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Treating Chronic Myeloid Leukemia

If you've been diagnosed with chronic myeloid leukemia (CML), your treatment team will discuss your options with you. It's important to weigh the benefits of each treatment option against the possible risks and side effects.

How is CML treated?

Targeted therapy drugs are the main treatment for chronic myeloid leukemia (CML), but some patients might also need other treatments.

- [Targeted Therapies for Chronic Myeloid Leukemia](#)
- [Interferon Therapy for Chronic Myeloid Leukemia](#)
- [Chemotherapy for Chronic Myeloid Leukemia](#)
- [Radiation Therapy for Chronic Myeloid Leukemia](#)
- [Surgery for Chronic Myeloid Leukemia](#)
- [Stem Cell Transplant for Chronic Myeloid Leukemia](#)

Common treatment approaches

Treatment options for people with chronic myeloid leukemia (CML) depend on the [phase](#) of their disease (chronic, accelerated, or blast phase), their age, other prognostic factors, and the availability of a stem cell donor with matching tissue type.

- [Treating Chronic Myeloid Leukemia by Phase](#)
- [How Do You Know If Treatment for Chronic Myeloid Leukemia Is Working?](#)

Who treats CML?

Based on your treatment options, you might have different types of doctors on your

- [Clinical Trials](#)

Considering complementary and alternative methods

You may hear about alternative or complementary methods to relieve symptoms or treat your cancer that your doctors haven't mentioned. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

Complementary methods are treatments that are used **along with** your regular medical care. **Alternative** treatments are used **instead of** standard medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be harmful.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision.

- [Complementary and Integrative Medicine](#)

Help getting through cancer treatment

People with cancer need support and information, no matter what stage of illness they may be in. Knowing all of your options and finding the resources you need will help you make informed decisions about your care.

Whether you are thinking about treatment, getting treatment, or not being treated at all, you can still get supportive care to help with pain or other symptoms. Communicating with your cancer care team is important so you understand your diagnosis, what treatment is recommended, and ways to maintain or improve your quality of life.

Different types of programs and support services may be helpful, and they can be an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

The American Cancer Society also has programs and services - including rides to treatment, lodging, and more - to help you get through treatment. Call our Cancer Knowledge Hub at 1-800-227-2345 and speak with one of our caring, trained cancer helpline specialists. Or, if you prefer, you can use our chat feature on cancer.org to connect with one of our specialists.

- [Palliative Care Programs & Services](#)

Targeted Therapies for Chronic Myeloid Leukemia

kinase. Drugs known as **tyrosine kinase inhibitors** (TKIs) that target BCR-ABL are the standard treatment for CML. These include:

- Imatinib (Gleevec)
- Dasatinib (Sprycel)
- Nilotinib (Tasigna)
- Bosutinib (Bosulif)
- Ponatinib (Iclusig)
- Asciminib (Scemblix)

These drugs seem to work best when CML is in the [chronic phase](#)¹, but some can also help patients with more advanced disease (accelerated or blast phases). In most people, the TKIs don't seem to make the leukemia go away forever, so these drugs need to be taken indefinitely. But for some people who have very good, long-lasting responses to treatment, it might be possible to stop taking these drugs, or at least lower the dose. (See [Treating Chronic Myeloid Leukemia by Phase](#) to learn more.)

These drugs are pills you take at home. To get the best outcomes, it's important to take them exactly the way your doctor tells you to take them. Skipping pills or adjusting doses can effect the way TKI treatment works. See [Oral Chemotherapy: What You Need to Know](#)² for more on how to best manage cancer treatments you take at home.

All of these drugs can have serious interactions with some other drugs, over-the-counter , 154 c

Almost all CML patients respond to treatment with imatinib, and most of these responses seem to last for many years.

Imatinib is taken by mouth as a pill with food, usually once a day.

Generic imatinib is also available. Studies have shown that it works as well as and causes the same kinds of side effects as the brand name, Gleevec.

Side effects of imatinib

Common side effects can include diarrhea, nausea, muscle pain, and fatigue. These are generally mild. Some people have itchy skin rashes. Most of these symptoms can be treated, if needed.

