

STEP BY STEP

Late Effects of Treatment



Introduction

Your cancer treatment can cause side effects. Some of these will occur at the time of treatment and will normally stop when treatment ends (you can find information about these in our booklet *Step by Step Common Side Effects of Treatment*). Some of these side effects may last for a long time after treatment, these are called 'long term effects'. Some side effects don't occur for months or even years after treatment ends, these side effects are called 'late effects'. These late effects can be physical or emotional. Not everyone gets late effects, the risk depends on the type of treatment, the dose of treatment and the patient's age at the time of treatment.

This booklet is designed to provide you with information about the late effects you may experience, what to expect and how they may be managed. If you need specific advice or are concerned about a particular late effect, please contact your medical team or Clinical Nurse Specialist.

This booklet has been compiled by Dr Victoria Grandage (UCLH) and peer reviewed by Dr Panos Kottaridis, Royal Free Hospital. We are also grateful to our patient reviewers, Simon Walker, John Watson and Steve Colbourne and the Brighton support group.

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Visit our website:



www.leukaemiacare.org.uk

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Useful personal information and contact details

| | | |
|--|------|-----------------|
| Date of diagnosis | | Contact details |
| My diagnosis | | |
| My hospital | Name | |
| Consultant haematologist | | |
| Specialist nurse | | |
| GP | | |
| Haematology clinic | | |
| Haematology ward | | |
| Emergency contact number / Out of hours contacts | | |



A note from our CARE Team

We know that sometimes the late effects of treatment can be more difficult to manage than the illness itself. Sometimes the effects can be unexpected or more severe than you anticipated.

We know that many patients have lots of questions about the late effects of treatment and how to deal with them and we hope this booklet helps to answer some of them.

We have included the effects that are most commonly experienced by patients and not all late effects feature in this booklet. This doesn't mean that what you're experiencing is wrong or not related to your illness or treatment, so if you're at all worried, please speak to your medical team.

If you have any questions about the information in this booklet or you want to know where you can get more information, please call us on 08088 010 444, where a member of the CARE Team or a dedicated trained volunteer will be ready to answer your questions.

Best wishes
The Care Team

The difference between long term and late effects

All methods of treatment for blood cancer can cause side effects. Some of these are **acute** or early side effects and occur at the time of administration of the treatment, for instance nausea and hair loss. These side effects usually stop once the drug is stopped. Certain early side effects persist after treatment, for instance reduced fertility, and are permanent. These are **long term** side effects. Side effects that develop months or years after treatment has stopped are known as **late effects** i.e. they have a delayed onset. These side effects may be physical, or emotional, and can include second cancers and heart disease.

As treatments have become more effective and more people survive, our knowledge of late effects has improved. The focus of many newer treatments has moved towards reducing the number, and intensity, of late effects. Certainly many of the treatments used now are much less likely to cause health problems than those used 20 years ago. Not everyone gets late effects, the risk depends on type of treatment, dose and age when they had treatment.

Because late effects can take many years to appear they may not be known for some of the new drugs being used to treat blood cancer today.

Treatments for blood cancer

Chemotherapy

Chemotherapy is the name given to a group of drugs that are used to treat cancer. There are lots of different groups of drugs, all working in different ways to stop the cells growing and dividing and to damage them so that they eventually die. These drugs may be given in the following ways:

- by mouth, as tablets or liquids
- by injection into a vein or muscle or into the spinal fluid (intrathecal)

A combination of drugs is usually used to treat blood cancer as each drug works in a slightly different way and it allows the maximum number of cancer cells to be killed at a given dose of drug.

Chemotherapy is not cell specific and affects all dividing cells and so affects normal cells as well, this is how it causes its side effects. Chemotherapy works best on the cells which are dividing faster which is usually the cancer cells.

Drugs commonly used to treat blood cancers:

- Vincristine
- Anthracyclines
- Steroids
- Asparaginase
- Cyclophosphamide
- Cytarabine
- Methotrexate
- 6 mercaptopurine

Monoclonal antibodies

Monoclonal antibodies are antibodies directed at a specific protein on the surface of a cell and so target cells expressing that protein. Sometimes they are tagged with a toxin or a radioactive substance and deliver that agent directly to the cell. Once the antibody has latched onto the cell, the immune system is triggered to destroy it. These are relatively new drugs and some of them are still in clinical trials. You usually have monoclonal antibody treatment through a drip (infusion).

Most side effects occur at the time of the infusion and include fever, rash, feeling sick, wheezing, headaches and faintness. There are not many known late effects but as they are new drugs some late effects may not yet have become evident.

Common monoclonal antibodies used to treat blood cancer:

- Rituximab
- Brentuxumab
- Gemtuzumab ozogamicin
- Alemtuzumab

Radiotherapy

Radiotherapy is the use of high energy radiation to kill cancer cells. It works by damaging the DNA (genetic code) of the cancer cells and causing them to die. Normal tissues nearby can be affected but these have better repair mechanisms and are usually able to repair the DNA damage and grow normally. Modern radiotherapy techniques are aimed at keeping irradiation of normal tissues to a minimum and aim to limit the risk of permanent side effects, but when given along with chemotherapy the risk of late effects increases. The dose of radiotherapy, how the dose is divided up into treatment sessions, and the area irradiated will all impact on the side effects that might be predicted.

