



FRANKLY SPEAKING ABOUT CANCER

A PROGRAM OF THE CANCER SUPPORT COMMUNITY



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UNDERSTANDING MEASURABLE RESIDUAL DISEASE

What is Measurable Residual Disease (MRD)?

Even if you've had cancer treatment such as chemotherapy and reached remission, a small number of cancer cells can remain in your body. This is called measurable residual disease (MRD). It is sometimes referred to as minimal residual disease. These cancer cells may not be detected through normal lab tests, and you may not show any signs or symptoms of cancer.

MRD testing is so powerful because it can detect 1 cancer cell in 100,000 healthy cells and may even be able to detect 1 cancer cell in 1 million healthy white blood cells. Understanding how much MRD you have gives you and your doctor insights about how your body is responding to treatment. This form of personalized medicine allows treatment to be tailored to your unique needs. This means that you can get the best care available.

People without MRD may live longer without disease than those with MRD. Specifically, MRD testing can:

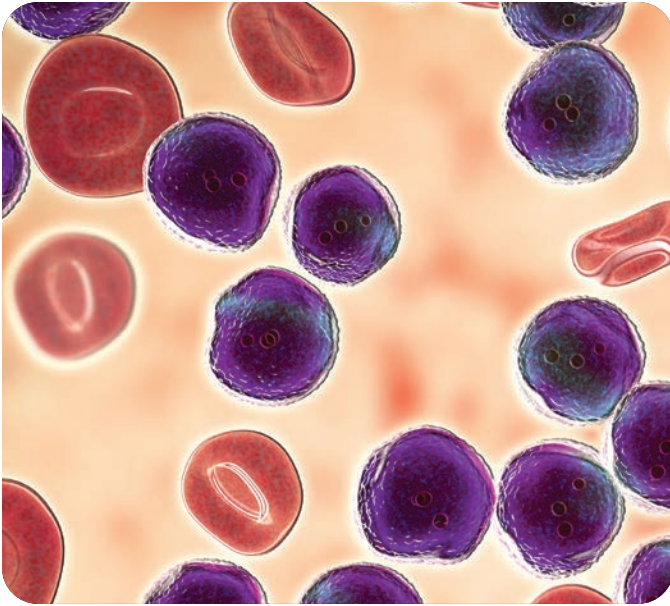
- Determine how your cancer is responding to a particular treatment
- Confirm and/or monitor remission
- Recognize cancer recurrence sooner than other tests

- Pinpoint if you might benefit from other treatments, such as combination therapy with stem cell transplantation

Three types of tests are available to assess MRD, with the testing method determined by the type of blood cancer you have. The main tests for MRD are:

1. **Flow cytometry**, which is performed using a bone marrow sample. Flow cytometry can find 1 cancer cell in 100,000 healthy bone marrow cells. Results are usually available in less than 1 day.
2. **Polymerase chain reaction (PCR)**, using either a blood sample or a bone marrow sample to recognize DNA specific to cancer cells. PCR can find 1 cancer cell in 100,000 to 1 million healthy bone marrow cells. Results may take several weeks.
3. **Next-generation sequencing (NGS)**, which requires a bone marrow sample to examine the DNA or RNA of cells for patients living with acute lymphoblastic leukemia. NGS is the most sensitive of the 3 tests. NGS can find 1 cancer cell in 1 million healthy bone marrow cells. Results are usually available within 1 week.





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How Are Measurable Residual Disease Results Used in ALL?

Acute lymphoblastic leukemia (ALL) is a type of cancer that begins in the immature white blood cells in the bone marrow, the hollow space inside your bones where blood is made. ALL can start in either B cells or T cells. These are both types of white blood cells. White blood cells are important to your immune system because they play a role in helping your body fight infection and disease. When you have ALL, the bone marrow makes too many of these white blood cells and they do not work properly. ALL is most common in children, teens, and young adults ages 15 to 39. But, it can happen at any age.