Another common side effect is fluid build-up around the eyes, feet, or abdomen (belly). In rare cases the fluid may collect in the lungs or around the heart, which can cause trouble breathing. Some studies have suggested that some of this fluid build-up may be caused by effects of the drug on the heart, though this is rare. It's not yet clear how serious this is or if it might go away if treatment is stopped. If you are taking this drug, tell your doctor right away if you notice sudden weight gain or fluid build-up anywhere in the body or have trouble breathing.

A person's white blood cell and platelet counts could possibly drop. When this happens at the beginning of treatment, it might be because the blood-forming cells that are making these are part of the leukemia process. If this is the case, normal blood-forming cells take over and the blood counts will begin to rise over time.

Your doctor might tell you to stop taking the drug for a short period if your blood counts get too low. This can also happen later on in treatment. Your doctor may lower the dose of imatinib to see if your blood counts improve.

In some patients, imatinib seems to stop working over time. This is known as **imatinib resistance**. Resistance to imatinib seems to be caused by changes in the genes of the CML cells. Sometimes this resistance can be overcome by increasing the dose of imatinib, but some patients need to change to a different drug, such as one of the other TKIs.

Dasatinib

Dasatinib (Sprycel) is another TKI that targets the BCR-ABL protein.

This drug is a pill taken once a day with or without food.

Dasatinib can be used as the first treatment for CML, but it can also be helpful for

TKIs used when other TKIs stop working

Bosutinib

Bosutinib (Bosulif) is another TKI that targets the BCR-ABL protein. It can be used as the first treatment for CML, but most often it's used if another TKI is no longer working.

This drug is taken as a pill with food once a day.

Side effects of bosutinib

Common side effects are usually mild and include diarrhea, nausea, vomiting, abdominal (belly) pain, rash, fever, fatigue, and low blood cell counts (including low platelet counts, low red blood cell counts, and low white blood cell counts). Less often, this drug can also cause problems with fluid retention, liver damage, and severe allergic reaction. Your doctor will check your blood test results regularly to watch for problems with your liver and low blood counts.

Ponatinib

Ponatinib (Iclusig) is a TKI targeting the BCR-ABL protein. Because this drug can cause

Less often, this drug can also weaken the heart muscle, leading to a condition known as congestive heart failure (CHF). It can also cause liver problems, including liver failure, as well as pancreatitis (inflammation of the pancreas, which can lead to severe belly pain, nausea, and vomiting).

Asciminib

Asciminib (Scemblix) is a TKI targeting a very specific area of the BCR-ABL protein. This drug is used to treat patients with chronic phase CML if two or more other TKIs have already been tried or if their leukemia cells have a gene change called the *T315I mutation*. Asciminib is another TKI to work against CML cells that have the ***T315I mutation***.

This drug is a pill taken once a day or twice a day depending on the dose.

Side effects of asciminib

The most common side effects of asciminib include feeling tired, nausea, diarrhea, joint and muscle pain, skin rash, and infection of the upper airways. It might also cause some changes to your bloodwork such as a low platelet count, increased triglycerides, low white and red blood cell counts, and abnormal kidney function.

More information about targeted therapy

To learn more about how targeted drugs are used to treat cancer, see [Targeted Cancer Therapy](#)³.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁴.

Hyperlinks

1. www.cancer.org/cancer/types/chronic-myeloid-leukemia/detection-diagnosis-staging/staging.html
2. www.cancer.org/cancer/managing-cancer/treatment-types/chemotherapy/oral-chemotherapy.html
3. www.cancer.org/cancer/managing-cancer/treatment-types/targeted-therapy.html

4.4 www.cancer.org/cancer/managing-cancer/side-effects.html

Interferon Therapy for Chronic Myeloid

Leukemia

- [Side effects of interferon](#)
- [More information about immunotherapy](#)

Interferons are a family of substances naturally made by our immune system (CML). Interferon-alpha is a man-made drug that acts like the substance our immune system naturally produces. It reduces the growth and division of leukemia cells. Interferon-alpha is the type most often used in treating chronic myeloid leukemia (CML).

