
Adult Acute Myeloid Leukaemia (AML)

A Guide for
Patients

Leukaemia Care
YOUR Blood Cancer Charity

Introduction

Being diagnosed with acute myeloid leukaemia (AML) can be a shock, particularly when you may never have heard of it. If you have questions about AML – what causes it, who it affects, how it affects your body, what symptoms to expect and likely treatments – this booklet covers the basics for you.

This booklet focuses on adult AML. If you are looking for information about children with AML, please refer to our other booklet Childhood AML.

For more information, talk to your haematologist, clinical nurse specialist or hospital pharmacist. You'll also find useful advice about how to get the best from your haematologist, plus practical advice on how to help important people in your life understand such a rare condition.

This booklet was originally compiled by Ken Campbell and peer reviewed by Dr Richard Kelly, Consultant Haematologist at Leeds Teaching Hospital. We are also grateful to Sally Sizeland, AML patient reviewer, for her valuable contribution. The rewrite was put together by Lisa Lovelidge, reviewed by Manos Nikolousis and patient reviewed by Julie Quigley. This booklet has then been updated by our Patient Information Writer Isabelle Leach.

If you would like any information on the sources used for this booklet, please email communications@leukaemicare.org.uk for a list of references.

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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

Helpline

Our helpline is available 8:30am – 5:00pm Monday - Friday and 7:00pm – 10:00pm on Thursdays and Fridays. If you need someone to talk to, call **08088 010 444**.

Alternatively, you can send a message via WhatsApp on **07500068065** on weekdays 9:00am – 5:00pm.

Nurse service

We have two trained nurses on hand to answer your questions and offer advice and support, whether it be through emailing **nurse@leukaemicare.org.uk** or over the phone on **08088 010 444**.

Patient Information Booklets

We have a number of patient information booklets like this available to anyone who

has been affected by a blood cancer. A full list of titles – both disease specific and general information titles – can be found on our website at **www.leukaemicare.org.uk/support-and-information/help-and-resources/information-booklets/**

Support Groups

Our nationwide support groups are a chance to meet and talk to other people who are going through a similar experience. For more information about a support group local to your area, go to **www.leukaemicare.org.uk/support-and-information/support-for-you/find-a-support-group/**

Buddy Support

We offer one-to-one phone support with volunteers who have had blood cancer themselves or been affected by it in some

way. You can speak to someone who knows what you are going through. For more information on how to get a buddy call **08088 010 444** or email **support@leukaemiacare.org.uk**

Online Forum

Our online forum, **www.healthunlocked.com/leukaemia-care**, is a place for people to ask questions anonymously or to join in the discussion with other people in a similar situation.

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**.

Campaigning and Advocacy

Leukaemia Care is involved in campaigning for patient well-being, NHS funding and drug and treatment availability. If you would like an update on any of the work we are currently doing or want to know how to get involved, email **advocacy@leukaemiacare.org.uk**

Patient magazine

Our magazine includes inspirational patient and carer stories as well as informative articles by medical professionals: **www.leukaemiacare.org.uk/communication-preferences/**

What is acute myeloid leukaemia?

Acute myeloid leukaemia (AML) is a blood cancer of the bone marrow's myeloid cells. Acute leukaemias are so called because they develop rapidly and are aggressive types of leukaemia. This is in contrast to chronic leukaemias which develop, and usually progress, slowly.

Acute leukaemia is classified as AML or acute lymphoblastic leukaemia (ALL) depending on if the origin of the leukaemia cells are myeloid or lymphoid, respectively:

- Myeloid cells are one of the most basic cells in the bone marrow.
- Lymphoid cells give rise to lymphocyte cells which are the white blood cells that help fight infections as part of the immune system.

Development of blood cells

Blood cells are produced in the bone marrow. A blood stem cell from the bone marrow may become a myeloid cell or a lymphoid cell.

A myeloid cell develops into one of three types of mature blood cells:

1. Red blood cells that carry oxygen and other substances to all tissues of the body.
2. Platelets that form blood clots to stop bleeding.
3. White blood cells that fight infection and disease.

A lymphoid cell becomes one of three types of lymphocyte white blood cells:

1. B-lymphocytes (B-cells) that make antibodies to help fight infection.
2. T-lymphocytes (T-cells) that help the B-cells make the antibodies to fight infection.
3. Natural killer cells (NK-cells) that attack cancer cells and viruses.

People with AML produce too many immature myeloid cells in the bone marrow. In most types of AML, the immature myeloid cells become white blood cells. However, in less common types of AML such as acute erythroid leukaemia and acute megakaryoblastic leukaemia,

they can become red blood cells or platelets, respectively. Over time, these immature myeloid cells accumulate and begin to fill up the bone marrow, preventing it from producing healthy blood cells.

Classification of AML

AML is divided into four groups according to the 2016 World Health Organisation (WHO) Classification of Tumours of Haematopoietic and Lymphoid Tissues:

- AML with genetic abnormalities: 40% - 50%
- AML with myelodysplasia-related changes: 24% - 35%
- AML due to prior treatment with chemotherapy/radiation: 10%
- AML, not otherwise specified (cases of AML that do not fit into the above three groups)

The WHO classification is based on the appearance of the AML cells under the microscope, as well as information of the specific genetic changes in the AML cells.

Who is affected by AML?

AML is the most common type of acute leukaemia representing 80% of acute leukaemias in adults and 15% to 20% in children. The median age of patients with AML at diagnosis is 68 years.

The incidence of AML is 1 out of 100,000 persons when you are in your 20s increasing to 25 out of 100,000 persons when you are in your 80s.

AML is slightly more common in males.

What causes AML?

The exact cause of AML is unknown. The origin of the AML cells is thought to be the myeloid stem cells in the bone marrow. A stem cell is the most basic cell in the body that has the ability to develop into any of the body's specialised cell types, from muscle cells to brain cells. However, what makes these stem cells reproduce uncontrollably in the case of AML is thought to be linked to genetic abnormalities.

Chromosomal abnormalities are identified in just over 50%

What is acute myeloid leukaemia? (cont.)

of all adult patients with AML and are accepted as the genetic events that cause AML. These include abnormalities in several chromosomes.

Some 40% to 50% of all cases of AML have normal chromosomes; however, they have mutated genes. The most common gene abnormalities in patients with AML are mutations in the:

- FMS-Like Tyrosine Kinase 3 (FLT3) gene
- DNA methyl-transferase 3A (DNMT3A) gene
- Nucleophosmin 1 (NPM1) gene
- Tumour suppressor 53 (TP53) gene
- Runt-related transcription factor (RUNX1) gene

Not only are these mutations complex, but they can be present in patients at the same time and influence each other to give different prognoses.

