helpline* at the Lymphoma Research Foundation at (800) 500-9976 to request a clinical trial search.
- Cancer centers in your area may also have information about clinical trials for your type of lymphoma.
- The NIH websites Cancer.gov and Clinicaltrials.gov are good online resources and have clinical study listing services for patients.

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for additional and updated information.

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Chapter 15

Therapies Under Investigation

There are many therapies being investigated through clinical trials in the treatment of Hodgkin lymphoma. Many of these therapies incorporate standard treatments described on the previous pages. The chart below includes many of these therapies, although it is not meant to be an entirely comprehensive list of all the drugs being tested. Check with your physician for additional information.

Monoclonal Antibodies	Predominant Target Mechanism of Action	Comments
Rituximab (Rituxan)	CD20	Adult Hodgkin lymphoma
Alemtuzumab (Campath)	CD52	Adult Hodgkin lymphoma
SGN-30 and SGN-35	CD30	Childhood and adult Hodgkin lymphoma
MDX-060	CD30	Childhood and adult Hodgkin lymphoma
XmAb-2513	CD30	Adult Hodgkin lymphoma
Other Biologic Therapies		
EBV-specific cytotoxic T lymphocytes	adoptive immunotherapy	Childhood and adult Hodgkin lymphoma
New Agents		
Lenalidomide (Revlimid)	IMiDs (immunomodulatory derivative)	Adult Hodgkin lymphoma
Bortezomib (Velcade)	proteasome inhibitor	Childhood and adult Hodgkin lymphoma
Panobinostat (LBH589)	histone deacetylase inhibitor	Adult Hodgkin lymphoma
MGCD-0103	histone deacetylase inhibitor	Adult Hodgkin lymphoma
Vorinostat (Zolinza)	histone deacetylase inhibitor	Adult Hodgkin lymphoma
SNDX-275 (Entinostat)	histone deacetylase inhibitor	Adult Hodgkin lymphoma
SB101518	JAK2 inhibitor	Adult Hodgkin lymphoma
RAD001 (Everolimus)	mTOR inhibitor	Adult Hodgkin lymphoma
Alkylators		
Bendamustine (Treanda)	Alkylating agent	Adult Hodgkin lymphoma

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GLOSSARY OF MEDICAL TERMS

Absolute neutrophil count (ANC): A measurement of the number of mature neutrophils (a type of white blood cell) that are available for fighting infection. A low ANC increases the risk for infection.

Advanced disease: Disease that has spread to multiple locations.

Aggressive lymphomas: Lymphomas that are fast growing and generally need to be treated immediately. Also called intermediate-grade or high-grade lymphomas.

Allogeneic transplant: A procedure in which a patient receives bone marrow or stem cells donated by another person.

Alopecia: Hair loss. Alopecia from chemotherapy is almost always temporary; hair grows back when therapy is finished.

Anemia: A shortage of red blood cells, causing weakness and fatigue.

Angiogenesis: The process of developing new blood vessels.

Antiangiogenesis therapies: Drugs that prevent tumors from developing new blood vessels, thereby stopping or limiting tumor growth.

Antibody: A substance made by B lymphocytes that reacts with antigens (particularly identifying proteins) on toxins, bacteria and some cancer cells and either kills or marks them for removal.

Antiemetic: A drug that reduces or prevents nausea and vomiting.

Antigen: Identifying proteins located on the surface of all cells. The immune system uses antigens to determine whether cells are a necessary part of the body or need to be destroyed.

Apheresis: The part of the stem cell transplantation procedure in which stem cells are removed from the blood.

Autologous transplant: A type of bone marrow or stem cell transplantation in which a patient receives his or her own cells.

Beta (2) microglobulin (B2M): A protein found in the blood. Higher levels of B2M suggest that the lymphoma may be more aggressive.

Biologic therapy: Treatment that uses or stimulates the immune system or other body systems to fight infection and disease.

Biopsy: Removal of a small piece of tissue for evaluation under a microscope.