Interferon was once the best treatment for CML, but now, the [tyrosine kinase inhibitors](#) are the mainstay of treatment and interferon is rarely used.

To treat CML, this drug is most often given as a daily injection (shot) under the skin. It may also be injected into a muscle or vein. It's given for many years.

Side effects of interferon

Interferon can cause significant side effects. These include "flu-like" symptoms like muscle aches, bone pain, fever, headaches, fatigue, nausea, and vomiting. Patients taking this drug may have problems thinking and concentrating. Interferon can also lower blood cell counts.

Side effects continue as long as the drug is used, but can become easier to tolerate over time. They get better after the drug is stopped. Still, some patients find it hard to deal with these side effects every day and may need to stop treatment because of them.

More information about immunotherapy

To learn more about how drugs that work on the immune system are used to treat cancer, see [Cancer Immunotherapy](#)¹.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)².

Hyperlinks

1. www.cancer.org/cancer/managing-cancer/treatment-types/immunotherapy.html
2. www.cancer.org/cancer/managing-cancer/side-effects.html
3. www.cancer.org/cancer/types/chronic-myeloid-leukemia/references.html

References

[See all references for Chronic Myeloid Leukemia](#)

American Society of Clinical Oncology. Leukemia - Chronic Myeloid - CML: Treatment Options. 11/2016. Accessed at www.cancer.net/cancer-types/leukemia-chronic-myeloid-cml/treatment-options on May 16, 2018.

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Chemotherapy for Chronic Myeloid Leukemia

- [Chemo drugs used to treat CML](#)
- [Side effects of chemotherapy](#)
- [More information about chemotherapy](#)

Chemotherapy (chemo) is the use of anti-cancer drugs that are injected into a vein or taken by mouth. These drugs enter the bloodstream and reach all areas of the body, making this type of treatment useful for cancers that spread throughout the body, like chronic myeloid leukemia (CML). Any drug used to treat cancer (including [tyrosine kinase inhibitors](#) or TKIs) can be considered chemo, but here chemo is used to mean treatment with conventional cytotoxic (cell-killing) drugs that mainly kill cells that are growing and dividing rapidly.

Chemo was once one of the main treatments for CML. It's seldom used now because TKIs like imatinib (Gleevec[®]) work much better. Today, chemo may be used to treat CML when the TKIs have stopped working. It's also used as part of a stem cell

transplant.

Chemo drugs used to treat CML

The chemo drug hydroxyurea (Hydrea[®]) is taken as a pill, and can help quickly lower very high white blood cell counts and shrink an enlarged spleen. Other drugs sometimes used include cytarabine (Ara-C), busulfan, cyclophosphamide (Cytosan[®]), and vincristine (Oncovin[®]).

Omacetaxine (Synribo[®]) is a chemo drug that was approved to treat CML that's resistant to TKIs and progresses to the [accelerated phase](#)¹. It can also help some patients whose CML has developed the T315I mutation that keeps most TKIs from working (discussed in the section about [targeted therapy](#)).

Side effects of chemotherapy

Chemo drugs work by attacking cells that divide quickly, which is why they work against cancer cells. But other cells in the body, such as those in the bone marrow, the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are also likely to be affected by chemo, which can lead to side effects.

Possible side effects depend on the type and dose of drugs given and how long they are taken. Some common side effects of chemo include:

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Low white blood cell counts (leukopenia), which increases the risk of serious infection
- Low blood platelet counts (thrombocytopenia), which can lead to easy bruising or bleeding
- Low red blood cell counts (anemia), which can lead to feeling tired and weak

Still, different drugs can have different side effects. For example, vincristine can cause nerve damage (neuropathy) leading to numbness, tingling, or even pain or weakness in the hands or feet. Lung damage from busulfan is rare, but can be severe. Before starting treatment, speak with your health care team about the drugs you'll get and their possible side effects. Most side effects last a short time and go away once treatment is

over, but some can be permanent.

