Lymphoma: What You Need to Know

Lymphoma subtype fact sheets available on the website.

Lymphoma Australia

www.lymphoma.org.au

Lymphoma What You Need to Know

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Acknowledgements
Lymphoma Australia would like to give a very special thank you to sponsors, hospitals, doctors, nurses, patients, families and friends that make our educational resources possible. Taking the fear of the unknown out of the Lymphoma journey can make a huge difference.

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Lymphoma Australia
PO BOX 676, Fortitude Valley, QLD 4006 Australia
Telephone 1800 359 081 **Email** enquiries@lymphoma.org.au **Website** lymphoma.org.au

A Resource for Anyone Touched by Lymphoma

Being diagnosed with any type of cancer is frightening and something any person would prefer not to face. However, many people find themselves in the situation that you are in right now and are uncertain of what to do next. The good news is that there are many experienced people and resources that can help guide you on this journey.

This resource manual has been developed especially for someone like you who has been recently diagnosed with a cancer called lymphoma. Included in this booklet is all the information you need to know right now, including an explanation of cancer, the lymphatic system and lymphoma is explained in depth and in uncomplicated language. There is information on each type of lymphoma and how each one is diagnosed and treated and you can find more detailed information on each main subtype of lymphoma in our fact sheets available on the website.

It is very important for you to know that potential new treatments are being developed all the time for cancer and for lymphoma specifically. The treatment of lymphoma has advanced significantly in the last few years, giving patients with lymphoma more hope than ever before.

People need support when going through difficult times. Recruit friends and loved ones on this journey with you. Tell them what you need and how they can help. Whether it is a conversation, a ride to the hospital, help with

groceries, or better yet, going out and having fun. Everyone needs help, especially when challenging situations arise.

Do not be afraid to ask for help. Friends and family can help by sharing the load. Understand that you are not alone. Many people are also facing similar circumstances, and it is often very useful to share your experience with someone who understands, to gain insight from their experience. The more you reach out for support, the easier and less distressing this experience will be.

We sincerely hope that this resource manual provides you with a thorough understanding of lymphoma. Lymphoma Australia is dedicated to providing support and information to people with all types of lymphoma. It is our mission to arm you with the information you need to continue your journey in a confident and empowered way.

Lymphoma Australia

Lymphoma Australia

Our Mission

Raising Awareness, Giving Support, Searching for a Cure.

Lymphoma Australia is the only Australian charity (with DGR status) focused exclusively on providing awareness, advocacy, education and support to help lymphoma patients, their carers, family, friends and healthcare professionals.

We also campaign to give Australian's affected by lymphoma a voice. We highlight the issues and challenges faced by people living with lymphoma. We engage with decision makers and key stakeholders across Australia so we can work towards achieving the best possible care and outcomes for the many thousands of people affected by lymphoma in Australia.

Lymphoma Australia is a member of the Lymphoma Coalition, a global network of 50 patient groups working together to provide global support to the millions of people around the world living with lymphoma.

The feather in our logo symbolises a guardian angel as our founding group wanted to ensure that no one ever felt alone in their lymphoma journey. It is also a symbol of hope to those with lymphoma and reflects the search for a cure for this group of cancers, which is happening every day.

Lymphoma Care Nurses

Lymphoma Australia is dedicated to raising funds to ensure specialist Lymphoma Care Nurses are available wherever they are needed.

Our Lymphoma Care Nurses will help patients and their families from the time of diagnosis, throughout treatment and after treatment. They also educate and support cancer nurses to ensure they know the latest information to best support you. This support is available for free regardless of where you live in Australia.

You can contact our Lymphoma Care Nurses by calling our Lymphoma Nurse Support Line 1800 953 081 or email: nurse@lymphoma.org.au

Patient Support

The following resources and information are avaliable by visiting Lymphoma Australia at www.lymphoma.org.au

- Living with Chronic Lymphocytic Leukaemia (CLL) - Booklet
- What Is New for Lymphoma and CLL Know Your Treatments - Booklet (available on the website only)
- Keeping Track of My Lymphoma and CLL - Patient Diary

- Patient & Carer Newsletters
- Patient & Carer Education Days
- Lymphoma Subtypes, Management & Supportive Care Fact Sheets
- Video presentations from our education days, presentations and interviews with lymphoma/CLL experts on the Lymphoma Australia YouTube channel
- Join our closed Facebook group **Lymphoma Down Under**
- Sign up for our eNewsletter at www.lymphoma.org.au

Shirley Winton OAM
Founding President of Lymphoma Australia.

The dedication and work of lymphoma patients formed the foundations of Lymphoma Australia so that today our organisation is in a position to provide the support and information to Australians during their lymphoma journey.

This book is also a tribute to Shirley Winton OAM the Founding President of Lymphoma Australia and all of the lymphoma angels that are with her as they look after us and guide us in our lymphoma work.

Contents

Lymphoma Overview

Lymphoma is the name given for cancers that develop within the lymphatic system. To understand lymphoma, it is necessary to firstly develop an understanding of cancer in general as well as the role of the lymphatic system in the body.

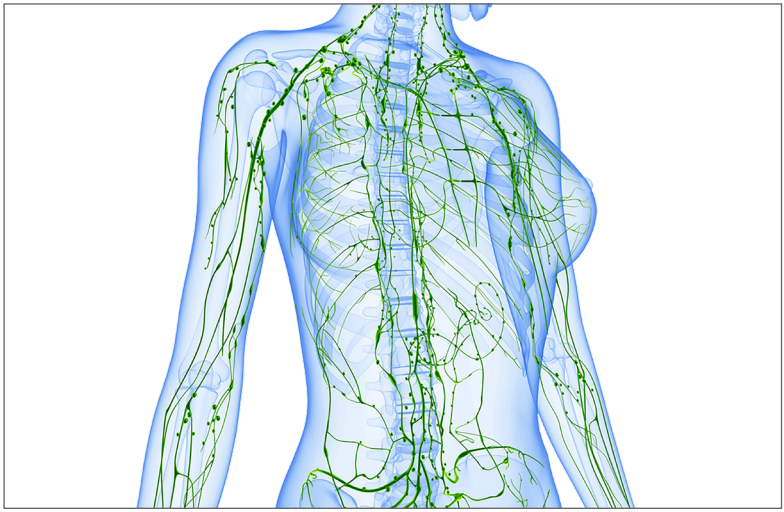
What is cancer?

Cells make up every part of the human body including our skin, hair, nails, lymph nodes, blood and body organs. Cell division is a normal part of a cell's life cycle and is regulated by our genes (segments of DNA that determine a person's unique characteristics and how their body functions). Under healthy conditions, the process of cell division is tightly controlled with numerous checks and balances in place, where cells grow and replace cells that have reached their lifespan. The definition of cancer is the abnormal, uncontrolled growth of cells, where cells do not die when they are supposed to.

Why does cancer occur?

This is a question that scientists have been trying to answer for a long time. One main reason that cancer may develop is due to genetic errors. There are many different genes present in all cells and each one controls a different function in the body. When errors occur in the genes (called genetic mutations) that control cell division, the result is a cell that cannot divide normally. This results in an abnormal cell that cannot properly perform its intended function.

The cells of the immune system are constantly circulating in the body to identify and destroy these abnormal cells. However, in instances where the immune system does not work properly, or if the genetic mutation is too severe, these



Lymph nodes can be found all over our body

abnormal cells remain and grow at an uncontrolled rate. Cancer is what occurs when these abnormal cells continue to grow at an uncontrolled rate. As these abnormal cells divide, they can create their own blood supply and form a solid mass called a tumour. A cancerous tumour will continue to grow at an uncontrolled rate and will eventually cause harm to other areas of the body.

What is the lymphatic system?

The lymphatic system is made up of lymph nodes, vessels and organs that runs throughout the body, and often seems mysterious and elusive as it does not receive the same

attention as other body systems, like the cardiovascular or digestive systems. Individuals may be aware of lymph nodes in the neck when they become swollen with a sore throat or infection.

The lymphatic system is a very important part of the body serving many life-preserving functions. The lymphatic system is a network primarily made up of:

- Lymph nodes: small, bean-shaped organs found throughout the body
- Lymphatic vessels: vessels which circulate lymphatic fluid (also called lymph) throughout the body

Organs that include:

- Bone marrow
- Thymus gland
- Tonsils
- Spleen
- Liver
- Lymphocyte accumulations in the lining of the intestinal, respiratory, genital and urinary tracts.

How does the lymphatic system work?

The lymphatic system has three main functions:

1. To circulate and regulate fluid levels in the body: Any excess fluid that escapes from the bloodstream is picked up by the lymphatic system and returned to the blood stream. This helps to prevent oedema (swelling in the tissues due to excess fluid) and keeps the fluid levels in the body and the bloodstream within normal limits.

2. To absorb fats from the digestive system: Special lymph vessels, called lacteals, are located in the lining of the digestive system where they are responsible for absorbing fat and fat-soluble vitamins from food. The fats are then transported to the bloodstream and used as needed.

3. To defend the body against infection: The vessels of the lymphatic system move lymphatic fluid and lymphocytes, a specific type of white blood cell, throughout the body. The lymphatic fluid travelling through the lymphatic vessels passes through lymph nodes. The lymph nodes serve to filter the lymphatic fluid of any debris, removing bacteria, viruses and other foreign substances. This helps keep the body free of invading organisms and therefore, free of infection.

What are lymphocytes?

Lymphocytes are a type of white blood cell and are a major component of the lymphatic system. Lymphocytes are divided into two types: B-lymphocytes or T-lymphocytes (also called B-cells or T-cells), and function to fight infection and prevent disease. They are an integral part of a healthy immune system.

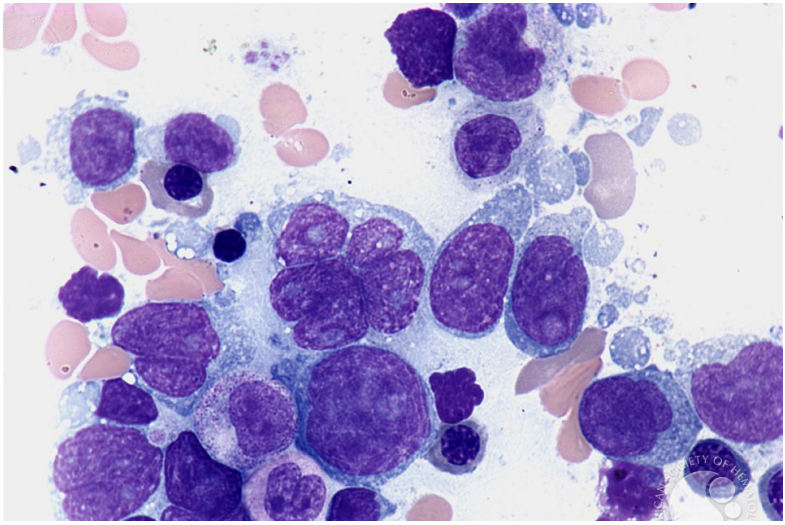
Normal functioning B-cells transform into highly specialised cells called plasma cells in the face of infection. Plasma cells manufacture antibodies which function to fight infections. T-cells directly attack foreign invaders such as bacteria and viruses, and also kill cancer cells and rid them from the body. Lymphocytes can be found in the blood however, the majority of them are normally stored and circulating within the lymphatic system.

What is Lymphoma?

Lymphoma is a group of cancers that affect the lymphatic system so understanding the lymphatic system and cancer in general makes it easier to understand. In lymphoma, a tumour develops due to uncontrolled growth of abnormal lymphocytes. Because the lymphatic system exists throughout the body and involves many organs, there may be cancerous tumours in many parts of the body when someone has lymphoma. There are two main categories of lymphoma: Hodgkin lymphoma (HL) and non-Hodgkin lymphoma (NHL).

What is The Difference Between Hodgkin and Non-Hodgkin Lymphoma?

The difference between Hodgkin lymphoma and non-Hodgkin lymphoma is the presence of Reed-Sternberg cells. A Reed-Sternberg cell is a cell derived from a B-lymphocyte and is only present in HL. If Reed-Sternberg cells are present when the tumour is examined under a microscope, the diagnosis is HL. If there are no Reed-Sternberg cells in a lymphatic tumour, the diagnosis is most likely to be NHL.



A tissue biopsy is one of the most important steps for diagnosing lymphoma. Information gained from a lymph node biopsy and a bone marrow biopsy is used to obtain an accurate diagnosis and decide on the best treatment for each individual person.

