
Blastic Plasmacytoid Dendritic Cell Neoplasm (BPDCN)

**A Guide for
Patients**

Introduction

Being diagnosed with Blastic Plasmacytoid Dendritic Cell Neoplasm (BPDCN) can be a shock, particularly when you may never have heard of it. If you have questions about BPDCN – 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.

For more information, talk to your haematologist, clinical nurse specialist or hospital pharmacist.

Booklet compiled by our Patient Information Writer Isabelle Leach and peer reviewed by Dr Manos Nikolousis. We are also grateful to Sedef Baran Gurbuz for their contribution as a patient reviewer.

Disclaimer: As we are accredited by the Information Standard, all

of our information has to adhere to a standardised process that ensures it is of the highest quality. Unfortunately, due to the rarity of BPDCN, we were unable to complete the production process which meant that this booklet cannot be formally accredited. However, we assure you that this information was created with the same values as that which is.

If you would like any information on the sources used for this booklet, please email communications@leukaemiacare.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 quarterly magazine includes inspirational patient and carer stories as well as informative articles by medical professionals: **www.leukaemiacare.org.uk/communication-preferences/**

What is BPDCN?

Previously known as natural killer (NK) cell leukaemia, blastic plasmacytoid dendritic cell neoplasm (BPDCN) is a rare cancer of the bone marrow. Neoplasm is one of the medical terms for cancer, meaning a new and abnormal growth of tissue anywhere in the body.

BPDCN cells are abnormal immature plasmacytoid dendritic cells (PDCs). PDCs are cells from the bone marrow whose role is to secrete large amounts of type I interferon when they come across viruses. Interferons are naturally-occurring body proteins that send signals to interfere with the ability of viruses to multiply.

BPDCN normally starts with generalised skin lesions and may involve other organs in the body before progressing to leukaemia. For this reason, BPDCN is classified as a condition distinct from other types of leukaemia in the 2016 World Health Organization (WHO) classification of Haematopoietic and Lymphoid Tissues. As well as involving the skin, BPDCN is also commonly seen in the bone marrow, blood, lymph nodes and the spleen.

Who is affected by BPDCN?

BPDCN is seen mainly in middle-aged and elderly patients; however, it can occur at any age and has been seen in children.

BPDCN is estimated to account for 0.44% of haematologic neoplasms annually, which translates to approximately 1000 cases in Europe and 700 cases in the United States.

Based on data from case series, the median age of patients with BPDCN at diagnosis is 67 years, and BPDCN occurs approximately three times more commonly in men than women. However, in a recent large population study from the United States which included 595 patients with BPDCN between the years 2000-2013, median age at diagnosis was found to be 52 years, and the disease was only twice as common in men than women.

BPDCN occurs with a similar prevalence in all races. Moreover, the disease does not show any geographic differences having been reported in various countries

around the world.

What causes BPDCN?

The cause of BPDCN is currently unknown.

An association between BPDCN and myelodysplastic syndromes has been suggested because the development of these diseases and the appearances of their bone marrows under the microscope are similar.

Myelodysplastic syndromes are a group of cancers in which immature blood cells in the bone marrow do not develop into healthy blood cells. In addition, approximately 15% of BPDCN patients have been shown to have myelodysplastic syndrome or experience a transformation to acute myeloid leukaemia (AML).

PDCs are known to secrete large amounts of type I interferon in response to activation by viruses, thereby playing an important role in the immune system. Type I interferons protect the body from viral attacks by promoting antimicrobial activity within cells to prevent the spread of the infection and by regulating the

natural immune response so that it is at its most effective.

BPDCNs are derived from the PDCs, but they are not related to any specific cell or cell line. As the PDCs do not have a marker for a specific cell line, it is difficult to determine the exact origin of the BPDCNs and how they develop. However, they are known to be associated with the T-cell markers CD4 and CD56, as well as a few other markers including CD123. A recent important discovery is that while CD123 is seen in 70-80% of patients with AML, it is present in virtually all patients with BPDCN. The levels of CD123 are much higher in BPDCN and AML compared with normal bone marrow cells.

