

## CONTENTS

# Classifying & Clarifying MDS

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As scientists learned more about MDS, they found varying characteristics in the disease, including appearance, prognosis and the likelihood of developing into acute myeloid leukemia. First separated into categories by the French-American-British Cooperative Group, the World Health Organization modified the FAB classifications in 1999. The improvements better defined prognosis and helped patients and doctors make treatment-related decisions.

The International Prognostic Scoring System (IPSS) assesses the overall risks associated with the disease and its progression. IPSS uses chromosomal information, the percentage of abnormal early blood cells in the bone marrow (called blast cells) and blood cell deficiencies outside the bone marrow to develop the score. Several groups are now working on modifications of that system as well, such as incorporating whether a patient becomes transfusion-dependent.

Unfortunately, there is continued debate over where the line is drawn between MDS and acute myeloid leukemia and whether such a precise distinction needs to be made. One of the changes the WHO implemented in categorizing MDS included lowering the percentage of blast cells to indicate AML from 30 to 20 percent, but some experts recommend also taking into account other factors, such as age, comorbidities, chromosomal abnormalities and overall health.

The following types are described in the WHO classifications based on blast percentage, cell appearance and affected blood cells. As the blast cell percentage increases, the risk of AML also increases.

1. When blast cells comprise less than 5 percent of red blood cells in the bone marrow, a patient is diagnosed with **classic refractory anemia**. It has a good prognosis, and only 6 percent of these patients develop AML.
2. Patients with refractory anemia who have ring-shaped iron deposits in more than 15 percent of their blast cells are diagnosed as having **refractory anemia with ringed sidero-blasts**. These deposits form because the cells aren't able to use iron properly. It carries a low risk of developing AML (1 to 2 percent).
3. The most common type, **refractory anemia with excess blasts**, is separated into two types. The percentage of blast cells defines the disease as **type 1** (less

than 10 percent blasts) or **type 2** (10 percent blasts or higher). Refractory anemia with excess blasts can affect up to 20 percent of all blood cells in the bone marrow. This type comprises about 40 percent of all MDS cases, and evolves into AML in about 25 percent (type 1) to 33 percent (type 2) of cases.

4. A quarter of MDS patients have **refractory cytopenia with multilineage dysplasia**, which is characterized by having less than 5 percent blasts. Occasionally more than one blast cell will form, leading to multiple abnormal cell lines. In contrast to anemia, patients with cytopenia will have low blood counts for at least two types of blood cells. Ten percent of patients with this type will develop leukemia. Patients with **refractory cytopenia with multilineage dysplasia and ringed sideroblasts** have a similar prognosis.

5. Refractory anemia patients with a section of chromosome 5 missing have **5q deletion MDS**, which has a good prognosis and rarely develops into leukemia. Revlimid is especially effective for this MDS type and has been approved only for use in this subgroup of patients.

6. Formerly called chronic myelomonocytic leukemia in the FAB classification, the inclusion of **MDS/myeloproliferative disorder** in the WHO classification is controversial because it mostly affects white blood cells. It has a few similarities to chronic myelogenous leukemia, but does not have the identifying Philadelphia chromosome.