While getting treatment, be sure to tell your cancer care team about any side effects you have. There may be ways to treat them or keep them from getting worse. For instance, there are drugs that work well to prevent or reduce nausea and vomiting.

For information on infections and how to avoid them, see [Infections in People With Cancer](#)².

If your platelet counts are very low, you may be given platelet transfusions to help protect against bleeding. Likewise, if low red blood cell counts are causing problems (like shortness of breath and/or weakness), you may be treated with [red blood cell transfusions](#)³.

More information about chemotherapy

For more general information about how chemotherapy is used to treat cancer, see [Chemotherapy](#)⁴.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁵.

Hyperlinks

1. www.cancer.org/cancer/types/chronic-myeloid-leukemia/detection-diagnosis-staging/staging.html
2. www.cancer.org/cancer/managing-cancer/side-effects/infections.html
3. www.cancer.org/cancer/managing-cancer/treatment-types/blood-transfusion-and-donation.html
4. www.cancer.org/cancer/managing-cancer/treatment-types/chemotherapy.html
5. www.cancer.org/cancer/managing-cancer/side-effects.html
6. www.cancer.org/cancer/types/chronic-myeloid-leukemia/references.html

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[See all references for Chronic Myeloid Leukemia](#)

American Society of Clinical Oncology. Leukemia - Chronic Myeloid - CML: Treatment Options. Accessed at cancer.net. Content is no longer available.

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Teva Pharmaceuticals, Highlights of prescribing information: SYNRIBO (omacetaxine mepesuccinate). 06/2017. Accessed at www.accessdata.fda.gov/drugsatfda_docs/label/2017/203585s005lbl.pdf on May 16, 2018.

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Radiation Therapy for Chronic Myeloid Leukemia

- [Side effects of radiation therapy](#)
- [More information about radiation therapy](#)

Radiation therapy is treatment with high-energy rays or particles to destroy cancer cells.

Radiation is seldom part of the treatment for patients with chronic myeloid leukemia (CML), but it might be used in certain situations.

Surgery for Chronic Myeloid Leukemia

- [Splenectomy](#)
- [More information about Surgery](#)

Leukemia cells spread widely throughout the bone marrow and other organs, so surgery cannot be used to cure this type of cancer. Surgery rarely has any role even in diagnosing chronic myeloid leukemia (CML), since a blood test or [bone marrow aspirate and biopsy](#)¹ are usually all that's needed.

Splenectomy

If leukemia spreads to the spleen, it can become large enough to compress nearby organs and cause symptoms. If [chemotherapy](#) or [radiation](#) doesn't help shrink the spleen, it may be removed with surgery. This operation, called a splenectomy, is meant to improve the symptoms of an enlarged spleen — it has no role in curing CML.

Splenectomy may also improve blood cell counts and lower the need for [blood product transfusions](#)². One of the spleen's normal functions is to remove worn-out blood cells from the bloodstream. If leukemia or other diseases cause the spleen to become too large, it may become too active in removing blood cells, leading to a shortage of red blood cells or platelets. Taking out the spleen may improve red blood cell and platelet counts in some patients.

Most people have no problem living without a spleen, but the risk for certain bacterial infections is increased. This is why doctors often recommend certain vaccines be given before the spleen is removed.

More information about Surgery

For more general information about surgery as a treatment for cancer, see [Cancer Surgery](#)³.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁴.

Hyperlinks

1. www.cancer.org/cancer/types/chronic-myeloid-leukemia/detection-diagnosis-staging/how-diagnosed.html
www.cancer.org/cancer/managing-cancer/treatment-types/blood-transfusion-and-donation.html

Stem Cell Transplant for Chronic Myeloid Leukemia

Because allogeneic SCT offers the only proven chance to cure CML, doctors may still recommend a transplant for younger patients, particularly children. Transplant is more likely to be considered for those with an available matched donor, like a well-matched brother or sister.

Transplant may also be considered if CML is not responding well to TKI. It's an important option for people with CML that's advancing to or diagnosed in the accelerated or blast phases.

What is a stem cell transplant?

The usual doses of chemotherapy drugs can cause serious side effects by damaging

or even life-threatening complications and side effects, and it's often not be a good option in people who are older or have other health problems.