I heard the word lymphoma and didn't know what this meant. Then I heard the words chemotherapy and radiation and the scary reality hit, I had cancer" – *Sam*

Of all diagnosed lymphoma cases, 90% of them are NHL and 10% HL. Distinguishing between HL and NHL is important to show different patterns of spread and to determine different treatment options.

Hodgkin Lymphoma Overview

Being diagnosed with any cancer is often overwhelming. Learning more about the disease can ease confusion and allow you to feel more in control. This section contains information on HL including its symptoms, how it is diagnosed and the treatments used to treat it.

Hodgkin Lymphoma Overview

The first lymphoma was indentified in the 1830s by the English doctor named ThomasHodgkin, called “Hodgkin lymphoma” (around 15% of all B-cell lymphomas). All subsequent lymphomas discovered were called “non-Hodgkin lymphoma” (these can be either a B-cell or a T-cell lymphoma). Two scientists called Reed and Sternberg studied tissue samples of people with HL and found a particular type of cell was always present. This cell is now called the Reed-Sternberg cell and it is larger in size than other lymphocytes. It is the presence of this Reed-Sternberg cell that distinguishes HL from other types of lymphoma.

Currently, it is not known how HL develops and research continues to investigate the cause of the disease. However, it is thought that the cancer cells grow due to an abnormal immune response from a past infection e.g. the Epstein Barr Virus (EBV) which causes glandular fever. Other people who develop HL may have a genetic tendency to abnormal immune responses.

What is known is that HL is not contagious so you cannot “catch it” from someone nor can you give it to someone else. There is no evidence to suggest that anything you have done or not done (such as lifestyle choices) will cause the development of HL.

How Common is Hodgkin Lymphoma?

In Australia, over 600 people are diagnosed with HL each year. It is a rare disease, accounting for 0.5% of all cancer types diagnosed. HL can occur in various age groups. In developed countries, it is most likely to occur:

- Between the ages of 15 – 29 years old, or after the age of 65 years old
- In young adults, it occurs in similar numbers of males and females
- In older adults, it is more likely to occur in males

Symptoms

The effect that HL has on the body will depend on where the lymphoma cells are located and what parts of the body are involved.

Enlarged lymph nodes: the lymph nodes become enlarged because of the growth of lymphoma cells. Abnormal lymphocytes divide and form more lymphoma cells. HL often starts in the neck or chest area but may also occur in other parts of the body. As these lumps of lymphoma cells in lymph nodes and other organs grow they affect the surrounding area causing pain and/or irritation. For example, a lump in the neck and throat area may cause a cough. While this may not seem

a serious symptom, the lumps will continue to grow if left untreated and can spread to other parts of the body.

Immune system problems: the body uses healthy lymphocytes to fight infection. In HL, cancer cells are produced instead of normal lymphocytes, leaving the body with less healthy cells to protect it from infection, even from a simple common cold. Lymphoma cells in the immune system can also cause it to react as if it is fighting infection causing symptoms such as night sweats, fevers, generalised itch and unexplained weight loss. These are referred to as B symptoms and they are commonly experienced in someone with HL.

Other symptoms: HL can grow in other parts of the body and so can interfere with the normal function of that particular part of the body. For example, HL can grow in the bone marrow which can cause problems with the production of new healthy blood cells. A growing tumour will also compete with the healthy cells and organs of the body for energy and blood supply.

Diagnosis

As the symptoms of HL are not specific, a person may initially see their doctor because of the lymph node swelling or general symptoms such as fatigue or lacking energy. More serious B symptoms such as severe weight loss, fever and night sweats may also be reported prior to diagnosis. The doctor will detect swollen lymph nodes during a physical

examination but the confirmation of HL requires a tissue biopsy. The presence of Reed-Sternberg cells found under microscopic examination of the tissue biopsy confirms the diagnosis of HL.

A number of different examinations and tests are usually required to diagnose HL and to see if the disease has spread. Depending on the situation, the doctor may use some or all of these tests to decide the best way to treat the disease. Information from the following sources helps doctors determine the diagnosis:

- Biopsy: A biopsy is one of the most important steps in diagnosing HL. It involves the removal of a sample of tissue (cells), usually performed by a surgeon or a radiologist. The cells are then examined under a microscope. The cells from the tissue are then examined under a microscope to look for the presence of Reed-Sternberg cells. Most patients will have two types of biopsies: a lymph node biopsy and a bone marrow biopsy (only in some patients). A lymph node biopsy is used to confirm the diagnosis of HL and a bone marrow biopsy determines if the HL has invaded (spread to) the bone marrow. All of this information is used to obtain an accurate diagnosis and decide on the best treatment for each person.

- Your health history including your family's history of disease, your personal illness history and your general

health status

- Physical examination by the doctor

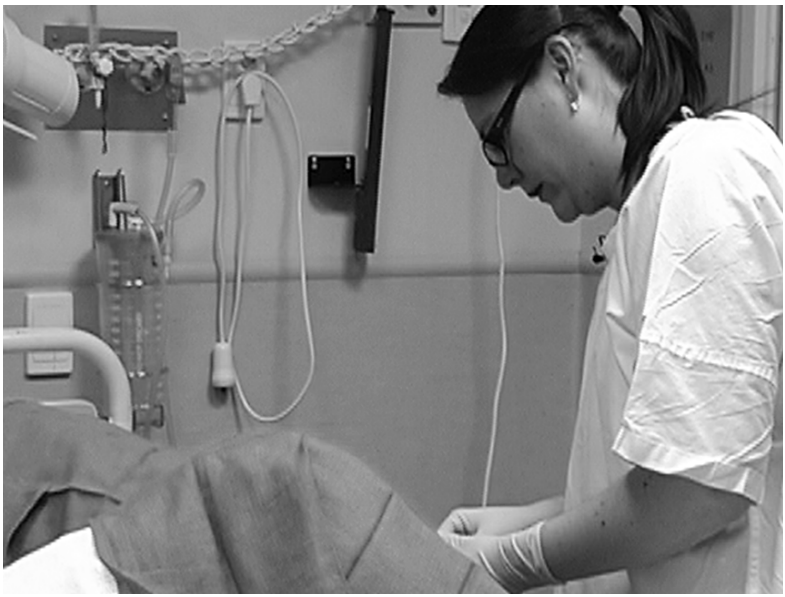
- X-ray: A procedure where low dose radiation beams are used to provide images of the inside of the body for diagnostic purposes.

- Ultrasound: A non-invasive procedure where sound waves are used to create images of lymph nodes and other structures in the body.

- CT (computed tomography) scan: A series of X-rays that provide detailed, three-dimensional images of the inside of the body.

- MRI (magnetic resonance imaging) scan: A technique used to obtain three-dimensional images of the body. An MRI is similar to a CT scan, but uses magnets instead of x-rays.

- Gallium scan: Gallium is a chemical taken up by some cancer cells and can therefore help doctors visualise cancer in the body. In this procedure, a safe amount of radioactive gallium is injected into the person, after which the person undergoes an X-ray where the radioactive gallium makes the tumour(s) visible. This test is performed in the Nuclear Medicine facility at the hospital.



Patients can be lightly sedated for a bone marrow biopsy procedure

- PET (positron emission tomography) scan: A way to visualise cancer in the body. Radioactive glucose (a sugar molecule used as the energy source for cells) is injected into the person and is taken up preferentially by cells with a high metabolic (energy) activity, such as cancer cells. A scanner is then used to visualise the areas of the body where the radioactive glucose is concentrated. PET scans are also performed in the Nuclear Medicine facility at the hospital. Some machines can do PET and CT scans at the same time.

- Laboratory tests: Blood tests and urine tests.

Classifying and Staging

Once a diagnosis of HL has been made through the various tests the doctor will also identify the stage of your disease and what type or classification it is. Classifying and staging your disease defines the type of treatment you need to treat the HL.

Classification

A lymphoma is classified as HL if the Reed-Sternberg cell is detected. However, HL is further classified into subtypes which describe the disease in more detail such as what the affected lymph nodes look like, what other cells are present and what characteristics the cells have under the microscope. The five subtypes of HL are;

Classical Hodgkin Lymphoma - Nodular Sclerosing: This is the most common subtype of HL accounting for 60-80% of cases. This is more common in women than men and usually affects adolescents and adults under the age of 50. The majority of patients are cured with current treatments (almost 90%).

Classical Hodgkin Lymphoma – Lymphocyte Rich: This accounts for less than five percent of all cases. This subtype is usually diagnosed at an early stage in adults and has a low relapse rate.

Classical Hodgkin Lymphoma – Mixed Cellularity: This accounts for about 15-30% of all cases. The disease is found

A tissue biopsy on my neck confirmed my lymphoma diagnosis, what followed were more tests – blood tests, CT scans bone marrow tests... this revealed I had stage 3 Hodgkin lymphoma" – *Michael*

more commonly in men than in women and it primarily affects older adults. More advanced disease is usually present by the time this subtype is diagnosed.

Classical Hodgkin Lymphoma – Lymphocyte Depleted: is rare and not usually diagnosed until it is widespread throughout the body.

Nodular Lymphocyte Predominant Hodgkin lymphoma: This occurs more often in older adults and grows slower than Classical Hodgkin Lymphoma. It is often diagnosed at an early stage when "B symptoms" are not yet present.

Staging

Staging is a medical term used to describe the extent to which the lymphoma has spread within the body. The stage is determined by the following three factors:

1. The number and location of lymph nodes affected

2. Whether the affected lymph nodes are above, below or on both sides of the diaphragm (the large, dome-shaped muscle under the ribcage that separates the chest from the abdomen)

3. Whether the lymphoma has spread to the bone marrow or to other organs such as the liver, lungs, or bones.

The most common method of staging is called the Ann Arbor Staging System, which can be summarised as follows:

Stage	What it means?
1	The lymphoma is only present in one group of lymph nodes
2	The lymphoma is present in two groups of lymph nodes on the same side of the diaphragm
3	The lymphoma is present in two or more groups of lymph nodes on both sides of the diaphragm
4	The lymphoma is present in at least one organ (e.g bone marrow, liver or lungs) as well as the lymph nodes

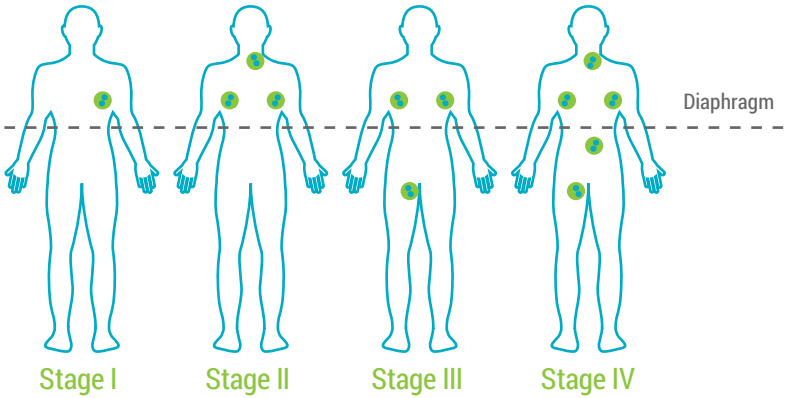
Each stage of HL may also be classified as “A” or “B”. People with a B classification have one or more of the following B symptoms:

1. Unexplained weight loss of more than 10% in the six months before diagnosis

2. Unexplained fever with temperatures above 38°C

3. Drenching night sweats

For example, if your HL is on both sides of your diaphragm and you have been having night sweats, the doctor will refer to your disease as stage 3B. Or, if your disease is in several lymph nodes above your diaphragm in your neck and chest and you have no B symptoms, your doctor will refer to your disease as stage 2A. The classification a simply stands for no presence of B symptoms.



Treatment

HL is treated by a specialist doctor called a Haematologist and a Radiation Oncologist may also be involved. There are several factors for the doctor to consider when deciding on the best treatment for a patient. These include:

1. The stage of the disease and the size of the lymph nodes

2. Age and general health/fitness

3. Blood test results

4. Presence of B symptoms

Sometimes patients with the same stage of HL will have different treatments because of the differences in their general health and/or symptoms so do not be concerned if patients you talk to at your hospital are having different treatments. Always ask your doctor questions you may have about your lymphoma treatments and managing side effects.

Treatment of Early Stage Hodgkin Lymphoma

Early stage refers to Stage 1A and Stage 2A HL where the cancer is localised to one or two lymph node areas located in a similar part of the body e.g. the neck and chest area.