Commonly irradiated sites:

- **Cranial irradiation** used to be used to prevent the spread of leukaemia to the brain in the treatment of childhood leukaemia and was associated with a high number of late effects. Now it is usually used for treatment of chemotherapy resistant or relapsed leukaemia/lymphoma involving the brain or spinal fluid.
- **Involved site radiation** is aimed at the lymph nodes that originally contained the cancer and any areas it extended into.
- **Extended field radiation** was used more commonly in the past and was associated with exposure of a greater proportion of normal lymph node areas and tissues and thus greater late effects.

Common extended fields used:

- **Mantle field** lymph node areas in neck, chest and under the arms.
- **Inverted Y** included the lymph nodes in the upper abdomen, spleen and pelvis.
- **Total Body Irradiation (TBI)** as the name suggests the whole body is irradiated. This is usually used in preparation for a bone marrow transplant.

Possible Late effects

Secondary cancers

Secondary cancers are not linked to the original cancer and can occur months to years after the original treatment. The risk is increased by the intensity of treatment you have received and is a result of the cell damage that chemotherapy and radiotherapy can cause. Certain chemotherapy drugs have a higher risk than others e.g. alkylating drugs. Furthermore, secondary cancers are more frequent in patients who receive radiation therapy and chemotherapy together compared to either treatment alone.

Because secondary cancers are late effects and can occur many years after treatment has finished they have been best studied in cancers for which successful treatments have been available for longer e.g. Hodgkin's Disease.

The cancers most often linked to chemotherapy are myelodysplastic syndrome (MDS) and acute myeloid leukaemia (AML). Sometimes, MDS occurs first, and then turns into AML. Acute lymphocytic leukemia (ALL) has also been linked to chemotherapy. Chemotherapy is known to be a greater risk factor than radiation therapy in causing leukemia. Secondary leukaemia tends to occur between 2-10 years post treatment and in many cases is more difficult to treat than primary leukaemia.

The risk of developing a secondary cancer after radiation treatment goes up as the dose of radiation increases. The area treated is also important, since these cancers tend to develop within the radiation field. Certain organs, such as the breast and thyroid, seem to be more likely to develop cancers after radiation than others.

Age at the time of treatment also affects the risk of solid tumors. For example, the risk of developing breast cancer after radiation is higher in those who were treated when they were young compared with those given radiation as adults. Risk decreases as the age at the time of radiation increases, with little or no increase in breast cancer risk among women who had radiation after the age of 40. Age at the time of radiation treatment has a similar effect on the development of other solid tumors. Other factors can also affect the risk of radiation-related cancers. Smoking, for example, increases the risk of lung cancer after radiation even more. Early menopause, which can be caused by chemotherapy, can lower the risk of radiation-related breast cancer.

Management of the risk

All cancer survivors will be advised to live a healthy life style, exercise regularly and reduce known risk factors for cancer such as smoking or excess sun exposure. They should be self-aware and report new symptoms in a timely manner especially symptoms that could be indicative of a second cancer such as new lumps, bleeding, weight loss etc. Women should be encouraged to be breast aware and men should know how to examine their testicles. Patients should be encouraged to enter a screening program where there is one available e.g. cervical screening and breast screening. Patients should discuss their exact risks of second cancer with their treating team.

Heart Problems

The heart sits between the lungs on the left side of your chest. It sits within a fibrous sack called the pericardium. The heart is essentially a muscle which contracts and relaxes in a coordinated way to pump blood throughout the body to deliver oxygen and nutrients to the tissues. The heart beat is initiated and coordinated by the electrical conduction system. The heart itself is supplied by special blood vessels known as the coronary arteries and damage to these vessels means that the heart muscle may not get enough oxygen and can be damaged.

The heart can be affected by a number of chemotherapy drugs used to treat blood cancers, as well as by radiotherapy if the heart is in the radiotherapy field. This effect is often referred to as **cardiotoxicity**. It may be acute at the time of administration of the drug or may develop as a late effect many years after the end of treatment.

How might chemotherapy affect the heart?

Drugs (eg daunorubicin) may have a direct toxic effect on the heart muscle affecting the way the heart pumps, this might also be called cardiomyopathy or left ventricular dysfunction and may lead to heart failure.

The pericardium which is the sack that the heart sits in can be affected. It can be inflamed which is known as pericarditis or thickened which is known as pericardial fibrosis.

Drugs (eg ifosfamide, gemcitabine) may affect the heart rhythm leading to the heart beating either too fast, too slow or irregularly.

The blood vessels supplying the heart can become hardened or blocked and this may affect oxygen getting to the heart, this is also known as coronary artery disease, this is more usual after radiotherapy.

