Acute Myeloid Leukemia Early Detection, Diagnosis, and Types

Detection and Diagnosis

Catching cancer early often allows for more treatment options. Some early cancers may have signs and symptoms that can be noticed, but that is not always the case.

- Can Acute Myeloid Leukemia Be Found Early?
- Signs and Symptoms of Acute Myeloid Leukemia
- How Is Acute Myeloid Leukemia Diagnosed?

Types of AML

Learn how AML is classified and how this may affect your treatment options.

- How Is Acute Myeloid Leukemia Classified?

Questions to Ask About AML

Here are some questions you can ask your cancer care team to help you better understand your AML diagnosis and treatment options.

- What Should You Ask Your Doctor About Acute Myeloid Leukemia?

Can Acute Myeloid Leukemia Be Found Early?

For many types of cancer, finding the cancer early makes it easier to treat. The American Cancer Society recommends screening tests for early detection of certain
cancers in people without any symptoms.

But at this time, there are no special tests recommended to find acute myeloid leukemia (AML) early. The best way to find leukemia early is to report any possible symptoms of leukemia to the doctor right away.

Some people are known to be at increased risk of AML because they have certain blood disorders (such as myelodysplastic syndrome) or inherited disorders (such as Down syndrome), or because they were treated with certain chemotherapy drugs or radiation. Most doctors recommend that these people get careful, regular medical checkups. These people don’t usually develop leukemia, but they and their doctors should be familiar with the possible symptoms of AML.

- References
See all references for Acute Myeloid Leukemia

Last Medical Review: December 9, 2014 Last Revised: February 22, 2016

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**Signs and Symptoms of Acute Myeloid Leukemia**

Acute myeloid leukemia (AML) can cause many different signs and symptoms. Some are more common with certain subtypes of AML.

**General symptoms**

Patients with AML often have several non-specific (general) symptoms. These can include:

- Weight loss
- Fatigue
- Fever
- Night sweats
• Loss of appetite

Of course, these are not just symptoms of AML, and more often are caused by something other than leukemia.

**Problems caused by low numbers of blood cells**

Many signs and symptoms of AML result from a shortage of normal blood cells, which happens when the leukemia cells crowd out the normal blood-making cells in the bone marrow. As a result, people do not have enough normal red blood cells, white blood cells, and blood platelets. These shortages show up on blood tests, and they can also cause symptoms.

**Symptoms from low red blood cell counts (anemia):** Red blood cells carry oxygen to all of the cells in the body. A shortage of red blood cells can cause:

• Tiredness (fatigue)
• Weakness
• Feeling cold
• Feeling dizzy or lightheaded
• Headaches
• Shortness of breath

**Symptoms from low white blood cell counts:** Infections can occur because of a shortage of normal white blood cells (called leukopenia) or a shortage of normal neutrophils (called neutropenia). Neutrophils are a type of white blood cell needed to fight infections from bacteria. Patients with AML can get infections that don’t seem to go away or may get one infection after another. Fever often goes along with the infection.

Although people with AML may have high white blood cell counts due to excess numbers of leukemia cells, these cells don’t protect against infection the way normal white blood cells do.

**Symptoms from low blood platelet counts:** Platelets in the blood normally help stop bleeding. A shortage of blood platelets (called thrombocytopenia) can lead to:

• Excess bruising and bleeding
• Frequent or severe nosebleeds
• Bleeding gums

**Symptoms caused by high numbers of leukemia cells**
The cancer cells in AML (called blasts) are bigger than normal white blood cells and have more trouble going through tiny blood vessels. If the blast count gets very high, these cells can clog up blood vessels and make it hard for normal red blood cells (and oxygen) to get to tissues. This is called leukostasis. Leukostasis is rare, but it is a medical emergency that needs to be treated right away. Some of the symptoms are like those seen with a stroke, and include:

- Headache
- Weakness in one side of the body
- Slurred speech
- Confusion
- Sleepiness

When blood vessels in the lungs are affected, patients have problems with shortness of breath. Blood vessels in the eye can be affected as well, leading to blurry vision or even loss of vision.

