National Cancer Control Programme

Good bone health after cancer treatment

What you should know

Contents

About this guide

If you had cancer treatment, this guide is for you. It may help you understand how treatment can affect your bone health and what you can do to improve bone health after your cancer treatment. We hope it will answer questions you may have about your bone health.

Cancer-related bone loss can happen for many reasons. As chemotherapy and other treatments are developed and the number of survivors of cancer grows, the long-term complications from treatment and the cancer itself are becoming ever more important.

Good bone health is particularly important if you have had:

- childhood cancer
- hormone treatment for breast or prostate cancer
- radiotherapy

Not all issues mentioned in this guide will apply to you. The effects of treatment depend on which cancer and treatment you had. You don't need to read this guide from cover to cover, just read the parts that you think may help you best.

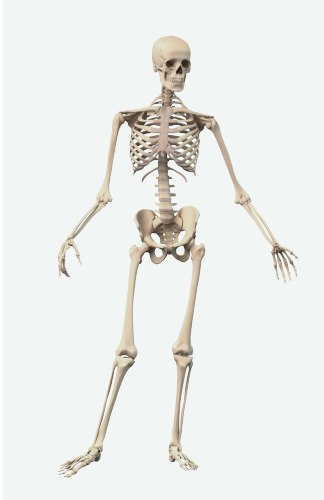
We explain some specialist terms we use in the glossary on page 42.

This guide was developed as part of the National Cancer Control Programme (NCCP) Survivorship Programme.

Bone and what it does

Bone is a living tissue that is constantly being removed and replaced by new bone tissue. Bone is made from protein called collagen and minerals like calcium. Bone mass is a measure of bone density or how strong your bones are.

Bones provide several important functions in the body.



Structure: The skeleton is made up of bones, which provides structure and support for the body.

Protection: Bones provide protection for many vital organs and soft tissues of the body. For example, your ribs protect your heart and lungs.

Mobility: Bones work with skeletal muscle, tendons, ligaments, joints and cartilage to help your body move.

Blood Cell Production: Bone marrow is spongy tissue inside some of your bones where your blood cells are made. Bone marrow stem cells develop into red blood cells, white blood cells, and platelets.

Storage: Bones store important minerals including calcium.

Poor bone health

Bone density decreases naturally as people age and this may lead to osteopenia and osteoporosis.

What is osteopenia?	What is osteoporosis?
• Osteopenia is a bone condition which leads to bone weakening and an increased risk of breaking a bone (fracture). It affects all age groups and both sexes.	• Osteoporosis is a bone condition which affects all age groups and both sexes. It is not just a female or old person's disease.
• Osteopenia is the early stage of osteoporosis.	• Osteoporosis causes low bone strength and a weakening of bone tissue.

What is osteopenia?	What is osteoporosis?
• Osteopenia is a warning that you must start taking care of your bones and that a prevention plan needs to be put in place.	• This causes bones to become fragile and they can break easily (for example, after a minor bump or fall).
• The causes of osteopenia are the same as for osteoporosis.	• Osteoporosis can affect the whole skeleton, but the most common areas to break are the wrist, spine and hip.

There are many causes of poor bone health besides cancer treatment:

Lifestyle	Things you cannot change	Other causes
• being underweight • being overweight • physical inactivity • smoking • recreational drugs • drinking too much alcohol • over exercising • low Vitamin D • low calcium diet	• your sex • your genes • your hormones • growing older	• certain medications • certain surgical procedures • digestive disorders (for example, Crohns disease) • menopause • other illnesses (for example, diabetes, thyroid disease)

Please speak to your healthcare team if you need further information

How childhood cancer treatment may affect your bone health

Maintaining a healthy body weight during childhood and early adult life helps maintain healthy bones.

Childhood is a time where rapid changes occur in your body. The strength of your bones in childhood and adolescence sets the tone for bone health in later life. The stronger your bones are to begin with, the less likely you are to develop bone problems as you get older.

Puberty is a very important time for bone growth and development because it is when most of your bone mass is formed. Therefore, the years around puberty are a once-in-a-lifetime opportunity to build the strongest and healthiest bones possible.

Your teenage years are the peak time for your skeleton growth. It's then you develop more than 25% of your adult bone mass. By around 18 years

you are likely to have finished your growth spurt and may have already developed 90% of your adult bone mass.

Most cancer treatments have side effects that appear during or just after treatment. However, some side effects might not go away or might not show up until months or years after treatment. These problems are called late effects. Because most children with cancer now survive into adulthood, taking care of your bone health is very important.