The most common drugs implicated in late cardiotoxicity are anthracyclines. These drugs are included in many chemotherapy regimens used to treat cancer. They include doxorubicin (adriamycin), daunorubicin, idarubicin and epirubicin. They are often considered with another drug, mitoxantrone, which has a similar effect although is from a different group of drugs. These drugs can affect the heart muscle and thus the ability of the heart to pump. Usually these effects are associated with higher doses of the drug but not always and some people will be more susceptible than others. Life style behaviours such as smoking, obesity, high cholesterol and high blood pressure will also have an impact.



How can radiotherapy affect the heart?

Radiotherapy can have a number of effects on the heart. Although modern radiotherapy fields will try and avoid the heart where possible it might still be exposed.

Pericarditis

Inflammation of the pericardium or pericarditis usually occurs early after radiotherapy and presents with a sharp chest pain which is worse on breathing in and maybe relieved by sitting forward, together with a fever.

Coronary artery disease

Radiotherapy may lead to proliferation of the cells lining the blood vessels leading to narrowing of the artery and a reduction in blood flow. It can occur many years after radiotherapy and depending on age at treatment it is likely to occur at a younger age than in the normal population.

As a patient it is important that you understand the treatment that you have received. Ideally you will have an end of treatment summary or care plan that outlines problems you may be at risk for. Your consultant should inform you if you are at risk of heart problems after treatment and let you know if any surveillance is necessary.

Management of the risk

Below is a list of symptoms associated with heart disease. These are not specific to heart disease but you should be checked out if you develop any of them.

- Shortness of breath
- Feeling short of breath when lying flat
- Fatigue
- Chest pain or jaw pain (pain classically radiates to the arm or neck)
- Nausea or vomiting
- Swollen feet and ankles

- Cough or wheeze
- A sensation that your heart is racing or missing a beat

If you received anthracyclines in childhood or adolescence you should be on a screening programme. Usually echocardiograms are used to monitor your heart function and size. The usual screening frequency is five yearly unless an abnormality is detected. Screening is also more frequent during pregnancy due to the strain put on the heart. If you were treated at an older age your consultant will decide what screening is necessary based on your history and any other risk factors. It is important to highlight if you have a family history of stroke or heart disease. With aging the risk of heart problems increases in the general population and the incidence of high blood pressure, coronary artery disease, diabetes and other risk factors also increase.

What you can do to help yourself

It's always worrying to know that you have a risk of heart disease but there are things that you can do to keep yourself well. If you are a smoker it is advisable to give up and your GP may have some resources to help you do that successfully.

A healthy balanced diet and exercise are also important. Current guidelines are that we should all have at least 30mins moderate exercise daily or at least 150 mins weekly.

If you have high blood pressure, diabetes or high cholesterol, these should all be controlled as well as possible as they are also risk factors for cardiovascular disease. In case of severe heart damage, medications such as beta blockers and ACE inhibitors might offer some delay in progression and also reverse part of the damage. These drugs might have to be continued for life.

Bone problems

Normal bones are made up of a hard outer layer known as the cortex and a softer inner layer made of spongy bone. The cells that form bone are known as osteoblasts and the cells that resorb and

remodel the bone e.g. after injury or to maintain bone mass are known as osteoclasts.

Osteopenia/osteoporosis

The bone matrix is predominantly made of collagen. The hardness of the bone relates to its salt mineral content which is made up of calcium and phosphate. Our bones reach maximum density in our early to mid-twenties and as we get older the density reduces. In women this tends to happen after the menopause and in men later in life.

Weight bearing exercise, calcium and vitamin D are all important for maintaining bone density. Immobility, some hormone deficiencies and certain drugs and radiotherapy can lead to a reduction in bone density.

A reduced bone density is known as osteopenia, a severe reduction leading to fractures is known as osteoporosis

Fixed risk factors for osteoporosis:

- Female gender
- Age
- Menopause/hysterectomy
- Ethnicity-caucasian and Asian more than black
- Family history

Drugs that can affect bone density

Corticosteroids (prednisolone or dexamethasone) these are commonly used to treat acute lymphoblastic leukaemia, lymphoma, myeloma and chronic graft versus host disease. Their effect on bone density will depend on your age at treatment, and how long you take them for. If you are prescribed them at a younger age, before you have reached peak bone mass, you are likely to have less reduction over all than if you are prescribed them later in life. Continuous steroids are more damaging to bone mass than pulses (intermittent dosing). The bone loss is most rapid in the first few months of therapy and Bone Mineral

Density (BMD) should be considered in anyone that is intended to continue therapy for 3 months continuously. The fracture risk increases rapidly after the onset of treatment and declines rapidly after stopping therapy.

Methotrexate

Ciclosporin

Radiotherapy including TBI

Some conditions that may occur after cancer treatment that increase the likelihood of osteoporosis:

- Low female/male hormones
- Growth hormone deficiency
- Immobility

Risk factors for osteoporosis that you can do something about:

- Smoking
- High alcohol intake
- Low body mass index
- Nutritional state
- Low vitamin D levels

How might osteoporosis be picked up?