**Bleeding and clotting problems**

Patients with a certain type of AML called acute promyelocytic leukemia (APL) might go to the doctor with problems with bleeding and clotting. They may have a nose bleed that won’t stop, or a cut that won’t stop oozing. They may also have calf swelling from a blood clot called a deep venous thrombosis (DVT) or chest pain and shortness of breath from a blood clot in the lung (called a pulmonary embolism or PE).

**Bone or joint pain**

Some patients have bone pain or joint pain caused by the buildup of leukemia cells in these areas.

**Swelling in the abdomen**

Leukemia cells may collect in the liver and spleen, causing them to enlarge. This may be noticed as a fullness or swelling of the belly. The lower ribs usually cover these organs, but when they are enlarged the doctor can feel them.

**Spread to the skin**

If leukemia cells spread to the skin, they can cause lumps or spots that may look like common rashes. A tumor-like collection of AML cells under the skin or other parts of the
body is called a chloroma, granulocytic sarcoma, or myeloid sarcoma. Rarely, AML can first appear as only a chloroma with no leukemia cells in the bone marrow.

Spread to the gums

Certain types of AML may spread to the gums, causing swelling, pain, and bleeding.

Spread to other organs

Sometimes, leukemia cells can spread to other organs. Spread to the brain and spinal cord can cause symptoms such as:

- Headaches
- Weakness
- Seizures
- Vomiting
- Trouble with balance
- Facial numbness
- Blurred vision

On rare occasions AML can spread to the eyes, testicles, kidneys, or other organs.

Enlarged lymph nodes

In rare cases, AML can spread to lymph nodes (bean-sized collections of immune cells throughout the body), causing them to get bigger. Affected nodes in the neck, groin, underarm areas, or above the collarbone may be felt as lumps under the skin.

Although any of the symptoms and signs above may be caused by AML, they can also be caused by other conditions. Still, if you have any of these problems, it’s important to see a doctor so the cause can be found and treated, if needed.

- References
See all references for Acute Myeloid Leukemia

Last Medical Review: December 9, 2014 Last Revised: February 22, 2016

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How Is Acute Myeloid Leukemia Diagnosed?

Certain signs and symptoms might suggest that a person could have acute myeloid leukemia (AML), but tests are needed to confirm the diagnosis.

**Medical history and physical exam**

If signs or symptoms suggest you might have leukemia, the doctor will want to get a thorough medical history, including how long you have had symptoms and whether or not you have any risk factors.

During the physical exam, the doctor will likely pay close attention to your eyes, mouth, skin, lymph nodes, liver, spleen, and nervous system, and will look for areas of bleeding or bruising, or possible signs of infection.

If there is reason to think there might be problems caused by abnormal blood cells (anemia, infections, bleeding or bruising, etc.), you will get tests to check your blood cell counts. You might also be referred to a hematologist, a doctor who specializes in diseases of the blood (including leukemia).

**Types of samples used to test for acute myeloid leukemia**

If signs and symptoms and/or the results of the physical exam suggest you might have leukemia, the doctor will need to check samples of cells from your blood and bone marrow to be sure. Other tissue and cell samples may also be taken in order to help guide treatment.

**Blood samples**

Blood samples for tests for AML are generally taken from a vein in the arm.

**Bone marrow samples**
Bone marrow samples are obtained from 2 tests that are usually done at the same time:

- Bone marrow aspiration
- Bone marrow biopsy

The samples are usually taken from the back of the pelvic (hip) bone, but sometimes other bones are used instead. If only an aspiration is to be done, it may be taken from the sternum (breast bone).

In bone marrow aspiration, you lie on a table (either on your side or on your belly). The doctor will clean the skin over the hip and then numb the area and the surface of the bone by injecting a local anesthetic. This may cause a brief stinging or burning sensation. A thin, hollow needle is then inserted into the bone, and a syringe is used to suck out a small amount of liquid bone marrow. Even with the anesthetic, most patients still have some brief pain when the marrow is removed.