Although no specific gene has been linked to BPDCN, the most commonly occurring mutations include TET2, ASXL1, RAS, and TP53. These mutations have also been observed in myelodysplastic syndromes and chronic myelomonocytic leukaemia.

Symptoms of BPDCN

BPDCN normally starts with non-specific skin lesions (64-100% of patients), with or without symptoms in other areas of the body. BPDCN is also seen in the bone marrow and peripheral blood (60-90%) and in lymph nodes (40-50%). It invariably progresses to one of the types of leukaemia.

Skin lesions may be individual, isolated or multiple. These often do not cause any symptoms and can have one of three appearances:

1. Purplish nodule (rounded lump with a distinct border)
2. Bruise-like papule (inflamed blemish on the skin)
3. Numerous lesions consisted of purplish nodules and/or papules and/or macules (skin discolouration)

Numerous lesions of all types are the most characteristic clinical presentation. Some of the isolated nodules can be greater than 10cm in diameter and are usually seen on the head and legs. However, rarely, some patients do not show any skin lesions, and swollen lymph nodes are generally the first symptom. Nevertheless, most

of these patients will develop skin lesions at some point during their condition.

Approximately 20% of patients present with swollen lymph nodes, irrespective of their other symptoms. Involvement of the blood, bone marrow and spleen can be slight at first, but this often progresses with time. Thrombocytopenia (low levels of platelets, which are small blood cells that help the body form clots to stop bleeding) can occur at diagnosis, as well as a reduction of all the mature blood cells produced by the bone marrow (cytopenia). In a minority of cases, the cytopenia is very severe which indicates bone marrow failure has occurred.

In approximately 10% of patients with BPDCN, evidence of impact to the central nervous system (CNS) confirmed by cytology is seen at diagnosis in patients presenting with neurological symptoms such as seizures or raised intracranial pressure (pressure within the skull). These patients often have a leukaemia-type variation of BPDCN.

Despite responding to

chemotherapy at first, the majority of cases of BPDCN invariably relapse. Up to 30% of patients with BPDCN who relapse have isolated CNS involvement, or a CNS relapse as part of a full body relapse.

In most cases, a leukaemic phase of BPDCN eventually develops. Additionally, 10-20% of patients with BPDCN are associated with, or develop, another bone marrow neoplasm, most commonly myelodysplastic syndromes, chronic myelomonocytic leukaemia or AML.

Diagnosis of BPDCN

Even with the recent increase in the reporting of BPDCN cases and improved recognition of BPDCN by doctors, making an early diagnosis of the disease is still challenging, mainly because of its similarity to the myelodysplastic syndromes and other haematological cancers.

The diagnosis of BPDCN is based on a combination of the symptoms, the microscopic structure of the skin lesions, lymph nodes or blood marrow, and the finding of the immunophenotyping and cytogenetic analysis. For patients who do not have skin involvement and only a leukaemic presentation, diagnosis can be made by immunophenotyping of the peripheral blood or bone marrow cells.

Skin lesions are the most common presentation in patients with BPDCN, and the diagnosis can be made on skin biopsy, although it can just as easily be made using body tissue from a lymph node or the bone marrow. Microscopic examination shows a large amount of monotonous-

looking, intermediate-sized cells with round to oval nuclei. These cells have only a small amount of cytoplasm with no visible granules and they resemble myeloid cancer cells. Normal human cells consist of a nucleus which contains the chromosomes, and it is located in the cytoplasm, a jelly-like fluid that houses all the constituents required for survival and reproduction of the cell.