Osteopenia and osteoporosis are unlikely to produce any symptoms unless a fracture has occurred. Your clinical team will decide if you are high risk and if you require investigation/screening. The most usual method for screening is via a dual x-ray absorptiometry or DEXA scan which is a low radiation x-ray that can detect small changes in the bone density at the spine and hip. The results are given as a T score or Z score.

How is osteoporosis treated?

Any underlying hormone deficiencies would be treated and your calcium and vitamin D levels should be maximised. Young females with premature ovarian failure (POF) should be

considered for Hormone Replacement Treatment (HRT) up to the age of 50. HRT should be prescribed with caution in patients with previous history of clotting events or strong family history of breast cancer.

Weight bearing exercise is good for your bone density and immobility may make it worse. Smoking also has an effect on bone density and should be avoided. Whether you are offered medical treatment or not will depend on your gender, age, whether you have had a fracture already or what your risk of a fracture is.

Other rarer bone problems that can occur after treatment for haematological cancers include osteoradionecrosis and avascular necrosis.

Osteoradionecrosis (ORN)

This is a condition of poor bone repair because of damage to the small blood vessels supplying the bone and therefore poor supply of oxygen and nutrients. Osteoradionecrosis can be picked up by X-Ray or MRI.

It occurs usually after radiotherapy at high doses (>40Gy), usually to the jaw.

It can be spontaneous but usually occurs after dental trauma such as an extraction but can occur after trauma as minimal as irritation from dentures. If you have received radiotherapy to the head or neck above the collar bones or mouth and throat you are at risk.

Treatment of ORN

Treatment is symptomatic in most cases with pain killers and antibiotics if there is definite evidence of infection. Hyperbaric oxygen and surgery are sometimes used.

What can you do to prevent ORN?

- Good dental hygiene is essential
- Artificial saliva if you have a dry mouth
- Fluoride treatment may be helpful
- See a dentist every 6 months and make sure s/he is aware of your history, especially if s/he feels an extraction is necessary
- Healthy balanced diet

Osteonecrosis (avascular necrosis) (AVN)

This is a disorder caused by the temporary or permanent interruption to the blood supply to the bone. The bone tissue loses its oxygen and nutrient supply and dies. The bones commonly involved are the long bones in the leg, involving the hip and knee joints. Other common sites include the shoulder and ankles. One or more bones can be affected at the same time. It can be symptomless or cause significant pain. The amount of disability will depend on the bones/joints involved.

Causes of AVN

- Steroids
The mechanism by which steroids cause AVN is not clear. It seems to be more common when you receive these medicines during adolescence than in childhood or adulthood, possibly relating to the hormones and bone growth occurring at that time.
- Alcohol
- Injury

Diagnosis of AVN

X-Ray
MRI

Treatments

The goal of treatment is to improve the use of the bone by good pain relief and physiotherapy, to prevent any further damage to the bone, and to aim for joint survival.

- Pain relief

- Reduced weight bearing - this may slow the damage and allow natural healing
- Physiotherapy
- Surgery
- Decompression – this involves removing a core of bone and allowing a better blood supply, useful for early AVN
- Osteotomy –reshaping the bone to reduce stress on an affected area
- Joint replacement

Osteonecrosis of the jaw

This is a rare side effect of Bisphosphonate this is again due to poor bone healing and is most common with the drug zoledronic acid, usually in high doses. It is often related to tooth extraction or dental surgery and may present with pain and swelling, bad breath or spasm of the jaw muscles.

Diagnosis is the same as for Osteonecrosis

Treatment

- Pain killers
- Antibacterial mouth washes
- Antibiotics if necessary
- Surgery

Eye Problems

Some cancer treatments may have an effect on your vision. Some of these are acute and occur at the time of receiving the drugs, others may develop over time. As a deterioration in your vision can significantly impact your quality of life, it is important that if you are at risk you have your eyes monitored regularly. As you age other factors may compound the problem as age related visual changes occur. Diseases such as diabetes, if not well controlled, may also impact your vision. This is important to remember as some therapies may increase your risk of developing diabetes.

Cataracts

These are areas of clouding of the lens which interfere with light passing through it. Cataracts generally cause blurred vision, sensitivity to light and glare. It may cause double vision and poor vision at night. You may need a change to your glasses or contact lens prescriptions.

Risks

- Steroids
- Radiotherapy-the risk of cataract formation increases with radiation dose
- Total radiation dose of 10Gy or higher
- TBI as a single fraction
- Time

Not all cataracts need treatment and it may be that your vision requires monitoring in the first instance. If treatment becomes necessary the only treatment is surgical removal of the lens and replacement with an artificial lens.

Dry Eye syndrome (Keratoconjunctivitis sicca)

Dry eyes is a common condition in the general population especially over the age of 65yrs but certain cancer treatments may predispose to it especially radiotherapy or graft versus host disease. GVHD can affect any bit of the eye. It typically causes inflammation of the conjunctiva and tear glands.