Bone marrow: Spongy material found inside the bones containing stem cells that develop into three types of cells: red blood cells that deliver oxygen to the body and take away carbon dioxide; white blood cells that protect the body from infection; and platelets that help the blood to clot.

Cancer: Abnormal cell growth that cannot be controlled by the body's natural defenses. Cancerous cells can grow and eventually form tumors.

Catheter (intravenous access): A device that is temporarily or permanently put into a vein that makes it easier to give medications.

Cerebrospinal fluid: Fluid that is present around the spine and brain. It may be examined to determine if Hodgkin lymphoma has spread to these parts of the body.

Chemotherapy: Treatment with drugs to stop the growth of rapidly dividing cancer cells, including lymphoma cells.

Chemotherapy cycle: Term used to describe the process in which chemotherapy is given, followed by a period of rest in which the body is allowed to recover.

Chemotherapy regimen: Combinations of anticancer drugs given at a certain dose in a specific sequence according to a strict schedule.

Clinical trial: A research study in which a new treatment is given to patients to determine whether it is safe, more effective or less toxic than current therapies.

Complete remission (CR): Term used when all signs of the disease have disappeared after treatment.

CT or CAT (computerized axial tomography) scan: This imaging test provides a series of detailed pictures of inside the body using an X-ray machine linked to a computer.

Cure: The disease is gone. There are no signs or symptoms of lymphoma, and a significant period of time has passed during which there have been no relapses.

Decreased blood cell production: A decrease in the production of red blood cells, white blood cells and platelets that may occur as a side effect of cancer or cancer therapies. Also called myelosuppression.

Diaphragm: The muscle below the lungs and heart that separates the abdomen from the chest.

Disease progression: The term used if the disease worsens despite treatment (also called treatment failure).

DNA: Abbreviation for deoxyribonucleic acid, an essential component of genes.

Dose intensity: A term used to describe giving the highest possible doses of drugs over a specific period of time with acceptable side effects.

Durable remission: When a complete response lasts for years.

Dysgeusia: When familiar foods taste differently.

Echocardiogram: Use of ultrasound to examine the heart. It is ordered when potential cardiotoxic chemotherapy is used.

Etiology: The study of the causes of a disease. The cause of Hodgkin lymphoma is unknown.

Extranodal disease: Hodgkin lymphoma that has spread outside the lymphatic system.

Fatigue: A decreased capacity for activity that is often accompanied by feelings of weariness, sleepiness or irritability.

Gallium (radioisotope) scan: When injected into the body, radioactive gallium is a chemical that collects in some tumors. The body is then scanned to see whether the gallium has collected in a tumor.

Generalized disease: A cancer that has spread throughout the body.

Gene: The basic building block of heredity that are present in all cells. Genes are composed of DNA and other materials.

Gene therapy: Therapy approaches that alter the genetic structure, making tumor cells more susceptible to either the immune system or chemotherapy drugs.

Grade: A method of classifying a tumor on the basis of how aggressively it is growing.

Graft-versus-host disease (GVHD): Occurs when a donor's bone marrow (graft) recognizes the recipient of the marrow (the host) as foreign. In response, the immune cells in the donor marrow attack the foreign cells in the host.

Harvesting: A procedure in which stem cells are obtained from the blood or bone marrow for use in repopulating the body's cells after high-dose chemotherapy.

Hematologist: A doctor who specializes in treating diseases of the blood and blood-forming tissues.

Histology: The study of tissue characteristics that may lead to identifying a specific type of tumor.

Hodgkin lymphoma: One of the two major types of lymphomas that begin in the lymph nodes and tissues of the lymphatic system. All other lymphomas are classified as non-Hodgkin lymphomas.

Hypogeusia: When the flavors of foods are not as strong as normal.

Hypothyroidism: A condition in which there is lower than normal production of thyroid hormone. Low thyroid levels can lead to a variety of effects, including mild weight gain, dry skin, fatigue and sleepiness.

Idiotype: A unique “fingerprint” portion of an antibody present on the surface of B-cells.

Idiotype vaccine: A lymphoma vaccine that is custom-made to attack an individual patient’s lymphoma and contains idiotype (unique) tumor material and an immune stimulant.