Following the microscopical tissue examination, immunophenotyping is routinely used to confirm the diagnosis of BPDCN, by demonstrating that the cancer cells are positive for CD4, CD56, and CD123. This is known as the classic triad for the diagnosis of BPDCN. Immunophenotyping is a process that uses antibodies to identify cells based on the types of antigens or markers on the surface of the cells to diagnose specific types of leukaemia. Immunophenotyping plays an important role in the diagnosis of BPDCN. Positivity for CD4 or CD56 are not absolutely necessary for diagnosis, and either marker

can vary in intensity from weak to strong, however these cases are rare. Strong positivity for CD123 is normal for BPDCN, although it must be noted that slightly lower positivity for CD123 is also seen in other forms of leukaemia such as including AML, B-lymphoid leukaemia and hairy cell leukaemia. Therefore, confirmation of the diagnosis of BPDCN may require the isolation of other PDC markers, particularly T-cell leukaemia/lymphoma 1 (TCL1).

Finally, cytogenetic analysis can help make the diagnosis by excluding other haematological cancers. In patients with BPDCN, complex chromosome abnormalities are seen but with no specific mutations being described. The most reported abnormalities include deletions of chromosome 9, chromosome 13 and partial losses affecting chromosomes 17p or 12p. Combinations of deletions of tumour suppressor genes including tumour suppressor 53 (TP53) are also commonly seen in patients with BPDCN.

Therefore, the diagnosis of BPDCN requires assessing all the information derived from patients' symptoms, microscopic analysis of tissue samples, and findings of the immunophenotyping and cytogenetic analysis. In addition, it is helpful to exclude any conditions which can mimic features of BPDCN. This is known as the differential diagnosis.

Differential diagnosis

Differentiating BPDCN from other rash-producing diseases, both cancerous and non-cancerous, is crucial in order to select and plan the right course of treatment.

BPDCN with skin lesions should be differentiated from:

- **Skin myeloid sarcoma:** Myeloperoxidase staining is negative for myeloid sarcomas but positive for BPDCN. In addition, CD68 staining of the cytoplasm is dot-like in BPDCN, whereas in skin myeloid sarcoma, there is diffuse CD68 cytoplasmic staining. Moreover, the presence of CD123 in cutaneous myeloid sarcoma is

Diagnosis of BPDCN (cont.)

usually much weaker than for BPDCN.

- **Mature PDC proliferation:**

This condition has skin lesions such as rash, macules/papules but rarely nodules, together with lymph node and/or bone marrow involvement. It can be differentiated from BPDCN because the PDCs appear as mature and are negative for CD56. Mature PDC proliferation is also more commonly associated with myelodysplastic syndromes, chronic myelomonocytic leukaemia or AML.

- **Cutaneous T-cell lymphomas, and the less common but distinct, peripheral T-cell lymphomas:** Both produce skin lesions similar to BPDCN and should be differentiated from BPDCN, especially those cases that are positive for CD56. This is possible by the use of immunophenotyping.

For BPDCN with no skin involvement, immunophenotyping is used to differentiate BPDCN from other bone marrow cancers,

because there is substantial overlap of the clinical features of BPDCN with these conditions. These conditions are:

- AML (the distinction of BPDCN from AML is difficult when BPDCN extensively involves bone marrow as it closely resembles acute leukaemia. Immunophenotyping is required to establish a definitive diagnosis)
- Myeloid sarcoma
- T-cell lymphoblastic leukaemia/lymphoma
- Natural killer-cell lymphoma/leukaemia
- Mature T-cell lymphoma/leukaemia



Prognosis of BPDCN

BPDCN is difficult to diagnose and hard to treat. It has an aggressive, clinical course and a median overall survival of eight to 14 months is reported, regardless of how it presents. For patients who have received an allogeneic stem cell transplant (SCT) following intensive chemotherapy, a median overall survival of 22.7 months has been reported.

Prognosis in terms of overall survival is greater in patients with isolated skin lesions. When BPDCN co-exists with myelodysplastic syndrome or transforms into AML, which occurs in 15% to 20% of patients, the prognosis is worse. Other patient characteristics which suggest a poor prognosis include age greater than 65 years and late clinical stage at diagnosis. Prognosis is better for BPDCN patients of a young age and long-term survival has been reported in 36% of paediatric patients.