More information about stem cell transplant

To learn more about stem cell transplants, including how they are done and their potential side effects, see [Stem Cell Transplant for Cancer](#)¹.

For more general information about side effects and how to manage them, see [Managing Cancer-related Side Effects](#)².

Hyperlinks

1. www.cancer.org/cancer/managing-cancer/treatment-types/stem-cell-transplant.html
2. www.cancer.org/cancer/managing-cancer/side-effects.html
3. www.cancer.org/cancer/types/chronic-myeloid-leukemia/references.html

References

[See all references for Chronic Myeloid Leukemia](#)

Jabbour E, Kantarjian H. Chronic myeloid leukemia: 2018 update on diagnosis, therapy and monitoring. *Am J Hematol*. 2018;93(3):442-459.

National Comprehensive Cancer Network, Clinical Practice Guidelines in Oncology (NCCN Guidelines®), Chronic Myeloid Leukemia, Version 4.2018 -- January 24, 2018. Accessed at www.nccn.org/professionals/physician_gls/pdf/cml.pdf on May 16, 2018.

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How Do You Know If Treatment for Chronic Myeloid Leukemia Is Working?

- [Hematologic response](#)
- [Cytogenetic response](#)
- [Molecular response](#)

If you are being treated for chronic myeloid leukemia (CML), your doctor will check your blood counts, examine you, and do other tests like bone marrow biopsies and lab tests of blood and/or bone marrow samples. (These tests are discussed in [Tests for Chronic Myeloid Leukemia¹](#).)

These check-ups will be at least every 3 months for at least the first year of treatment. They're done to see how well the CML is responding to treatment. If the CML is not responding, you may need to switch to another drug.

Studies have suggested that a fast response (within 3 to 6 months) is linked to better outcomes.

Doctors look for different kinds of responses to treatment.

Hematologic response

Hematologic response is based mainly on if the numbers of cells in your blood have returned to normal. The main test used to measure this is a complete blood count (CBC). It's done on a sample of blood taken from your arm.

- **Complete hematologic response (CHR):** This means your white blood cell and platelet counts have returned to normal, there are no immature cells seen in your blood, and your spleen is back to a normal size.

Cytogenetic response

Cytogenetic response is based on the percentage of cells in a sample of your bone marrow that have the Philadelphia chromosome (and therefore are CML cells). This can be determined with either cytogenetics or FISH testing, both of which can find altered (mutated) chromosomes.

- A **major cytogenetic response** means no more than 35% of the cells in the bone marrow have the Philadelphia chromosome. A major response can be either complete or partial: A **complete cytogenetic response** means no (or less than 1% of) cells in the bone marrow have the Philadelphia chromosome. A **partial cytogenetic response** means between 1% and 35% of the cells in the bone marrow still have the Philadelphia chromosome.
- A **minor cytogenetic response** means that 36% to 65% of the cells in the bone marrow still have the Philadelphia chromosome.
- A **minimal cytogenetic response** means that 66% to 95% of the cells in the bone marrow still have the Philadelphia chromosome.
- **No response** means that more than 95% of the bone marrow cells still have the Philadelphia chromosome.

Molecular response

Molecular response is based on how much of the *BCR-ABL* gene (which is found in CML cells) can be detected by the PCR test. This test can be done on either your blood or bone marrow.

- A **complete molecular response (CMR)** means that the PCR test does not find the *BCR-ABL* gene.
- A **major molecular response (MMR)** means that the amount of *BCR-ABL* gene in your blood or bone marrow is 1/1000th (or less) of what's expected in someone with untreated CML.

You may hear the terms **long-term deep molecular response** or **durable complete molecular response**. This is a long-lasting complete molecular response. It's the goal of CML treatment.