Immune system: One of the body’s defense mechanisms. All lymphomas are diseases of the immune system.

Immunological test: Blood test that detects the presence of diagnostic proteins or antigens on a tumor.

Immunotherapy: See biologic therapy.

Improvement: This term is used if a tumor shrinks following therapy but is still more than one-half of its original size.

Indolent lymphoma: Lymphoma that is slow growing and has few symptoms. Also called low-grade lymphoma.

Laparoscopy: Passing a tube through the abdominal wall to obtain a small sample of tissue for examination under the microscope.

Leukemia: Disease generally characterized by the overproduction of abnormal or immature white blood cells that circulate or are present in the blood.

Leukopenia: A shortage of white blood cells, resulting in the inability to fight infecting organisms such as bacteria, fungi and viruses.

Localized disease: A cancer that is only present in a limited part of the body, for example, the neck or armpits.

Local therapy: A therapy that only affects a small area.

Lymph: The watery fluid in the lymph system that contains white blood cells (lymphocytes).

Lymph nodes: Small bean-shaped glands located in the small vessels of the lymphatic system. There are thousands of lymph nodes located throughout the body, with clusters of them in the neck, under the arms, the chest, abdomen and groin. Lymph nodes filter lymph fluid, trapping and destroying potentially harmful bacteria and viruses.

Lymphatics: Lymph channels and vessels that transport lymph fluid. They are similar to blood vessels but smaller.

Lymphatic system: The channels, tissues and organs that store and carry lymphocytes that fight infection and other diseases.

Lymphocyte: A type of white blood cell. Lymphocytes, carried along by the lymph fluid, are part of the immune system and fight infection.

Lymphoma: A malignant disease that begins in the lymph nodes, organs and tissues of the lymphatic system (immune system). Hodgkin lymphoma is one type of lymphoma; the other major type is called non-Hodgkin lymphoma.

Malignant: Cancerous—a malignant tumor is a cancerous tumor.

Medical oncologist: A doctor who specializes in the use of chemotherapy, hormone therapy and many other types of biologic therapies to treat cancer.

Memory cells: Types of B lymphocytes and T lymphocytes. After a foreign invader or unwanted cell has been destroyed, surviving B and T

lymphocytes develop into specialized memory cells that remain on watch and can provide protection if the invader is encountered in the future.

Metastasize: To spread to other organs of the body. Cancer may spread from its primary site to other sites or organs.

Monoclonal antibodies: Biologic therapies that act specifically against a particular antigen. Scientists can produce large amounts of antibody that can be directed to a single target (or antigen) on the cell's surface. Monoclonal antibodies have been developed to help combat specific cancers, including some forms of Hodgkin lymphoma.

MRI (magnetic resonance imaging): This test uses magnets and radio frequency waves to produce images of inside the body. MRIs can provide information about tissues and organs that is not available from other imaging techniques.

Mucositis: Inflammation of the lining of tissues and organs. In the mouth, it is characterized by sores or inflammation.

Myelosuppression: A reduction in the bone marrow's ability to make red blood cells, white blood cells and platelets.

Neutropenia: An abnormally low level of neutrophils (the white blood cells responsible for fighting bacterial infections).

Neutrophils: The primary type of white blood cells found in the blood that fight bacteria, etc.

Non-bulky tumor: A small tumor.

Non-Hodgkin lymphoma (NHL): A group of several closely related cancers that arise from the lymphatic system. Although the different types of NHL have some things in common, they differ in what the cancer cell looks like under a microscope, how the cells grow and how the tumor affects the body.

Oncologist: A doctor who specializes in treating cancer. Some specialize in chemotherapy (medical oncologists), radiotherapy (radiation oncologists) or surgery (surgical oncologists).

Palliation: Treatment that is given to remove or relieve symptoms.

Para-aortic: The area close to the aorta. The aorta is the largest vessel in the body and rises from the heart.

Partial remission: The term used when a cancer has shrunk in size by at least half but has not totally disappeared. The cancer can still be detected, and other treatments may be recommended.