Up to 90% of patients with BPDCN show an initial response to combination chemotherapy, but relapses with subsequent resistance to drugs are regularly

observed. Tagraxofusp is currently a promising option for BPDCN patients as good results have been obtained in previously-treated patients who are known to have a poor prognosis.

An allogeneic SCT is recommended for BPDCN patients as soon as possible in their first complete remission as the best option to achieve long-term survival, even in elderly patients with the use of reduced-intensity chemotherapy as conditioning for the allogeneic SCT.

More prospective trials are needed to determine the best treatments for BPDCN and the most suitable management of patients.



Treating BPDCN

In view of the low incidence of BPDCN, there is no consensus on the best treatment for patients with BPDCN.

Chemotherapy combinations

The majority of patients receive chemotherapy combinations which have been used previously for the treatment of AML and acute lymphoblastic leukaemia. These chemotherapy combinations include the CHOP regimen (cyclophosphamide, doxorubicin, vincristine, and prednisone), or the hyper CVAD regimen, which consists of alternating courses of the combination of cyclophosphamide, vincristine, doxorubicin and the combination of methotrexate and cytarabine.

At first, patients with BPDCN usually show high rates of complete remission to chemotherapy; however, their remissions are short, and they do not tend to respond to salvage therapy (chemotherapy given to a patient when all other options are exhausted).

Complete remission is said to have occurred when the following

conditions are met:

- Blood cell counts returned to normal
- Less than 5% of blasts (early stem cells) are still present in the bone marrow
- There are no BPDCN cells anywhere else in the body

In patients with BPDCN who only present with skin disease, surgical excision and localised radiation treatment is a good option that can resolve the skin lesion. However, these patients tend to relapse and chemotherapy with the excision is preferable. Nevertheless, for elderly patients who may not be able to withstand intensive chemotherapy, surgical excision and/or localised radiation treatment is an acceptable option.

BPDCN may also appear in other sites of the body such as the liver, tonsils, lungs, eyes and the CNS. Involvement of the CNS is relatively common in patients with BPDCN, and is seen in approximately 10% of patients at diagnosis and 30% of patients who have relapsed. Preventive intrathecal therapy, which involves injecting chemotherapy

in the cerebrospinal fluid that surrounds and protects the spinal cord and the brain, has shown promising results and is being recommended in order to improve the outcomes in patients with BPDCN. The rationale for intrathecal therapy is that it is thought the CNS is a sanctuary for BPDCN cells, given the high incidence of relapse after chemotherapy.

In children, BPDCN is less clinically aggressive than for adults. Treating children with the regimens used for high-risk acute lymphoblastic leukaemia has shown good results. Stem cell transplantation (SCT) is reserved for children who relapse.

Stem cell transplantation

Substantial benefit is seen following SCT in the younger and/or healthy BPDCN patients who are eligible, particularly if this has been performed as soon as possible in their first complete remission.

In a retrospective study in which data from 43 BPDCN patients was collected, a median overall survival of 22.7 months was seen

for patients who received an allogeneic SCT, which is a stem cell transplant of cells from a matching donor. BPDCN patients who did not receive an allogeneic SCT had a median overall survival of 7.1 months.

Unfortunately, allogeneic SCTs may not be a solution for the majority of older patients as they tend to have other illnesses that prevent them from being eligible for an allogeneic SCT.

Another retrospective study has shown that high-dose chemotherapy followed by an allogeneic SCT is capable of achieving a durable remission. Patients analysed in the study had received combinations of the total body irradiation, busulfan, cyclophosphamide, melphalan or fludarabine to prepare them for the allogeneic SCT. After 28 months, patients who received an allogeneic SCT had a 47% overall survival rate, while patients who received an autologous SCT, where the stem cells are derived from the same person, showed a 32% overall survival rate after 28 months.

