Acute Leukemia

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KEYWORDS

• Acute myeloid leukemia • Acute lymphoid leukemia • Acute promyelocytic leukemia

HOSPITAL MEDICINE CLINICS CHECKLIST

1. Acute leukemia includes 3 broad categories: acute myeloid leukemia (AML), acute lymphoid leukemia (ALL), and acute promyelocytic leukemia (APML). AML is the most common leukemia in adults.
2. Patients with acute leukemia can be admitted to hospital through the emergency department with acute complaints of infection, bleeding, or dyspnea and chest pain. In some cases, they are electively admitted from their primary care physician's or hematologist's office because of a chance finding of blasts on a complete blood count or progression of known myelodysplasia.
3. Acute leukemias are complex disorders, each type with its own cytologic, cytogenetic, and molecular subdivisions. Prognosis depends on these disease features and on the performance status and comorbidities of the patient.
4. All-transretinoic acid is an integral part of the treatment of APML and oncologists on call should be contacted to start this overnight even if the clinician merely has a suspicion of an APML diagnosis on review of the smear.
5. ALL is treated with a combination of drugs including asparaginase and the treatment program incorporates a maintenance phase and central nervous system prophylaxis with intrathecal therapy and may last for 2 years.
6. Stem cell transplant has a definite role in intermediate-risk and high-risk AML and in most patients with t(9;22) positive pre–B-cell ALL. It also has a definitive place in refractory/relapsed disease.
7. There are complications associated with the physiology of acute leukemia and to the chemotherapy agents used for treatment, which are important to recognize and treat.

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BACKGROUND

What is acute leukemia?

Acute leukemia is a disorder of hematopoietic progenitor cells defined by the presence of more than 20% blasts in the bone marrow on core bone marrow biopsy. The only exception to this number is the presence of the genetic abnormalities (1) 8:21 translocation, (2) 15:17 translocation, (3) inversion 16, and (4) 16:16 translocation in myeloid blasts. The presence of these in cells of the bone marrow aspirate or biopsy qualifies as acute myeloid leukemia (AML) even in patients with less than 20% blasts in the bone marrow.[1]

Acute leukemia can be divided into 3 broad categories: AML, arising from myeloid progenitors; acute lymphoblastic leukemias, (ALLs) arising from lymphoid precursors; and acute promyelocytic leukemias (APML), in which promyelocytes are blocked from differentiating into more mature cells. The median age at presentation of AML is 67 years and this is the most common leukemia in adults. ALL is most common in childhood and in adults follows 2 peaks: 26% or so of cases occurring after 45 years of age and 11% occurring in patients more than 65 years of age. APML presents at a median of 44 years of age.[2,3]

How may patients with acute leukemia present clinically?

Patients present either to the emergency department (ED) with shortness of breath (SOB) or chest pain (caused by anemia), easy bruising and bleeding (attributed to thrombocytopenia or disseminated intravascular coagulation [DIC]), or infections such as pneumonia, sinusitis, otitis, and cellulitis from leukopenia. The cytopenias are the result of the bone marrow being occupied by blasts or by direct inhibition of normal progenitor cells by chemicals released by leukemic blasts. Other rarer forms of presentation to the ED are headaches, dizziness, tinnitus, and visual disturbances with SOB, which are manifestations of leukostasis caused by a high white blood cell (WBC) count causing poor flow in smaller vessels. This condition is more common in AML than in ALL because myeloid blasts have a tendency to aggregate more easily because of the presence of specific surface molecules.

Patients with APML have a tendency toward DIC and can present with bleeding from gums and other mucous membranes; this is one of the major causes of early death in this disease.

Less commonly, patients with acute leukemia are admitted through their primary care physician's office after a high WBC count with a blast excess or pancytopenia is picked up on a complete blood count (CBC), prompting an outpatient bone marrow biopsy and a diagnosis of leukemia. Similarly, patients who are being followed by hematologists for myelodysplastic syndrome (a disease that by definition has <20% blasts in the bone marrow on core biopsy) may at a follow-up appointment have more than 20% blasts on their biopsy (technically a progression to acute leukemia) and be sent from the hematologist's office to the ED for admission and initiation of therapy or may be electively admitted to the hospital for the same.

How is acute leukemia risk stratified?

Although all patients receive the same induction and consolidation chemotherapy at initial presentation they do not all have the same disease. AML, ALL, and