How childhood surgical treatment may affect your bone health

Surgery involves removing a cancer growth from your body.

Type of surgery	Impact on bone health
Childhood cancer • Amputation or limb-sparing surgeries	• Reduced bone strength • Bone loss • Reduced physical activity • Lower bone strength

How childhood radiotherapy may affect your bone health

Radiotherapy uses high-energy rays that are focussed on the cancer in order to kill and shrink tumours.

Type of radiotherapy	Impact on bone health
Childhood cancer • Cranial radiotherapy in childhood • External beam radiotherapy	• Radiotherapy to the head, face or neck in childhood cancer may cause damage and restrict facial movement. This may require surgical or orthodontic (dental) treatments. • Radiotherapy to the femur can weaken bone and increase the risk of fracture. • Radiotherapy treatment may affect your bone health, depending on what area is being treated. It may damage the growth plate and affect growth.
Please speak to your healthcare team about your treatment if you need further information.	

How childhood anti-cancer drug therapy (chemotherapy) may affect your bone health

Chemotherapy is a cancer treatment that uses one or more anti-cancer drugs. Cancer treatments may affect bone health. Patients undergoing cancer treatment, as well as their families and carers, need to be educated about the short and long term side effects of cancer treatment.

Type of drug therapy	Impact on bone health
Childhood cancer • Anti-cancer drug therapy	• In the paediatric setting, certain chemotherapies are given over a prolonged period (for example, methotrexate). These combined doses may lead to poor bone strength in children.
Please speak to your healthcare team about this treatment if you need further information.	

Type of drug therapy	Impact on bone health
Childhood cancer • Steroid therapy	Prolonged steroid therapy may lead to poor bone strength. These include: • reduced growth hormone • reduced thyroid hormone • reduced sex hormones
Please speak to your healthcare team about this treatment if you need further information.	

How physical activity in childhood can help your bone health

Keeping active is important for bone health in all children. Children who have cancer or who have survived cancer are sometimes less active. This can lead to weaker bones and make them more prone to fractures. There are benefits of physical activity throughout the cancer journey, from diagnosis to survivorship.

Please see the pages 25-30 on exercise. If you are unsure whether these exercises are suitable for your child, speak to your healthcare team before you start them.

How nutrition in childhood can help your bone health

Healthy eating is important for all children. Children who have cancer, or who have survived cancer, may need extra nourishment, including food to help improve bone strength.

Please see the pages 33-36 on healthy eating and speak to your healthcare team if you need further information.

How adult cancer treatment may affect your bone health

The more you know about what you can do to keep your bones strong, the more likely you are to prevent osteoporosis. Osteoporosis is a silent disease that causes bones to become thin and weak, often resulting in fractures (broken bones).

How adult surgical treatment may affect your bone health

Surgery involves removing cancer from your body.

Type of surgery	Impact on bone health
Gynaecological cancer surgery • Bilateral Salpingoooophorectomy (removing both fallopian tubes and both ovaries)	• A low level of oestrogen is a major cause of accelerated bone loss after surgery. • Surgery to remove a woman's ovaries to treat cancer results in the menopause. In younger cancer patients, this often happens long before they would ordinarily experience the menopause.

Type of surgery	Impact on bone health
• Total hysterectomy (removing the womb and cervix)	• During the menopause the ovaries no longer produce oestrogen, a hormone which helps maintain strong bones. • Women experiencing an early menopause are at higher risk of losing bone.
Testicular cancer • Bilateral orchidectomy (removal of both testicles)	• A deficiency in testosterone is a major cause of bone loss. This risk is increased following bilateral orchidectomy due to a reduction in testosterone.

How adult radiotherapy may affect your bone health

Radiotherapy uses high-energy rays that are focussed on the tumour cells to kill or shrink the tumour.

Type of radiotherapy	Impact on bone health
• Internal beam radiotherapy (brachytherapy) • External beam radiotherapy • Cranial radiotherapy	Radiotherapy treatment may affect your bone health depending on what area of your body is being treated. • High doses of radiotherapy to the jaw may cause damage and restrict movement. • High doses of radiotherapy to the femur (leg bone) can weaken the bone and increase the risk of a break (fracture).
Please speak to your healthcare team about your treatment if you need more information.	

How adult hormone treatment may affect your bone health

Hormone therapy is a cancer treatment that slows or stops the growth of cancer.

Type of hormone therapy	Impact on bone health
Prostate cancer Examples of hormone therapies include: • Degarelix • Triptorelin • Leuprorelin Acetate • Goserelin	• Testosterone is the main male hormone, and may fuel prostate cancer cell growth. • Hormone therapy is used to treat men with prostate cancer by reducing testosterone. This is associated with significant bone loss and increased fracture risk. • Hormone therapy or removal of both testicles reduces testosterone levels.