Depending on your stage and B Symptoms your doctor will

come up with a plan to treat your disease. This can be any of the following;

- A combination of chemotherapy
- A combination of chemotherapy and radiotherapy. This enables the treatment to target not only the obvious areas of disease (such as affected lymph nodes) but also disease that might be in the peripheral blood or other areas of the body
- Radiotherapy alone to the affected lymph nodes (very rare)

Treatment of advanced stage Hodgkin Lymphoma

Advanced stage refers to Stage 2B, Stage 3A and 3B and Stage 4A and 4B HL when the lymphoma has spread to other parts of the body and may be bulky in size. Patients with advanced stage HL are generally treated with chemotherapy which is usually given as a combination of different chemotherapy medicines given over a period of time (up to 6-8 months).

There have been many clinical trials over the past few decades which have tested various combinations of chemotherapy and other cancer medicines for the treatment of HL. The doctor will discuss which treatment will be best suited for your particular situation.

Treatment of Relapsed Hodgkin Lymphoma

Relapsed disease is when the cancer comes back again after a period of remission defined as no detectable disease, following treatment. Some patients who have HL will experience a relapse and while it can be very distressing to experience relapsed disease, it can still be treated.

The treatment for relapsed disease will depend on the first treatment given and the duration and depth of response to it. The doctor may choose to use a combination of chemotherapy or other cancer medicines or, in some cases, a treatment of high dose chemotherapy and a stem cell transplantation.

Treating Hodgkin Lymphoma in Later Life

Approximately one in every five people diagnosed with HL is aged 60 years or older. Older people are more likely to have other health problems at the time of diagnosis which may add some complexity to treating the HL. For example, an existing health problem may exclude certain types of chemotherapy medicines because of their effect on the heart.

Older age and other health problems may also mean the person is less able to tolerate the treatment side effects and/or they may take longer to recover from treatment. In particular chemotherapy causes damage to the bone marrow and an older person may take longer to build back healthy blood cells. The doctor will carefully assess each

person's health status and response to treatment and discuss the best approach to treating the cancer. Simple strategies such as extending the period between treatment doses and/or reducing the dose of chemotherapy and/or adding in some supportive medicines will help an older person cope better with their treatment.

For more information on HL and treatments that are currently being investigated, see the HL fact sheet on the Lymphoma Australia website - resources.

You can also see video presentations on HL and related topics through the Lymphoma Australia YouTube channel.

Non-Hodgkin Lymphoma Overview

Being diagnosed with any cancer is often overwhelming. Learning more about the disease can ease confusion and allow you to feel more in control. This section contains general information on NHL including it's symptoms, how it is diagnosed and the treatments used.

Non-Hodgkin Lymphoma Overview

Non-Hodgkin lymphoma (NHL) is a group of blood cancers that includes all types of lymphoma except for Hodgkin lymphomas. All NHL's are classified into two groups called B-cell lymphomas or T-cell lymphomas. Lymphomas arise when developing B and T lymphocytes undergo a cancerous change, and multiply in an uncontrolled way. These abnormal lymphocytes, called lymphoma cells, form collections of cancer cells called tumours, in lymph nodes and other parts of the body. The majority of NHLs (around 85%) arise in developing B-lymphocytes (B-cell lymphomas). The remainder arise in developing T-lymphocytes (T-cell lymphomas). There are over 70 different subtypes of NHL that all have different characteristics (ranging from indolent to aggressive lymphoma) and all require different treatment management.

How common is NHL?

In the past 20 years, the number of people diagnosed with NHL has doubled. In Australia, there are now over 6,400 people diagnosed with NHL each year. Lymphoma therefore represents the sixth most common cancer diagnosed in the adult Australian population.

What are the risk factors for NHL?

Despite being one of the fastest increasing numbers of cancers, the cause of NHL is still unknown. People with the following risk factors may have an increased chance of developing NHL:

1. Previous infections with viruses such as Epstein-Barr Virus, Human Immunodeficiency Virus (HIV), Human T-Lymphotropic Virus Type 1 (HTLV-1) and Hepatitis C

2. Chemical exposure including pesticides, fertilisers or solvents

3. Autoimmune diseases including rheumatoid arthritis, scleroderma and Sjögren's Syndrome

4. Previous organ transplant

5. Infections with certain bacteria including Helicobacter pylori

6. A family history of NHL

It is not known with certainty that NHL can be inherited through family history. Furthermore, it is important to note that having these risk factors does not mean NHL will develop. Many people diagnosed with NHL have absolutely no risk factors.

How does NHL develop?

NHL can begin in any lymph node or lymph tissue found in the body. Tumours may involve just one lymph node or several lymph nodes at the same time. Since lymphocytes move throughout the body through either the bloodstream or more commonly the lymphatic system, any abnormal lymphocyte

has a clear path to travel all through the body. This is why NHL can start in or spread to any part of the body. It is for this reason that many people have widespread disease at the time of diagnosis. This is why systemic treatment such as chemotherapy is required to treat lymphomas, and although it has spread, it does not affect prognosis such as with solid tumour cancers (such as bowel cancer).

Common Symptoms

As mentioned, NHL is the name given to a group of closely related cancers, each of which has its own unique symptoms. However, we have listed the symptoms which are common among many types of NHL:

- Painless enlargement of lymph node(s)
- Fevers
- Night sweats
- Tiredness
- Weight loss (unintentional)
- Widespread itching

Other signs and symptoms may be present. Their occurrence depends on the site of the lymphoma and the extent of the disease.

Diagnosis

A number of different examinations and tests are usually required to diagnose NHL and to see if the disease has spread. Depending on the situation, the doctor may use some or all of these tests to decide the best way to treat the disease. Information from the following sources helps doctors determine the diagnosis:

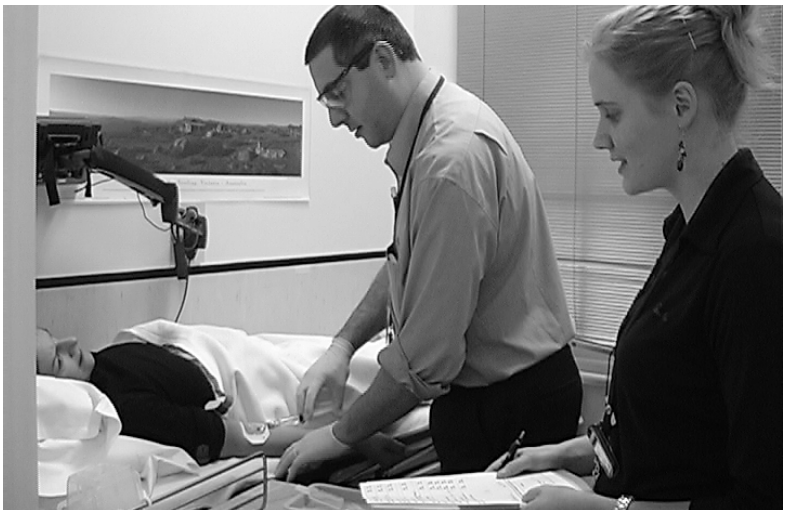
- Your health history including your family's history of disease, your personal illness history and your general health status
- Physical examination by the doctor
- X-ray: A procedure where low dose radiation beams are used to provide images of the inside of the body for diagnostic purposes.
- Ultrasound: A non-invasive procedure where sound waves are used to create images of lymph nodes and other structures in the body.
- CT (computed tomography) scan: A series of X-rays that provide detailed, three-dimensional images of the inside of the body.
- MRI (magnetic resonance imaging) scan: A technique used to obtain three-dimensional images of the body. An MRI is similar to a CT scan, but uses magnets instead of x-rays.

- Gallium scan: Gallium is a chemical taken up by some cancer cells and can therefore help doctors visualise cancer in the body. In this procedure, a safe amount of radioactive gallium is injected into the person, after which the person undergoes an X-ray where the radioactive gallium makes the tumour(s) visible. This test is performed in the Nuclear Medicine facility at the hospital.

- PET (positron emission tomography) scan: A way to visualise cancer in the body. Radioactive glucose (a sugar molecule used as the energy source for cells) is injected into the person and is taken up preferentially by cells with a high metabolic (energy) activity, such as cancer cells. A scanner is then used to visualise the areas of the body where the radioactive glucose is concentrated. PET scans are also performed in the Nuclear Medicine facility at the hospital. Some machines can do both a PET and CT scan at the same time.

- Laboratory tests: Blood tests and urine tests.

- Biopsy: A biopsy is important so as to obtain an accurate diagnosis, and that the best treatment can be prescribed. A biopsy is a surgical procedure to remove part or all of an affected lymph node or other abnormal tissue to look at it under the microscope in the laboratory to see what the cells look like. Some patients may also have a bone marrow biopsy to determine if the NHL has spread to the bone marrow.



The dye is being injected prior to a PET scan

Classifying and Staging

Classifying NHL

The health care team will determine the exact type (classification) of NHL as this helps doctors decide on the most appropriate treatment. The biopsy procedure is **critical** in the classification process as it provides cells taken directly from the tumour. This allows doctors to determine which type of cell the tumour originated from (B-cell or T-cell), as well as other important information about the tumour cells. The biopsy is often called a tissue diagnosis meaning the diagnosis is made through an examination of the tissue or cells and the course of the patient's treatment depends on these results.

Once the surgeon has performed the biopsy and the pathologist has examined the tissue and tumour cells, the information is used to determine the exact subtype of NHL. Once the NHL type, or classification, has been identified through the lymphoma classification system, it is then important to determine the stage of the NHL.

Staging NHL

The stage of a cancer provides information on whether the cancer has spread and the extent to which it has spread within the body. There are four stages of NHL, with stages 1 and 2 being limited (involving a limited area) and stages 3 and 4 being advanced (more widespread). The stage is determined by:

1. The number and location of lymph nodes affected

2. Whether the affected lymph nodes are above, below or on both sides of the diaphragm (the large, dome-shaped muscle under the ribcage that separates the chest from the abdomen)

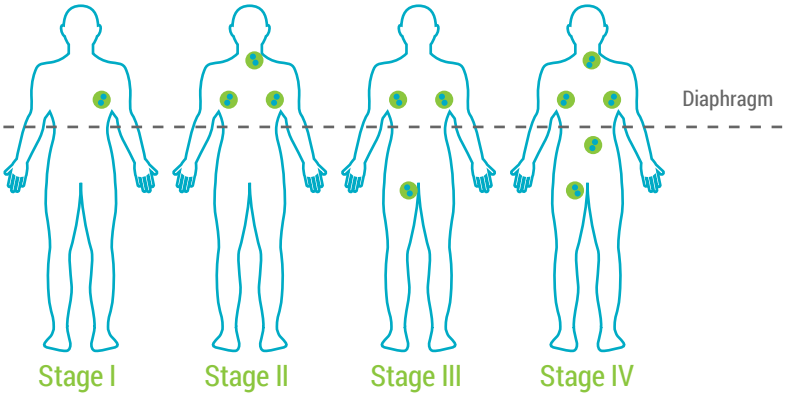
3. Whether the disease has spread to the bone marrow or to other organs such as the liver

The most common method for staging NHL is the Ann Arbour Staging System which can be summarised as follows:

Stage	What it means?
1	The lymphoma is only present in one group of lymph nodes
2	The lymphoma is present in two groups of lymph nodes on the same side of the diaphragm
3	The lymphoma is present in two or more groups of lymph nodes on both sides of the diaphragm
4	The lymphoma is present in at least one organ (e.g bone marrow, liver or lungs) as well as the lymph nodes

NHL Staging provides information on whether the cancer has spread and the extent to which it has spread within the body. Each stage of NHL may also be classified further based on the symptoms you have at diagnosis.

- If you do not have any symptoms at diagnosis you will be classified as A.for example Stage 1A
- If you have unexplained weight loss, fevers and drenching night sweats you will be classified as B, for example 2B
- If the lymphoma has spread to area or organs outside of the lymphoma nodes you will be classified with an E, for example 4E.



Grading of NHL

Grading defines how aggressive (fast growing) or indolent (slow growing) the lymphoma cells are likely to be. This is determined by the appearance of cells under the microscope.

Indolent – also called low-grade can grow slowly, where many cause few symptoms and may not need to be treated initially but may need to be treated at a later date.

Aggressive –also called intermediate-grade and high-grade lymphomas. They grow more quickly and may cause more severe symptoms and generally need to be treated soon after diagnosis.

Non-Hodgkin Lymphoma Subtypes

There are over 70 subtypes of NHL and they are categorised under B-cell lymphomas and T-cell lymphoma. Below is a list of some of the main subtypes of NHLs.