If you're living with ALL, your doctor may talk with you about MRD testing after induction therapy. The goal of induction therapy is to bring on, or induce, remission. This means that your body is free of signs and symptoms of cancer. Even if you reach remission, though, cancer cells may still be in your body. That's why MRD testing is an important part of treating children and adults living with ALL.

Testing MRD-positive means you have 0.1% or more cancer cells in your bone marrow sample. This amounts to 1 cancer cell in 1,000 healthy bone marrow cells. Research shows that MRD levels can predict the effectiveness of the treatment you received for ALL. Remaining traces of detectable cancer can also help determine if you're at higher risk for relapse and may need additional treatment. Specifically:

- If you test MRD-positive, your health care team may suggest consolidation treatment. This uses immunotherapy or chemotherapy to remove the remaining leukemia cells. MRD results may also show whether you'd benefit from stem cell transplant.
- If you test MRD-negative, it means that there are no detectable leukemia cells. While people who test MRD-negative are less likely to have their ALL come back, it is possible to test MRD-negative but still have your ALL return.

Immunotherapy Side Effects

Immunotherapy drugs are approved as part of consolidation therapy in ALL patients with complete remission after induction therapy who test MRD-positive. If you take these drugs, you may experience side effects. That's because immunotherapy treatments use your body's own immune system to target leukemia cells. The level of side effects that you might experience depends on many factors. This includes your individual body, your general health, and your age. Although side effects are common, it's important to remember:

- You're unlikely to experience all of the immunotherapy treatment side effects listed
- Your health care team will often be able to predict the onset, duration, and severity of side effects
- Immunotherapy side effects are almost always reversible and will go away once you complete therapy
- There's no connection between how severe your side effects are and the effectiveness of treatment
- Your health care team may be able to prevent or treat side effects

Common side effects when taking immunotherapy drugs include:

- Fever
- Neurotoxicity (seizures, confusion, disorientation, difficulty speaking or slurred speech, loss of balance, loss of consciousness)
- Headache
- Infection

An uncommon, but serious, side effect is cytokine release syndrome. Cytokines are released when T-cells (part of the body's immune system) are activated by immunotherapy treatments. Cytokine release syndrome often begins with fever and flu-like symptoms, but can worsen quickly and cause serious illness. Your health care team will monitor you closely for this syndrome. Your doctor can help manage and treat specific symptoms.

If you decide to take immunotherapy drugs and experience side effects, talk with your doctor. Also, visit www.CancerSupportCommunity.org/Cancer-Treatment-Side-Effects for information on managing specific side effects.



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How Are MRD Results Used in Other Cancers?

MRD monitoring is used to guide treatment decisions for blood cancers other than ALL, including AML, CML, lymphomas, and multiple myeloma. MRD helps to predict which patients are at greater risk of recurrence. This allows for early treatment before signs or symptoms develop. Patients who are MRD-positive after completing treatment may be candidates for continued or altered treatment.

Factors specific to your disease are used to determine when to test for MRD. For example, your doctor may recommend MRD testing:

- After the final cycle of a planned combination therapy
- After stem cell transplant
- During treatment to confirm the depth of remission
- At the 1-year point of maintenance therapy
- At regular intervals after treatment is completed

For instance, MRD results may be used with CML to decide whether to discontinue or change tyrosine kinase inhibitor (TKI) therapy. Your doctor may also use MRD results to determine how deep your CML remission is over time. Early in treatment, a decrease in cancer cells to 1/10th the starting level is important and called an early molecular response. If the levels go down 1,000 times below the starting level, it is called a major molecular response. Your doctor can follow the level even lower to deep molecular remission (DMR). After being in DMR for some time, your doctors may offer to take you off treatment and observe you closely for signs of recurrence. This is known as treatment-free remission.

When using MRD testing to follow your progress over time, make sure all the tests are being done by the same lab so you can compare numbers. Numbers for MRD are typically not standardized from lab to lab.