Please speak to your healthcare team about these treatments. They will also help you if you need further information.

Type of hormone therapy	Impact on bone health
Breast cancer Examples of hormone therapies include: • Tamoxifen • Fulvestrant • Anastozole (Arimidex) • Letorozole (Femara)	• Oestrogen is the female hormone and it can help to protect your bones. • Hormone therapy (anti-oestrogen therapy) blocks oestrogen production in the body. It may lead to some bone density loss.
If you have any history of bone problems, please speak to your healthcare team about these treatments and if you need more information.	

How adult anti-cancer drug therapy (chemotherapy) may affect your bone health

Chemotherapy is cancer treatment that uses one or more anti-cancer drugs.

Type of chemotherapy	Impact on bone health
Men and women	• Some chemotherapy may cause an increase in bone breakdown and reduces the formation of new bone. • Chemotherapy may reduce your appetite and cause weight loss. • Sometimes high dose steroids or long-term steroids are combined with chemotherapy drugs to treat cancer. This can lead to poor bone strength.
Please speak to your healthcare team about these treatments as they may reduce the amount of new bone formed, increasing the risk of osteopenia and osteoporosis.	

Type of chemotherapy	Impact on bone health
Women	• Chemotherapy may cause an early menopause in some women. This reduces oestrogen, a hormone which is necessary for strong healthy bones. • Early menopause or a long break between periods may result in bone loss and increase the risk of osteopenia and osteoporosis.
Please speak to your healthcare team about this treatment if you need more information.	

Screening for bone health

What is a DEXA scan? (dual-energy X-ray absorptiometry)

A DEXA scan is a bone mineral density test that measures bone density in various parts of your body.

Please speak to your healthcare team about this scan if you need more information.

What is a FRAX tool? (fracture risk assessment tool)

The FRAX tool helps to identify whether you are at risk of developing osteoporosis. Personal details such as your height, weight, medication history, smoking and family history are used to predict whether you are likely to develop osteoporosis in the next 10 years.

Ask your healthcare team for your FRAX score.

What to do to protect your bone health

The number of people with osteoporosis in Ireland is expected to increase significantly. This is because fewer people are physically active nowadays and more of them are living longer.

It is likely that the fall-off in physical activity will lead to a continuing rise in the number of people with osteoporosis. The good news is that the risk of developing osteoporosis can be reduced by changing your diet and lifestyle and through early diagnosis and treatment.

The amount of bone mass that you accumulate in your childhood and adolescence predicts your bone health in later life. The greater your bone strength is to begin with, the less likely you are to develop osteoporosis as you get older.

Muscle strengthening exercises have a positive effect on bone in people of all ages.

Speak to your healthcare team about exercising and always remember to start exercise sessions slowly with a warm up session and finish slowly to cool down.

Exercise

- Exercise can help to improve your bone quality and may provide many other health benefits, such as reducing your risk of falls and improving overall health.
- The best activities for your bones are weight-bearing exercises, such as walking, climbing stairs or dancing, and muscle-strengthening exercises.
- Remember: you can go for a walk anywhere.

- Marching on the spot for a few minutes at home is a good exercise goal on days when you feel tired or unwell. March while walking to create impact through your bones.
- Break up sitting time with movement. For example, when watching TV, use the ad breaks as a prompt to get up and walk about.
- Change your exercise pattern often by adjusting your walking speed and walking route. Doing this will help strengthen your bones.
- If you are at risk of, or have symptoms of lymphoedema (fluid retention), consult your healthcare team before you start exercising.

Get advice from your healthcare team if any exercise causes you pain or discomfort.

How much exercise can I do?

- Start slowly and build up exercises gradually.
- Achieve your exercise goals by exercising throughout the day in short sessions lasting at least 10 minutes. This can be particularly useful if you are tired.
- Short bouts of good quality exercise can help alleviate tiredness and energise you throughout the day.

You can use household items such as tins of food or bottles of water to make the exercises harder.

Below are some examples of muscle-strengthening exercises that you can do at home standing or sitting.

Exercise 1: Biceps curl

Position 1

This exercise strengthens the muscles in the front of your arm between the shoulder and the elbow.

Start the exercise in Position 1 with arms straight by your sides.

Position 2

Move your arm by bending your elbow into Position 2.

Keep your back straight and try not to lean back during the exercise.

Breathe out as you lift the weights up and breathe in as you control the weight back to the starting position.