A bone marrow biopsy is usually done just after the aspiration. A small piece of bone and marrow is removed with a slightly larger needle that is pushed down into the bone. This causes a feeling of pressure and may also cause some brief pain. Once the biopsy is done, pressure will be applied to the site to help prevent bleeding.

These bone marrow tests are used to help diagnose leukemia, but they are also repeated later to tell if the leukemia is responding to treatment.

**Spinal fluid**

The cerebrospinal fluid (CSF) is the liquid that surrounds the brain and spinal cord. AML can sometimes spread to the area around the brain and spinal cord. To check for this spread, doctors remove a sample of CSF for testing. The procedure used to remove this fluid is called a *lumbar puncture* (spinal tap). A lumbar puncture is not often used to test for AML, unless the patient is having symptoms that could be caused by leukemia cells spreading into the brain and spinal cord.

For this test, the patient may lie on his side or sit up. The doctor first numbs an area of skin on the lower part of the back over the spine. A small, hollow needle is then inserted between the bones of the spine into the area around the spinal cord to withdraw some of the fluid. A lumbar puncture is sometimes used to deliver chemotherapy drugs into the CSF to help prevent or treat the spread of leukemia to the spinal cord and brain.

**Lab tests used to diagnose and classify acute myeloid leukemia**
One or more of the following lab tests may be done on the samples to diagnose AML and/or to determine the specific subtype of AML.

**Complete blood count and peripheral blood smear**

The complete blood count (CBC) is a test that measures the amounts of different cells in the blood, such as the red blood cells, white blood cells, and platelets. This test is often done along with a differential (or diff), which looks at the numbers of the different types of white blood cells. For the peripheral blood smear, a sample of blood is looked at under the microscope. Changes in the numbers and the appearance of different types of blood cells often help diagnose leukemia.

Most patients with AML have too many immature white cells in their blood, and not enough red blood cells or platelets. Many of the white blood cells may be myeloblasts (often just called blasts), which are immature blood-forming cells that are not normally found in the blood. These immature cells don’t work like normal, mature white blood cells. These findings may suggest leukemia, but the disease usually is not diagnosed without looking at a sample of bone marrow cells.

**Blood chemistry and coagulation tests**

These tests measure the amounts of certain chemicals in the blood and the ability of the blood to clot. These tests are not used to diagnose leukemia, but they can help detect liver or kidney problems, abnormal levels of certain minerals in the blood, or problems with blood clotting.

**Routine microscopic exams**

Samples of blood, bone marrow, or CSF are looked at under a microscope by a pathologist (a doctor specializing in lab tests) and may be reviewed by the patient’s hematologist/oncologist (a doctor specializing in cancer and blood diseases).

The doctors will look at the size, shape, and other traits of the white blood cells in the samples to classify them into specific types.

A key element is whether the cells look mature (like normal blood cells) or immature (lacking features of normal blood cells). The most immature cells are called myeloblasts (or blasts for short).

The percentage of blasts in the bone marrow or blood is particularly important. Having
at least 20% blasts in the marrow or blood is generally required for a diagnosis of AML. It can also be diagnosed if the blasts are found (using another test) to have a chromosome change that occurs only in a specific type of AML, even if the blast percentage doesn’t reach 20%. Sometimes the blasts look like normal immature cells in the bone marrow. But in normal bone marrow, the blast count is 5% or less.

Sometimes just counting and looking at the cells isn’t enough to provide a clear diagnosis. Additional tests may be used to confirm the diagnosis of AML.

**Cytochemistry**

For cytochemistry tests, cells are exposed to chemical stains (dyes) that react with only some types of leukemia cells. These stains cause color changes that can be seen under a microscope, which can help the doctor determine what types of cells are present. For instance, one stain can help distinguish AML cells from acute lymphocytic leukemia (ALL) cells. The stain causes the granules of most AML cells to appear as black spots under the microscope, but it does not cause ALL cells to change colors.

**Flow cytometry and immunohistochemistry**

Flow cytometry is often used to look at the cells from bone marrow and blood samples. It is very helpful in determining the exact type of leukemia.

