Chemotherapy for acute lymphoblastic leukaemia

Chemotherapy uses anti-cancer (cytotoxic) drugs to destroy the leukaemia cells. These work by disrupting the production of the leukaemia cells.

On this page:
- How the chemotherapy is given
- Side effects of chemotherapy
- Contraception during chemotherapy

Chemotherapy drugs circulate all over the body in the bloodstream. However, the chemotherapy drugs can't get into the fluid around the brain and spinal cord (cerebrospinal fluid – CSF). This means they need to be injected directly into the fluid through a lumbar puncture. This is done even if leukaemia cells can't be detected in the CSF, as research has shown that there will almost always be some leukaemia cells in the CSF which need to be destroyed.

For people who have just been diagnosed with ALL, it's important to start treatment quickly. Chemotherapy treatment is divided into three different phases:

1. **Induction**

This is the initial intensive phase of treatment, aimed at destroying as many leukaemia cells as possible. It usually achieves a remission of the disease. Common chemotherapy drugs which may be used in this phase include:

- daunorubicin
- doxorubicin
- idarubicin
- mitoxantrone
- methotrexate
- crisantaspase (asparaginase)
- mercaptopurine
- cyclophosphamide
- vincristine.

**Steroids** are often given as part of the chemotherapy treatment. You may also have a drug called allopurinol. This helps to protect the kidneys against damage caused by the increase in uric acid, a waste chemical produced when the leukaemia cells are destroyed. Another drug that helps to prevent damage caused by too much uric acid is rasburicase (Fasturtec®).

Patients who have the Philadelphia chromosome may be given a drug called imatinib (Glivec®).

The induction phase of treatment normally lasts 3-8 weeks. As this is a very intense phase, you'll need to stay in hospital for about four weeks. This is because you're likely to need antibiotics and drips (infusions) of red blood cells and platelets.

2. **Intensification (consolidation)**

After the induction phase, more chemotherapy can be given to increase the chance of destroying any remaining leukaemia cells that can't be seen in the blood or bone marrow. You're likely to receive the same drugs used during the induction phase, plus some of the following:

- cytarabine
- etoposide
- tioguanine (thioguanine)

The consolidation phase of the treatment usually lasts for several months.
3. Continuing therapy (maintenance)

This treatment phase reduces the risk of the leukaemia coming back at a later stage after treatment has finished. It’s a less intensive course of chemotherapy. Common drugs used are **mercaptopurine** and **methotrexate**, which are given as tablets, and **vincristine**, which is given by injection. Steroids are usually continued in short courses. The chemotherapy tablets and steroids can be taken at home. You’ll need to go to hospital to have the vincristine.

This phase may last for a couple of years and is usually given as an outpatient. You don’t usually need to be admitted to hospital unless you develop problems such as an infection.

Throughout these three phases of your treatment you’ll have regular blood tests and lumbar punctures to check for leukaemia cells. Your doctor will look at the results of these and make changes to your treatment if needed.

Instead of standard-dose maintenance chemotherapy, some people will have **high-dose treatment with a stem cell transplant**. This may be given to increase the chances of a cure. It may also reduce the possibility of a relapse if someone has risk factors which make it more likely that the ALL will come back.

High-dose treatment involves being given high doses of a chemotherapy drug such as **etoposide** or **busulfan**, and may also include **radiotherapy** to the whole body (known as total body irradiation or TBI).

If you have standard-dose continuing chemotherapy, your complete chemotherapy course is likely to last for at least two years. If you have high-dose chemotherapy after the induction and intensification phases, the treatment time may be shorter and may finish in less than a year.

**How the chemotherapy is given**

The main induction and intensification treatments consist of a combination of three or four drugs given by injection into a vein (intravenously), and some drugs which are given as tablets.

**Central lines**

To make having chemotherapy easier and to prevent you from having frequent injections, a narrow, flexible plastic tube (called a **central line**) can be put into a vein in your chest. It’s put in under a general or local anaesthetic. Usually a small cut (incision) is made in the skin over your chest, and the tube is placed under your skin and into a large vein in your neck. The other end of the tube stays outside your body and has a screw cap at the end. The tube can be used to give drugs, fluids, stem cells or bone marrow, and also to collect blood samples.
PICC lines and implantable ports

Instead of a central line, a **PICC line** (peripherally inserted central venous catheter) or an **implantable port** may be used.

A PICC line is a long, thin tube put into a vein in the crook of the arm. An implantable port is a thin, soft plastic tube that’s put into a vein in the chest and has an opening (port) just under the skin of the chest or arm.

Position of a PICC line

View a [large version of an image of the PICC line](https://www.pdfcrowd.com)

Your doctor or chemotherapy nurse will explain the procedure to you. You will be given a local anaesthetic before the line is put in.

**Intrathecal chemotherapy**

As well as by injection into a vein, chemotherapy for ALL is often given directly into the fluid around the brain and spinal cord (cerebrospinal fluid). Giving chemotherapy in this way is known as **intrathecal chemotherapy**. This is done using a similar procedure to the lumbar puncture.