B-cell Lymphoma

- Diffuse Large B-cell Lymphoma (DLBCL)
- Follicular Lymphoma (FL)
- Mantle Cell Lymphoma (MCL)
- Burkitt Lymphoma (BL)
- Chronic Lymphocytic Leukeamia (CLL)/Small Lymphocytic Lymphoma (SLL)
- Marginal Zone Lymphoma (MZL)
- Waldenstroms Macrogloulineamia (WM)
- B-cell Acute Leukaemia/Lymphoma (B-ALL)

T-cell Lymphoma

- Cutaneous T-cell Lymphoma (CTCL)

When you are diagnosed with lymphoma, do not forget to ask – what is my subtype?'

- Adult T-cell Lymphoma/Leukaemia (ATCL)
- Anaplastic Large Cell Lymphoma (ALCL)
- Peripheral T-cell Lymphoma (PTCL)
- T-cell Acute Leukaemia/Lymphoma (T-ALL)

B-cell Lymphomas - Overview

Diffuse Large B-cell Lymphoma (DLBCL)

Diffuse Large B-cell Lymphoma (DLBCL) is an aggressive B-cell lymphoma and is the most common subtype of NHL accounting for around 30% of all cases. The average age of diagnosis for DLBCL is over 60 years, however this cancer can also affect younger adults, adolescents and children.

The most common symptom of DLBCL is a painless swelling of the lymph nodes in the neck, armpit or groin caused by

enlarged lymph nodes. Often lymph nodes are affected in more than one area of the body at dignosis. There can also be symptoms including weight loss, fever and night sweats.

Some people have organ involvement at the time of diagnosis with the most common organs involved being the digestive (gastrointestinal) tract and the bone marrow.

How is it treated?

The standard treatment for DLBCL is a monoclonal antibody plus combination chemotherapy medicines. Other therapies can include radiotherapy, stem cell transplants and targeted therapies. This type of aggressive NHL is very sensitive to treatment and a large percentage of people with DLBCL can be cured.

Follicular Lymphoma (FL)

Follicular Lymphoma (FL) is the most common subtype of indolent (slow-growing) NHL, comprising around 20-25% of all NHLs. FL typically affects middle-aged or older adults, but affect younger adults. Like most indolent lymphomas, people diagnosed with FL usually have lymphoma in many parts of the body at the time of diagnosis. A small percentage of people with FL can have their lymphoma transform into a more aggressive form of NHL, usually to a DLBCL over time.

The most common sign of FL is painless swelling in the lymph nodes of the neck, armpit or groin. More commonly more than one group of nodes are affected.

How is it treated?

Treatment for FL depends on the stage of the lymphoma. People who are diagnosed at an early stage (stage 1 or 2) may have radiotherapy or chemotherapy with the aim to cure the lymphoma so it never returns.

Most people are diagnosed with FL at a later stage (stage 3-4). Those who are not experiencing symptoms may receive no treatment (watch and wait approach) with very close monitoring, or chemotherapy, radiotherapy, a stem cell transplant and targeted therapies.

Once the need for treatment arises the most common treatments include combination chemotherapy medicines with the addition of a monoclonal antibody. These can be used alone or in combination with radiotherapy. FL usually responds quite well to chemotherapy however, there is a risk that it may return in future years. At that time, treatment is given again with the aim of achieving remission again. This pattern may repeat itself over many years. For more information please see the Lymphoma Australia website for our FL fact sheet and videos from leading experts.

Mantle Cell Lymphoma (MCL)

Mantle Cell Lymphoma (MCL) is an aggressive lymphoma, although can be have indolent characteristics for some people. MCL most commonly affects men more than women over the age of 50 years. It is relatively uncommon

and accounts for approximately 5-10% of all NHL cases. The most common symptom is a painless swelling of lymph nodes in the neck, armpit or groin. Often lymph nodes in more than one area of the body are affected. Splenomegaly (enlargement of the spleen) is relatively common with this lymphoma and may cause a feeling of fullness in the abdomen after eating only small amounts. MCL can grow aggressively (fast) and may spread to other organs in the body, including the bone marrow, spleen and liver. It can also spread to the stomach or digestive tract. MCL is usually widespread at the time of diagnosis.

How is it treated?

MCL is usually treated with combination chemotherapy medicines with the addition of a monoclonal antibody. MCL can also be treated with radiation therapy, stem cell transplant and targeted therapies. For more information, see the Lymphoma Australia website for the MCL fact sheet and videos from leading experts.

Burkitt Lymphoma (BL)

Burkitt Lymphoma (BL) is a very aggressive form of lymphoma and commonly affects both children and adults, with males being affected more frequently than females. The disease may be associated with viral infection such as the Human Immune deficiency Virus (HIV) and the Epstein-Barr Virus (EBV) more commonly known as Glandular Fever. BL occurs is most common in adults between the ages of 30 and 50 years,and can occur with the paediatric group.

The most common symptoms are swollen lymph nodes and abdominal swelling. BL may also affect other organs such as the eyes, ovaries, kidneys, central nervous system and glandular tissue such as breast, thyroid or tonsil. Disease in these organs may cause variable symptoms.

How is it treated?

Although BL has a very aggressive course, survival rates with treatment are very high. The most common treatment for BL is intensive combination chemotherapy medicines with the addition of a monoclonal antibody. Other treatments include stem cell transplants when required. For more information see the Lymphoma Australia BL fact sheet on the website.

Chronic Lymphocytic Leukaemia (CLL)/Small Lymphocytic Lymphoma (SLL)

Chronic Lymphocytic Leukaemia (CLL) and Small Lymphocytic Lymphoma (SLL) are lymphomas that affect mature B-cells. They affect men and women equally and are rare in children. CLL accounts for around 15% and SLL accounts for 4-5% of all NHL cases. The diseases are nearly identical and the terms are often used interchangeably.

Symptoms include swollen lymph nodes and an enlarged spleen (splenomegaly), which can cause a mass under the left ribcage, fullness in the abdomen and weight loss. Fatigue, recurrent minor infections or bleeding episodes may also be experienced.

How is it treated?

Initial treatment is often watch and wait (active monitoring). Some patients may never require therapy, whilst others may develop symptoms of advancing disease and require treatment. Combination chemotherapy medicines with a monoclonal antibody as well as targeted therapies are being used for the treatment of CLL/SLL. Younger people with this disease may also be candidates for a stem cell transplant if required. For more information on CLL/SLL see the Lymphoma Australia website for the "Living with CLL" booklet, CLL/SLL fact sheet or video presentations by lymphoma experts.

Marginal Zone Lymphoma (MZL)

Marginal Zone Lymphoma (MZL) is a type of indolent lymphoma that accounts for approximately 10% of all NHL cases and has several subtypes. The average age of diagnosis of MZL is 65 years, although MALT (see below) lymphomas can occur earlier. For more information see the Lymphoma Australia fact sheet on MZL and related other subtypes and video presentations from lymphoma experts.

There are 3 main subtypes of MZL that can be categorised according to the area affected:

Extranodal Marginal Zone Lymphoma of Mucosa-Associated Lymphatic Tissue (MALT)

Extranodal Marginal Zone Lymphoma of Mucosa-Associated Lymphatic Tissue (MALT) is the most common

form of MZL. It occurs outside of the lymph nodes, in places such as the stomach, small intestine, salivary gland, thyroid, bladder, kidney, neurological system, skin, eyes and lungs. MALT lymphoma is divided into symptoms this may include upper abdominal discomfort or local symptoms relating to where the disease occurs.

How is it treated?

MALT is often curable when the tumour is localised. Surgery can be used for certain sites (such as the lung or breast), or radiation. People with more extensive disease are usually treated with single agent or combination chemotherapy medicines. Treatment for gastric MALT is initially antibiotic therapy, which is typically given for several weeks. Approximately 70-90% of patients with evidence of Helicobacter pylori infection respond to antibiotic therapy, although can take months to disappear. In a small amount of cases, this type of NHL can transform into the more aggressive diffuse large B-cell lymphoma (DLBCL).

Splenic Marginal Zone Lymphoma (SMZL)

Splenic Marginal Zone Lymphoma (SMZL) is a type of lymphoma that predominantly involves the spleen. It is a rare type of lymphoma accounting for less than 1% of all NHL. It most commonly occurs in adults and slightly more frequent in women than in men.

Symptoms do not normally appear until years after the disease has begun. The most common symptom is an

enlarged spleen called splenomegaly. Unlike many other types of NHL, there are normally no swollen lymph nodes. The most common symtom when the spleen gets enlarged may cause a feeling of full stomach, and/or abdominal pain.

How is it treated?

A number of different approaches may be taken with SMZL, including watch and wait, removal of the spleen (splenectomy), radiotherapy, combination chemotherapy medicines with a monoclonal antibody and targeted therapies.

Nodal Marginal Zone Lymphoma (NMZL)

Nodal Marginal Zone Lymphoma (NMZL) is a type of lymphoma mainly confined to the lymph nodes. It is a rare form of lymphoma, accounting for only 1-3% of all NHL cases.

The most common symptom is a painless swelling in the neck, armpit or groin caused by enlarged lymph nodes. Sometimes more than one group of lymph nodes are affected. Patients with nodal MZL may develop frequent and persistent infections.

How is it treated?

The most common treatments for NMZL include watch and wait, radiotherapy, and combination chemotherapy medicines with a monoclonal antibody.

Waldenstroms Macroglobulinemia (WM)

Waldenstroms Macroglobulinemia (WM) is a rare form of lymphoma making up only 1-2% of all NHL cases and typically affects older adults.

WM normally develops over a long period of time. Symptoms are not usually very obvious and the disease is often found by chance when getting a routine blood test or an examination for some other reason.

Symptoms may include weakness, fatigue and bruising as a result of altered blood cell levels. Lymph nodes may be enlarged, as may the liver and spleen. Because there may be a thickening of the blood in WM when the IgM antibody is present, this can cause other symptoms including blurry vision, headaches, hearing loss or confusion (in advanced disease).

How is it treated?

Treatment may include combination chemotherapy medicines with a monoclonal antibody, targeted therapies or surgery to remove the spleen. A procedure called plasma exchange (or plasmapheresis) may also be used to treat the blood thickening (hyper viscosity) associated with this disease by temporarily taking out the affected plasma and replacing it with donated plasma. This will not treat the disease directly but give some relief of symptoms of the lymphoma. See Lymphoma Australia website for more information on WM with our fact sheet and video

presentations from lymphoma experts.

B-cell Acute Lymphoblastic Leukaemia/ Lymphoma (B-ALL)

B-ALL is a type of aggressive lymphoma that occurs mainly in children and adolescents, with two-thirds being male. A second peak of occurrence happens later in life in people over 40 years of age.

Lymphoblastic cancers are classified as either lymphoblastic leukaemias or lymphoblastic lymphomas. Both are cancers of immature lymphocytes.

Common symptoms include pallor (paleness of skin), fatigue, bleeding, fever and recurrent infections. At the time of diagnosis other sites outside of the lymph nodes may also be affected and may cause symptoms such as swollen lymph nodes, enlarged liver or spleen, neurological disturbances, enlargement of testicles in men or skin involvement. The diagnosis is usually made by bone marrow biopsy as this typically shows high numbers of the cancerous B-cell lymphoblasts.

How is it treated?

The treatment involves combination chemotherapy medicines and a monoclonal antibody, and a stem cell transplant where required.

T-cell Lymphomas

Adult T-Cell Leukaemia/Lymphoma (ATLL)

Adult T-cell Lymphoma (ATLL) is an aggressive type of lymphoma where the cancerous T-cells are found circulating in the blood stream. ATLL is more common in countries such as Japan and China where a viral infection called HTLV-1 infection is more common. HTLV-1 infection can make people more likely to develop this type of lymphoma. This type of lymphoma can occur at any age from young adulthood to old age. It occurs slightly more often in men than in women.

The most common symptoms include swollen lymph nodes and an enlarged liver and spleen. There may also be signs of skin involvement, high calcium levels in the blood, bone involvement and high levels of an enzyme in the blood stream called lactate dehydrogenase (LDH).

How is it treated?

ATLL is treated using combination chemotherapy medicines and a monoclonal antibody, targeted therapies and a stem cell transplant if required. For more information see the Lymphoma Australia website for the ATLL fact sheet and videos for lymphoma experts.

Cutaneous T-cell Lymphoma (CTCL)

Cutaneous T-cell Lymphoma (CTCL) is a rare type of

lymphoma caused by cancerous growth of T-cells in the skin. It is most common in adults between 40 and 60 years of age. There are a few subtypes of CTCL, the most common being:

Sezary syndrome: Large areas of skin or lymph nodes are affected. People with this lymphoma may have redness of the entire skin surface and tumour cells which circulate in the bloodstream. This type of CTCL often follows an aggressive course.

Mycosis fungoides: The most common subtype of CTCL, accounting for over 50% of all cases. Often, several years of eczema-like skin conditions occur before the diagnosis is finally established. In advanced stages, the lymphoma can spread to lymph nodes and other organs.