The test looks for certain substances on the surface of cells that help identify what types of cells they are. A sample of cells is treated with special antibodies (man-made immune system proteins) that stick to the cells only if they have these substances. The cells are then passed in front of a laser beam. If the cells now have antibodies attached to them, the laser will make them give off light, which can be measured and analyzed by a computer. Groups of cells can be separated and counted by these methods.

In immunohistochemistry tests, cells from the blood or bone marrow samples are also treated with special antibodies. But instead of using a laser and computer, the sample is treated so that certain types of cells change color when seen under a microscope.

These tests are used for *immunophenotyping* – classifying leukemia cells according to the substances (antigens) on their surfaces. Leukemia cells can have different antigens depending on which type of cells they start in and how mature they are, and this information can be helpful in AML classification.

**Cytogenetics**
For this test, a cell’s chromosomes (long strands of DNA) are looked at under a microscope. Normal human cells contain 23 pairs of chromosomes, each of which are a certain size and stain a certain way. In some cases of AML, the cells have chromosome changes that can be seen under a microscope.

For instance, 2 chromosomes may swap some of their DNA, so that part of one chromosome becomes attached to part of a different chromosome. This change, called a translocation, can usually be seen under a microscope. Other types of chromosome changes are also possible (see below). Recognizing these changes can help identify certain types of AML and can be important in determining a patient’s outlook.

It usually takes about 2 to 3 weeks to get results for this test because the leukemia cells must be grown in lab dishes for a couple of weeks before their chromosomes can be looked at under the microscope.

The results of cytogenetic testing are written in a shorthand form that describes the chromosome changes:

- A translocation, written as t(8;21), for example, means a part of chromosome 8 is now located on chromosome 21, and vice versa.
- An inversion, written as inv(16), for example, means that part of the chromosome 16 is now in reverse order but is still attached to the chromosome.
- A deletion, written as del(7) or -7, for example, indicates part of chromosome 7 has been lost.
- An addition or duplication, +8, for example, means that all or part of chromosome 8 has been duplicated, and too many copies of it are found within the cell.

Not all chromosome changes can be seen under a microscope. Other lab tests can often detect these changes.

**Fluorescent in situ hybridization (FISH)**

This is similar to cytogenetic testing. It uses special fluorescent dyes that only attach to specific genes or parts of particular chromosomes. FISH can find the chromosome changes (such as translocations) that are visible under a microscope in standard cytogenetic tests, as well as some changes too small to be seen with usual cytogenetic testing.

FISH can be used to look for changes in specific genes or parts of chromosomes. It can be used on regular blood or bone marrow samples without growing them in a lab first. This means the results are often available more quickly than with regular cytogenetic
testing. The drawback is that it only looks for certain gene or chromosome changes, so the doctor has to know what he or she is looking for before the test is run.

**Polymerase chain reaction (PCR)**

This is a very sensitive test that can also find some gene and chromosome changes too small to be seen under a microscope. It is helpful in finding gene changes that are in only a few cells, making it good for finding small numbers of leukemia cells in a sample (like after treatment). Like FISH, this test only looks for certain gene or chromosome changes, so the doctor has to know what he or she is looking for before the test is run.

**Imaging tests for acute myeloid leukemia**

Imaging tests use x-rays, sound waves, magnetic fields, or radioactive particles to create pictures of the inside of the body. Leukemia doesn’t usually form tumors, so imaging tests are not often helpful in making the diagnosis. When imaging tests are done in people with AML, it is most often to look for infections or other problems, rather than to look for the leukemia itself. In a few cases, imaging tests may be done to help determine the extent of the disease, if it is thought it may have spread beyond the bone marrow and blood.

**X-rays**

Routine chest x-rays may be done if a lung infection is suspected.

**Computed tomography (CT) scan**

This test can help show if any lymph nodes or organs in your body are enlarged. It isn’t usually needed to diagnose AML, but it may be done if your doctor suspects the leukemia is growing in an organ, like your spleen.

The CT scan uses x-rays to make detailed, cross-sectional images of your body. Unlike a regular x-ray, CT scans can show the detail in soft tissues (such as internal organs).

