MPN CONNECT

World Health Organization (WHO) Diagnostic Criteria for Primary Myelofibrosis (PMF), Polycythemia Vera (PV), and Essential Thrombocythemia (ET)[1]

Check off the major and minor criteria corresponding to a patient's clinical presentation. Review the check marks in each column and compare the result against the totals required to meet WHO guidelines for diagnosis of each myeloproliferative neoplasm (MPN).

JAK2 mutation is common to PMF, PV, and ET

PRIMARY MYELOFIBROSIS (PMF)	Major criteria	Minor criteria
Proliferation and atypia of megakaryocytes accompanied by either reticulin and/or collagen fibrosis grades 2 or 3 on a scale of 0 to 3	○	○
Not meeting WHO criteria for ET, PV, *BCR-ABL1*+ CML, myelodysplastic syndromes, or other myeloid neoplasm	○	○
Presence of ***JAK2***, *CALR* or *MPL* mutation or in the absence of these mutations, presence of another clonal marker[a] or absence of reactive myelofibrosis[b]	○	○
Anemia not attributed to a comorbid condition	○	○
Leukocytosis ≥11 x 10^9/L	○	○
Palpable splenomegaly	○	○
LDH increased to above upper normal limit of institutional reference range	○	○
Leukoerythroblastosis	○	○
TOTAL		
Diagnosis requires meeting all 3 major criteria and at least 1 minor criterion confirmed in 2 consecutive determinations		

CALR, calreticulin; CML, chronic myelogenous leukemia; JAK, Janus-associated kinase; LDH, lactate dehydrogenase; *MPL*, myeloproliferative leukemia virus oncogene

[a]In the absence of any of the 3 major clonal mutations, the search for the most frequent accompanying mutations (eg, *ASXL1, EZH2, TET2, IDH1/IDH2, SRSF2, SF3B1*) is of help in determining the clonal nature of the disease.

[b]Bone marrow fibrosis secondary to infection, autoimmune disorder or other chronic inflammatory conditions, hairy cell leukemia or other lymphoid neoplasm, metastatic malignancy, or toxic (chronic) myelopathies.

See next page for polycythemia vera (PV) and essential thrombocythemia (ET)

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World Health Organization (WHO) Diagnostic Criteria for Primary Myelofibrosis (PMF), Polycythemia Vera (PV), and Essential Thrombocythemia (ET)[1] (Continued)

JAK2 mutation is common to PMF, PV, and ET

POLYCYTHEMIA VERA (PV)	Major criteria	Minor criteria
Hb >16.5 g/dL in men, >16.0 g/dL in women, **or** Hct >49% in men, >48% in women, **or** increased red cell mass >25% above mean normal predicted value	○	
Bone marrow biopsy showing hypercellularity for age with trilineage growth (panmyelosis), including prominent erythroid, granulocytic, and megakaryocytic proliferation with pleomorphic, mature megakaryocytes (differences in size)	○	
Presence of ***JAK2*V617F** or ***JAK2*** exon 12 mutation	○	
Subnormal serum erythropoietin level		○
TOTAL		
Diagnosis requires meeting either all 3 major criteria or the first 2 major criteria and the minor criterion[c]		

[c]Major criterion number 2 (BM biopsy) may not be required in cases with sustained absolute erythrocytosis: Hb levels >18.5 g/dL in men (hematocrit 55.5 %) or >16.5 g/dL in women(hematocrit 49.5%) if mutation criterion 3 and the minor criterion are present. However, initial MF (present in up to 20% of patients) can only be detected by performing a BM biopsy; hypercellularity may predict a more rapid progression to overt MF (post-PV MF).

ESSENTIAL THROMBOCYTHEMIA (ET)	Major criteria	Minor criteria
Platelet count ≥450 x 10^9/L	○	
Bone marrow biopsy showing proliferation mainly of the megakaryocyte lineage with increased numbers of enlarged, mature megakaryocytes with hyperlobulated nuclei; no significant increase or left-shift in neutrophil granulopoiesis or erythropoiesis and very rarely minor (grade 1) increase in reticulin fibers	○	
Not meeting WHO criteria for *BCR-ABL1*+ CML, PV, PMF, myelodysplastic syndromes, or other myeloid neoplasms	○	
Presence of ***JAK2***, *CALR*, or *MPL* mutation	○	
Presence of a clonal marker or absence of evidence for reactive thrombocytosis		○
TOTAL		
Diagnosis requires meeting all 4 major criteria or the first 3 major criteria and the minor criterion		

BM, bone marrow; *CALR*, calreticulin; CML, chronic myelogenous leukemia; Hb, hemoglobin; Hct, hematocrit; JAK, Janus-associated kinase; *MPL*, myeloproliferative leukemia virus oncogene

REFERENCE: 1. Arber DA , Orazi A, Hasserjian R, et al. *Blood*. 2016;127(20):2391-2405.

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