Some 10% to 15% of patients develop AML secondary to treatment with chemotherapy, often given for a previous solid cancer such as lung or breast

cancer.

AML can also develop in people who already have a bone marrow disease. The bone marrow diseases most often associated with AML are myelodysplastic syndrome (MDS) and myeloproliferative cancers such as polycythaemia vera (PV), essential thrombocythaemia (ET) and myelofibrosis (MF). MDS is a collective name for a group of cancers where bone marrow cells of varying types reproduce excessively and have dysplastic (abnormal growth) changes.

AML is also known to develop in people exposed to benzene, which is a component of crude oil and gasoline, household glues, cleaning products, tobacco smoke, paint stripping products and pesticides.

What are the signs and symptoms of AML?

Early signs and symptoms of AML are a result of the leukaemia cells in the bone marrow which cause anaemia (low levels of red blood cells), thrombocytopenia (low levels of platelets), and an increased number of infections due to decreases in white cell counts.

Symptoms also include:

- Pale appearance
- Weakness or feeling tired
- Shortness of breath
- Easy bruising or bleeding
- Petechiae which are flat, pinpoint spots under the skin caused by bleeding
- Loss of weight or appetite
- Fever
- Frequent minor infections

Involvement of AML outside the bone marrow has been described in less than 10% of adult patients and occurs in sites such as the spleen, lymph nodes, and the brain.

How is AML diagnosed?

For the majority of patients, a diagnosis of AML can be made on the basis of examining a blood and bone marrow sample. Chromosome analysis and immunophenotyping analysis are only specific for AML with genetic abnormalities, but they do enable the diagnosis of other types of AML to be confirmed in difficult cases.

Chromosome and immunophenotyping analyses can also help to classify patients with AML as having a low, intermediate or high risk of relapse which will impact on their choice of treatments.

Diagnostic tests

The following tests are used to reach a diagnosis of AML:

Bone and marrow sample analysis

Using the patient's blood sample, a full count of the number of red cells, white cells and platelets is carried out, including a breakdown of the different white cell types to determine which white cells are involved.

An examination of a bone marrow sample is the most important test for diagnosing AML. A sample of bone marrow is taken from the hip bone, generally under local anaesthesia, and examined to determine the number and type of cells present and if they are developing normally.

In AML, the white blood cell count is higher than normal. Immature leukaemia cells, which are slightly larger than normal white blood cells, are seen in the blood as well as the bone marrow. A diagnosis of AML normally requires seeing at least 20% of immature leukaemia cells in the blood and bone marrow. The white blood cell involved will be specific for the type of AML.

In the case of AML with genetic abnormalities, AML can be diagnosed if the patient has certain chromosome abnormalities even if their leukaemia cell count is less than 20%.

Blood tests and bone marrow samples will be repeated throughout treatment to monitor

response to treatment.

Immunophenotyping

Immunophenotyping is a method used to count the number of leukaemia cells present in the patient's blood and bone marrow. In the laboratory, specific antibodies to the antigens on the leukaemia cells are developed and tagged with fluorescent markers. When mixed with the patient's blood sample, the antibodies attach themselves to the antigens on the leukaemia cells.

Immunophenotyping is routinely performed by flow cytometry which processes blood and bone marrow fluid and counts the number of cells with the tagged antibodies attached to the leukaemia cells. The flow cytometer rapidly measures the number and size of the thousands of blood cells. This enables a rapid count of the number of leukaemia cells as a proportion to normal cells.

Chromosome analysis

The study of abnormalities in the chromosomes and genes of patients with AML is important

not only to establish or assist the diagnosis, but also for the classification of AML and the risk of the AML to patients.

Molecular markers

AML is one of the first malignancies where the molecular mutations leading to the development of AML has been extensively studied. Next generation sequence analysis has become part of the standard diagnostic process which can lead to the use of targeted treatments against these mutations but also provides specific information on risk grouping and prognosis.

Risk grouping

An important part of classifying the types of AML is to allow the different kinds of AML to be grouped into three risk groups: high, intermediate and low risk of the patient relapsing.

For example, patients with low-risk AML have a good chance of being cured and a low risk of relapse, whereas patients with high-risk AML have a high risk of relapse and need to undergo intensive treatments.

How is AML diagnosed? (cont.)

Risk classification is based mainly on the chromosome/gene analysis.

A patient's risk group can change during treatment but your medical team will be able to provide updates relating to your condition.

Other tests

Other tests for patients with AML include:

- **Lumbar puncture** – A needle is inserted into the spinal canal to access the area around the spinal cord and draw off a small amount of cerebral spinal fluid (fluid that surrounds the brain and spinal cord) to determine if any leukaemia cells are present. Special treatment will be required to remove these leukaemia cells.
- **Imaging** – X-rays, ultrasound or scans are used to access and monitor the impact of the AML on the organs of the body. Computed tomography (CT) scans and magnetic resonance imaging (MRI) are used where appropriate.

Diagnosis of AML with genetic abnormalities and AML, not otherwise specified

Of the four groups into which AML is classified by the 2016 WHO classification, the two groups where chromosomes analysis is the most useful are:

- AML with genetic abnormalities
- AML, not otherwise specified

For the other two groups, AML with myelodysplastic-related changes and AML due to prior chemotherapy/radiation, the diagnosis of AML will be clear from the patient's history and, because the genetic abnormalities involved are varied, chromosome analysis is not particularly helpful.

AML with genetic abnormalities

Patients with AML and the following genetic abnormalities can be diagnosed as AML even if their percentage of immature leukaemia cells is less than 20%:

- t(8;21)
- t(16;16)
- t(15;17) – leads to a diagnosis of the AML subtype acute promyelocytic leukaemia (APL, previously called M3 AML)

These chromosome abnormalities are all chromosome translocations where the numbers in brackets after the 't' are the numbers of the chromosomes involved in the translocation. A translocation is the transfer of one part of a chromosome to another part of the same or a different chromosome, resulting in rearrangement of the genes.

For example, in the case of APL, which is a particular type of AML commonly associated with the PML-RARA gene, the promyelocytic leukaemia protein (PML) gene on chromosome 15 and the retinoic acid receptor alpha (RARA) gene on chromosome 17 swap and fuse to become the PML-RARA gene.

There are numerous other chromosomal abnormalities seen in patients with AML; however, they do not occur consistently

and therefore are not helpful in reaching a diagnosis.