Hyperlinks

1. www.cancer.org/cancer/types/chronic-myeloid-leukemia/detection-diagnosis-staging/how-diagnosed.html

2. www.cancer.org/cancer/types/chronic-myeloid-leukemia/references.html

References

[See all references for Chronic Myeloid Leukemia](#)

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Treating Chronic Myeloid Leukemia by Phase

- [Chronic phase](#)
- [Monitoring treatment results](#)
- [How often is treatment successful?](#)
- [If the first treatment doesn't work](#)
- [Treating CML after a stem cell transplant](#)
- [Accelerated phase](#)
- [Blast phase](#)
- [CML with the T315I mutation](#)

Treatment options for people with chronic myeloid leukemia (CML) depend on the [phase](#)¹ of their disease (chronic, accelerated, or blast phase), their age, other prognostic factors, and the availability of a stem cell donor with matching tissue type.

Chronic phase

The standard treatment for chronic phase CML is a [tyrosine kinase inhibitor](#) (TKI) like imatinib (Gleevec), nilotinib (Tasigna), dasatinib (Sprycel), or bosutinib (Bosulif). If the first drug stops working or it never really worked well at all, the dose may be increased or another TKI might be tried. Ponatinib (Iclusig) is an option after all of the other TKIs have been tried or if the leukemia cells later develop the **T315I mutation** (see more on

this below).

Switching to another TKI is also an option if a person can't take the first drug because of side effects.

Rarely, people in chronic phase may be treated with an allogeneic stem cell transplant (SCT). This treatment is discussed in detail in [Stem Cell Transplant for Chronic Myeloid Leukemia](#).

Monitoring treatment results

Monitoring the patient to see how they respond to treatment is very important. Blood counts are checked often. The blood is also checked with a polymerase chain reaction (PCR) test to measure the amount of the *BCR-ABL* gene. The bone marrow is checked, too, to see if the Philadelphia chromosome is there. Testing for the *BCR-ABL* gene or the Philadelphia chromosome is usually done about 3 months after a TKI is started, and then every 3 to 6 months after that. If the results show that treatment is working well, the patient stays on their current drug. If the results show that treatment isn't working well, and the patient is taking the drug the way they should, a new drug or treatment may be needed.

If the CML is responding well to treatment, 3 months after starting treatment, the patient should have:

- A complete hematologic response (CHR), and
- Some type of cytogenetic response, and/or
- A reduction of the number of copies of *BCR-ABL* on the PCR test by 90% or more

If treatment is working well, 18 months after starting treatment, the patient should have:

- A complete hematologic response (CHR), and
- A complete cytogenetic response (CCyR), and/or
- A major molecular response (MMR)

For more on these different types of response, see [How Do You Know If Treatment for Chronic Myeloid Leukemia Is Working?](#)

How often is treatment successful?

for the transplant (called **donor lymphocyte infusion**). This can induce an immune reaction against the leukemia. Other drugs may also be helpful. Most experts agree that these patients should take part in a clinical trial.

In patients who **do** have GVHD after a stem cell transplant, boosting the immune system further is not likely to help. These patients are often treated with a TKI like imatinib.

Accelerated phase

When CML is in accelerated phase, leukemia cells begin to build up in the body quickly, causing symptoms. The leukemia cells often acquire new gene mutations, which help them grow and might make treatments less effective.

The treatment options for accelerated phase CML depend on what treatments the patient has already had. In general, the options are a lot like those for patients with chronic phase CML. But patients with accelerated phase CML are less likely to have a long-term response to any treatment.

If the patient hasn't had any treatment, a **TKI** will be used. Imatinib (often at higher doses than used for chronic phase CML) is an option for most people. Most patients in this phase respond to treatment with imatinib, but the responses do not seem to last as long as they do in patients in the chronic phase. The newer drugs like dasatinib and nilotinib are often used in this phase, and other drugs are under study.

If the patient is already getting imatinib, the dose may be increased. Another option is to switch to one of the other TKIs. Sometimes the CML cells are tested to see if they have genetic changes (mutations) that may mean that a certain TKI is more or less likely to work (see the section below called CML with the T315I mutation). In CML without that mutation, ponatinib is an option after all of the other TKIs have been tried.

Interferon is another option, but it's also much less effective in this phase than in the chronic phase. Some patients have some response when chemo is added to the TKI, but these responses are usually shorter than 6 months.