Inflammation of the cornea, which is the clear outer surface of the eye and the conjunctiva (membrane covering the eye and eyelids) leads to reduced tear production.

Dry eyes are also more prone to eye infection.

Symptoms include dry gritty eyes, pain and light sensitivity. You may notice excessive watering of your eyes

Treatment

- Artificial tears or ointments to lubricate the eye.
- Surgery may be needed

Hearing Problems

Several chemotherapy drugs such as cisplatin as well as antibiotics such as aminoglycosides can affect your hearing. This can happen a few days, months or years after exposure to these medications. If you feel that your hearing is impaired you will need to speak to your consultant or to your GP in order to be referred to specialised services.

Skin problems

Chemotherapy can cause several skin problems; the most common ones include dry skin, hyperpigmentation, nail changes and photosensitivity.

Treating dry skin

Creams and lotions are effective ways of restoring moisture following dry skin reactions and patients should be encouraged to use them on a regular basis.

Photosensitivity is an enhanced skin response to ultraviolet radiation (sunlight). Things you can do to manage photosensitivity include the use of sun cream, protective clothing and use of moisturising creams and lotions.

Nail problems

There are several types of nail changes which may occur in patients receiving chemotherapy; the most common of these skin reactions seen, particularly in dark-skinned persons, is hyperpigmentation, vertical or horizontal bands, or general darkening.

Management of nail problems

There are several things you can do to prevent further damage;

- Nails should be trimmed and kept clean.
- Gloves should be worn for housecleaning and gardening to minimize damage and prevent infection.
- Nail polish and imitation fingernails should not be worn until the nails have grown out and returned to normal.

Fertility

Fertility is the ability to have children and can be affected by treatment with both chemotherapy and radiotherapy.

All patients at an age where they may be considering having children in the future who require anti-cancer treatment, should be fully informed about the potential effects on fertility at the time of diagnosis and prior to starting potentially sterilising treatment. Where children are having treatment their parents should be given this information.

Male Fertility

For men fertility can be affected by anything that interferes with sperm production; with the hormones necessary for sperm production and the ability to have an erection and ejaculate.

Chemotherapy can slow down or stop sperm production either temporarily or permanently. It depends very much on the chemotherapy drug and the doses used. Testosterone secretion is usually much less affected.

Male patients who have gone through puberty should be offered the opportunity to store sperm before treatment starts so that this can be used in the future for assisted conception. Some men may have very low sperm counts due to their cancer or may be too unwell and then it may not always be possible to store sperm. Sometimes your doctor may want to start your treatment very quickly. In this case it may not be possible to store sperm or to store more than one sample.

Chemotherapy drugs (alkylating agents) commonly implicated in affecting sperm production:

- BCNU (carmustine)
- Busulphan
- CCNU (Lomustine)
- Chlorambucil
- Cyclophosphamide
- Ifosfamide
- Melphalan
- Cisplatin
- Cytarabine
- Dacarbazine
- Procarbazine

Whether the sperm count is affected and whether this effect is temporary or permanent depends on the drug and the dose used. Recovery can take many years.

Pelvic radiotherapy can affect sperm production, testosterone secretion and also affect the nerves necessary for sustained erection.

If pelvic radiotherapy is being given and the testes do not need to be irradiated, they can be protected by taping them away from the radiotherapy beam or by using lead shielding.

The testes may need to be irradiated if involved with leukaemia/ lymphoma or during Total Body Irradiation (TBI) in preparation for transplant. At these doses the treatment usually results in permanent sterility. Despite the fact that germ cells are sensitive to chemotherapy/radiotherapy resulting to impaired spermatogenesis, the cells that produce testosterone (Leydig cells) are pretty resistant and therefore the levels of the hormone remain normal after treatment including TBI. Therefore, males rarely require hormone replacement treatment.

After cancer treatment it can be difficult to know whether you are fertile or not. When you are well enough you should be given the opportunity to assess this.

Fertility is most effectively assessed by a semen analysis. Deciding when to undertake this test is a personal decision. Some men wish to know straight away and others would rather wait until they begin actively trying for a child. It is important to consider how the results may affect you and to discuss this with your partner and family. You should be supported in this by your clinical team. It is important to bear in mind that if you are undertaking this test soon after treatment the results may improve with subsequent tests. Your clinical team will be able to inform you of the likelihood of that happening.

Female Fertility

The ovary is very sensitive to chemotherapy. Some drug treatments may have no effect on fertility, others may lead to an early menopause but with a period of normal fertility and others may lead to permanent and rapid ovarian failure.

Some drugs, particularly alkylating agents, are more damaging to the ovary than others. The impact of a given treatment will depend on the total dose of drugs and the age at which the patient is treated. Younger women have more eggs and as a consequence ovarian toxicity may appear less severe than in older women, since their ovaries still support regular menstrual cycles despite a dwindling egg cell reserve.