Exercise 2: Shoulder press

Position 1

This exercise strengthens the muscles around your shoulder.

Start the exercise in Position 1 with arms below shoulder level.

Position 2

Raise your arms straight above your head from your shoulders to move into Position 2.

Breathe out as you lift the weight up and breathe in as you lower the weight back to the starting position.

Exercise 3: Calf raise

Position 1

This exercise strengthens the muscles around at the back of your leg between your knee and your ankle.

Stand with your hands on the back of a chair.

Start the exercise in Position 1 with feet flat on the ground

Position 2

Lift your heels off the ground to move into Position 2.

Breathe out as you lift your heels up and breathe in as you return your heels back to the starting position.

Exercise 4: Squat

Position 1

This exercise strengthens several muscles in your legs.

Start the exercise in Position 1 standing up straight with your feet shoulder width apart. To help with completing this exercise stand close to a stable surface at home, such as the kitchen counter, so that you can hold onto it with your hands for support.

Position 2

While keeping your body upright, bend your knees and lower your bottom as if you were going to sit on a low chair (Position 2), then return to a standing position.

Practical things you need to consider for safe exercise

- Start any new exercise programme slowly and progress gradually. If you feel any pain, discomfort, shortness of breath or chest pain while exercising, you should stop and speak to one of your healthcare team.
- Start exercise with a warm-up session and finish slowly to cool down.
- Make your exercises enjoyable.
- Be aware of the danger of falling if you exercise outdoors during wet weather.
- Watch out for uneven surfaces and slippy wet leaves.
- Protect the bones in your back by avoiding movements involving excessive twisting or bending.
- Stay hydrated while exercising. Remember to drink water regularly.
- Exercise with a friend or engage in a group activity that you enjoy.

Follow these practical tips and look around you to prevent a fall.

Practical tips for reducing falls

Make your home safe

- Make sure there is good lighting where you walk, especially at night.
- Ensure your bed linen is tucked in well.
- Arrange furniture so that you can easily move around and keep areas where you walk tidy and free from clutter.
- Wipe up spills immediately.
- Keep all electric flexes tidy and secure.
- Check that all carpets are fixed firmly to the floor and remove small throw rugs.
- Install grab rails and hand rails in the bathroom and on the stairs and use a non-slip mat in the shower.

Practical tips for reducing falls

Manage yourself

- Move slowly and carefully after sitting or lying.
- Take your time and avoid rushing.
- Wear well-fitting shoes or slippers.
- Have your eyesight checked and wear your glasses if you are up at night.
- Avoid wearing loose clothing that can catch on furniture and cause a slip or fall.

Healthy eating

Speak to your healthcare team before you take any supplements.

Nutrition

Good nutrition is important for your continued recovery and overall health. Make sure to eat a balanced diet with an adequate intake of calcium and vitamin D. Try to maintain a healthy body weight and keep your muscles strong. All of this is important for bone health and to help reduce your risk of osteopenia and osteoporosis.

Calcium

The recommended daily intake for calcium is 800 mg a day for children, adults and older people, increasing to 1,200 mg for teenagers.

- The richest sources of calcium in your diet are milk, cheese and yoghurt. Three servings of dairy each day can help you achieve a calcium intake of 800 mg.
- Non-dairy sources of calcium include green leafy vegetables, sardines and hummus. However, the calcium in these foods is not as easily absorbed into the body.
- Foods with added calcium (fortified foods) are a useful way to increase your calcium intake, such as calcium fortified milk, yoghurts and breads.
- You may need more calcium because of your treatment if this includes using certain medications, or if you have already been diagnosed as having osteoporosis.

Please speak to your healthcare team about this treatment if you need more information.

Vitamin D

Vitamin D helps your body to absorb calcium from our food. Most of our vitamin D comes from sunlight. However, in Ireland we cannot get enough vitamin D from the sun

- You can get some vitamin D through your diet, from oily fish, eggs and fortified cereals and dairy products but this won't give you all you need.
- Individuals who are older, have darker skin, or are obese are at increased risk of low vitamin D levels.
- The exact vitamin D that different population groups need has to be taken into account before you can get the right advice on supplements.

Please speak to your healthcare professional about the right supplement for you.

Protein

Following cancer treatment, your muscles may shrink and become weaker. This is known as sarcopenia

- It is important to keep your muscles strong to reduce your risk of a fall. Protein is the building block of muscles and it is important to make sure you are consuming enough protein every day.
- Good sources of protein include dairy foods, lean meat, fish, poultry, eggs, beans, lentils, and nuts. As well as 3 servings of dairy each day for calcium, aim to include 2 servings of protein each day.