After giving you a local anaesthetic, the doctor gently puts a needle into the fluid in the spine. A small amount of fluid is drawn off and the drugs are injected. The drugs will help to destroy any leukaemia cells in the fluid.

**Supportive care**

During your treatment you will also need treatment for the symptoms that have been caused by a lack of normal blood cells. The reduction in numbers of blood cells may be due to both the leukaemia itself and the chemotherapy.

This treatment includes **drips (transfusion) of red blood cells and platelets** to replace the normal blood cells. You may also need antibiotics to prevent and treat any infections. These can be given through your central line.

**Side effects of chemotherapy**

**Risk of bruising and bleeding**

Platelets help the blood to clot. In leukaemia, the number of platelets in your blood is lower than normal, and chemotherapy may temporarily reduce the number even more.
This means that you may develop blood spots or rashes on the skin (petichiae), bruise very easily, have nosebleeds or bleed more heavily than usual from even minor cuts and grazes.

You may need to have a drip (transfusion) of platelets before your chemotherapy begins, and at times during your treatment, to increase the number of platelets.

If you develop any unexplained bruising or bleeding, such as nosebleeds, blood spots, rashes on the skin or bleeding gums, contact the hospital immediately.

**Risk of infection**

While the chemotherapy drugs are acting on the leukaemia cells in your body, they also reduce the number of normal cells in your blood for a while. When the white cells are low (known as neutropenia), you are more likely to get an infection.

During chemotherapy your blood will be tested regularly to check the number of white blood cells. You’ll probably be given tablets or other medicines to reduce the risk of developing an infection.

If you get an infection, you’ll be given medicines to treat it. Most infections are caused by bacteria already in your own body. These don’t normally cause infection, but when your immunity is low they are more likely to cause a problem.

While you’re having chemotherapy it’s best to avoid coming into contact with someone who may have an infection. This includes keeping away from large groups of people, where there’s more chance of someone having an infection. You may also be advised to be careful about what you eat, to guard against the risk of infection from raw, undercooked or contaminated food. The hospital will tell you how to prepare foods and which foods to avoid.

If your temperature goes above 38°C (100.4°F) or you suddenly feel ill, even with a normal temperature, contact your haematology team at the hospital straight away.

You may be given injections of a drug called G-CSF (granulocyte-colony stimulating factor). This is a type of protein that stimulates the bone marrow to produce more white blood cells. G-CSF may help reduce the length of time that your white blood cell count is low. The injections are given under the skin (subcutaneously).

**Anaemia**

If the level of red blood cells (which contain haemoglobin) in your blood is low you may become very tired and lethargic. You may also become breathless. These are all symptoms of anaemia - a lack of haemoglobin in the blood.

Anaemia can be treated very successfully by blood transfusions. You should quickly feel more energetic after a transfusion and the breathlessness will be eased.

**Tiredness (fatigue)**

This is a common effect of chemotherapy. The fatigue may be due to anaemia, but may also occur as a result of chemotherapy, even if your blood count is normal. You may be especially aware of this when you’re at home between courses of chemotherapy and for a few months after the treatment.

**Feeling sick**

Some of the drugs used to treat ALL may make you feel sick (nauseated) and may sometimes cause you to be sick (vomit). There are very effective anti-sickness drugs (anti-emetics) to prevent or greatly reduce nausea and vomiting, which your doctor can prescribe for you. If you still feel sick despite the anti-emetics, let your doctor or nurse know so they can change them for other drugs that may be more effective.

**Sore mouth**

Some chemotherapy drugs can make your mouth sore and cause mouth ulcers. Regular mouthwashes are important and your nurse will show you how to use these properly.

If you don’t feel like eating during treatment, you could try replacing some meals with nutritious drinks or a soft diet.
We have more information on eating well during and after cancer treatment including useful tips on coping with eating problems.

## Effects on the heart

Some of the drugs used to treat ALL may affect the heart muscle. The doses of the chemotherapy drugs are very carefully monitored, and heart tests (such as cardiac echograms) may be done from time to time.

### Hair loss

Hair loss is another common side effect of these drugs. If your hair falls out, you can cover your head by wearing wigs, hats or scarves. Most patients are entitled to a free wig from the NHS. Your doctor or one of the nurses on the ward can usually arrange a wig for you.

If your hair falls out, it will grow back over a period of 3-6 months when the treatment ends.

Although they may be hard to deal with at the time, all of these side effects will begin to disappear once your treatment is over.

Chemotherapy affects different people in different ways. Many people find that there are times during their treatment when they feel very unwell and tired and have to take things much more slowly. Do as much as you feel like and rest whenever you need to.

## Contraception during chemotherapy

It’s not advisable to become pregnant or father a child while taking any of the chemotherapy drugs used to treat ALL, as they may harm the developing baby. It’s important to use effective contraception during your treatment and for a few months afterwards. You can discuss this with your doctor or nurse.

Condoms should be used during sex for the first 48 hours after chemotherapy in order to protect your partner from any of the drug that may be present in semen or vaginal fluid.

Content last reviewed: 1 July 2011

Next planned review: 2014