Before the test, you may be asked to drink a contrast solution and/or get an intravenous (IV) injection of a contrast dye that helps better outline abnormal areas in the body. You may need an IV line through which the contrast dye is injected. Injecting contrast dye can cause a feeling of flushing or warmth, in the face or elsewhere. Some people get hives or, rarely, more serious allergic reactions like trouble breathing and low blood
pressure. Be sure to tell the doctor if you have any allergies or have ever had a reaction to any contrast material used for x-rays.

A CT scanner has been described as a large donut, with a narrow table that slides in and out of the middle opening. You need to lie still on the table while the scan is being done. CT scans take longer than regular x-rays, and you might feel a bit confined by the ring while the pictures are being taken.

**CT-guided needle biopsy:** In some cases, a CT can be used to guide a biopsy needle into a suspected abnormality, such as an abscess. For this procedure, you lie on the CT scanning table while the doctor moves a biopsy needle through the skin and toward the mass. CT scans are repeated until the needle is within the mass. A sample is then removed and sent to the lab to be looked at under a microscope.

**PET/CT:** Some machines combine the CT scan with a PET scan (PET/CT scan). For a PET scan, glucose (a form of sugar) containing a radioactive atom is injected into the blood. Because cancer cells in the body grow rapidly, they absorb large amounts of the radioactive sugar. A special camera can then create a picture of areas of radioactivity in the body. With a PET/CT scan, the doctor can compare areas of higher radioactivity on the PET scan with the more detailed appearance of that area on the CT.

**Magnetic resonance imaging (MRI) scan**

Like CT scans, MRI scans make detailed images of soft tissues in the body. But MRI scans use radio waves and strong magnets instead of x-rays. A contrast material is often injected into a vein before the scan to better see details. This contrast is not the same as the contrast used for CT scans, but allergic reactions can still occur.

MRI scans are very helpful in looking at the brain and spinal cord, but they are not usually needed in people with AML.

MRI scans take longer than CT scans – often up to an hour. You might have to lie inside a narrow tube, which is confining and can be distressing to some people. Newer, more open MRI machines may be another option. The MRI machine makes loud buzzing and clicking noises that you may find disturbing. Some places give you headphones or earplugs to help block this noise out.

**Ultrasound**

Ultrasound uses sound waves and their echoes to make pictures of internal organs or masses.
Ultrasound can be used to look at lymph nodes near the surface of the body or to look inside your abdomen for enlarged lymph nodes or organs such as the liver, spleen, and kidneys. (It can’t be used to look inside the chest because the ribs block the sound waves.) It is sometimes used to help guide a biopsy needle into an enlarged lymph node.

For this test, a small, microphone-like instrument called a transducer is usually placed on the skin over the area to be examined (the skin is first lubricated with gel). It gives off sound waves and picks up the echoes as they bounce off the organs. The echoes are converted by a computer into an image on a computer screen.

This is an easy test to have, and it uses no radiation. For most scans, you simply lie on a table, and a technician moves the transducer over the part of your body being looked at.

- References

See all references for Acute Myeloid Leukemia

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**How Is Acute Myeloid Leukemia Classified?**

For most types of cancer, determining the stage (extent) of the cancer is very important. The stage is based on the size of the tumor and how far the cancer has spread. This can be helpful in predicting a person’s outlook and deciding on treatment.

Acute myeloid leukemia (AML), on the other hand, does not usually form tumors. It generally is in all of the bone marrow in the body and, in some cases, has spread to other organs, such as the liver and spleen. Therefore AML is not staged like most other cancers. The outlook for a person with AML depends instead on other information, such as the subtype of AML (determined by lab tests), the patient’s age, and other lab test results.
Knowing the subtype of AML can be very important, as it sometimes affects both a patient’s outlook and the best treatment. For example, the acute promyelocytic leukemia (APL) subtype is often treated using drugs that are different from those used for other subtypes of AML.

Two of the main systems that have been used to classify AML into subtypes are the French-American-British (FAB) classification and the newer World Health Organization (WHO) classification.