Alcohol

Alcohol use can dramatically affect your bone health and increase your risk of developing osteoporosis. Alcohol also increases your risk for other cancers.

Smoking

Smoking increases your risk of osteoporosis. It also increases the risk of suffering a fracture and reduces your body's ability to heal.

Useful websites

www.askaboutalcohol.ie/parents/

www.indi.ie

www.quit.ie

www.healthyireland.ie/health-initiatives/heg/

As a cancer survivor, there is no need for you to follow a 'special diet'.

Maintain a healthy weight

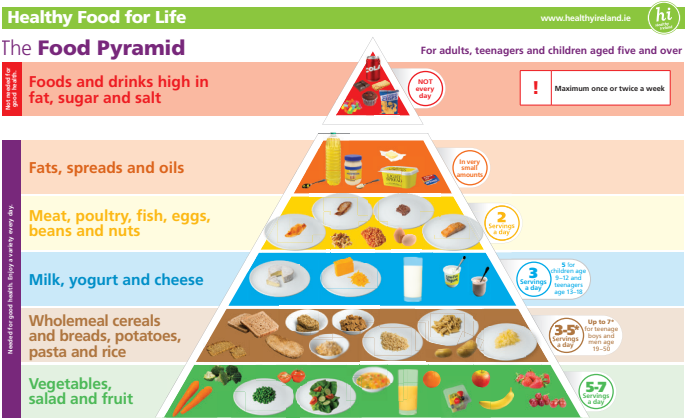
A healthy body weight is important for bone health. A healthy Body Mass Index (BMI) is between 18.5 and 25. This is calculated by measuring your body weight and your height. A BMI less than 18.5 is considered underweight and a BMI of greater than 25 is considered overweight. A BMI greater than 30 is considered obese.

You may find it difficult to maintain a healthy weight after cancer treatment. If you are struggling to do this, ask your healthcare team to measure your BMI and advise you on healthy ways to gain or lose weight.

Choose the right foods each day

The food pyramid (below) is a useful tool to guide healthy eating. It shows the type and quantity of foods that you need to include in a healthy diet. If you have concerns, talk to your healthcare team.

The guide below is for age 5 and over.



Adapted from healthyireland.ie

Healthy living tips after cancer treatment

Quit smoking

Ireland now has more quitters than smokers. Go to **www.quit.ie** or call **1800 201 203** for support.

Alcohol; Less is best

Alcohol causes 7 types of cancers. Go to **www.askaboutalcohol.ie** to learn more.

Stay a healthy weight

Being overweight is linked to 11 cancers. **Keep a check on your weight.**

Activity; More is best

Physical activity protects against cancer. **Be active for at least 30 minutes every day, and sit less.**

Be smart in the sun to protect against skin cancer

Slap on a hat, slip on sunglasses, seek shade, slop on suncream of at least factor 30.

Food is to be enjoyed, have a healthy diet

- Eat plenty of **vegetables and fruits**
- Check food labels and **keep salt below 6g per day**
- **Limit high-calorie foods** (foods high in sugar or fat), and avoid sugary drinks
- **Avoid processed meat,** limit red meat.

Questions to ask your healthcare team

It is a good idea to write down any questions you may have, so that you may remember to ask your healthcare professional when you see them.

Glossary

Healthcare team	Doctors, nurses, physiotherapists, dieticians and other healthcare professionals from different specialities working together.
Hormone	A chemical substance produced in the body that controls and regulates the activity of certain cells or organs.
Menopause	The time in a woman's life when menstrual periods permanently stop.
Oestrogen	A group of steroid hormones which promote the development and maintenance of female characteristics of the body. It is important for bone growth and strength because it works with the cells responsible for forming bone.

Radiotherapy	The use of high-energy rays to damage cancer cells, stopping them from growing and dividing. Like surgery, radiation therapy is a local treatment that affects cancer cells only in the treated area.
Sarcopenia	The loss of skeletal muscle mass and strength.
Stem cells	A stem cell is a type of cell that can produce other cells which are able to develop into any kind of cell in the body.
Steroid or glucocorticoid	A glucocorticoid is a steroid hormone, such as cortisone, that is produced by the adrenal glands in the kidney and which control carbohydrate, fat and protein metabolism and has an anti-inflammatory effect.

Testosterone	A group of steroid hormones sometimes called androgens, which promote the development and maintenance of secondary sex characteristics at puberty. Testosterone is important for bone growth and strength because it works with the cells responsible for forming bone.

Plain English
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