Chemotherapy drugs (alkylating agents) commonly implicated in affecting ovarian function:

- BCNU
- Busulphan
- CCNU
- Chlorambucil
- Cyclophosphamide
- Ifosfamide

- Melphalan
- Cisplatin
- Cytarabine
- Dacarbazine
- Procarbazine

Radiotherapy produces severe dose-related damage to the ovarian tissue, both the egg producing and hormone producing cells. It may cause immediate permanent sterility, temporary cessation of the periods or lead to an early menopause. The probability of infertility from a given dose of radiotherapy increases with age and simultaneous use of chemotherapy.

Pelvic radiation is most likely to be used to treat lymphomas involving pelvic lymph nodes and in the bone marrow transplant setting as TBI. From a fertility point of view it is also important to consider the effect of radiation on the uterus. High doses of radiotherapy can affect the function of the lining of the uterus (endometrium) and lead to an increase risk of early pregnancy loss.

Fertility preservation pre-treatment is not as simple for women as it is for men. The best validated methods would be storage of embryos but often lack of a partner and time constraints make this impossible. Eggs can also be frozen, and results with this technique are improving all the time. Freezing (cryopreservation) of embryos or eggs require hormonal manipulation and invasive egg retrieval and take between 2-4 weeks. This makes them unfeasible for the majority of patients with a new diagnosis of blood cancer.

Assessing fertility post treatment in a woman is difficult. The onset of regular periods is encouraging. Blood tests to look at certain hormone levels may give an idea of fertility and ovarian reserve. If you have been told you are at risk of an early menopause then it is important to start your family as early as possible. If you do not have a partner and are at risk of a reduced ovarian

reserve, oocyte cryopreservation (egg freezing) may be an option post treatment (at least 6 months later) and you should have an opportunity to discuss this with a fertility expert. The best way to assess your fertility is to combine blood tests (looking several hormone levels) with an internal ultrasound around the third day of your period. Within the last few years a hormone under the name of AMH can give a good indication of fertility, however robust interpretation requires specialised knowledge that only fertility units with experience in cancer patients can provide.

Thyroid

The thyroid gland is a small gland based in the lower neck. It produces the hormone thyroxine which helps regulate the body's metabolism. The thyroid gland is not usually affected by chemotherapy but is very sensitive to the effects of radiotherapy to the neck. This is often given to treat lymphoma involving the lymph nodes in the neck or as part of total body irradiation in preparation for a bone marrow transplant. Occasionally it may happen in some patients who have received cranial/craniospinal irradiation.

Underactive thyroid (hypothyroidism)

The most common effect of radiation is for the thyroid gland to become underactive. This leads to a reduction of thyroid hormone production and a slowing of the body's metabolism.

Common symptoms include:

- fatigue/lethargy
- Hoarseness
- Difficulty concentrating
- Feeling cold
- Low mood
- Constipation
- Weight gain
- Slow pulse rate
- Brittle hair

An underactive thyroid is diagnosed by a blood test. This will show a low thyroxine and a high thyroid stimulation hormone (TSH). If you have received radiotherapy to the neck you should have your thyroid function monitored yearly.

Treatment of underactive thyroid

An underactive thyroid is easily treated with thyroxine tablets. Once you are on replacement thyroxine you will require regular testing to make sure you are on the correct dose.

Thyroid nodules/thyroid cancer

These can occur after radiotherapy to the neck. If you have received radiotherapy to that area you should have your neck examined every year to feel for nodules. If your clinician feels a nodule he will arrange an ultrasound of the thyroid gland to assess it and usually a fine needle aspiration is carried out so that the cells in the nodule can be examined.

Management of thyroid nodules/thyroid cancer

If the cells are benign the nodules will most likely be monitored for any change by yearly ultrasounds. If the cells are concerning for a thyroid cancer, you will most likely be referred to a surgeon in this area to discuss removing part or all of the thyroid gland.

Symptoms and signs of thyroid cancer:

- Usually a painless hard lump in the thyroid gland
- Hoarseness
- Difficulty swallowing
- Enlarged lymph nodes
- Rarely difficulty breathing

Lungs

The lungs are essential organs that supply oxygen to the body. A normal lung is spongy and full of tiny air sacks which are important for passing oxygen from the lungs into the blood.

The lungs can be affected by:

- radiation to the chest in isolation or as part of TBI
- chemotherapy - bleomycin, busulphan, CCNU, BCNU, high dose cyclophosphamide
- Chronic graft versus host disease (GVHD) after a bone marrow transplant
- Severe infection during your treatment.

Your risk of problems will be increased by smoking, pre-existing lung problems eg asthma, younger age of treatment and administration of drugs that increase the effect of radiotherapy eg anthracyclines.

Problems that can occur

- Reduced lung capacity
- Lung tissue which is stiffer than normal (fibrosis)
- Increased risk of infections
- Increased risk of lung cancer

Symptoms to look out for

- Shortness of breath
- Long standing cough
- Tiredness on mild exercise
- Recurrent chest infections.

