

Amelia Cain, SPT

***A REVIEW OF LEUKEMIA
WITH IMPLICATIONS FOR REHABILITATION***

Objectives

- Attendees will be able to recognize the different types of leukemia and anticipate appropriate associated prognosis and plan of care.
- Attendees will be able to proactively consider symptoms and treatment side effects when implementing patient care.
- Attendees will be able to consider and incorporate current available evidence for rehabilitation in the population of acute leukemia patients.

The Basics

- Leukemia is a cancer that affects the blood and bone marrow¹
 - >380,000 people with or in remission from leukemia in the US in 2018
 - Median age at diagnosis: 66 years
 - Five-year relative survival rate of 62.7%
- Risk Factors for Leukemia:²
 - Smoking
 - History of radiation or chemo
 - Myelodysplastic Syndromes
 - Certain genetic syndromes
 - 1st degree relative with leukemia
 - “Agent Orange”
 - Benzene exposure (cigarettes, petroleum)
- Signs and Symptoms of Leukemia:³
 - Fever or chills
 - fatigue
 - weakness
 - frequent infections
 - weight loss
 - swollen lymph nodes
 - enlarged liver or spleen
 - easy bleeding/bruising
 - petechiae
 - night sweats
 - bone pain

Leukemia Classifications³

Acute: the abnormal blood cells are immature blasts, multiplying rapidly and leading to rapid worsening of disease

Chronic: the abnormal blood cells are mature, which accumulate more slowly and can go undetected/undiagnosed for years

Lymphocytic: affecting lymphoid cells/tissues

Myelogenous: affecting myeloid cells which give rise to red blood cells, white blood cells, and platelet-producing cells

Major Types of Leukemia³

Chronic Lymphocytic Leukemia (CLL)

- Most common type in adults

Acute Lymphoblastic/Lymphocytic/Lymphoid Leukemia (ALL)


- Most common in children/adolescents, adults >70

Acute Myeloid Leukemia (AML)

Chronic Myeloid/Myelogenous/Granulocytic/Myelocytic Leukemia (CML)


Chronic Lymphocytic Leukemia⁴

*Most common type in adults
86.2% - 5 year survival rate
71 – Median age at diagnosis*

- Nonfunctional lymphocytes interfere with normal lymphocytes, weakening immune response. Accumulations in blood, bone marrow, spleen, and lymph nodes
 - Often slow; disease may not progress or need treatment for a long time
 - Possible genetic risk factors
 - Treatments: “watch-and-wait”, single or combination drug therapy (chemo + steroids), targeted therapy (kinase inhibitor), monoclonal antibody therapies, WBC growth factors, clinical trial
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Acute Lymphoblastic Leukemia⁵

*Most common type in children
71% - 5 year survival rate
15 – Median age at diagnosis*

- Nonfunctional lymphoblasts multiply rapidly, suppressing normal blood cells—typically leading to infection, anemia, excess bleeding
 - Rapid; requires treatment ASAP
 - Many subtypes of ALL, including Ph+ ALL (treated by tyrosine kinase inhibitors)
 - Long-term chemo is “standard” treatment—typically lasting a total of 2-3 years. Includes induction, consolidation, and maintenance therapies
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Acute Myeloid Leukemia⁶

*27% - 5 year survival rate
70 – Median age at diagnosis*

- Nonfunctional leukemic blasts build up in bone marrow; can lead to anemia, infection, easy bleeding
 - Older adults at increased risk for AML, highest risk at ages 80-84
 - Many subtypes with varying chromosomal abnormalities, variable prognoses
 - “Standard” treatment is induction chemo followed by 1-4 cycles of consolidation chemo; Participation in clinical trials often preferred
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Chronic Myeloid Leukemia⁷

68% - 5 year survival rate

64 – Median age at diagnosis

- CML is a myeloproliferative neoplasm; bone marrow produces too many blood cells or platelets
- Caused by the BCR-ABL fusion gene; >95% of CML patients have the Philadelphia chromosome (Ph+). Treated with TKIs
- Chemo rarely used unless high-dose in preparation for SCT
- Most significant prognostic factor for post-transplant survival is phase of CML: chronic; accelerated; blast