For more information about APL, you can order one of our booklets by calling the helpline on **08088 010 444** or online via our website at www.leukaemiacare.org.uk

Diagnosis of AML, not otherwise specified

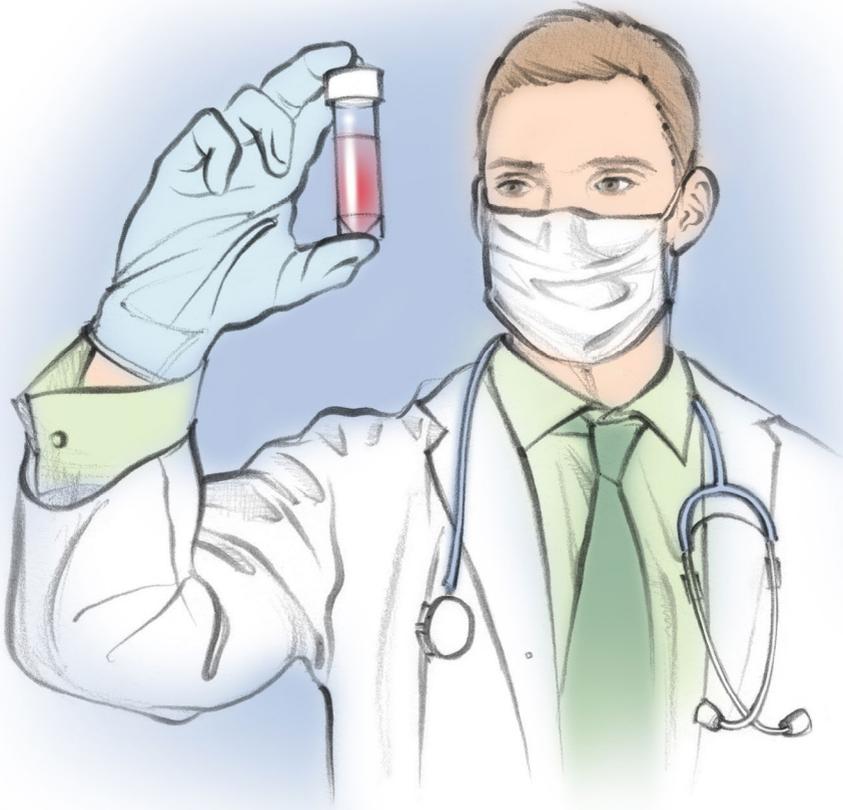
A diagnosis of AML, not otherwise specified requires the presence of at least 20% of the specific leukaemia cells in the blood/bone marrow.

Immunophenotyping and genetic information can be used to confirm the diagnosis. As with chromosome abnormalities, the immunophenotypes seen in AML are not specific to AML, and are therefore not conclusive when making a diagnosis. However, knowledge of a patient's

How is AML diagnosed? (cont.)

immunophenotype is useful to exclude other types of leukaemia in difficult cases.

For more information about leukaemia types that fall into the AML, not otherwise specified group, you can take a look at our booklets online at www.leukaemiacare.org.uk. We have booklets on acute megakaryoblastic leukaemia (AMKL) and acute myelomonocytic leukaemia (AMML).



What is the treatment for AML?

Because AML progresses rapidly, virtually all patients with AML start treatment as soon as possible after diagnosis.

Overview of treatment

The main aim for the treatment of AML is to achieve and maintain complete remission. Complete remission is defined as less than 5% of leukaemia cells in the bone marrow and recovery of blood cell counts to normal.

Standard treatment of AML remains intensive induction chemotherapy to remove the majority of the leukaemia cells in the blood and bone marrow. This is followed by a consolidation phase with either further chemotherapy or an allogeneic stem-cell transplant (allo-SCT) to destroy any remaining leukaemia cells in the body and prevent a relapse.

Most patients with AML will receive the combination of anthracycline chemotherapy drugs and the chemotherapy drug cytarabine to which a targeted drug may be added if required. The exception to this is APL,

which should not be treated with chemotherapy as this can lead to severe bleeding. APL does not respond to chemotherapy, but can achieve very good results if treated with the differentiating agents all-trans retinoic acid and arsenic trioxide.

A targeted drug is a drug that is designed to specifically interrupt the leukaemia cells from growing in the body without simultaneously harming healthy cells the way conventional chemotherapy drugs do.

The use of maintenance therapy in AML is controversial. However, if it is deemed necessary, patients usually receive the same therapy as used during induction.

For patients who cannot withstand intensive chemotherapy, low-intensity treatment with low-dose cytarabine or therapy with hydroxycarbamide (also called hydroxyurea) is often beneficial and generally well-tolerated.

Despite the introduction of new targeted drugs such as FLT3 inhibitors, a number of patients

with AML will still have to undergo an allo-SCT.

Induction therapy

Standard induction therapy generally consists of a continuous infusion of cytarabine for seven days, combined with an anthracycline drug (daunorubicin or idarubicin) for three days.

The drug Vyxeos contains cytarabine and daunorubicin combined in tiny fat droplets called liposomes. The liposomes protect the drugs from being broken down early so they remain in the body longer than if cytarabine and daunorubicin were given as separate infusions. It is also thought that the liposomes build up in the bone marrow to enhance their effect in leukaemia cells.

Vyxeos is approved for the treatment of adults with newly diagnosed AML and has also been recommended by NICE for patients with untreated AML who have secondary AML or AML with myelodysplasia-related features.

Alternatively, gemtuzumab

ozogamicin is a newly NICE approved monoclonal antibody (anti-CD33) administered for three days that can be given in combination with a continuous infusion of cytarabine for seven days, combined with an anthracycline drug (daunorubicin or idarubicin) for three days to all newly diagnosed patients with AML except patients who are high risk.

Finally, midostaurin is the only flt-3 inhibitor which is given after the continuous infusion of cytarabine for seven days combined with an anthracycline drug (daunorubicin or idarubicin) for three days (starts on day eight). This is for patients with the flt-3 ITD mutation positive AML and has significantly improved the survival for this group of AML patients.

If patients with AML do not achieve remission, induction therapy can be repeated, or a different chemotherapy drug can be tried. Several studies to improve the complete remission rate in patients have tried using different anthracycline drugs,

What is the treatment for AML? (cont.)

higher doses of cytarabine, or adding in other drugs such as etoposide, fludarabine, or cladribine. However, there is no conclusive evidence that any of these options are any more effective than the cytarabine and daunorubicin combination.