The French-American-British (FAB) classification of AML

In the 1970s, a group of French, American, and British leukemia experts divided AML into subtypes, M0 through M7, based on the type of cell from which the leukemia develops and how mature the cells are. This was based largely on how the leukemia cells looked under the microscope after routine staining.

- **FAB subtype**
  - Name
  - M0
    - Undifferentiated acute myeloblastic leukemia
  - M1
    - Acute myeloblastic leukemia with minimal maturation
  - M2
    - Acute myeloblastic leukemia with maturation
  - M3
    - Acute promyelocytic leukemia (APL)
  - M4
    - Acute myelomonocytic leukemia
  - M4
    - Acute myelomonocytic leukemia with eosinophilia
  - M5
    - Acute monocytic leukemia
  - M6
    - Acute erythroid leukemia
  - M7
    - Acute megakaryoblastic leukemia

Subtypes M0 through M5 all start in immature forms of white blood cells. M6 AML starts in very immature forms of red blood cells, while M7 AML starts in immature forms of cells that make platelets.

World Health Organization (WHO) classification of AML
The FAB classification system is useful and is still commonly used to group AML into subtypes. But it doesn’t take into account many of the factors that are now known to affect prognosis (outlook). The World Health Organization (WHO) has developed a newer system that includes some of these factors to try to better classify AML.

The WHO system divides AML into several groups:

**AML with certain genetic abnormalities**

- AML with a translocation between chromosomes 8 and 21
- AML with a translocation or inversion in chromosome 16
- AML with a translocation between chromosomes 9 and 11
- AML with a translocation between chromosomes 6 and 9
- AML with a translocation or inversion in chromosome 3
- AML (megakaryoblastic) with a translocation between chromosomes 1 and 22

**AML with myelodysplasia-related changes**

**AML related to previous chemotherapy or radiation**

**AML not otherwise specified** (This includes cases of AML that don’t fall into one of the above groups, and is similar to the FAB classification.)

- AML with minimal differentiation (M0)
- AML without maturation (M1)
- AML with maturation (M2)
- Acute myelomonocytic leukemia (M4)
- Acute monocytic leukemia (M5)
- Acute erythroid leukemia (M6)
- Acute megakaryoblastic leukemia (M7)
- Acute basophilic leukemia
- Acute panmyelosis with fibrosis

**Myeloid sarcoma (also known as granulocytic sarcoma or chloroma)**

**Myeloid proliferations related to Down syndrome**

**Undifferentiated and biphenotypic acute leukemias** (leukemias that have both lymphocytic and myeloid features). Sometimes called ALL with myeloid markers, AML with lymphoid markers, or mixed phenotype acute leukemias.
Prognostic factors for acute myeloid leukemia

In recent years, research has focused on why some patients have a better chance to be cured than others. Differences among patients (or their leukemias) that affect response to treatment are called **prognostic factors**. Prognostic factors help doctors decide if people with a certain type of AML should get more or less treatment. Some of these include:

**Chromosome abnormalities**

AML cells can have many kinds of chromosome changes, some of which can affect a person's prognosis. Those listed below are some of the most common, but there are many others. Not all patients have these abnormalities. Patients without any of these usually have an outlook that is between favorable and unfavorable.

**Favorable abnormalities:**

- Translocation between chromosomes 8 and 21 (seen most often in patients with M2)
- Inversion of chromosome 16 (seen most often in patients with M4 eos) or a translocation between chromosome 16 and itself
- Translocation between chromosomes 15 and 17 (seen most often in patients with M3)

**Unfavorable abnormalities:**

- Deletion (loss) of part of chromosome 5 or 7 (no specific AML type)
- Translocation or inversion of chromosome 3
- Translocation between chromosomes 6 and 9
- Translocation between chromosomes 9 and 22
- Abnormalities of chromosome 11 (at the spot q23)
- Complex changes - those involving several chromosomes (no specific AML type)

**Gene mutations**

People whose leukemia cells have certain gene mutations may have a better or worse outlook.

For instance, about 1 patient out of 3 with AML has a mutation in the **FLT3** gene. These people tend to have a poorer outcome, but new drugs that target this abnormal gene
are now being studied, which may lead to better outcomes.