Pathologist: A doctor who specializes in studying disease through microscopic evaluation of body tissues and organs. Any tissue suspected of being cancerous must first be examined by a pathologist to confirm the diagnosis.

PCR (Polymerase chain reaction): A molecular test that can identify small amounts of genetic material.

Performance status: A method used to describe a person's ability to follow a typical lifestyle.

Peripheral neuropathy: Damage to the nerves. This condition can be caused by some drugs and is usually characterized by tingling and weakness or numbness in the extremities.

PET (positron emission tomography) scan: A type of test that may be used instead of a gallium scan to identify areas in the body that are affected by Hodgkin lymphoma. This test evaluates metabolic activity in different parts of the body using a radioisotope.

Plasma cell: A mature B-cell that makes antibodies—these antibodies help the body destroy or remove toxins, bacteria and some cancer cells.

Primary therapy: The first therapy given after a diagnosis of cancer.

Prognosis: The likely outcome of a disease, including the chance of recovery.

Pulmonary function test: A procedure for determining the capacity of the lungs to exchange oxygen and carbon dioxide efficiently.

Radiation field: The part of the body that receives radiation therapy.

Radiation oncologist: A doctor who specializes in treating cancer with radiation.

Radiation therapy: The use of radiation beams (X-rays) to treat a cancer. High doses of high-energy radiation beams, carefully focused on a tumor, will kill cancer cells. Radiation therapy (with or without chemotherapy) is used to treat certain lymphomas, including Hodgkin lymphoma.

Radioimmunotherapy: A therapy that is prepared by attaching a radioactive isotope to a monoclonal antibody.

Radionuclide tests: Tests that use radioactive substances to help evaluate the function of tissues.

Refractory disease: A cancer that is resistant to treatment.

Regimen: A specific combination of drugs (chemotherapy), their doses and their schedules of administration. A regimen may also include radiotherapy.

Relapse: The return of cancer after treatment. Lymphoma may recur in the area where it first started, or it may occur in another place.

Remission: The absence of disease. A patient is considered in remission when the lymphoma has been treated and tumors have diminished by at least 50 percent (partial) or have totally disappeared (complete). Remission does not necessarily mean cure.

Risk factor: A factor that may increase the chance that a person will develop Hodgkin lymphoma. It is important to note that most people with risk factors never develop lymphoma, and many who are diagnosed have no identifiable risk factors.

Salvage therapy: Therapy that is given if the primary therapy is not successful or if the disease disappears and then comes back.

Spleen: An organ on the left side of the upper abdomen, near the stomach. A key component of the lymphatic system, the spleen produces and stores lymphocytes and releases them when required as part of the body's response to infections and other stimuli. The spleen may store blood and remove old blood cells from circulation.

Stable disease: Disease that does not get better or worse following therapy.

Stage: The extent of cancer in the body, including whether the disease has spread from the original site to other body parts.

Standard therapy: The most widely used primary therapy.

Synergism: The term used when two or more drugs given together provide a better anticancer effect than expected from the additive effects of the medications alone.

Systemic symptoms: Symptoms that affect the entire body. Examples of these include fever, night sweats and weight loss.

Thrombocytopenia: A shortage of platelets in the blood, which reduces the ability of the blood to clot.

Thymus gland: A gland located behind the sternum (breastbone) that enhances the reproduction and development of lymphocytes. T lymphocytes are processed in the thymus.

Toxicities: The unwanted side effects of cancer therapies, such as a decrease in blood cells, nausea and vomiting, and hair loss.

Tumor: An abnormal mass or swelling of tissue. Tumors may occur anywhere in the body. A tumor may be benign (harmless) or malignant (cancerous).

Vaccine: A substance or group of substances meant to cause the immune system to respond. A vaccine can help the body recognize and destroy cancer cells. Lymphoma vaccines often combine cancer antigens with a substance to stimulate the patient's own natural defenses to fight the disease. These vaccines are custom-made for each patient, using a sample of tumor obtained from the patient's lymph nodes.