Consolidation therapy

Consolidation therapy is used to eradicate any remaining leukaemia cells in the body, which is also called minimum residual disease (MRD). Consolidation therapy lessens the risk for relapse and increases patient survival. It can be used to achieve a cure or as bridge treatment to an allo-SCT. Conventional consolidation therapy includes intensive chemotherapy including a targeted drug followed by an allo-SCT.

Chemotherapy

Consolidation therapy with further chemotherapy, often with higher doses of the same drugs used for induction therapy, will depend on:

- Patient's age

- Their physical fitness
- Detection of any chromosomal abnormalities which are linked with a likelihood of relapse

Patients with low-risk AML can undergo further consolidation chemotherapy, whereas those with intermediate-risk AML should undergo either chemotherapy or an allo-SCT and those with high-risk AML are recommended for an allo-SCT.

For young patients (aged 18 to 60/65 years old), the following treatments are recommended according to their AML risk:

- **Low-risk:** Two to four cycles of intermediate-dose cytarabine.
- **Intermediate-risk:** Two to four cycles of intermediate-dose cytarabine, with or without an allo-SCT depending on the chromosome abnormalities.
- **High-risk:** An allo-SCT using a related or unrelated donor.

For older patients (aged over 60/65 years old), the following treatments are recommended according to their AML risk:

- **Low-risk:** Two to three cycles of low-dose cytarabine.
- **Intermediate to high-risk:** No value was found with consolidation therapy. An allo-SCT or new drugs being tested in clinical trials should be considered.

For patients who cannot tolerate any of the treatments for AML, or who do not wish any treatment, the best supportive care can be achieved with hydroxycarbamide. This is a drug that prevents cell division with the aim of lowering the white blood cell count. This helps relieve pain which can be caused by a high white blood cell count.

Allogeneic stem cell transplantation

In younger patients, who are more likely to withstand the rigours of bone marrow transplantation, an allo-SCT can be performed. An allo-SCT is the transplantation of bone marrow stem cells from a matching donor such as a sibling, parent or child. The allo-SCT helps re-establish a healthy bone marrow. Patients are given high

doses of chemotherapy to destroy any cancerous cells, and then healthy cells from the donor are transplanted into the recipient.

An allo-SCT is known to reduce the risk of relapse of the leukaemia more than chemotherapy, but it is also associated with serious complications, including an increased risk of death. For this reason, allo-SCTs tend only to be used in patients who have a greater risk of relapse.

Central nervous system treatment

In patients where leukaemia cells have spread to the brain and spinal cord, chemotherapy may be injected directly into the cerebrospinal fluid to kill any remaining leukaemia cells.

Cytarabine 40mg to 50mg can be administered into the cerebrospinal fluid, two to three times per week until all the leukaemia cells have been removed, and then followed by three further injections at the same dosage. Alternatively, cytarabine 50mg can be given every other week for

What is the treatment for AML? (cont.)

approximately six cycles in special situations, for example if the patient has very high levels of white blood cells.

Radiation therapy of the brain and spinal cord can also be performed. Radiation therapy consists of irradiation of the brain and spinal cord with high doses of X-rays or proton beams. Radiation therapy of the brain is often restricted to the 5% of patients who persistently show leukaemia cells in the body.

Treatment of older and frail patients with AML

For older patients (aged over 65 years old), the best treatment strategies are still under discussion as elderly patients with AML tend to have high-risk AML, are less probable to have a good response to chemotherapy, and often suffer more side effects with the currently established treatments.

Older and frail patients cannot tolerate intensive induction or consolidation chemotherapies. Alternative treatments available for them include low-intensity

treatments such as low-dose cytarabine or hypomethylating agents such as decitabine and azacitidine. Hypomethylating agents inhibit the enzyme DNA methyltransferase which is vital for cell development. Azacitidine is approved for the treatment of AML patients with 20% to 30% of leukaemia cells in the blood and bone marrow. Decitabine is approved specifically for the treatment of adult patients with AML who are not suitable for standard induction chemotherapy.

Both azacitidine and decitabine may help induce remission and control the progression of AML for a while. Treatment with these drugs can be given as required and it is not divided into induction and consolidation treatment.

Patients with heart disease cannot be treated with anthracyclines. Additionally, some chemotherapy drugs can have cardiovascular side effects which worsen existing heart disease. These chemotherapy drugs include mitoxantrone and arsenic

trioxide. Therefore, patients with heart disease are often given different chemotherapy drugs.

Treatment of refractory or relapsed AML

Despite ongoing improvements of the treatment of patients with newly diagnosed AML, up to 45% of patients will not achieve remission. In addition, of the patients who do achieve a first complete remission, between 30% (younger patients with low-risk AML) and 80% (older patients with high-risk AML) may relapse.

For patients whose AML has returned (relapsed AML) or for those who did not respond to induction therapy (refractory AML), re-induction therapy can be given. Re-induction therapy can be the same as induction therapy or a different chemotherapy drug can be tried.

In patients with a low risk of relapse, successive cycles of chemotherapy alone is usual, and in patients with a high risk of relapse, an allo-SCT is typically recommended.

For more information on relapse in AML, call the helpline on **08088 010 444** to order a hard copy booklet or go to www.leukaemiacare.org.uk.

Supportive treatment

Supportive care does not include active treatment, but endeavours to maintain a quality of life. It concentrates on treating any symptoms or complications that arise so that the patient is as comfortable as possible.

Supportive treatment consists of blood and platelet transfusions and administration of hydroxycarbamide. Induction treatment destroys leukaemia cells, but also most of the normal bone marrow cells; therefore, patients may need antibiotics if they develop infections.

Supportive care is also called palliative care. For more information on this type of treatment, go to page 34 of this booklet.

What is the treatment for AML? (cont.)

What is the prognosis of AML?

By classifying patients according to prognostic factors for their risk of relapse, clinicians can make decisions about the intensity of treatment required, which consolidation therapy is suitable and whether an allogeneic stem cell transplant or new emerging drug may be helpful.

The major prognostic factor which contributes towards two thirds of the prognosis is the abnormality of chromosomes or genes, followed by age, sex, physical fitness and clinical features. Some 40% to 50% of all cases of AML have normal chromosomes; however, they do have mutated genes.

Younger patients with low-risk AML will therefore have a better prognosis than older patients with high-risk AML. Low-risk AML refers to AML with chromosomes and/or gene abnormalities associated with a low risk of relapse. Similarly, high-risk AML describes a type of AML where the genetic abnormalities are known to cause a high rate of relapse.

Chromosome and/or gene abnormalities

Patients with the t(8;21), t(15;17) or t(16;16) chromosomal translocations have a relatively good prognosis, with a three-year survival of 66% in younger patients (under 60 years of age) and 33% in patients older than 60 years of age.