Management of the risk of developing lung problems

If you have received any of the above treatments it is essential that you don't smoke as this will no doubt increase your risk of developing problems. You should also try to exercise regularly and have a healthy diet. If you have evidence of lung problems you should consider having the yearly flu vaccine and also the pneumococcal vaccine. If you have received Bleomycin it is important you let your anaesthetist know if you are having an operation as it is important to avoid breathing high concentrations of oxygen for long times. It is also important to discuss this with the British Diving Association if you plan to go scuba diving.

Kidneys

Some chemotherapy drugs can damage the kidney function which might remain impaired for several months years or for life after exposure to the offensive agent. When the kidneys are not functioning properly, filtration is reduced and urea builds up in the blood. Also the balance of electrolytes and water cannot be adequately regulated, resulting in a buildup of potassium, sodium and fluid. Kidney damage may also result in increased excretion of protein in the urine. Protein is an important component in our blood that carries food, hormones, and many other things through the body.

Management of kidney damage

In order to prevent further damage, patients should be encouraged to drink plenty of fluids daily and avoid nephrotoxic drugs that potentially can deteriorate the already impaired function.

Liver

The liver breaks down many chemotherapy drugs. Certain chemotherapy drugs can damage cells in the liver (hepatotoxicity). Some drugs are more likely to cause liver damage than others. For some drugs, liver damage is greater when higher doses are used. History of hepatitis can speed up the development of cirrhosis and therefore patients should be followed for life in specialised centres.

Emotional and psychological late effects

What emotional and psychological effects can happen?

Most of the services for people with blood cancers are focused on the earlier stages of diagnosis and treatment, so patients may feel lonely or even abandoned when treatments are over. This later period, often described as 'survivorship' involves many challenges. It can feel hard to get back to 'normal', as so many things will have changed. You may feel that you are not the same person, that your

experience of cancer has changed you and perhaps those closest to you as well. This is a time when uncertainty can be a prominent feature of life, and most people have an ongoing fear of the cancer coming back. Though uncommon, severe psychological reactions like depression can have a very negative effect on quality of life.



Managing late effects

Managing physical late effects

Your treating clinician should have informed you before you started treatment about the acute and long term effects of the treatment you were to receive. The pressure at this point of course is to get on and treat the cancer as delay could have a detrimental effect on outcome. Your risk of late effects depends on your age at treatment, your diagnosis and the treatment you have received. You may not be able to stop late effects from happening but you can work towards reducing the risk and catching them early. It is important to have a frank discussion with your clinical team about your risks for late effects. Ideally you should have this information written down. You should understand what monitoring is necessary and attend your follow up appointments. You should also be mindful of what symptoms to look out for.

Be self-aware; know what is normal for you, so that when you develop a new symptom you can report it in a timely manner. For women this includes examining your breasts and for men examining your testicles. Know your skin and your moles so that you can report any changes.

Follow a healthy lifestyle, have a balanced diet, exercise regularly, avoid risk factors such as smoking and excess sun exposure.

Sensitivity to sunlight is a common side effect of many treatments. Wear a hat and high factor sun cream whenever you are outside to protect your skin

Exercise

If you've experienced different side effects after finishing treatment, regular physical activity can help you manage these. For example:

- Regular activity can help to alleviate fatigue: even a small increase in activity can help to improve your energy levels.
- During exercise the brain produces chemicals called endorphins

which can help to manage stress, anxiety, low mood or depression.

- Exercise can help build muscle strength which can often be affected following treatment. Low intensity weight training may help to build strength.
- If you've gained weight during treatment due to inactivity, exercise can help to maintain a healthy weight. A healthy weight can help to reduce the risk of getting other health problems.
- Exercise promotes better sleep. Being more active during the day helps you to relax and sleep better at night.

Healthy eating

A balanced diet is eating the correct amount of the seven nutrients to give you enough energy for daily activity. The seven nutrients are: Protein; Carbohydrates; Fats; Fibre; Minerals; Vitamins and Water

A daily diet for most people should include varying portions of:

- Fruit and vegetables
- Starchy, carbohydrate-rich foods such as bread, rice, pasta, and potatoes
- Foods high in protein such as meat, poultry, fish, nuts, eggs and pulses like beans and lentils
- Some milk and dairy foods such as cheese, yoghurts and cream
- A small amount of food high in fat, salt and sugar
- Plenty of water

You can find more information about diet and exercise in the 'looking after you', section on our website:
www.leukaemiacare.org.uk/looking-after-you

If you develop a late effect it is likely you will be referred to a clinician with expertise in that area. Most late effects are managed the same way whether they occur post cancer therapy or not. There will be special considerations as it is likely they will be occurring at a younger age e.g. heart failure or coronary artery disease.

Certain treatments are associated with a significant number of late effects and so you may find yourself seeing a number of different clinicians at different hospitals, this can be stressful and have an impact on your education or work. This in turn may have a financial impact. You will need to talk to your employer with regard to your working arrangements.

You may need to negotiate a reduction in working hours or need to make an arrangement with your employer for times when you may need to go to hospital, or for those times when you may not be well enough to work.

Your consultant or GP can arrange letters to to your employer to confirm that you are suffering late effects of cancer treatment and the effect it may have on your work life.