VEGF (vascular endothelial growth factor): One of a number of substances that stimulate blood vessel formation, angiogenesis—a process necessary for tumor growth.

Watchful waiting: An approach in which no immediate medical, surgical or radiation therapy is given. Patients are followed closely to make sure the cancer does not progress.

Xerostomia: A temporary reduction in the production of saliva.

X-ray: Radiation that is used in low doses to provide images of the inside of the body and in high doses to treat cancer.

**Please refer to our website
for additional and updated information.**

[lymphoma.org](https://www.lymphoma.org)

About the Lymphoma Research Foundation

The Lymphoma Research Foundation (LRF) is the nation's largest lymphoma-focused nonprofit health organization devoted exclusively to funding lymphoma research and providing patients and healthcare professionals with the most current information on the disease. The Foundation's mission is to eradicate lymphoma and serve those touched by this disease.

The Lymphoma Research Foundation was formed in 2001 with the merger of the Cure For Lymphoma Foundation (CFL) and the Lymphoma Research Foundation of America (LRFA). Both organizations were founded by lymphoma advocates who wanted to turn a life-altering diagnosis into a positive experience for others with the disease. Ellen Glesby Cohen founded LRFA in Los Angeles in 1991. Until her death in 2000, Ellen was a tireless champion for patients and their families who created new education and support programs and served as a staunch advocate for improved government legislation. Jerry and Barbara Freundlich founded CFL in 1994 in New York City. Jerry is a long-term survivor of non-Hodgkin lymphoma.

Resources for Patients, Survivors and Loved Ones

Receiving a diagnosis of lymphoma can be challenging. Whether you or someone you love is newly diagnosed or a long-term survivor, understanding the latest medical information and accessing appropriate support services may help. LRF offers a wide array of programs and support services to assist you from the point of diagnosis through long-term survivorship.

Patient Services and Support

Lymphoma Helpline and Clinical Trials Information Service

Through this phone and email service, trained staff members are available to answer your questions and provide individual support to you and your loved ones. Services are available in any language.

Lymphoma Support Network (LSN)

This national one-to-one peer support program matches lymphoma patients or caregivers with volunteers who have had similar lymphoma-related experiences.

Lymphoma Newsline

Lymphoma-related news can be distributed to you directly through this free electronic news services. Sign up by clicking on the “register” icon on LRF’s homepage at lymphoma.org.

In-Person Patient Education Programs

North American Educational Forum on Lymphoma

This two-day national forum is held annually and provides critical information about the latest in lymphoma research, making the best decisions about treatment options and patient support issues.

Lymphoma Workshop: Understanding Lymphoma Basics and Current Treatment Options

These regional, full-day educational programs provide the latest information about lymphoma, current treatment options and patient support issues.

Multimedia Programs

Because LRF understands that information about lymphoma continually changes throughout the year, the ongoing production of webcasts, podcasts and teleconferences enable you to access the latest information on specific topics anywhere, anytime.

Webcasts

Webcast programs offer you the opportunity to navigate through a synchronized audio and slide presentation.

Podcasts

Podcasts (video format) can be viewed on LRF’s website.

Teleconferences

Teleconferences are hour-long interactive telephone programs that provide an opportunity to learn more about lymphoma, treatments and promising research from leading lymphoma experts. These are conducted live, and the archived version is available after the program.

Publications

Patient Guides

In addition to this publication, LRF also produces *Understanding Non-Hodgkin Lymphoma: A Guide for Patients, Survivors and Loved Ones* and *Understanding Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma (CLL/SLL): A Guide for Patients, Survivors and Loved Ones*.

Fact Sheets

Fact sheets with the latest disease- and treatment-specific information are available in either hard copy or in PDF on LRF's website. New topics are added on a regular basis; check to see if the topic you are looking for is available.

Newsletters

To keep you abreast of LRF research and news in the wider lymphoma community, you can sign up to receive any of LRF's regular newsletters either electronically or via mail.

Any of LRF's publications may be ordered by visiting lymphoma.org. Individual and bulk copies are available free of charge.