CTCL can appear as small, raised, red patches on the skin, often on the breasts, buttocks, skin folds and face. These patches often look similar to eczema or psoriasis, and may be associated with hair loss in the affected area. People in later stages may have ulcerating tumours that appear on the skin. Lymph nodes in the affected region may also be involved.

How is it treated?

Many therapies are used to treat CTCL. They may include:

PUVA: consists of a medicine called psoralen plus ultraviolet

A (UVA) light. Psoralen makes the skin more sensitive to the healing effects of the UVA light. The treatment is similar to sitting under a sunlamp and may be given several times a week and is generally used when the lymphoma is over large areas of the skin.

UVB therapy: Ultraviolet B (UVB) light slows the growth of the cancerous cells in the skin. This treatment does not include the use of a medicine to make the skin more sensitive. Treatment may be given several times a week.

Radiotherapy: Local radiation may be used for early-stage CTCL if only one or two small areas of skin are affected. Radiotherapy may also be used to treat the entire surface of the skin if the CTCL is more widespread. This type of radiotherapy is called total skin electron beam treatment. It is only given once and may be followed up with further PUVA treatments if needed in the future.

Chemotherapy: Chemotherapy medicines may be applied directly to the skin in the form of an ointment. Intravenous chemotherapy may be used if the CTCL is more advanced.

Monoclonal antibodies and targeted therapies: monoclonal antibodies in combination with chemotherapy medicines and targeted therapies are also available for patients with CTCL.

Interferon: Interferon is a naturally occurring protein in the body and is an important part of a healthy immune system.

A synthetic form of interferon can be injected under the skin to help boost the immune response and fight the CTCL.

Photopheresis: This treatment is used particularly for Sezary Syndrome. It involves passing the person's blood through a machine where it is exposed to ultraviolet light and a medicine before returning it back to them. This procedure takes around three hours to complete and can be given every month, every fortnight, every week or more frequently depending on the person's skin and their response to treatment. For more information see Lymphoma Australia website for the CTCL (early & advanced) fact sheets and videos from lymphoma experts.

Anaplastic Large Cell Lymphoma (ALCL)

Anaplastic refers to the appearance of the lymphoma cells, which look quite different from normal lymphocytes. ALCL can occur in two different forms:

- Occurring throughout the body – systemic type
- Occurring in the skin only – primary cutaneous type

ALCL systemic type is an aggressive lymphoma, whereas the primary cutaneous type follows a more indolent course. Patients with ALCL are typically male, although can affect paediatric, adolescents and young adults. ALCL systemic-type have symptoms of enlarged lymph nodes as well as involvement of other organs. Systemic symptoms and

elevated levels of the enzyme lactate dehydrogenase (LDH) occur in approximately 50% of people. Bone marrow and the gastrointestinal tract are rarely involved but skin involvement is common.

ALCL primary cutaneous type has symptoms that usually appear as a single lump or ulcerating tumour on the skin. Lymph nodes in the area may also become involved.

How is it treated?

ALCL systemic type treatments are similar to the aggressive lymphomas, such as diffuse large B-cell lymphoma (DLBCL), are generally utilised in ALCL e.g. combination chemotherapy medicines, radiotherapy, targeted therapies and a stem cell transplant where required. With combination therapy, many people with ALCL may be cured.

ALCL primary cutaneous type has treatments that include radiotherapy to the area, surgery to remove the area of skin affected and combination chemotherapy medicines (used only in patients who have extensive involvement that cannot be treated with localised therapies). Spontaneous remission may also occur with this lymphoma. For more information see Lymphoma Australia website for the ALCL fact sheets and videos from lymphoma experts.

Peripheral T-Cell Lymphoma (PTCLs)

Peripheral T-cell Lymphomas (PTCL) are a group of lymphomas that can be aggressive that affect a certain type

of T-cell. They account for approximately 7% of NHL cases. There are many subtypes of PTCLs including:

Subcutaneous panniculitis-like T-cell lymphoma: This type of PTCL is quite rare and is often confused with a condition called panniculitis, an inflammation of fatty tissue in the body. The most common symptoms include nodules under the skin (subcutaneous nodules) which can progress to open, inflamed sores. Haemophagocytic syndrome—a serious condition in which there is uncontrolled activation of certain parts of the immune system— is also common in this lymphoma.

Hepatosplenic gamma delta T-cell lymphoma: This type of PTCL affects the whole body, with infiltration of the liver, spleen and bone marrow by the T-cells. Usually there are no actual tumours. It is associated with systemic symptoms including fever, weight loss, night sweats, fatigue and is quite difficult to diagnose.

Enteropathy-type intestinal T-cell lymphoma: This type of PTCL is very rare and occurs in people with untreated gluten-sensitive intestinal disease, called celiac disease. These people are often in a very weakened state and may have intestinal perforation (an abnormal hole in the wall of the intestine) when they are diagnosed.

Extranodal T-cell lymphoma, nasal type: This type of PTCL, previously referred to as angiocentric lymphoma, is more

common in Asia and South America. It most frequently affects the nose and nasal passages but can involve other organs as well. It has an aggressive course, and haemophagocytic syndrome can also occur in this condition.

Angioimmunoblastic T-cell lymphoma: This is a more common subtype of PTCL, accounting for approximately 20% of all T-cell lymphomas. Symptoms include generalised lymphadenopathy (swollen lymph nodes), fever, weight loss, skin rash and high levels of antibodies in the blood.

PTCL, unspecified: This is the most common PTCL subtype. It represents all of the PTCLs lacking in a clear definition and thus not classifiable as a specific subtype. Most people with PTCL, unspecified have lymph node involvement however a number of extranodal sites may also be involved such as the liver, bone marrow, intestinal tract and skin.

How are they treated?

Treatment of PTCLs are similar to those used for other aggressive lymphomas, such as combination chemotherapy medicines, radiotherapy, targeted therapies and stem cell transplant when required. The response to treatment is not often as effective in PTCLs as it is in DLBCL and as a result, stem cell transplantation is sometimes considered an early treatment option in appropriate cases.

T-cell Acute Lymphoblastic Leukaemia/ Lymphoma (T-ALL)

T-cell Acute Lymphoblastic Lymphoma (T-ALL) is a type of aggressive lymphoma that occurs mainly in children and adolescents and more often in males than females. A second peak of occurrence is seen later in life in people over 40 years of age. Lymphoblastic cancers are classified as either lymphoblastic leukaemias or lymphoblastic lymphomas.

The most common symptoms include breathing difficulties and other problems resulting from a large mass in the mediastinal area (the centre area of the upper chest), as well as fluid accumulation around the lungs. This type of lymphoma can spread to the central nervous system and neurological symptoms may also be present at diagnosis.

How is it treated?

Intensive combination chemotherapy medicines are the most common treatment for older children and young adults with aggressive lymphoblastic lymphoma. Young people with localised disease have an excellent prognosis. Adults with later stage disease may have a stem cell transplant as part of their initial treatment plan.

If your subtype has not been discussed see the Lymphoma Australia website resource section, call Lymphoma Nurse Support Line: T 1800 953 081 or email: nurse@lymphoma.org.au for information.

Lymphoma Treatments

There are many different types of treatments for lymphoma and these are described in this section. Your individual treatment for your lymphoma is based on many different factors and your health care team will consider these factors when making treatment decisions.

To learn more about lymphoma treatments please visit our website www.lymphoma.org.au and see our resource titled 'What is New for Lymphoma and CLL, Know Your Treatments'. Also see the fact sheet for your subtype of lymphoma for more information on current treatments and those that are being investigated. Our video library also has interviews from the lymphoma experts.

Understanding Lymphoma Treatments

Lymphoma often responds very well to treatments. This does not mean that all types of lymphoma are always curable but it does mean that treatment can often provide long cancer-free periods known as remissions, reduced symptoms and improved quality of life for many people. There are many different types of treatment approaches for lymphoma including:

- Watch and wait (active monitoring)
- Chemotherapy
- Radiotherapy
- Targeted therapies (immune therapies)
- Stem cell transplants
- Chimeric Antigen Receptor (CAR) T-cell Therapy
- Clinical trials

Goals of Treatment

The major goals of lymphoma treatment include:

- Cure (if possible)

- Achieving and prolonging remission (cancer-free period)
- Minimising the number of lymph nodes and/or organs affected
- Preventing the development of symptoms and treating existing ones
- Improving the patient's quality of life

Decisions Around Treatment

Each patient responds differently to treatment, as does each lymphoma subtype. Predicting response to treatment depends on many variables. Factors that can affect the type of treatment are:

- The type of lymphoma
- The grade of lymphoma
- The stage of lymphoma
- Whether it is the first lymphoma treatment for the patient or if the lymphoma has relapsed following prior therapy
- The symptoms the patient is experiencing
- The overall health of the patient including age, medical history and current medical issues

- The recommendations of the Haematologist and their health care team

Treatment Terms

Doctors talk about results of treatment using certain terms such as:

Frontline: Also called induction therapy. The first treatment given after a patient is diagnosed with cancer.

Treatment cycle: A term used to describe the administering of treatment which includes the duration of time the treatment is given and the rest period for the patient to recover. For example, a treatment cycle may involve a combination of chemotherapy and a monoclonal antibody (such as rituximab or obintuzumab) given in the first week, with two weeks of rest. This three week treatment cycle may be repeated three to six times over three to six months.

Complete remission: Also called a complete response (CR) or complete metabolic response (CMR) means all signs of the lymphoma have disappeared following treatment.

Partial remission: Also called partial response (PR), means the lymphoma has decreased in size by half or more but has not been completely eliminated. The lymphoma is still detectable and more treatment may be necessary.

Stable disease: The lymphoma does not get better or worse

following treatment.

Disease progression: A worsening of the disease despite treatment. The term is often used interchangeably with the term treatment failure.

Refractory disease: A lymphoma that does not respond to treatment.

Relapse: The return of lymphoma after a period of improvement. Lymphoma may recur in the same area as the original tumour or in another body area.

Remission: A patient is said to be in remission if the tumour has diminished in size by half or more (partial remission) or is undetectable (complete remission). For some types of lymphoma, for example an aggressive lymphoma, a remission period of five or more years may be considered a cured. However, remission does not always imply that the disease has been cured. Indolent lymphomas are not commonly considered cured because these cancers can relapse even after a long period of remission.

Prognosis: is a term used when predicting how a disease will likely progress after diagnosis and treatment. It refers to the outcome of the disease and the likelihood of recovery for the patient. The prognosis given from the doctor is based on statistical research from hundreds or thousands of people who had the same type of cancer and other variables similar.

However, it is important to keep in mind that the prognosis is a prediction and does not always accurately reflect the course of disease for each patient.

Cure: The term used when no signs or symptoms of the disease have been present for a certain period of time and the lymphoma has been eradicated. The longer a patient is in remission (absence of signs or symptoms of cancer), the higher the likelihood of a cure.

Chemosensitive: means that the lymphoma is responsive to chemotherapy and the treatment is effective in killing the lymphoma cells.

Chemoresistant: means that the lymphoma does not respond to chemotherapy and an alternate treatment is required.

Treatment Advancements

Lymphoma is a very active area of research and many new treatments and combinations of existing treatments are being tested all the time. The goal of this research is to:

- Find more effective treatments for lymphoma
- Decrease the side effects of lymphoma treatments, including both short-term and long-term toxicities
- Find more effective ways of administering treatment.

Significant advances have been made and continue to be made in lymphoma treatment. New medicines are being developed whilst existing therapies are being used in different ways. The introduction of maintenance therapy in the treatment of indolent lymphoma, using the biologic therapy such as rituximab or obintuzumab, represents a proactive approach to prolong remission rather than waiting for the disease to relapse. New hope for lymphoma is always on the horizon.

Types of Lymphoma Treatments

There are many different types of treatment for lymphoma such as watch and wait, chemotherapy, radiotherapy and immunotherapy. These different treatments can be used alone or in combination. Most blood cancers are treated with, chemotherapy and/or radiotherapy. Other treatments, such as hormone therapy and immunotherapy, can also be used. Sometimes targeted therapy is used instead of or with chemotherapy. We have listed the more common treatments but you can refer to the "Know your Treatments" produced by Lymphoma Australia which looks at some of the new treatment options for people with lymphoma. This can be viewed or downloaded from the website.

Watch and Wait

This type of treatment approach is most often used in people who are diagnosed with indolent (slow-growing) NHL and have no symptoms or other risk factors that require immediate treatment. These patients are closely

monitored using a 'Watch and Wait' approach. They have regular visits with their doctor, including blood tests and imaging (such as PET or CT scans), but they do not receive treatment unless the disease progresses or symptoms need treatment.