The current recommendation is for BPDCN patients to be

Treating BPDCN (cont.)

evaluated for an allogeneic SCT as soon as possible and to begin searching for a donor.

New treatments

Recent studies have shown that abnormalities of CD123, also known as the alpha-chain of the interleukin-3 receptor (IL-3RA), are often seen in several leukaemia disorders. High levels of CD123 have been described in both the acute myeloid and B-lymphoid leukaemias, hairy cell leukaemia and BPDCN.

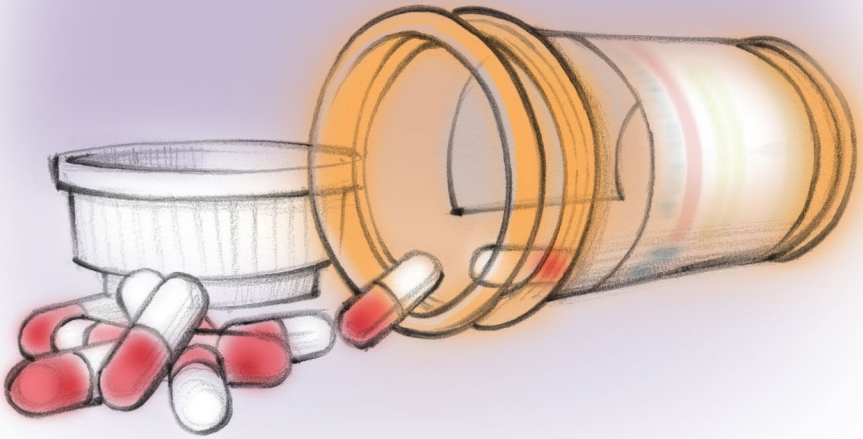
For patients with BPDCN, CD123 is a useful biological marker for making the diagnosis, and possibly a valuable tool for developing a targeted treatment. The new drug, tagraxofusp (Elzonris™ developed by Stemline Therapeutics Inc) is a recombinant IL-3A protein conjugated to a diphtheria toxin which is a potent inhibitor of protein synthesis. The binding of tagraxofusp with IL3A receptor prevents a cell from synthesising proteins and therefore results in the death of the cell. As the BPDCN cells have a greater amount of CD123 than the normal

plasmacytoid dendritic cells, they are targeted by tagraxofusp.

In the UK, tagraxofusp was granted orphan designation on 11 November 2015 for the treatment of BPDCN. In December 2018, the FDA approved tagraxofusp infusion for the treatment of BPDCN adults and children aged \geq two years.

In a Phase 1/2 study, 11 patients with BPDCN (seven relapsed and four previously-untreated) were given a single daily course of tagraxofusp for five days. The overall response rate was 78%, with a median response duration of five months. All adverse events were short-term and resolved completely. These promising results have led to a larger multicentre trial (NCT02113982).

Other new therapies which are being developed for the treatment of BPDCN include UCART123, IMG632, venetoclax and CSL362. Despite some of these drugs demonstrating early promise, none are currently approved for use in BPDCN.



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 your 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 I need to have?
- What will the tests show?

- How long will it take to get the results back?
- How common is my condition?
- What sort of treatment will I need?
- How long will my treatment last?
- How will I know if my treatment has worked?
- What will the side effects be?
- Are there any food or medications I need to avoid?
- 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 doctor. 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 you had performed, and the next steps in your BPDCN journey.

Ask also if you will receive any intensive treatment or palliative care.

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 both 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 your 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 your diagnosis and treatment.

Telling your family

Planning who to tell

Telling your family and friends that you have been diagnosed with BPDCN can be difficult.

You may want to create a list of people you want to tell, starting with close family and friends, and then 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 your story that you want to tell, the diagnosis, the prognosis, the next treatment steps, and what you expect to be going through 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 I've had treatment."
- "You know I've been feeling unwell for a while. I've had some tests and they've found out 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 for getting cancer, that they weren't strong enough, 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 them 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.