An **allogeneic stem cell transplant** may be the best option for most patients who are young and healthy enough to have this treatment. Most doctors prefer that the leukemia be controlled, preferably in remission, before starting the transplant procedure. To achieve this, **chemo** will often be used.

In some cases, an autologous SCT may be an option to try to get the CML back into the

chronic phase, but it's very unlikely to result in a cure.

Blast phase

In the blast phase of CML, the leukemia cells become more abnormal. The disease acts like an acute leukemia, with blood counts getting higher and symptoms appearing or getting worse.

For people with blast phase CML who haven't been treated before, high-dose imatinib may be helpful. But it works in a smaller number of people and for shorter lengths of time than when used earlier in the course of the disease. Newer [TKIs](#), such as dasatinib, nilotinib, and bosutinib, seem to be better in this phase, particularly if they hadn't been used earlier. Ponatinib may also be used, but only after all of the other TKIs have been tried. Patients who respond to these drugs may want to consider a [stem cell transplant](#), if possible.

Most often, the leukemia cells in this phase act like cells of [acute myeloid leukemia \(AML\)](#)², but they're often resistant to the chemo drugs normally used to treat AML. Standard chemo for AML will bring about a remission in about 1 out of 5 patients, but this is usually short-lived. If remission does occur, it may be a chance to consider some type of stem cell transplant.

A smaller number of patients have blast cells that act like cells of acute lymphoblastic leukemia (ALL). These cells are more sensitive to chemo drugs. Remissions can be induced in about half of these patients with drugs like vincristine, prednisone, and doxorubicin, along with imatinib, if that hasn't been given yet. Like patients with ALL, these patients are at risk for having leukemia cells in the fluid that surrounds the brain and spinal cord, so they often get chemo (cytarabine or methotrexate) put directly into that fluid (like during a spinal tap). Radiation therapy to the brain is another option, but is used less often. For more information, see [Acute Lymphocytic Leukemia](#)³.

Allogeneic SCT is less successful for blast phase CML than for earlier phases, and the long-term survival rate is less than 20%. Still, it's the only known option that may cure the disease. It's more likely to work if the CML can be brought back to the chronic phase before the transplant.

Because most patients with blast phase CML can't be cured, [palliativetreatment](#)⁴ (intended to relieve symptoms rather than cure the disease) is important. For instance, radiation therapy can help shrink an enlarged spleen or reduce pain from areas of bone damaged by leukemia. [Chemo](#) (usually with drugs such as hydroxyurea) may relieve some symptoms for a time.

[Clinical trials](#)⁵ of new combinations of chemo, targeted agents, and biologic therapies are important options.

CML with the *T315I* mutation

As was mentioned in the section about [targeted therapy](#), in some patients on TKI treatment, the cancer cells develop a gene change called the *T315I mutation* that keeps most of the TKIs from working. If your CML stops responding to treatment with a TKI, another one may be tried. Your doctor may also check to see if the cancer cells have developed the *T315I* mutation. If they have, you may be switched to ponatinib or asciminib, which are the only two TKIs that work for CML with this mutation. If these drugs don't work or you can't take them because of side effects, you may be started on chemotherapy (chemo). Omacetaxine (Synribo[®]) is a newer chemo drug that has been shown to help sometimes in this situation, but other chemo drugs may help, too.

Hyperlinks

1. www.cancer.org/cancer/types/chronic-myeloid-leukemia/detection-diagnosis-staging/staging.html
2. www.cancer.org/cancer/types/acute-myeloid-leukemia.html
3. www.cancer.org/cancer/types/acute-lymphocytic-leukemia.html
4. www.cancer.org/cancer/managing-cancer/palliative-care.html
5. www.cancer.org/cancer/managing-cancer/making-treatment-decisions/clinical-trials.html
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Written by

The American Cancer Society medical and editorial content team
(<https://www.cancer.org/cancer/acs-medical-content-and-news-staff.html>)

Our team is made up of doctors and oncology certified nurses with deep knowledge of cancer care as well as editors and translators with extensive experience in medical writing.

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