Resources for Children and Young Adults

Lymphoma in Your Teens, 20s and 30s

LRF offers a wide array of webcasts and podcasts for individuals affected by lymphoma as teens or young adults, including topics specifically designed to help friends and family. Visit lymphoma.org/youngadults to access these programs.

LIVESTRONG Young Adult Alliance

The Lance Armstrong Foundation's LIVESTRONG Young Adult Alliance is a coalition of organizations with the goal to improve the survival rates and quality of life for young adults with cancer between the ages of 15 and 40. By visiting livestrong.org/yaa you can access the websites of all member organizations that specifically provide services for young adults with cancer.

Planet Cancer

Planet Cancer is a peer support community for young adults going through the tremendously isolating experience of cancer between the ages of 18 and 40. On Planet Cancer, young adult patients and survivors connect 24 hours a day, 7 days a week through a dynamic and irreverent social networking website and face-to-face retreats. Planet Cancer also provides advocacy programs to build awareness about the unique medical and psychosocial needs of this often-overlooked age group. Visit planetcancer.org to access these services.

Ulman Cancer Fund for Young Adults

This organization focuses on how cancer affects young adults and offers scholarships, community grants, advocacy services and a guidebook. Visit ulmanfund.org for more information.

How to Access Programs and Services

Many of the aforementioned programs are available on LRF's website at lymphoma.org. For additional information about these resources, call (800) 500-9976 or email us at helpline@lymphoma.org.

If you would like to order additional copies of *Understanding Hodgkin Lymphoma: A Guide for Patients, Survivors and Loved Ones*, please call (800) 500-9976 or visit lymphoma.org.

HOW TO GET INVOLVED AND GIVE BACK

Take Action to Make a Difference

The LRF Advocacy Program is a network of people and programs dedicated to increasing awareness and support for the lymphoma community. The Advocacy Program focuses on taking action on laws, policies and positions that affect every lymphoma patient and survivor. By contacting elected officials via phone calls, email and letters in support of these priorities, local advocates help LRF to make lymphoma a national health priority. To become involved, visit lymphoma.org/advocacy.

Start or Join a Local Chapter

Chapter volunteers work tirelessly to educate people about lymphoma, conduct outreach, raise funds for research and participate in public policy and advocacy initiatives. To learn more about a chapter in your area or how to start one, please visit lymphoma.org/chapters or call (800) 235-6848.

Raise Funds and Awareness

Raise funds and awareness by participating in a variety of events being held across the country such as Lymphomathon walks, bike rides, golf tournaments, galas, lunches, young professional social events and much more! Visit lymphoma.org/events for more information.

Join Team LRF

Team LRF is a program through which people across the country raise much-needed funds and awareness for lymphoma research through sporting events such as marathons, half marathons, triathlons, hiking adventures, bowling tournaments, soccer matches, bike rides, lacrosse tournaments, paddling events, dance-a-thons, spin-a-thons, yoga-a-thons and much more. Join Team LRF in an existing LRF-partnered event in your area, or join Team LRF Teammates Across the Country if you wish to raise funds by starting your own event or by participating in an event in which LRF does not have official charity entries. Visit lymphoma.org/teamlrf for more information.



Donate Now

The Lymphoma Research Foundation (LRF) is a nonprofit health organization with 501(c)(3) status. If you would like to support LRF, your generous gift will help us move closer to finding a cure, while helping those affected by the disease.

Three easy ways to give:

 Website: lymphoma.org/donatenow

 Call: (800) 235-6848

 Mail: Cut out this form and mail it to Lymphoma Research Foundation, 115 Broadway, 13th Floor, New York, New York 10006

or

 Fax: (212) 349-2886

Amount of donation \$ _____

Make checks payable to the Lymphoma Research Foundation.

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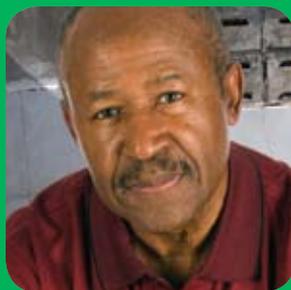
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