It is important for you to know that people who have had any form of cancer are covered by law by the Equality Act. This means that legally your employer cannot discriminate against you and must make reasonable adjustments relating to the late effects you are suffering.

Managing emotional and psychological late effects

Late effects may have a negative effect on your quality of life. They can affect your body image and your confidence. This may lead to difficulties in forming relationships and a feeling of isolation. It is important that you discuss your feelings with your clinical team, so they can assess your needs for support and intervention and point you in the right direction for advice on social and financial issues.

Not everything about having cancer is bad. Many people find a renewed sense of purpose or value in life. Relationships can become closer and more meaningful. So, look for the positives and learn from your experience of cancer. Manage uncertainty by taking control and making positive choices about the rest of your life. Fears of cancer recurrence can be very troubling, but they usually fade with time. Think about your priorities and make plans for the future you want. This could be making more time for hobbies and interests, or with the people you love. Or it can be

bigger things like a change of occupation, or a new direction in life. Find a 'new' normal, based on your priorities now, and build your life into what you want it to be. Be kind to yourself, make time for yourself and the things you want to do.

What support should I look for?

It is important as you go through life after treatment to have someone to listen and be there for you. This may be your partner, another family member, or a friend. Many people also find support groups helpful, sharing experiences with people who know what they have been through. For others it is better to move on, and seek a new identity after cancer. Most people cope with this informal support, but others will need professional psychological help, especially if they are depressed. Places to seek this include your local health centre or cancer centre, or there are some private or charitable services that offer support. See if your local cancer services have a directory or recommendations of who can help.

Mindfulness has emerged as a way that people can learn to live with long term challenges and periods of uncertainty, by cultivating a balanced and non-judgemental approach to their experience of life. It is often taught in groups but can be learned and practiced alone.

Useful contacts and further support

There are a number of organisations, including ourselves, who provide expert advice and information.

Leukaemia CARE

We are a charity dedicated to supporting anyone affected by the diagnosis of any blood cancer. We provide emotional support through a range of support services including a 24 hour CARE Line, with access to a nurse, patient and carer conferences, support groups, informative website, one-to-one buddy service, high quality patient information and a nurse led online forum.

Care Line: 08088 010 444 (Freephone 24 hours a day)

www.leukaemiacare.org.uk

care@leukaemiacare.org.uk

Macmillan Cancer Support

Macmillan provides practical, emotional and financial support to cancer patients and their carers.

0808 808 0000

www.macmillan.org.uk

Maggie's Centres

Maggie's offers free practical, emotional and social support to people with cancer and their families and friends.

0300 123 1801

www.maggiescentres.org



British Association for Counselling and Psychotherapy (BACP)

The BACP aims to increase public understanding of the benefits of counselling and psychotherapy and raise awareness of therapy to increase its availability.

01455 883300

www.bacp.co.uk

Be Mindful (Mental Health Foundation)

This is an introduction Mindfulness and its benefits, with some learning resources and contacts.

<http://bemindful.co.uk/>

Citizens Advice Bureau

Offers advice on benefits and financial assistance.

08444 111 444

www.adviceguide.org.uk



Symptom tracker

It is a good idea to keep a record of any physical or emotional symptoms that you experience so that you can discuss them with your healthcare team.

In this section we have provided some simple symptom trackers to make it easier for you to keep a record.

Symptom Tracker

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About Leukaemia CARE

Leukaemia CARE is a national charity dedicated to ensuring that people affected by blood cancer have access to the right information, advice and support.

Our services

CARE Line

Our 24-hour CARE Line is available any time of the day or night with access to a nurse specialist at set times.

Support Groups

Our nationwide support groups are a chance to meet and talk to other people who are going through a similar experience.

Patient and carer conferences

Our nationwide conferences provide an opportunity to ask questions and listen to patient speakers and medical professionals who can provide valuable information and support.

Website

You can access up-to-date information on our website, www.leukaemiacare.org.uk, as well as speak to one of our CARE advisers on our online support service, LiveChat (9am-5pm weekdays).

Campaigning and Advocacy

Leukaemia CARE is involved in campaigning for patient well-being, NHS funding and drug and treatment availability.

Journey magazine

Our quarterly magazine includes inspirational patient and carer stories as well as informative articles by medical professionals.

Online Forum

Our nurse led online forum allows patients, carers and health care professionals to talk about blood cancer and receive answers from a qualified haematology nurse.

Leukaemia CARE is a national charity dedicated to providing information, advice and support to anyone affected by a blood cancer.

Around 34,000 new cases of blood cancer are diagnosed in the UK each year. We are here to support you, whether you're a patient, carer or family member.

Want to talk?



CARE Line: 08088 010 444

(free from landlines and all major mobile networks)

Office Line: 01905 755977



www.leukaemiacare.org.uk

care@leukaemiacare.org.uk

Leukaemia CARE, One Birch Court,
Blackpole East, Worcester, WR3 8SG

Registered charity 259483 and SC039207