'Watch and Wait' may initially cause distress to some people as it may seem a risky or passive approach to a serious disease. However, studies have demonstrated that the results are no different between patients with indolent NHL who receive treatment immediately and those who wait until treatment is required. The benefit of 'Watch and Wait' is that it delays the often significant side effects that cancer therapy can cause.

The 'Watch and Wait' approach does not mean nothing is done - the process is still an active one. Patients are seen regularly by their doctors and are very closely monitored for signs of disease progression. Patients should be observant about the presence of disease symptoms, most notably the presence of B symptoms (e.g. fever, night sweats and unexplained weight loss) which may indicate that active treatment should begin. Most patients may go on to need active treatment for their NHL. However, some patients with indolent lymphomas never require treatment. For more information see the Lymphoma Australia website for the Understanding Watch and Wait' fact sheet and video presentations from lymphoma experts.

I have been on watch and wait now for more than 10 years. I often forget that I have lymphoma."
– Ros

Chemotherapy

Chemotherapy means using chemicals to treat disease. In cancer, chemotherapy means medications that kill cancer cells or prevent their growth. Most (but not all) patients with lymphoma will have chemotherapy at some point during their treatment.

Chemotherapy works to prevent lymphoma cells from multiplying and to remove or reduce the number of cancerous cells in the body. It is often part of a larger treatment plan, used in combination with other therapies such as radiotherapy or an immunotherapy.

How does chemotherapy work?

Chemotherapy are medicines that target and kill rapidly dividing cells in the body such as cancer cells. There are also normal cells in the body which are rapidly dividing as well, and chemotherapy may damage these healthy cells. This is why chemotherapy can have side effects including hair loss,

diarrhoea, nausea and vomiting. Not all patients experience side effects from chemotherapy and if side effects do occur they can be treated effectively.

There are many different ways of attacking rapidly dividing cells and hence many different types of chemotherapy. Each chemotherapy medicine attacks the cell in a specific way but because these are all different ways of achieving the same result—destruction of the cancer cells—chemotherapy medicines are often given in combination in order to attack the lymphoma cells from all possible angles to increase the odds of achieving remission.

Chemotherapy combinations are often referred to by the initials of the medicine names in the combination. An example of a combination used in lymphoma is CHOP which is a combination of four medicines, namely, three chemotherapy medications and one steroid medication: Cyclophosphamide, Doxorubicin (also called Hydroxydaunorubicin), Vincristine (also called Oncovin) and Prednisone (steroid medication). Steroid medicines are included in many of the lymphoma treatments as they are an effective therapy for lymphoma and can quickly get symptoms under control.

Chemotherapy is given in cycles, where the treatment is given for a period of time (e.g. for one day) followed by a rest period where no treatment is given. The rest period allows the healthy cells and the body to recover. Together, each period of treatment and rest is called a chemotherapy cycle. A full

course of chemotherapy often takes several months (4-6 cycles). Each dose of chemotherapy kills only a percentage of cancer cells. Chemotherapy is, therefore, often given in multiple treatment cycles in order to destroy as many cancer cells as possible.

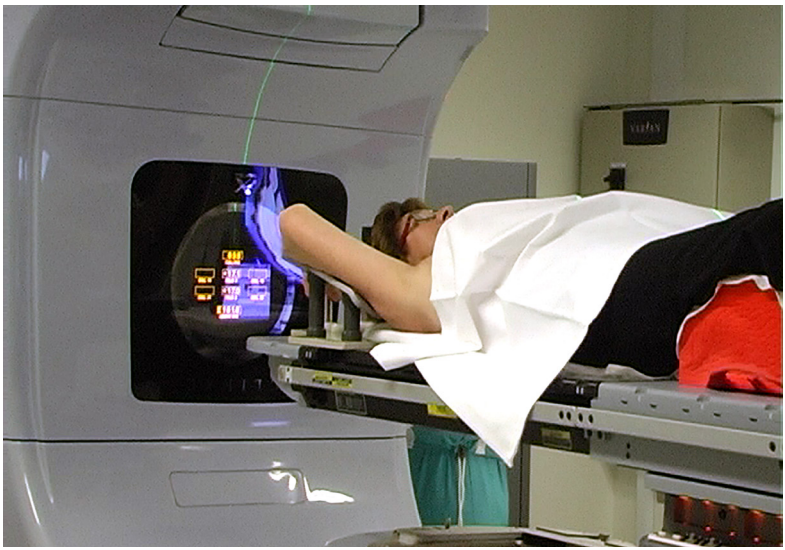
How is chemotherapy given?

Most chemotherapy treatments are given in a day oncology centre, so patients can go home the same day but sometimes people can be admitted as an inpatient for their treatment which means they have to stay in the hospital ward overnight or for several days at a time. Chemotherapy may be given in different forms: tablets, injections or given through a vein (intravenously through a needle).

If a patient is receiving multiple cycles of intravenous chemotherapy, the doctor may recommend having a central venous catheter inserted. This is a device, usually a flexible tube that is more permanent catheter and is usually inserted into a large vein in your arm, chest or neck. Once the catheter is inserted the patient will not require a new needle with each treatment and the chemotherapy and blood tests can be done using this device.

Radiotherapy

Radiotherapy is a local therapy meaning that it only treats the area of the body where the cancer is located. Radiotherapy is often combined with chemotherapy but is sometimes used alone as the main treatment.



Radiotherapy is given by a radiologist and is normally an outpatient procedure

How does radiotherapy work?

Radiotherapy uses high-energy x-rays to kill cancer cells. The x-rays cause damage to the cell's DNA (the genetic material of the cell) which makes it impossible for the cancer cell to repair itself and causing the cell to die. The radiation does not distinguish between cancerous and non-cancerous cells and therefore the surrounding healthy cells are also affected. Care is always taken when planning the treatment to ensure that other areas of the body are affected as little as possible. Normal cells affected by the radiation have a greater capacity to heal themselves than the lymphoma cells.

How is radiotherapy given?

A radiation field is the area of the body which will receive the radiotherapy. To clearly outline the radiation field the skin is marked with tiny ink dots called tattoos. This ensures that the appropriate area is targeted for the radiation and that the exact same area is treated each time.

Radiation is usually confined to lymph nodes or the area immediately surrounding the lymph nodes. The radiation field is different in each patient and depends on many factors including the type of lymphoma and the extent of the disease. Healthy areas are shielded from the radiation with lead shields, which block the path of any stray radiation beams and prevents them from affecting the DNA of normal cells.

Prior to radiotherapy a planning session is scheduled with a radiation technician, a nurse and a specialist doctor. The actual treatment lasts only for a few minutes and causes no pain or discomfort. Side effects can be dependent on where on the body the treatment is targeting.

Radiotherapy is most often given on an outpatient basis. The patient may need to visit the hospital as many as five times per week during a course (cycle) of radiation therapy. The total dose deemed appropriate is divided up and given over a period of one to six weeks.

Targeted Therapies

Targeted therapies are treatments that work by using the body's own immune system to fight the cancer. There are different types of targeted therapies including:

Monoclonal Antibodies

Monoclonal antibodies are a more specific therapy than chemotherapy, meaning that they are directed at a target that is primarily located on tumour cells, as opposed to normal body cells. Monoclonal antibody drugs are treatments that enlist natural immune system functions to fight cancers. These drugs may be used in combination with other treatments. Not only does this make for very effective lymphoma treatment, it can also greatly reduce the side effects, as normal cells are minimally affected.

How do monoclonal antibodies work?

One way the immune system attacks foreign substances in the body is by making large numbers of antibodies. An antibody is a protein that sticks to a specific protein called an antigen. Antibodies circulate throughout the body until they find and attach to the antigen. Once attached, they can recruit other parts of the immune system to destroy the cells containing the antigen.

Researchers can design antibodies that specifically target a certain antigen, such as one found on cancer cells. They can then make many copies of that antibody in the lab. These are known as monoclonal antibodies (mAbs).

Several monoclonal antibodies are available for the treatment of NHL and many more are under clinical investigation. The most commonly used monoclonal antibodies in the treatment of lymphoma are rituximab and obintuzumab.

Prolonged treatment with a monoclonal antibody is called maintenance therapy, that may also be given for the treatment of patients with some lymphomas who have responded to their initial combination immuno-chemotherapy treatment. The maintenance therapy is generally given as one dose every two to three months for a period of two years. The ongoing maintenance treatment has been shown to sustain the response obtained from the initial therapy and may improve survival for people with some types of lymphoma. See the Lymphoma Australia website for "Maintenance therapy in Lymphoma" fact sheet.

Bispecific Monoclonal Antibodies

Bispecific monoclonal antibodies are a new immunotherapy that binds to two different types of antigen. Bispecific antigens have a higher potential of killing cancer cells and can avoid resistance to the drug (eg. Mosunetuzumab).

Cell Signal Blockers

We now understand a lot more about the pathways within lymphoma cells that make them divide and keep them alive. Often signals reaching the surface trigger a series of steps along one or more pathways for the lymphoma cell to be able to divide and survive. Scientists have found that blocking

either the signal or a key step in the pathway can make the lymphoma cells die.

There are a number of medicines that have been developed to target these signals and pathways. Ibrutinib and Acalabrutinib are BTK inhibitors that target an important pathway in B-cells and is used in a number of B-cell lymphomas including CLL/SLL, FL and MCL. Idelalisib (Zydelig) is a PI3-Kinase inhibitor that targets another pathway in some lymphomas.

Immunomodulators

There are medicines that can change the response of the immune system in a person who has lymphoma called immunomodulator medicines. Lenalidomide is one such medicine that modulates the immune system in a number of ways. These include blocking some of the signals between immune system cells, also blocking some of these signals inside lymphoma cells and stopping new blood vessels being able to grow in or around the lymphoma cells therefore causing the lymphoma cells to stop growing and die.

Antibody Drug Conjugates (ADCs)

Antibody Drug Conjugates (ADCs) are made up of an antibody which targets lymphoma cells joined to a chemotherapy medicine. This chemotherapy medicine cannot simply be given into the blood stream on its own because of its side effects, and is more effective as it allows the chemotherapy to be delivered directly to the lymphoma cells by attaching to the antigen on the lymphoma cell. The lymphoma cells can

therefore die without the wide spread side effects of the chemotherapy.

These medicines include Brentuximab Vedotin which is a targeted medicine being used in certain types of lymphoma by targeting the CD30 protein found on the surface of lymphoma cells (such as HL and ALCL). Another medicine is called Polatuzumab Vedotin that is used in lymphomas with CD79b (such as DLBCL).

Checkpoint Inhibitors / Immunotherapy

Check point inhibitors are a class of medicines that block signalling through check points in a cell which are used by lymphomas to evade detection by your immune system. These types of treatments are based on the concept that immune cells or antibodies that can recognize and kill cancer cells can be produced in the laboratory and then given to patients to treat cancer. Cancer cells may also suppress immunity, which may contribute to the immune system's failure to recognize cancer cells as foreign invaders.

Immunotherapy treatments help fight the lymphoma by giving the immune system a long-lasting memory so that it can continually adapt to the cancer over time and provide a durable, long term response to the cancer. Immunotherapy is administered as an infusion into a vein in the arm.
Two checkpoint inhibitors that are used for lymphoma include pembrolizumab and nivolumab (used mainly for relapsed or refractory classical HL and PMBCL).

Chimeric Antigen Receptor (CAR) T-cell Therapy

Chimeric antigen receptor, or CAR T-cell therapy, is a new form of immunotherapy that uses specifically altered T-cells to directly and precisely target cancer cells. After a small portion of a patient's own T-cells has been collected from the blood, these cells are re-engineered in a special laboratory, so they now carry special structures called chimeric antigen receptors (CARs) on their surface. When these CAR T-cells are re-injected into the patient, they multiply rapidly, and these engineered receptors may help the T-cells to identify and attack cancer cells throughout the body.

After Treatment Has Finished

When the treatment is completed the patient will continue to have follow-up appointments with the specialist doctor. Usually these are quite regular (monthly) to start with but, if remission continues, they will decrease in frequency to 3 monthly, then to 6 monthly appointments and then once a year.

Follow-up appointments can be difficult due to the worry of the disease relapsing. But these appointments are an important part of care, as it allows the doctor to assess progress and it gives the opportunity to talk about any concerns following treatment.

It is also important to have regular contact with the general practitioner (GP) as he or she can offer support and advice on a more regular basis, to monitor your general health.