Patients with AML and the chromosomal abnormalities t(9;11) are thought to have an intermediate-risk prognosis.

However, patients who have complex chromosomal abnormalities, where three or more chromosomes are involved, have all been associated with a very high risk of treatment failure and relapse.

Single chromosome abnormalities linked with a poor prognosis are:

- Deletion or abnormalities of chromosome 5 or chromosome 7
- Inv(3), an inversion of genes in chromosome 3
- t(6;9), a translocation

abnormality involving chromosomes 6 and 9

Irrespective of their chromosome abnormalities, patients with mutations in the following genes will also have a poor prognosis: RUNX1, ASXL1, FLT3-ITD and TP-53. On the other hand, patients with AML and the mutation of the NPM1 gene have a relatively good prognosis if there are no other associated chromosome abnormalities or gene mutations.

Other prognostic factors

Factors - other than chromosome and gene abnormalities - which have been linked with a poor prognosis include:

- A high white cell count
- The presence of MRD after remission (remaining leukaemia cells are in the body)
- Response to treatment

Complete remission is generally achieved in 60% to 85% of younger patients, and in 40% to 60% of patients older than 60 years. Patients who relapse within six months of induction treatment have a significantly poorer prognosis compared with patients

who relapsed after a period longer than six months. Patients who are refractory to first-line treatment also generally have a poor prognosis.

Overall survival rate in patients is also dependent on age:

- 40% to 50% for younger patients (under 50 years of age) with previously untreated AML
- 30% for patients under 60 years of age
- 10% for patients over 60 years of age and those with relapsed or refractory AML

If you would like more information about AML, including booklets on living well with AML, treatments and relapse, speak to our Patient Services team by calling **08088 010 444** or emailing support@leukaemiacare.org.uk. Alternatively, go to our website at www.leukaemiacare.org.uk.

Seeing your doctor

Your symptoms

Whatever symptoms you have, make sure you write a list of all of them to share with your doctor as they may be important to the treatment.

Your appointment

Arranging an appointment with your GP will be one of the first things you will need to do when you start to notice symptoms. Pick a time convenient for you that you know you will be able to attend.

Your preparation

It is important to know exactly what you would like to ask your doctor. Make a list of your questions and leave spaces for the answers so you can write them down when you see the doctor. This way you can go into the appointment ready and prepared.

Examples of questions to ask the doctor:

- What tests will be needed?

- What will the tests show?
- How long will it take to get the results back?
- How common is this condition?
- What sort of treatment will be needed?
- How long will the treatment last?
- How will I know if the treatment has worked?
- What will the side effects be?
- Are there any foods or medications that need to be avoided?
- Will I be able to go back to work?
- Where can I get help with claiming benefits and grants?
- Where can I get help dealing with my feelings?

Talking to your doctor

Be honest with your doctors; they have seen and heard everything before, so there is no need to feel embarrassed about anything. If you saw your healthcare team

before seeing your doctor, be sure to share with your doctor everything your healthcare team told you about your condition, the blood tests that were performed, and the next steps. Ask also if any intensive treatment or palliative care will be needed.

Your support

If it helps, take a family member or friend in with you for support. Some people take a pen and paper in to make notes, and repeat back to their doctor everything they have been told to ensure that they are on the same page, and that nothing has been missed or forgotten.

The next steps

Always ensure that you leave the GP surgery, or the hospital, having shared everything you know about the condition, with all of your questions answered, and knowing exactly what the next steps are, whether it is more tests, further treatment or palliative care. You can ask for a summary letter of the consultation to have

everything in writing. Your doctor will generally send a letter like this to your GP.

Furthermore, be sure to access all of the other support available to you as this may be able to help you with your feelings towards the diagnosis and treatment.

Telling your family

Planning who to tell

Telling your family and friends what is happening can be difficult.

You may want to create a list of people you want to tell, starting with close family and friends, and extending it beyond, from your colleagues at work to friends in your neighbourhood.

Planning what to say

It is important to know what you want to say and exactly how much you want people to know. Being clear in your mind about that before speaking to anyone will make this a much smoother experience. Know the story that you want to tell, the diagnosis, the prognosis, the next treatment steps, and what you expect will happen physically and emotionally. Be sure to speak to people in an environment where both of you can hear each other clearly and where there are likely to be no interruptions.

How to say it

Using a conciliatory tone will

help keep both yourself and the other person calm. Deliver what you have to say slowly, calmly, concisely, and sentence by sentence to allow the other person time to take in the information. Be sincere, and hold their hands if you need to.

You can use the following sentences to help you articulate what you need to say:

- "This is going to be difficult, but I need to tell you something."
- "I've had some bad news but there's a good chance that everything will be okay after treatment."
- "You know I have been feeling unwell for a while. Some tests have been done and they've found what's wrong."

How to respond

Naturally people will feel sad and concerned for you. Everyone deals with this type of news in their own way, from shock and silence, to questions and support. Invariably, people respond positively, which in turn means you will respond

back positively.

Accepting help

Sometimes people feel guilty if they get cancer, that it's their fault, and that they will be a burden on those around them. This is where your loved ones come in, so make sure you do ask for and accept offers to help and support you. Do not try to cope on your own. If they offer to help, tell them that you will get in touch when you need them.

Repeating yourself to different people can become burdensome. Your network of family and friends can help you out by telling those beyond that about your current situation.

You can receive help from us on how to deal with telling your family and friends. You can visit www.leukaemiacare.org.uk or call **08088 010 444** to find out more.

Managing your emotions

Being told that you have cancer may be difficult for you to deal with.

You may have a positive demeanour, which will obviously be helpful to you during the next steps in the management of the condition. However, you may experience a range of emotions, including uncertainty, isolation, anxiety, anger, sadness and depression. Understanding each emotion and developing ways that help you deal with them will help you move forward with your life.

Uncertainty

You may think "what happens next?". You may be unsure about your health and what the future holds for you. You may or may not have had meetings with your healthcare team to discuss the next steps. Once you have a clear path set out in front of you, you will be able to develop a clearer picture of where you are headed. Gaining a sensible balance between being vigilant about your symptoms and carrying on with your life will help ease any anxieties. Help, care, kindness

and support will be available to you from your healthcare team, and you will have access to counsellors and therapists when you need it.

Isolation

If you have received a diagnosis of AML, you may feel alone.

Alternatively, you may feel dealing with your cancer allows you to be around those closest to you. Being around your family and friends can be positive and negative.

