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 marrow\(^1\)
  - >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
  - Myleodysplastic Syndromes
  - Certain genetic syndromes
  - 1\(^{st}\) 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 Classifications

**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 Leukemia

- **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 Leukemia

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
Acute Lymphoblastic Leukemia

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
Acute Myeloid Leukemia

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
Chronic Myeloid Leukemia

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 Types

- Hairy Cell Leukemia
- Chronic Myelomonocytic Leukemia
- Large Granular Lymphocytic Leukemia
- Blastic Plasmacytoid Dendritic Cell Neoplasm
- B-Cell Prolymphocytic Leukemia
- T-Cell Prolymphocytic Leukemia
Treatment Overview\textsuperscript{5}

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\textsuperscript{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
## Treatment Side-Effects and Risks

<table>
<thead>
<tr>
<th>SCT side effects&lt;sup&gt;11&lt;/sup&gt;</th>
<th>• lack of appetite ▪ fatigue ▪ weakness ▪ sleep disturbances ▪ nausea ▪ diarrhea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graft-Versus Host Disease, associated symptoms:&lt;sup&gt;12&lt;/sup&gt;</td>
<td>• Rash, reddening, itchiness ▪ yellow discoloration of skin/eyes ▪ nausea ▪ diarrhea ▪ abdominal cramping ▪ dryness/irritation of eyes</td>
</tr>
<tr>
<td>General chemo side effects:&lt;sup&gt;10&lt;/sup&gt;</td>
<td>• Fatigue ▪ hair loss ▪ infection ▪ nausea ▪ numbness, tingling, pain ▪ “chemo brain” ▪ mood changes ▪ etc</td>
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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 chemotherapy.\(^{14}\)

- **Aerobic fitness, lower body strength, grip strength, and fatigue** improved with mixed-modality, moderate intensity exercise in patients undergoing induction chemotherapy.\(^{15}\)
Evidence for Exercise in Patients with Leukemia

- Improvements in global health, emotional functioning, nausea, vomiting, fatigue, anxiety, and depression in multimodal intervention during consolidation treatment\(^\text{16}\)

- 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.\(^\text{17}\)

- Aerobic exercise training reduces depressive symptoms among cancer survivors, particularly when exercise sessions were supervised\(^\text{18}\)
So what?

• How does this translate to the acute setting?

• Consider timeline, treatments and side-effects, and patient values

• Buy-in
References
References