Managing Treatment Side Effects

Therapies commonly used to treat lymphoma may cause a range of side effects with varying degrees of severity. The following section provides further detail on some of the side effects that you may experience. It also provides some tips on how to minimise and manage these side effects.

Treatment Side Effects

The following section provides further detail on some of the side affects you may experience whilst receiving treatment for lymphoma. It also provides some tips on how to minimise and manage these side effects. Chemotherapy and radiation therapy are the most commonly used in the treatment of lymphoma. However, they may cause a range of side effects with varying degrees of severity.

The following list of side effects is not exhaustive, however covers the most common complaints experienced by many patients. Included in the summaries are some helpful tips to deal with side effects should you experience them. It is often helpful for you to keep a diary of what you are experiencing during your therapy so that specific symptoms can be addressed at your next appointment.

Remember your cancer nurse or treating doctor can be contacted to discuss any of these side effects and how to approach to them.

Risk of Infection

Receiving treatment for lymphoma, such as chemotherapy, gives you a risk of developing infections. You, your family and friends need to be aware of this and be mindful of ways you can all help to minimise the risk of you getting infections.

- Make sure you have a thermometer at home that you are confident to use.

- Approximately 50% of patients will develop a fever whilst on chemotherapy and at least half of these patients will have serious infections.

- Take your temperature twice a day while having chemotherapy even if you feel well.

- If you have a fever (temperature of >38°C) you must attend the hospital for urgent antibiotics. The appropriate emergency department will be discussed with you at your appointments.

- Most patients stay at least 48 hours in hospital depending on their condition.

- If you have a fever overnight, please do not wait until the morning to present to the emergency department. The time taken until the first antibiotic dose influences how quickly patients recover from their infection.

Avoiding infection:

- Wash your hands often, and take extra care to protect your skin from becoming dry or cracked use moisturising soap and/or moisturise hands afterwards.

- Make sure you shower or bath every day, hygiene is very important.

- Use a soft toothbrush that is gentle on your gums, to brush your teeth (to keep gums healthy).
- Use an electric shaver instead of a razor to shave (to prevent shaving cuts).
- Ensure all food is properly handled, washed and thoroughly cooked.
- Avoid gardening especially mulch and compost.
- Wear protective gloves cleaning up after pets.
- Always wash your hands after touching pets, going to the toilet or after being outside.
- Stay away from crowds and people with colds or infections.
- Stay away from public swimming pools or hot tubs while your immune system low.
- Tell friends and family if they have the flu, a cold or any other contagious illness e.g. diarrhoea, conjunctivitis to not come and visit until they are feeling better and the infection has gone. Be especially mindful of children with this, as they are more likely to be carrying even minor infections.

- Don't have vaccinations unless they have been approved by your doctor.
- Speak to your doctor before having any dental work done.
- Tell your doctor immediately if you have a fever or other signs of infection.

Nausea and Vomiting

Chemotherapy often causes nausea and, sometimes, vomiting, and radiotherapy targeted towards the abdomen can sometimes cause nausea. Having nausea and vomiting places you at risk of dehydration. Nausea commonly occurs on the day you receive chemotherapy but can also occur in the few days following treatment.

During your chemotherapy course, you will be given routine medications to lessen nausea and vomiting. There are many medications that can be given to help with these symptoms. We encourage you to call the staff at the hospital if you feel your nausea and/or vomiting is not well controlled, so further medications can be added (or changed). Occasionally you may need to be admitted to hospital for intravenous fluids to help prevent dehydration during this time.

Simple ways to decrease nausea and vomiting that some patients find helpful:

- Eating small, frequent meals
- Avoid high fat foods
- Drink cool, clear fluids
- Eat in a room where there are not the smells associated with cooking (some patients find the smell of food makes them nauseated)
- Take the anti-nausea medication prescribed by your doctor as directed.

Diarrhoea

Diarrhoea is the term used to describe frequent and watery bowel movements. Diarrhoea is a common side effect of chemotherapy or radiation therapy that is directed at the abdominal area. Diarrhoea can occur as part of therapy, usually 7-10 days after chemotherapy administration. Diarrhoea can also occur as part of an infection. If you are experiencing frequent episodes of diarrhoea it is important to notify the ward, as you may need to be assessed for dehydration.

If you have diarrhoea it is important to:

- Increase fluid intake
- Eat small, frequent meals

- Eat a bland diet (bread, crackers, clear soup)
- Limit intake of spicy or fatty foods
- Avoid foods that are high in fibre or fat
- Sometimes limiting dairy can be helpful for short periods of time
- If you have abdominal cramps certain medications can help to reduce these (i.e. buscopan)
- Call the hospital if you have increasing or ongoing diarrhoea to see if you need additional assessment for fluids
- Take the medications your doctor recommends for controlling diarrhoea as directed.

Constipation

Chemotherapy and other medications such as anti-nausea medications, may also cause constipation. The term is used to describe difficulty passing stools or a decrease in the number of stools passed compared to your normal bowel activity. Abdominal cramping and an increased passing of gas (flatulence) can also occur.

Constipation can be at best uncomfortable and at worst very

painful, but there are ways to help /relieve constipation.

- Drink plenty of water; fluids will help to keep the stools soft.
- If you are able to, eat foods high in fibre such as fruit and vegetables.
- Avoid cheese, meat and processed food.
- If you are able and your doctor approves, try to do some exercise every day such as going for a walk. Exercise helps stimulate digestion and prevent constipation.
- Take the medications your doctor recommends for relieving constipation.

Low Blood Counts

Having treatment for lymphoma can cause your blood counts to be low, as many of the treatments kill or destroy healthy cells as well as the lymphoma cells. You will have regular blood test to measure your blood counts. The blood counts that are monitored include:

Low White Cells (Neutropenia) – The role of the white blood cell is to fight infection. Normal, healthy people have total white blood cell counts between 4,000 and 11,000 (or 4-11). When you receive chemotherapy your white blood cell count

often drops below 1,000 (or 1.0) which makes you very susceptible to infections. In cancer therapy, we are most concerned with the neutrophil count, the neutrophil is a type of white cell and they are bacteria fighting cells. The lower the neutrophil count, the higher the risk of infection. If the neutrophil count is <1.5, you are referred to as *neutropenic* and your risk of infection is very high, particularly if <0.5. Normal range is 1.5 - 8.0 (1,500 - 8,000).

Signs you may have an infection include:

- Fever
- Fatigue
- Back ache
- Diarrhoea
- Chills or shivers/shakes
- Cough or difficulty breathing
- Redness/pus around central venous access device

If you suspect you have an infection:

- Attend your local emergency department

- Do not stay at home if you have any of the above symptoms waiting for a fever, as it is better that you are reviewed earlier rather than later

Low Red Cells (Anaemia) – Red blood cells carry oxygen in the blood and deliver oxygen to all tissues of the body. Oxygen itself is bound to haemoglobin in red blood cells. Your haemoglobin or haematocrit are measured regularly throughout your therapy as chemotherapy can lower these levels.

Signs that you may have low haemoglobin:

- Tiredness
- Headache
- Shortness of of breath
- Fast heart rate or palpitations
- Light headedness
- Pale

What to do if I suspect my haemoglobin is low?

- A routine full blood count will be ordered

- Haemoglobin (Hb) is ordered regularly throughout treatment and you will have a guide as to when your blood count will be low.

- A red cell transfusion (blood transfusion) is given to correct low Hb – after matching for your blood type.

- Blood is given over several hours either via a drip or through a central access device (PICC, port-a-cath, hickman etc).

- You will be consented for blood transfusions throughout therapy.

Low Platelet Count (Thrombocytopenia) - Platelets stop bleeding in the body by allowing clots to form. Chemotherapy will transiently decrease your platelet counts and make you at risk of bleeding. Normal platelet counts are between 150,000 – 400,000 (or 150-400).

Signs that you may have a low platelet count:

- Bruising

- Petechiae (small, red, pinpoint spots on the skin)

- Blood nose

- Bleeding from the gums

- Bleeding from central line insertion site
- Black stools
- Blood in vomit
- Blood in urine

What to do if I suspect my platelets are low?

- It is likely you will need a platelet transfusion.
- You will need to have an urgent full blood count taken to confirm what your platelet count is.
- A full blood count can be organized at your local hospital.
- Once a low platelet count is confirmed (< 10,000 or 10) or if ongoing active bleeding a platelet transfusion will be given.
- It is important not to wait until morning or your next appointment if you have bleeding overnight - make your way to your local hospital emergency department.
- Do not use ibuprofen or blood thinners whilst on chemotherapy as it makes you more prone to bleeding.

Mouth and Throat Problems

Chemotherapy and/or radiation therapy may lead to side effects which affect your mouth and throat such as:

- Mouth sores/ulcers: sometimes called mucositis, occurs when the inside of your mouth becomes red, sore and irritated. Infections of the mouth may occur.

- Dry Mouth: radiation therapy in the area of the mouth may cause a decrease in saliva production, leading to a dry mouth.

- Throat soreness/irritation: this may be due to decreased saliva production or a direct result of radiation to the area or as a consequence of mucositis.

If you have a persistently sore mouth or throat whilst receiving treatment for your lymphoma, you should tell your doctor.

There are a number of things you and your doctor can do to prevent and treat mouth and throat problems as a consequence of chemotherapy or radiation therapy:

- Drink lots of fluids to keep your mouth as moist as possible.

- Oral hygiene is important, especially if saliva production is low (saliva is an important natural antibacterial).

- Clean your teeth gently after each meal with a soft, nonabrasive toothbrush.
- Rinse your mouth frequently with a mouthwash, avoid mouthwashes that contain alcohol.
- Your doctor may recommend you visit your dentist prior to receiving radiation and/or chemotherapy.
- Use lip moisturiser to avoid dry, irritated lips.
- Avoid citrus fruits, citrus juices and spicy foods.
- Eat softer foods so they are easier on the moist tissues of your mouth.
- Avoid flossing your teeth if your blood cell counts are low.

Loss of Appetite and Taste

Following chemotherapy or radiation therapy you may find that foods you previously enjoyed no longer appeal to you or taste different. You may also not feel as hungry as you normally do. Loss of appetite is also a common side effect of chemotherapy. It may be a result of other symptoms such as nausea and vomiting or it may be that the chemotherapy has altered the taste of foods. Taste changes are usually temporary and disappear once chemotherapy treatment is completed.

Managing Loss of Appetite and Taste

Certain foods may be more appealing than others. If foods are not appetising they may need to be avoided for a period of time and then gradually re-introduced.

- Keep your mouth fresh and clean; frequent mouth rinsing may help
- Eat smaller, more frequent meals throughout the day
- Avoid strong odours, food preparation and hot food
- Drink plenty of fluids to stay hydrated
- Try to eat healthy foods to keep your energy up and for optimal nutrition.

Hair Loss

Hair loss (also called alopecia) is a common side effect of chemotherapy and can affect the hair of the scalp, eyebrows, eyelashes, arm, legs and pelvic region. It affects different people in different ways, some people may lose all their hair and some may only experience thinning of their hair.

Hair loss or thinning usually begins gradually, within two to three weeks of your first chemotherapy treatment. This can be a very distressing side effect for people. However, not everyone experiences hair loss and your hair will usually grow back when cancer treatments become milder or end.

Many people find that their hair may be slightly different after therapy (i.e. curlier, thicker, thinner or a different colour).

Managing Hair Loss

- Pat your hair dry rather than rubbing it vigorously with a towel.
- Some patients prefer to cut their hair short just prior to the hair falling out.
- Avoid using hair dryers, curling or straightening irons.
- Avoid dying your hair or using other chemicals.
- Wear a hat when exposed to the sun, as areas of hair loss are very susceptible to sun damage.
- Consider wearing a hat, wig, scarf, turban or head wrap if it makes you feel better.
- If you are having radiation therapy, you may require special shampoos or soaps.

Skin Reactions

There are many reasons for the skin to become sensitive during therapy. This can relate to radiotherapy to the area, or the use of some medications (i.e. antifungals, chemotherapy

and antibiotics). If you are receiving radiation the radiation oncology specialist will give you an approach to managing the skin sensitivity that comes from radiotherapy. These skin reactions are usually short-lived and diminish over a few weeks.

During any type of cancer therapy, it is recommended that all patients comply with sunsmart habits including wearing protective clothing (long sleeves and pants), hats and sunscreen when out in the sun. These measures will help to avoid further skin damage that can result from the medicines used in your therapy.

Fatigue

Fatigue, or tiredness, is one of the most common side effects of chemotherapy. Severe fatigue can be a symptom of anaemia and should be mentioned to your doctor.