Rarer Types⁸

Hairy Cell Leukemia


Chronic Myelomonocytic Leukemia

Large Granular Lymphocytic Leukemia

Blastic Plasmacytoid Dendritic Cell
Neoplasm

B-Cell Prolymphocytic Leukemia

T-Cell Prolymphocytic Leukemia



Treatment Overview⁵

Treatment varies depending on type and acuity of leukemia; consideration of individual differences

General ALL Treatment Timeline:



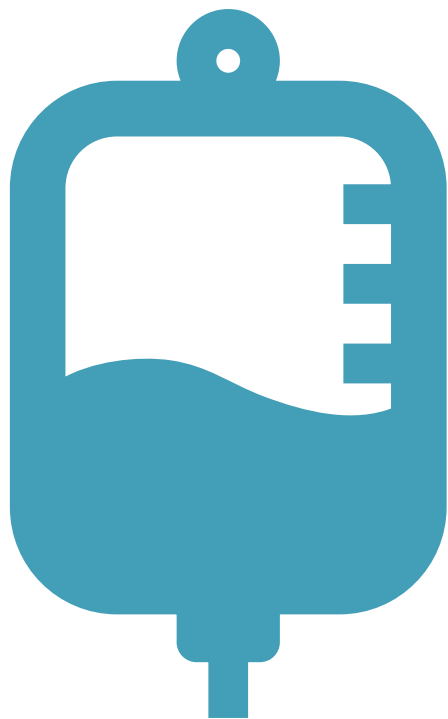
Induction (4-6 weeks): Multiagent chemo, CNS prophylaxis. Goal to achieve remission



Consolidation/Intensification (4-6 months): Given in cycles, may be similar to induction therapy. Consideration of SCT for high-risk patients. Goal to eliminate remaining leukemic cells



Maintenance (2 years): 1 or 2 intensified drug combination treatments. Goal to prevent relapse



Stem Cell Transplant^{9,10}

Types:

Allogenic: stem cells from matched donor

Autogenic: stem cells from same person getting transplant

- Possible conditioning treatment (bone marrow preparation or myeloablation) with high-dose chemo and/or radiation
 - Infusion of stem cells via central venous catheter
 - Engraftment typically occurs within first 30 days
 - Nadir typically occurs around 10 days after treatment
 - 6 to 12 months to achieve close to normal blood counts
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Treatment Side-Effects and Risks

SCT side effects¹¹

- lack of appetite ▪ fatigue ▪ weakness ▪ sleep disturbances ▪ nausea ▪ diarrhea


Graft-Versus Host Disease, associated symptoms:¹²

- Rash, reddening, itchiness ▪ yellow discoloration of skin/eyes ▪ nausea ▪ diarrhea ▪ abdominal cramping ▪ dryness/irritation of eyes


General chemo side effects:¹⁰

- Fatigue ▪ hair loss ▪ infection ▪ nausea ▪ numbness, tingling, pain ▪ “chemo brain” ▪ mood changes ▪ etc

Evidence for Exercise in Patients with Leukemia

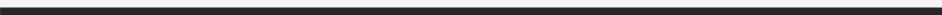
- **Aerobic exercise** improves **QOL, fatigue, and physical performance** in adults with haematological malignancies ¹³
 - **Resistance training** improves **maximum strength and increases endurance capacity** compared with endurance and control groups in patients undergoing induction chemotherapy¹⁴
 - **Aerobic fitness, lower body strength, grip strength, and fatigue** improved with mixed-modality, **moderate intensity exercise** in patients undergoing induction chemo¹⁵
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Evidence for Exercise in Patients with Leukemia

- Improvements in **global health, emotional functioning, nausea, vomiting, fatigue, anxiety, and depression** in multimodal intervention during consolidation treatment¹⁶
 - **Aerobic exercise, resistance training, flexibility training**, or combination of the 3 showed improvement in **QOL and/or physical function** in patients with leukemia undergoing treatment.¹⁷
 - **Aerobic exercise training reduces depressive symptoms** among cancer survivors, particularly when exercise sessions were supervised¹⁸
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So what?

- How does this translate to the acute setting?
- Consider timeline, treatments and side-effects, and patient values
- Buy-in



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