Let them know what you do and don't want to do, how you do and don't wish to be treated, and what you do and don't feel comfortable talking about. Sometimes, it is difficult for your family, friends and colleagues to understand what you are feeling and going through. Being clear will help create the kind of positive, supportive, and caring environment that will help as you move forward with your life.

Anxiety

Being fearful of the unknown, especially when we are feeling threatened, is natural. You may

experience an increased heart rate, rapid breathing, and muscle tension. These things help us to face a danger or run away. These changes in you are part of the 'fight or flight' response. Any feeling of discomfort, pain or even another appointment with your healthcare team may elicit such responses, and give you sleepless nights or feelings of worry. This is completely natural.

Such reflexes and responses will ease over time with the building of daily routines and planning things for the future, which will help you to cope with the physical effects of anxiety. Cognitive behavioural therapy can help you deal with your worrying thoughts.

Anger

Feeling angry at the cancer diagnosis is natural and normal. You may be angry with yourself, with the healthcare team or with family and friends. You may display your anger as impatience, irritability and frustration with people and things that would not normally bother you.

Understanding exactly what is

making you angry will help you deal with your feelings effectively. In addition, setting yourself achievable, but demanding, goals will help reduce the anger and impatience, especially with each passing success. Don't forget to congratulate yourself for each successfully completed task, however small.

Physical exercise is a great way to release your anger and frustrations, and channel energy positively with no negative impact on the body. Talking about feelings, letting them out, will also help stop you lashing out at people and keep things calm.

Sadness and depression

You may feel a sense of loss at how safe you once felt. You may also feel that your illness is a heavy burden on those around you. You might be feeling low, which is a natural effect of your situation and the illness, treatment and recovery process. However, if this low mood persists for more than several weeks, and you feel hopeless, and

Managing your emotions (cont.)

lose interest and pleasure with things in life, then you may have depression.

Your first steps should be to speak to your loved ones around you about your mood and state of mind, and then contact your GP. You may lift the way you feel by engaging in activities that you were enjoying before diagnosis and connecting back with your life. Only do as much as you can and try and talk about your thoughts and feelings. This will help lighten your burden and put things into perspective. If you have made any acquaintances or friends in the same position as you, talk to them over coffee as they will understand what you are facing.

Self-confidence

Being forced to adjust your daily routine during the visits to the hospital for treatment can take its toll. This interruption of your life can impact on how you feel about your appearance and how you feel emotionally. In turn, this can knock your self-confidence and self-esteem. Your feelings of

relief, hope and optimism have just been replaced with their polar opposites.

You can gradually build your self-confidence and self-esteem back up by engaging in the activities you did before the diagnosis, and socialising with family, friends, and those in the same position as you. This will help to create a supportive atmosphere to get you back to your old self.

Mindfulness and relaxation

Simple practices from mindfulness and relaxation techniques can help you calm the mind, release tension and ease any pain.

- Put yourself in a relaxing environment, sitting or lying down comfortably.
- Loosen your clothing so you can move more freely.
- Calmly breathe in through your nose, and out through your mouth, developing a steady natural rhythm, focusing on your chest and abdomen as you

do so.

- Visualise that you are inhaling positivity and exhaling negativity.

By taking some time out of your day to do these exercises, you can help quieten your mind and remove the stress of coming to terms with your diagnosis, so you

feel calmer and more relaxed.

Survivorship

Someone who is living with or beyond a cancer diagnosis can be considered a cancer survivor.

Survivorship can be defined as:

"...cover[ing] the physical, psychological and economic issues of cancer, from diagnosis until the end of life. It focuses on the health and life of a person with cancer beyond the diagnosis and treatment phases. Survivorship includes issues related to the ability to get health care and follow-up treatment, late effects of treatment, secondary cancers and quality of life. Family members, friends and caregivers are also part of the survivorship experience."

When living with cancer, you will face new challenges to cope with from physical to psychological and social ones. Survivorship aims to provide personalised care based on improving your health, wellbeing, quality of life and your confidence and motivation, to help you manage. Survivorship also focuses on your health and life with cancer after the end of treatment until the end of life. At

this point, your routine of meeting frequently with your healthcare professionals also ends, so you may feel a mixture of emotions from relief to fear, anxiety and uncertainty about the future. You may wonder how you will slot back into your life after coming through the treatment period.

Your survivorship pathway began at the point when you were diagnosed with AML. By this point, you will have been starting to receive support for work, finance, and personal relationships through to managing pain, fatigue and make positive lifestyle changes, such as starting a healthy diet or gentle exercise.

Your individual needs will be identified and addressed, including:

- Dealing with the emotional impact of receiving an AML diagnosis, which may have created feelings of uncertainty, fears of recurrence and difficulties in planning for the future. These will be discussed with you to develop an individualised care plan with

support from social care staff and therapists, as and when you need it.

- Improving your quality of life through efficient and co-ordinated care during treatment, with effective communication within the treatment team, and a positive attitude.
 - Taking care of comorbidities – that is, other medical conditions and diseases – and offering a cancer rehabilitation based on your clinical needs as assessed by informed professionals, and ensuring compliance with the National Cancer Rehabilitation Pathways and Rehabilitation Peer Review requirements.
 - Providing you with a treatment summary from the diagnosis of your condition to the end of treatment. This would include any ongoing medication and noting possible symptoms that may occur in the future. You would also be provided details of who to contact in addition to your GP for any concerns you may have.
- Preparing you fully for the impact of the treatment, the physical and physiological side effects of treatments and the psychological impact of AML in general. You will be provided physical equipment, and taught about various coping strategies to adapt to your new situation.
 - Supporting you with advice for social and financial difficulties, including caring responsibilities, your inability to participate in social activities, any debt and financial worries from not being able to work, and perhaps the need to return to work before you feel ready.
 - Receiving health and nutrition advice from a nutritionist on following a healthy and balanced diet to help improve your general health and wellbeing. The World Cancer Research Fund published a report for cancer survivors which suggests that even small dietary and lifestyle changes can produce large health benefits.

Palliative care

Palliative care, also known as supportive care, involves a holistic or "whole person" approach, which includes the management of pain and symptoms as well as psychological, social and spiritual support for you and your loved ones.

Palliative care aims to reduce the symptoms, control the AML, extend survival, and give you and your loved ones the best quality of life possible. Your doctor will discuss the options with you in detail before you decide the next steps.

Who provides palliative care?

Palliative care will be provided by a team of health and social care professionals trained in palliative medicine who will coordinate the care.