Indeed, you may have a positive demeanour, which will obviously be helpful to you during the next steps in the management of your 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 if and when you need it.

Isolation

If you have received a diagnosis of BPDCN, 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. This 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 after your diagnosis is natural and normal. You may be angry with yourself, your body, the healthcare team or your 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 goals that stretch you will help reduce the anger and impatience you feel, 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 your energy positively with no negative impact on your body. Talking about your feelings and letting them out, will also help stop you lashing out at people and keep you calm.

Sadness and depression

You may feel a sense of loss of the person you used to be, and how safe you 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 illness, treatment and recovery. However, if this low mood persists for more than several weeks, and you feel

Managing your emotions (cont.)

hopeless, and 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 your diagnosis, to connect 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 from your daily routine during the visits to the hospital for treatment can take its toll. This interruption of your life, along with your lack of energy because of your condition and the effects of your treatment, 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 your diagnosis, and socialising with family, friends, and fellow patients. This will help 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 in your muscles.

- 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 is beyond a cancer diagnosis can be considered a cancer survivor.

Survivorship can be defined as:

"...cover[ing] the physical, psychosocial 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 your need to improve 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 BPDCN. By this point, you will have been starting to receive support for work, finances, and personal relationships through to managing pain, fatigue and making positive lifestyle changes, such as starting a healthy diet and gentle exercising.

Your individual needs as a patient will be identified and addressed, including:

- Dealing with the emotional impact of receiving a BPDCN 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 your individualised care plan with support from social care staff and therapists, as you need it.

- Improving your quality of life through efficient and co-ordinated care during your treatment, with effective communication within the treatment team, and a positive attitude.
- Taking care of any comorbidities – that is, other medical conditions and diseases – and offering you 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 your 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 your BPDCN and treatment, the physical and physiological side effects of treatments and the psychological impact of BPDCN 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 your pain and symptoms as well as psychological, social and spiritual support for you and your loved ones.

Palliative care aims to reduce your symptoms, control your BPDCN, extend your 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?

Your palliative care will be provided by a team of health and social care professionals trained in palliative medicine who will coordinate your 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. Your palliative care services may be provided by the NHS, local council or a 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 BPDCN and the impact of your treatments. Your therapy may continue because of potential remission and/or useful palliation.

You may experience various pains and other clinical complications such as:

- **Bone pain:** Radiotherapy and/or oral steroids, and sometimes non-steroidal anti-inflammatory drugs (NSAIDs), may be used, although these are used with caution because they can interfere with your 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 mouth washes and topical ointments may help with ulceration. Chewing gum, and mouth washes, have been shown to help with dry mouth, tooth decay and oral thrush.
- **Night sweats and fever:** These can 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 fracture 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 your treatment hasn't worked and you are going through palliative care, you may be offered end of life care. End of life care begins when you need it 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 you enjoy a good quality of life until you die, and to die with dignity. The professionals looking after you will ask you 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 you are, 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 your 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 to you can help to make the decision a little easier.

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

loved ones, may be something that you will find reassuring. External care professionals will be able to visit you at 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 your symptoms are controlled and offer you a number of services to make your stay as comfortable as possible. For more information on the care that they can provide, go to <https://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 your specific needs. Pressures on the NHS mean that your stay will only be as long as strictly required. As soon as the condition you were admitted for has 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 you for 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 which are a type of white blood cell. Myeloid cells are cells in the bone marrow.

Allogeneic stem cell transplant

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, which contain haemoglobin and transport oxygen to body cells, are reduced. This may be due to a lack of iron, leukaemia, or sickle cell disease.

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.

Antimicrobial activity

Antimicrobial activity is the process of inhibiting or killing microbes that cause an illness. Antimicrobial may be antibacterial, antifungal or antiviral.

Autologous stem cell transplant

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

Blasts

Patients with leukaemia have a high number of abnormal white blood cells. These white blood cells are not fully developed and are called blasts or leukaemia cells.

