

Acute Lymphoblastic Leukemia (ALL)

Acute lymphoblastic leukemia (ALL) is a cancer of the lymphocytes

Leukemia, a cancer of the blood, begins when normal blood cells change and grow uncontrollably. Acute lymphocytic leukemia is a cancer of the lymphocytes, a type of white blood cell involved in the body's immune system. ALL is also called acute lymphoid leukemia or acute lymphoblastic leukemia. Acute means that the disease begins and gets worse quickly; patients with ALL usually need immediate treatment¹.

In people with ALL, the abnormal cells crowd other types of cells in the bone marrow, preventing the production of red blood cells (which carry oxygen), other types of white blood cells, and platelets (parts of the blood needed for clotting). As a result, those with ALL may be anemic, more likely to get infections, and bruise or bleed easily. Lymphoblasts also may collect in a person's lymphatic system and cause swelling of the lymph nodes. Some cells may invade other organs, including the brain, liver, spleen, or the testicles in men¹.

ALL makes up approximately **25%** of cancer diagnoses among children under 15 years old; it is the most common childhood cancer in the US². The risk for developing ALL is highest in children younger than five years of age³.

Treatment for ALL

ALL is unique in that it is not a single disease but a group of related diseases with different subtypes. Patients with different subtypes of ALL may have different treatment regimens that may include chemotherapy, targeted therapy, radiation therapy and/or bone marrow transplant. Each patient's outcome depends on their response to treatment. Therefore, it is important for patients to discuss all options with their doctor, and develop a plan that will help them reach their treatment goals.

Following initial treatment, about 80%-90% of adults will have complete remissions⁴. Of note, despite aggressive treatment, 15%-20% of children and 40%-45% of adults relapse^{4,5}.

There is no formal staging system for ALL

The general classifications of ALL include⁶:

- **Newly diagnosed and untreated.** A patient may have decreased numbers of normal white blood cells, red blood cell, and platelets. Often there are many abnormal lymphoblasts in the blood and bone marrow.
- **Remission.** A patient has received treatment for ALL. The bone marrow contains less than 5% lymphoblasts, and the patient has no symptoms. The numbers of normal white blood cells, red blood cells, and platelets are normal.
- **Relapse.** Leukemia has come back after being in remission. Relapse is the most common cause of treatment failure in pediatric ALL, occurring in about 15%-20% of patients⁵. These incidents make relapsed ALL the fourth most common childhood malignancy⁵.
- **Refractory.** Refractory leukemia means that the disease has not responded to treatment.

ALL Outlook

- From 2007-2013, the five-year relative survival rate in the US for ALL was **68.2%**⁷
- **80%-90%** of adults will have complete remissions; however, **roughly half** of these patients relapse⁴
- Patients with relapsed/refractory ALL have limited options
 - The chance of survival in patients who relapse or fail to attain remission is:
 - **16-30.1%** for children⁸
 - **5-8%** for adults⁹
- While bone marrow transplant (BMT) is considered curative, it is not always the answer. 3-year survival among children receiving a matched donor BMT following a 2nd or subsequent remission is **62%**^{10,11}

¹American Society of Clinical Oncology. Leukemia - Acute Lymphocytic - ALL: Introduction (Jan 2015 revision). <http://www.cancer.net/cancer-types/leukemia-acute-lymphocytic-all/introduction>. Accessed May 2017.

²Howlader, N., Noone, A. M., Krapcho, M, et al. SEER Cancer Statistics Review, 1975–2010. National Cancer Institute, April 2013; Section 28.9 (12). http://www.seer.cancer.gov/csr/1975_2010/results_merged/sect_28_childhood_cancer.pdf. Accessed May 2017.

³American Cancer Society. About Acute Lymphocytic Leukemia (ALL) (Feb 2016 revision). <https://www.cancer.org/content/dam/CRC/PDF/Public/8669.00.pdf>. Accessed May 2017.

⁴American Cancer Society. Typical Treatment of Acute Lymphocytic Leukemia (Feb 2016 revision). <https://www.cancer.org/cancer/acute-lymphocytic-leukemia/treating/typical-treatment.html>. Accessed May 2017.

⁵Locatelli, F., M. Schrappe, M. E. Bernardo, and S. Rutella. "How I treat relapsed childhood acute lymphoblastic leukemia." *Blood* 120.14 (2012): 2807-2816. <http://www.bloodjournal.org/content/bloodjournal/120/14/2807.full.pdf?sso-checked=true>. Accessed May 2017.

⁶American Society of Clinical Oncology. Leukemia - Acute Lymphocytic - ALL: Subtypes and Classification (Aug 2013 revision). <http://www.cancer.net/cancer-types/leukemia-acute-lymphocytic-all/subtypes-and-classification>. Accessed May 2017.

⁷ National Cancer Institute. SEER Cancer Stat Facts: Acute Lymphocytic Leukemia. <http://seer.cancer.gov/statfacts/html/aly1.html>. Accessed May 2017.

⁸Satwani, Prkash, Sather, Harland, Ozkaynak, Fevzi, et al. Allogeneic Bone Marrow Transplantation in First Remission for Children with Ultra-high-risk Features of Acute Lymphoblastic Leukemia: A Children's Oncology Group Study Report." *Biology of Blood and Marrow Transplantation* 13.2 (2007): 218-27. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2731715/>. Accessed May 2017.

⁹Gokbuget, N. et al. Outcome of Relapsed Adult Lymphoblastic Leukemia Depends on Response to Salvage Chemotherapy, Prognostic Factors, and Performance of Stem Cell Transplantation. *Blood Journal*, September 2012; 120(10). <http://www.bloodjournal.org/content/120/10/2032.full-text.pdf+html>. Accessed May 2017.

¹⁰Copelan, E. Hematopoietic Stem-Cell Transplantation. *New England Journal of Medicine*, April 2006; 354: 1813-1826. <http://www.nejm.org/doi/full/10.1056/NEJMra052638>. Accessed May 2017.

¹¹Center for International Blood and Marrow Transplant, a contractor for the C.W. Bill Young Cell Transplantation Program operated through the U. S. Department of Health and Human Services, Health Resources and Services Administration, Healthcare Systems Bureau. U.S. Patient Survival Report. http://bloodcell.transplant.hrsa.gov/RESEARCH/Transplant_Data/US_Tx_Data/Survival_Data/survival.aspx. Accessed May 2017.



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