On the other hand, people with changes in the \textit{NPM1} gene (and no other abnormalities) seem to have a better prognosis than people without this change. Changes in the \textit{CEBPA} gene are also linked to a better outcome.

In the coming years, doctors will use newer lab tests to learn more about the underlying genetic defects that cause AML and how they can be used to predict a patient's prognosis. These genetic defects might also form the basis for treating these leukemias.

\textbf{Markers on the leukemia cells}

If the leukemia cells have the CD34 protein and/or the P-glycoprotein (\textit{MDR1} gene product) on their surface, it is linked to a worse outcome.

\textbf{Age}

Older patients (over 60) generally don't do as well as younger patients. Some of this may be because they are more likely to have unfavorable chromosome abnormalities. Older patients sometimes also have other medical conditions that can make it harder to treat them with more intense chemotherapy regimens.

\textbf{White blood cell count}

A high white blood cell count (>100,000) at the time of diagnosis is linked to a worse outlook.

\textbf{Prior blood disorder leading to AML}

Having a prior blood disorder such as a \textit{myelodysplastic syndrome} is linked to a worse outcome.

\textbf{Treatment-related AML}

AML that develops after treatment for another cancer tends is linked to a worse outcome.

\textbf{Infection}
Having an active systemic (blood) infection at the time of diagnosis makes a poor outcome more likely.

**Leukemia cells in the central nervous system**

Leukemia that has spread to the area around the brain and spinal cord can be hard to treat, since most chemotherapy drugs can’t reach that area.

**Status of acute myeloid leukemia after treatment**

Not surprisingly, how well (and how quickly) the leukemia responds to treatment also affects long-term prognosis. Better responses have been linked with better long-term outcomes.

A *remission (complete remission)* is usually defined as having no evidence of disease after treatment. This means the bone marrow contains fewer than 5% blast cells, the blood cell counts are within normal limits, and there are no signs or symptoms of the disease. A *molecular complete remission* means there is no evidence of leukemia cells in the bone marrow, even when using very sensitive tests, such as PCR (polymerase chain reaction).

*Minimal residual disease* is a term used after treatment when leukemia cells can’t be found in the bone marrow using standard tests (such as looking at cells under a microscope), but more sensitive tests (such as flow cytometry or PCR) find evidence that there are still leukemia cells in the bone marrow.

*Active disease* means that either there is evidence that the leukemia is still present during treatment or that the disease has come back after treatment (relapsed). For a patient to have relapsed, they must have more than 5% blast cells in their bone marrow.

- References

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

Last Medical Review: December 9, 2014 Last Revised: February 22, 2016

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What Should You Ask Your Doctor About Acute Myeloid Leukemia?

It is important to have open and honest communications with your doctor about your condition. Ask about anything you don’t understand or want to know more about. For instance, consider these questions:

- What kind of acute myeloid leukemia (AML) do I have?
- Are there any specific factors that might affect my prognosis?
- Do I need other tests before we can decide on treatment?
- Do I need to see any other doctors?
- How much experience do you and this medical center have treating this type of cancer?
- Should I get a second opinion?
- What are my treatment choices?
- Should we consider a stem cell transplant? When?
- Which treatment do you recommend, and why?
- What should I do to be ready for treatment?
- How long will treatment last? What will it be like? Where will it be done?
- What are the risks and side effects of treatment?
- How will treatment affect my daily activities?
- What is my prognosis?
- What will we do if the treatment doesn’t work or if the leukemia comes back?
- What type of follow-up will I need after treatment?

Be sure to write down any questions you have that are not on this list. For instance, you might want specific information about expected recovery times. Or you may want to ask about clinical trials for which you may qualify. Taking another person and/or a tape recorder to your appointments can be helpful.

Keep in mind, too, that doctors aren’t the only ones who can give you information. Other health care professionals, such as nurses and social workers, might be able to answer some of your questions. You can find out more about speaking with your health care team in Talking With Your Doctor.

- References
  See all references for Acute Myeloid Leukemia