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Making Treatment Decisions

Making decisions about whether to undergo MRD testing or what to do with MRD test results can be daunting. Break your decision-making process into small steps by following these tips:

- Think about who you are, your goals, and your life situation
- Work with your health care team to develop a specific, written plan
- Remember that nurse practitioners, nurses, social workers, and navigators are there to help you
- Be selective about the information you find. Use proven, reliable sources
- Benefit from other people's experience, but don't assume your experience will be like theirs

In addition, ask your cancer care team the following questions:

- Do I need to have an MRD test? Why?
- When and how often should I have an MRD test?
- What does an MRD-positive or an MRD-negative result mean for me?
- How will MRD results affect my treatment plan?
- What types of MRD tests are available for my specific cancer? How do they vary in sensitivity and accuracy?
- Is MRD testing covered by insurance?
- Is financial assistance available?

For more information about making treatment decisions and to download our free booklet, visit [**www.CancerSupportCommunity.org/Decisions**](http://www.CancerSupportCommunity.org/Decisions).

What Does MRD Testing Cost?

Many new specialized tests, including MRD testing, can be expensive. Ask your health care plan before getting MRD testing or beginning any treatment. Find out exactly what is covered and what your cost will be. Not all labs can perform MRD testing. If the blood or bone marrow sample for MRD testing needs to be sent to an out-of-network lab, you may have to pay additional fees. MRD testing may also require preauthorization.

Many treatment centers have resources to help patients access programs that help cover the costs of testing and treatment. Ask your health care team for a financial counselor to talk through financial issues before beginning treatment. Ask if you qualify to get MRD testing or ALL therapy as part of a clinical trial where the testing and/or drug cost is covered. Call **888-793-9355** or visit **www.CancerSupportCommunity.org/Cost** for more help on coping with cancer costs.



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General Cancer Information, Survivorship, and Support

Cancer Support Community • 888-793-9355 • www.CancerSupportCommunity.org

American Cancer Society • 800-227-2345 • www.cancer.org

CancerCare • 800-813-4673 • www.cancercare.org

Cancer.Net • 888-651-3038 • www.cancer.net

National Cancer Institute (NCI) • 800-422-6237 • www.cancer.gov

NCI Clinical Trial Information • 800-422-6237 • www.cancer.gov/ClinicalTrials

Patient Advocate Foundation • 800-532-5274 • www.patientadvocate.org

Cancer Support Community Resources

The Cancer Support Community's resources and programs are available free of charge. To access any of these resources below call **888-793-9355** or visit www.CancerSupportCommunity.org.

Cancer Support Helpline® — Have questions, concerns or looking for resources? Call the Cancer Support Community's toll-free Cancer Support Helpline (**888-793-9355**), available in 200 languages Mon–Fri, 9 am to 9 pm ET.

Open to Options® — Preparing for your next appointment? Our trained Open to Options specialists can help you create a list of questions to share with your doctor. Make an appointment by calling **888-793-9355** or by contacting your local Cancer Support Community or Gilda's Club.

Frankly Speaking About Cancer® — Trusted information for cancer patients and their loved ones is available through publications, online, and in-person programs. www.CancerSupportCommunity.org/FranklySpeakingAboutCancer.

Services at Local CSCs and Gilda's Clubs — With the help of 170 locations, Cancer Support Community and Gilda's Club affiliates provide services free of charge to people touched by cancer. Attend support groups, educational sessions, wellness programs, and more at a location near you. www.CancerSupportCommunity.org/FindLocation.

Cancer Experience Registry® — Help others by sharing your cancer patient or cancer caregiver experience via survey at www.CancerExperienceRegistry.org.

MyLifeLine — Cancer Support Community's private, online community allows patients and caregivers to easily connect with friends and family to receive social, emotional, and practical support throughout the cancer journey and beyond. Connect with other Multiple Myeloma patients by joining the Managing Multiple Myeloma online discussion board. Sign up at www.MyLifeLine.org.

Grassroots Network — Make sure your voice is heard by federal and state policy makers on issues affecting cancer patients and survivors by joining our Network at www.CancerSupportCommunity.org/Become-Advocate.

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