Many aspects of treatment can cause fatigue including:

- Chemotherapy
- Low blood counts (Anaemia)
- Fever and/or infection
- Pain
- Poor sleep

- Anxiety/depression
- Trying to do too much

Managing Fatigue

- Include daily exercise wherever possible in your day (low impact). Start slowly and build up your endurance to a comfortable range.
- Consider a physiotherapy review for exercises that will increase your strength, stamina and endurance.
- Keep an eye on nutrition and make sure you are eating frequent, small nutritious meals.
- Encourage good sleep routines and adequate amounts of sleep. In general, this will include avoiding caffeine after 3pm.
- Alter your regular routine to create a better balance (i.e. half days at work, university, school) and allow your body more time to recover.
- If pain is contributing to your fatigue please speak up! There are many avenues to deal with pain and physicians that specialise in pain medicine to improve these symptoms.

For more information see the Lymphoma Australia fact sheet "Fatigue and Lymphoma" and our video presentation on the YouTube channel for more advice.

Problems with Memory/Concentration

Some people with cancer report that they become forgetful or unable to concentrate and informally refer to this as "chemo brain". But it is not only people having chemotherapy that find they have problems with memory and concentration. Other factors, such as the lymphoma itself, a decrease in blood cell counts, fatigue, or even the stress and anxiety that can come with having cancer can cause difficulty concentrating and forgetfulness.

Problems with memory and concentration may improve once you complete your chemotherapy, but there is also a possibility that these may be long-term problems.

Managing Memory or Concentration Problems

- Use a planner for appointments, medication, birthdays etc
- Try to have a place for everything e.g. put car keys in the same place
- Keep your brain active – crosswords, Sudoku, hobbies
- Have a notepad and pen with you at all times to note things that need to be remembered

- Look after yourself – get plenty of rest, exercise if you are able (and with the doctor's OK)
- Keep your fluids up and have a healthy diet
- Consider relaxation techniques to help reduce stress and anxiety

Peripheral Neuropathy (nerve damage)

Some chemotherapy drugs may cause damage to the nerves that carry information about touch, temperature, pain and sensation. The drugs may also damage the nerves involved in muscle movement. This is called "peripheral neuropathy", it commonly affects the nerves in the hands and feet, but it may occur in other parts of the body too. Symptoms may include pins and needles, pain, numbness, increased sensitivity to heat and problems with balance.

Symptoms of peripheral neuropathy usually develop soon after you start treatment. For most people these will be temporary however some people may experience long-term or permanent damage. Please discuss any symptoms you have with your doctor e.g. pins and needles, pain, numbness in the hands/fingers or feet/toes.

Managing Peripheral Neuropathy

- Regularly check your hands and feet for cuts, burns or scalds you may not have noticed; treat these immediately

to protect against infection

- Protect your hands and feet
- Wear gloves, keep skin moisturised, trim fingernails
- Always wear shoes/slippers indoors and outdoors, keep toenails trimmed and feet well moisturised
- Avoid situations of extreme heat and cold e.g. cooking, freezers
- Always check the water temperature of a bath or shower before placing your hands/ feet in the water – perhaps use your elbow to check water temperature
- Be mindful of sunshine and protect against sunburn
- Discuss pain relief with your doctor if this is an issue.

Fertility Issues

Chemotherapy and radiation therapy may pose some risk to fertility.

For men, general health will affect sperm production so a serious illness like lymphoma may result in a low sperm count. Some treatments may further reduce sperm production.

Women may experience reduced fertility as a result of treatment, with the principle risk to fertility being your age at the time you start treatment. Older women (aged 35 years or over) are more likely to experience reduced fertility than someone younger at diagnosis. The risk to fertility will also depend on what drugs you have and at what dose. Women of childbearing age may find that menstrual periods become irregular or stop during treatment. Following treatment, they may return to normal or remain irregular. Some women, particularly those who are close to normal menopause age, may experience an early menopause following treatment.

Before commencing treatment, it is very important that you discuss these fertility issues with your doctor, or get a referral for a consultation to a fertility specialist, who will advise you further on this matter.

Managing Fertility Issues

For Men: you may be offered sperm banking, where sperm samples can be frozen for many years. Remember that even with a low sperm count it is still possible to achieve conception with a female, so contraception may still be required.

For Women: it may be possible for you to store ova (eggs). Discuss this carefully with your doctor as it takes time to produce the eggs (hormonal stimulation is required) and this can delay the start of your lymphoma treatment.

For women of childbearing potential, contraception use should continue during treatment. All women of childbearing potential should discuss with their doctor the possibility of early menopause due to treatment.

For more information see the website for the fertility fact sheet and the video presentation "Fertility preservation for young lymphoma patients" on the Lymphoma Australia YouTube channel.

Managing Pain

Pain is one of the most common and feared symptoms of cancer. It may occur due to the cancer or as a side effect of cancer treatment. If not adequately managed, pain may have a tremendous effect on quality of life.

Modern medications can help control pain so if you are experiencing pain it is important that you tell your doctor. In addition to medicines to reduce pain there are other methods of pain control and relief, including meditation and even exercise. But you must discuss any form of pain relief with your doctor beforehand to make sure it is the right approach for you to take at that point in time.

Don't wait for pain to become unbearable – it is much better to take measures to control pain early. Your doctor will help you find the right medication or combination of medications and dose to control your pain.

Allergic Reactions

Certain drugs can cause allergic reactions when being infused. One of the lymphoma treatments that can cause these reactions are monoclonal antibody therapies such as rituximab or obintuzumab.
Unlike the side effects associated with chemotherapy and radiation, most of the side effects from monoclonal antibody treatment are minor and short-lived, lasting only during the actual infusion and for a few hours afterwards. The chances of experiencing side effects also decrease with each treatment received because the person adjusts to the treatment and, as treatment continues, there are fewer lymphoma cells to kill.

The most common side effects from these monoclonal antibodies are flu-like symptoms including fever, chills and sweating. Patients are monitored throughout their treatment infusion session for signs of allergic reactions including itching, rashes, wheezing and swelling. If these symptoms occur, the treatment is slowed down or stopped for a short time until the symptoms subside. An antihistamine and paracetamol are commonly given before treatment to avoid allergic reactions.

Clinical Trials

A major part of developing new treatments involves clinical trials. Clinical trials are carefully planned research that is conducted on patients in order to test new medications or new treatment approaches. The new treatment is usually compared with an existing treatment to assess if the outcome is more beneficial for patients.

What is a Clinical Trial?

A clinical trial is a type of research where patients may elect to participate in clinical trials which evaluate new treatments. A clinical trial can test many aspects of treatment, including the safety and effectiveness of new medications, the addition of new medications to standard treatments and potential new methods of administering standard treatments.

Trials usually compare a new treatment with a standard treatment whose effects are already known. These trials are called randomised controlled trials. In these trials, half the patients receive the new treatment and half receive the standard treatment. A computer determines which patient receives which treatment to ensure that the comparison is truly objective and not biased. This is the process of randomisation and hence the term randomised trial.
If the doctors who treat the patients were to decide who receives the new treatment and who does not, they might be biased towards choosing the sickest patients to receive the new treatment, making the results less accurate and less reliable for the future. The protocol of a clinical trial is examined and approved by ethics committees and must meet rigorous government and medical standards.

A significant amount of careful, detailed research is conducted on the new medication before it reaches the stage where it is tested on patients.

Benefits of participating in a clinical trial?

Investigational treatments are not available to people outside of a clinical trial. For a treatment to be given to people in Australia, it must have been rigorously studied and tested, and must be approved by the Therapeutic Goods Administration (TGA). The TGA is the government body which assesses and monitors all therapeutic goods to ensure that they are of an acceptable standard before becoming available to the Australian community.

The main benefit of participating in a clinical trial is that people can receive new treatments that are not yet available for clinical practice. For example, if a person has received the standard therapy for their particular type of lymphoma and has not achieved the desired response, a clinical trial may be a good option.

Risks associated with participating in a clinical trial?

You should be aware of the risks before participating in a clinical trial. They include:

- The treatment may be toxic such that you may experience severe side effects
- The treatment may prove less effective than standard therapies and offer little or no benefit
- You may be in the control group of the clinical trial and as such may receive a standard lymphoma therapy and not the experimental drug.

There are different types of trials in which a person may participate. They are listed in the following table:

Clinical Trial	Description
Phase 1	New medicine tested in a small group of patients to evaluate safety and determine safe dose of medicine and identify any side effects
Phase 2	The medicine is then tested in a larger group of patients to determine how effective the medicine is and further evaluate its safety
Phase 3	The medicine is then tested in a larger group of patients by comparing the intervention to other standard or experimental interventions and is used to monitor adverse side effects and collect information that will allow the medicine to be used safely
Phase 4	Once the medicine is approved for use these trials are used to monitor the effectiveness of the medicine in the general population and to collect information about any adverse side effects associated with the new medicine over longer periods of time and may be used to investigate the use of the medicine in different indications

People who choose to take part in a clinical trial must give informed consent. This means they acknowledge that they understand both the potential benefits and associated risks and that they are a willing participant. No person should be forced or pressured into participating in a clinical trial.

Furthermore, once a person is in a trial they have the right to leave the trial at any time without explanation. Leaving a trial will in no way affect the attitude of your healthcare team, and you will still receive the best current standard treatments.

ClinTrial Refer APP

ClinTrial Refer app is an innovative tool that brings together clinicians, researchers and patients. It enables clinicians and patients to quickly access the latest information on clinical trials so together they can make informed decisions on the best treatment options available. Clinical trials are vitally important to patient care. Researchers are constantly striving to find answers to improve the quality of life of our patients and the ClinTrial Refer app means faster and improved access to clinical trials for Australian patients with lymphoma.

For more information see Lymphoma Australia's website for the “Understanding Clinical Trials” fact sheet, your subtype’s fact sheet or videos with presentations or interviews from lymphoma experts on the Lymphoma Australia YouTube channel.

Questions to Ask your Doctor and Healthcare Team

It is common for people newly diagnosed with lymphoma to feel confused and to have difficulty finding answers to help them feel more in control of their situation. The questions below may be helpful in initiating a discussion with your doctor and health care team to gain a better understanding of your lymphoma.

General Questions

- What type of lymphoma do I have? (There are over 80 subtypes of lymphoma so be sure you know exactly what type you have. For example, Diffuse Large B-cell Lymphoma (DLBCL), Follicular Lymphoma (FL) or Hodgkin's Lymphoma (HL) are all different subtypes of lymphoma).
- What is the stage of my lymphoma? (Stage 1, 2 3 or 4).
- What is my prognosis with this type of lymphoma?
- What tests will I need to have done?
- How will this lymphoma affect my life? My work? My family?
- What changes should I expect to happen to my body such as my appetite, appearance, and energy levels?
- What adjustments should I make to my everyday life?
- How much experience do you have in treating my type of lymphoma?

Treatment Options

- What are my treatment options for this lymphoma?

- What treatment options do you recommend and why?
- How does the treatment work?
- What are the names of the medicines I will be given? What does each medicine do and what are the potential side effects?
- What outcome do you hope for after this treatment? Do you hope to cure or control the lymphoma and what are the chances of the lymphoma coming back?
- What other treatments may I have after my initial treatment if the lymphoma does come back?
- How will you know that my treatment is working?
- Is there any new research or clinical trials that I should know about for my lymphoma?
- What can I do to prepare myself for treatment?
- How will treatment affect my life? My work? My family?
- How is my type of lymphoma normally treated?
- How long will my treatment last?

Side Effects of Treatment

- What are the possible risks or side effects of treatment?
- How serious are the side effects?
- Can the side effects be managed with treatment?
- What symptoms should I report right away?
- What are the long-term side effects to look out for after this treatment?
- If I do not feel sick, does that mean the treatment is not working?
- How long will potential side effects of this treatment last?

Practicalities of Treatment

- How often will I need to come in for treatment or tests?
- What if I miss a treatment or it is delayed because I am unwell?
- What is my treatment schedule?
- If I get radiation therapy, how will it be given to me? Is it painful?

- How long will my treatments last?
- Why do I need blood tests and how often will they be required?
- Are there any special foods I should or should not eat?
- Can I drink alcoholic beverages?
- Should I still take the other medicines I am on?
- Is it okay to continue with the supplements I am currently taking?
- What costs will I encounter?
- What should I do if I cannot afford any costs associated with treatment?
- Who should I call if I have questions?
- What should I do to try to stay healthy and strong during my treatment?
- Can I come for my treatments alone or do I need assistance?

The Future

- What are the chances that my lymphoma may return? What are the signs to look out for?
- What life changes should I plan for in regard to my family and my work?
- Will I still be able to have children after treatment?

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