Bone marrow failure

The term used when the bone marrow is unable to keep up with the body's need for white and red blood cells and platelets.

Central nervous system (CNS)

The part of the nervous system which includes the brain and spinal cord.

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.

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.

Chronic myelomonocytic leukaemia

A type of leukaemia which develops slowly and is characterised by an excess of monocytes in the blood. Monocytes are a type of large white blood cell that overwhelm and destroy bacteria, viruses and fungi.

ClinicalTrials.gov

ClinicalTrials.gov is a database of trials and includes details of approximately 276,190 research

studies in 205 countries.

Complete remission

Complete remission is said to have occurred when the following conditions have been met:

- Blood cell counts return to normal
- Less than 5% of blasts (abnormal, immature, early lymphocytes) are still present in the bone marrow
- There are no cancer cells anywhere else in the body

Cytogenetic

Relating to the study of inheritance in connection with the structure and function of chromosomes.

Cytology

An examination of body cells under a microscope.

Cytopenia

The reduction of all the mature blood cells produced by the bone marrow.

Cytoplasm

A jelly-like fluid that houses all

Glossary (cont.)

the constituents required for survival and reproduction of the cell.

Dendritic cells

Dendritic cells capture toxins or other foreign substances and present them on the cell surface to the T-cell lymphocytes. A dendritic cell has a branched appearance resembling a tree, hence their name.

Immunophenotyping

A 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.

Interferons

Naturally-occurring body proteins that send signals to interfere with the ability of viruses to multiply.

Intrathecal therapy

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

Leukopenia

Abnormally low number of white blood cells in the blood.

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 neck, armpit and groin.

Lymphocytes

Lymphocytes are a type of white blood cell that are vitally important to the immune response.

Macule (skin)

A patch of skin discolouration.

Myelodysplastic syndromes

A group of diseases where the bone marrow does not make enough normal blood cells.

Myeloid

Relates to bone marrow.

Neoplasm

The medical term for cancer, literally meaning a new and abnormal growth of tissue anywhere in the body.

Nodule (skin)

A rounded lump with a distinct border on the skin.

Oedema

Excess fluid in an area of the body which usually causes swelling of the area.

Paediatric patients

Patients from birth up to the age of 18.

Papule (skin)

An inflamed blemish on the skin.

Plasma cell

A type of white blood cell that produces antibodies and is derived from a B-cell lymphocyte. It is an ovoid (egg-shaped) cell with an off-centre nucleus.

Plasmacytoid

A cell that resembles a plasma cell.

Plasmacytoid dendritic cells (PDC)

A cell from the bone marrow whose role is to secrete large amounts of type I interferon when it comes across viruses.

Platelets

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

Prognosis

An indication of how well a patient is expected to respond to treatment based on their individual characteristics at the time of diagnosis or other timepoints in the disease.

Proliferation

A rapid increase, for example in the number of cells.

Protein expression

The process by which proteins are synthesised, modified and regulated in living organisms.

Radiation treatment

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

Glossary (cont.)

Refractory leukaemia

Leukaemia in which treatment does not result in a remission or that gets worse within six months of the last treatment. However, the leukaemia may be stable.

Relapsed leukaemia

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

Salvage chemotherapy

Chemotherapy given to a patient when other options are exhausted.

Seizure

A sudden, uncontrolled burst of

electrical activity in the brain.

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

Low levels of platelets, which are small blood cells that help the body form clots to stop bleeding.

Total body irradiation

Radiation treatment to the whole body to prepare a patient for a stem cell transplant.

Tell us what you think!

If you would like to give us some feedback about this patient information booklet, please hover over the code to the right using your phone or tablet's camera. Click the link as it appears and this will take you to a short web form to fill in.

Suitable for Android, iPhone 7 and above.



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

Bloodwise

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

020 7504 2200
www.bloodwise.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.leukaemiacare.org.uk

support@leukaemiacare.org.uk

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Leukaemia Care
YOUR Blood Cancer Charity