These professionals can include your GP, hospital doctors and nurses, community nurses, hospice staff and counsellors, social care staff, physiotherapists, occupational therapists, complementary therapists, and

religious leaders, if you would like this. The palliative care services may be provided by the NHS, local council or charity. You may receive day-to-day care at your home and at the hospital.

What is the clinical course?

You will have a number of treatments, and be prone to frequent infections because of the AML and the impact of the treatments. Your therapy may continue because of potential remission and/or useful palliation.

Various pains and other clinical complications can occur such as:

- **Bone pain:** Radiotherapy and/or oral steroids, and sometimes non-steroidal anti-inflammatory drugs (NSAIDs), may be used with caution, because they can interfere with the immune system and kidney function.
- **Bone marrow failure:** Blood and platelet transfusions are provided to prevent and fight recurrent infections and bleeding episodes.

- **Oral problems:** Analgesic mouthwashes and topical ointments may help with ulceration. Chewing gum, and mouthwashes, have been shown to help with dry mouth, tooth decay and oral thrush.
- **Night sweats and fever:** These can also place a heavy burden on carers because of so many changes of night clothes and bedding.
- **Pathological fractures:** Orthopaedic intervention and subsequent radiotherapy, with consideration given to prophylactic pinning of long bones and/or radiotherapy to prevent fractures will be performed. This will reduce the likelihood of complex pain syndromes developing.
- **Spinal cord compression:** Immediate high single daily dose oral steroids will be given.
- **Back pain from wedge and crush fractures of the vertebrae of the spinal column:** Treatments can include analgesics, antidepressants and/or anticonvulsant

medication used in tandem with opioids.

- **Hypercalcaemia:** Treatment is usually with intravenous hydration and intravenous bisphosphonates.
- **Loss of appetite:** Low-dose steroids may temporarily boost the appetite, while small, frequent and appetising meals and supplement drinks will also help.

End of life care

When does end of life care begin?

If the treatment hasn't worked and you are going through palliative care, end of life care may be offered. End of life care begins when it is needed and may last a few days, months or years.

What does end of life care involve?

End of life care is support for people who are in the last few months or years of their life. The aim is to help patients enjoy a good quality of life until they die, and to die with dignity. The professionals looking after you will ask about your wishes and preferences on how to be cared for and put these into action. They will also provide support to your family, carers and loved ones. You will be able to decide where you will receive end of life care, be it at home or in a care home, hospice or hospital. The same will be true of where you would like to die. Wherever this is, you will receive high quality end of life care.

Who provides end of life care?

A team of health and social care professionals may be involved in the end of life care, including hospital doctors and nurses, your GP, community nurses, hospice staff and counsellors, social care staff, physiotherapists, occupational therapists or complementary therapists, and religious leaders, if you would like this. If you are being cared for at home or in a care home, your GP will have overall responsibility for your care with the support from community nurses, along with your family and friends.

What choices do I have in terms of end of life care?

Deciding where you want to die can be a difficult choice to make. Working out what you and your loved ones want, together with seeing what services are available can help to make the decision a little easier.

- **Staying at home:** A place of familiarity, surrounded by loved

ones, may be something that will be reassuring. External care professionals will be able to visit your home to make sure your symptoms are looked after.

- **Hospices:** These are specialised in looking after those with life-limiting illnesses and those who are coming to the end of their life. Hospices are staffed with care professionals who are able to keep an eye on you, make sure that symptoms are controlled and offer a number of services to make the stay as comfortable as possible. For more information on the care that they can provide, go to www.hospiceuk.org
- **Residential care/nursing homes:** If you think that your stay may be a few months or more, then a nursing home may be more suitable than a hospice. These can be private or run by a charity or the local council so be sure to check if there are any fees.
- **Hospitals:** Although you may be used to staying in a hospital ward, the care routine cannot

always be tailored to patients' specific needs. Pressures on the NHS mean that your stay will only be as long as strictly required. As soon as the condition requiring hospital admission has been resolved, you will need to go back to your home or nursing home. However, a number of specialists will be available to help look after specific problems, and a number of hospitals also have a designated palliative care team for patients who require them.

Whatever your choice, speak with your GP or healthcare team who will be able to help you put everything into place.

Glossary

Acute Myeloid Leukaemia (AML)

A rapid and aggressive cancer of the myeloid cells in the bone marrow.

Acute Promyelocytic Leukaemia (APL)

A rare sub-type of AML in which there is an increased production of immature, abnormal white blood cells called promyelocytes in the bone marrow.

Allogeneic Stem Cell Transplant (allo-SCT)

A transplant of stem cells from a matching donor.

Amino Acids

Organic molecules which are the building blocks for making proteins.

Anaemia

A condition where the number of red blood cells are reduced. Red blood cells contain haemoglobin and transport oxygen to body cells. This may be due to a lack of iron, leukaemia, or sickle cell disease.

Anthracycline

An antibiotic derived from the bacteria *Streptomyces peucetius* and found to be an effective anticancer drug.

Antibody

A large Y-shaped protein produced by B-cell lymphocytes in response to a specific antigen, such as a bacteria, virus, or a foreign substance in the blood. The antibodies neutralise the bacteria and viruses.

Antigen

A toxin or other foreign substance which induces an immune response in the body, especially the production of antibodies.

Autologous Stem Cell Transplant (ASCT)

A transplant of stem cells derived from part of the same individual.

Bone Marrow

The soft blood-forming tissue that fills the cavities of bones and contains fat, immature and mature blood cells, including white blood cells, red blood cells and platelets.

Chemotherapy

Drugs that work in different ways to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing.

Chromosome Inversion

Chromosome inversion occurs when a segment is clipped out, turned upside down

and reinserted back into the chromosome. This may be inherited or a random mutation.

Chromosomes

Thread-like structures which carry the genes, and are located in the nuclei of every cell in the body. There are 46 chromosomes (23 pairs) in humans.

Complete Remission

Complete remission has occurred when:

- Blood cell counts have returned to normal
- Less than 5% of abnormal, leukaemia cells are still present in the bone marrow

Consolidation (Phase)

Treatment following remission intended to kill any cancer cells that may be left in the body.

Cytarabine

An antimetabolite drug which works by disrupting the DNA of cancer cells, thereby slowing or stopping their growth.

DNA (Deoxyribonucleic Acid)

Thread-like chain of amino acids found in the nucleus of each cell in the body which carries genetic instructions used in the growth, development and functioning of

the individual's cells.

Dysphagia

Difficulty swallowing.

Eosinophil

A type of white blood cell which has a protective immunity role against parasites and allergens.

First-line Treatment

The first treatment given for a disease. It is generally the treatment accepted by the medical establishment for initial treatment of a given type and stage of cancer.

Flow Cytometry

Technology used to analyse the physical and chemical characteristics of particles in a fluid as it passes through at least one laser. A flow cytometer can rapidly measure the size and structures of thousands of cells.

FLT3 (FMS-like Tyrosine Kinase 3) Mutation

A mutation in a gene called FLT3 which is responsible for AML leukaemia.

Genes

Genes are made up of DNA which stores the genetic information required to make human proteins.

Glossary (cont.)

Immunophenotyping

The process that uses antibodies to identify cells based on the types of antigens or markers on the surface of the cells. This process is used to diagnose specific types of leukaemia and lymphoma by comparing the cancer cells to normal cells of the immune system.

Induction (Phase)

The first treatment after diagnosis intended to kill the majority of the leukaemia cells and stimulate remission.

Intrathecal Therapy

An injection of chemotherapy in the cerebrospinal fluid that surrounds and protects the brain and spinal cord.

Irradiation

Particles or rays falling on to a surface (a radiation wave on the surface of the skin).

Leukaemia

A group of cancers that usually begin in the bone marrow and result in high numbers of abnormal blood cells. These cells are not fully developed and are called blasts or leukaemia cells. Depending on the type of blood cell involved, there are different types of leukaemia with varying characteristics, such as being

acute (develops quickly) or chronic (develops slowly).

Lymph Nodes

Components of the lymphatic system (part of the body's immune system) that contain lymphocytes which produce antibodies and macrophages to digest dead cells. Lymph nodes are swollen with cell fragments in the event of infection or cancer. They are located mainly in the spleen but also in the neck, armpits and groin.

Lymphocytes

Lymphocytes are a type of white blood cell that are vitally important to the immune response. There are three types of lymphocytes: B-cells, T-cells and natural killer (NK)-cells.

Lymphoid

Relates to lymphocyte white blood cells.

Megakaryocyte

A large cell in the bone marrow which produces the platelets in the blood to prevent bleeding.

Minimal Residual Disease (MRD)

A measure of the presence of leukaemia at a molecular level rather than at a cell level. It is measured using molecular

techniques such as flow cytometry and polymerase chain reaction analysis.

Monocyte

A white blood cell that attacks invading organisms and helps combat infections.

Myeloid

Relates to the bone marrow.

Myeloid Cell

A cell originating in the bone marrow which will eventually become the following white blood cells: neutrophils, monocytes (present in the blood), macrophages (present in different tissues), basophils, and eosinophils. Myeloid cells can also develop into red blood cells and platelets.

Myeloproliferative Cancer

A disease of the bone marrow in which excess cells are produced.

Petechiae

Red or purple, flat, pinhead spots under the skin.

Platelets

One of the types of blood cells which help to stop bleeding.

Precursor Cell

Precursor cells are a type of partially differentiated cell which

has the capacity to differentiate into only one cell type (e.g. precursor B-cell or precursor T-cell).

Radiation Treatment

A cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumours.

Red Blood Cells

Small blood cells that contain haemoglobin and carry oxygen and other substances to all tissues of the body.

Refractory Condition

A condition for which treatment does not result in remission. However, the condition may be stable.

Relapse Condition

A relapse occurs when a patient initially responds to treatment, but after six months or more, the response stops. This is also sometimes called a recurrence.

Secondary Cancers

A secondary primary cancer that often appears after a number of years following chemotherapy or radiation treatment for a previous different primary cancer. Secondary cancer is not an occurrence or spread of the primary cancer in another part of the body, which is called a

Glossary (cont.)

metastatic cancer. Secondary cancers are often other blood cancers, lung cancer or skin cancers.

Spleen

The largest organ of the lymphatic system whose function is to help rid the body of toxins, waste and other unwanted materials. The spleen is located under the ribs on the left of the abdomen.

Stem Cell

The most basic cell in the body that has the ability to develop into any of the body's specialised cell types, from muscle cells to brain cells. However, what makes these stem cells reproduce, as in a cancer, is thought to be linked to chromosome abnormalities.

Steroids (also called Corticosteroids)

Man-made versions of the hormones normally produced by the adrenal glands; two small glands found above the kidneys. Steroids reduce inflammation (redness and swelling) and the activity of the immune system.

Targeted Therapy

Drugs that specifically interrupt the leukaemia cells from growing in the body. These drugs do not simultaneously harm healthy

cells the way conventional chemotherapy drugs do.

Thrombocytopenia

This is a low level of platelets, which are small blood cells that help the body form clots to prevent or stop bleeding.

Total Body Irradiation

Radiation treatment to the whole body to prepare a patient for a stem cell transplant. Irradiation is the term used when radiation falls onto a surface (e.g. radiation waves on the surface of the skin). Total body irradiation is used to destroy or suppress the patient's immune system in order to prevent rejection of the donor's stem cells. In addition, it can eliminate any residual cancer cells in the patient's body to increase the chances of a successful transplant.

Translocation

In genetics, translocation is the transfer of one part of a chromosome to another part of the same or a different chromosome, resulting in rearrangement of the genes.

Useful contacts and further support

There are a number of helpful sources to support you during your diagnosis, treatment and beyond, including:

- Your haematologist and healthcare team
- Your family and friends
- Your psychologist (ask your haematologist or CNS for a referral)
- Reliable online sources, such as Leukaemia Care
- Charitable organisations

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 helpline, patient and carer conferences, support group, informative website, one-to-one buddy service and high-quality patient information. We also have a nurse on our help line for any medical queries relating to your diagnosis.

Helpline: **08088 010 444**
www.leukaemiacare.org.uk
support@leukaemiacare.org.uk

Blood Cancer UK

Bloodwise is the leading charity into the research of blood cancers. They offer support to patients, their family and friends through patient services.

0808 169 5155
www.bloodcancer.org.uk

Cancer Research UK

Cancer Research UK is a leading charity dedicated to cancer research.

0808 800 4040
www.cancerresearchuk.org

Macmillan

Macmillan provides free practical, medical and financial support for people facing cancer.

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

Citizens Advice Bureau (CAB)

Offers advice on benefits and financial assistance.

08444 111 444
www.adviceguide.org.uk

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?

Helpline: **08088 010 444**

(free from landlines and all major mobile networks)

Office Line: **01905 755977**

www.leukaemicare.org.uk

support@leukaemicare.org.uk

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Leukaemia Care is registered as a charity in England and Wales (no.1183890) and Scotland (no. SC049802).
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Leukaemia Care
YOUR Blood Cancer Charity