Evaluating Abnormal RBC Indices

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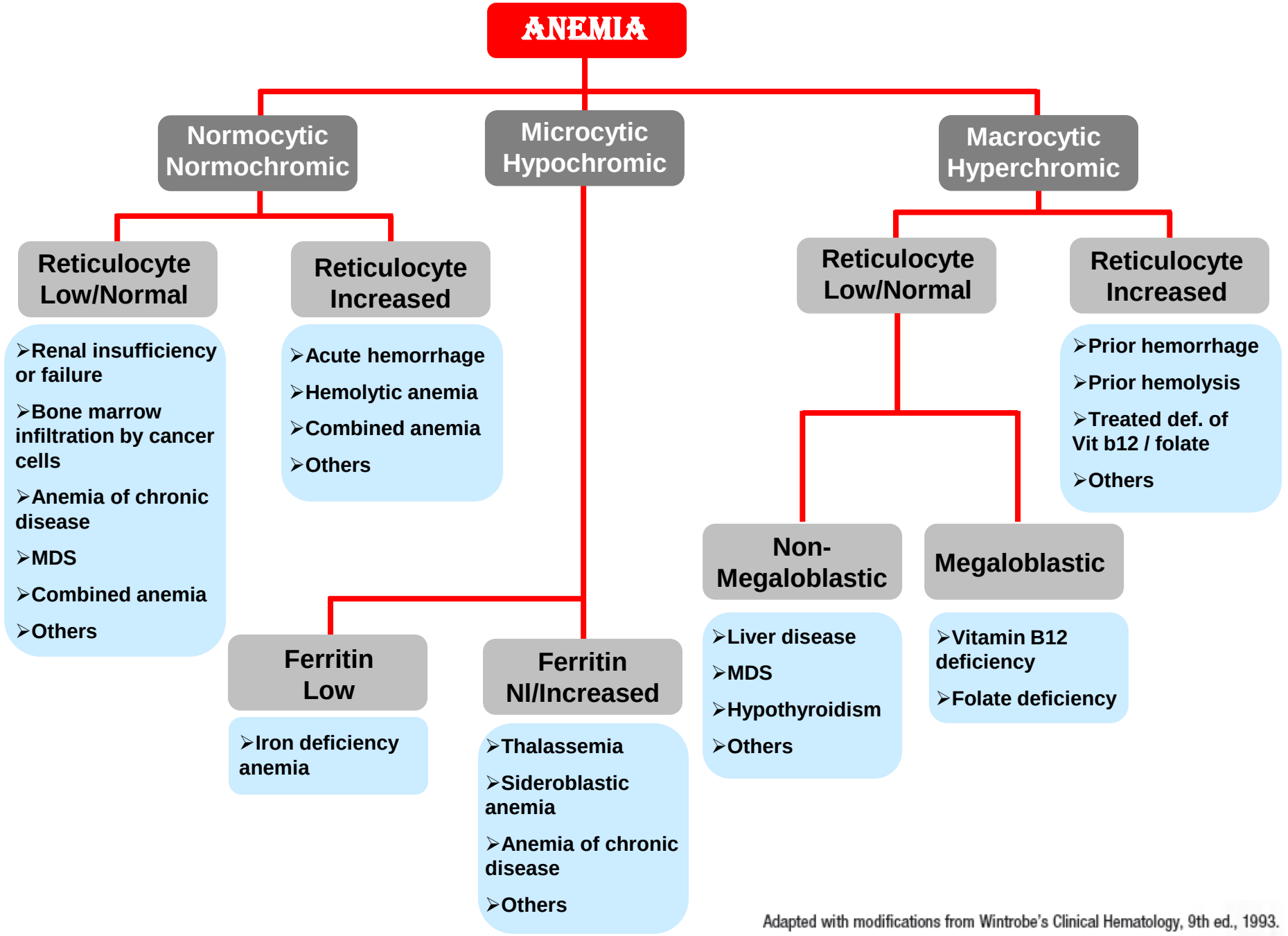
Learning Objectives

- How do I evaluate a patient with low MCV or high MCV, with or without anemia
- What are the common causes of low or high MCV?

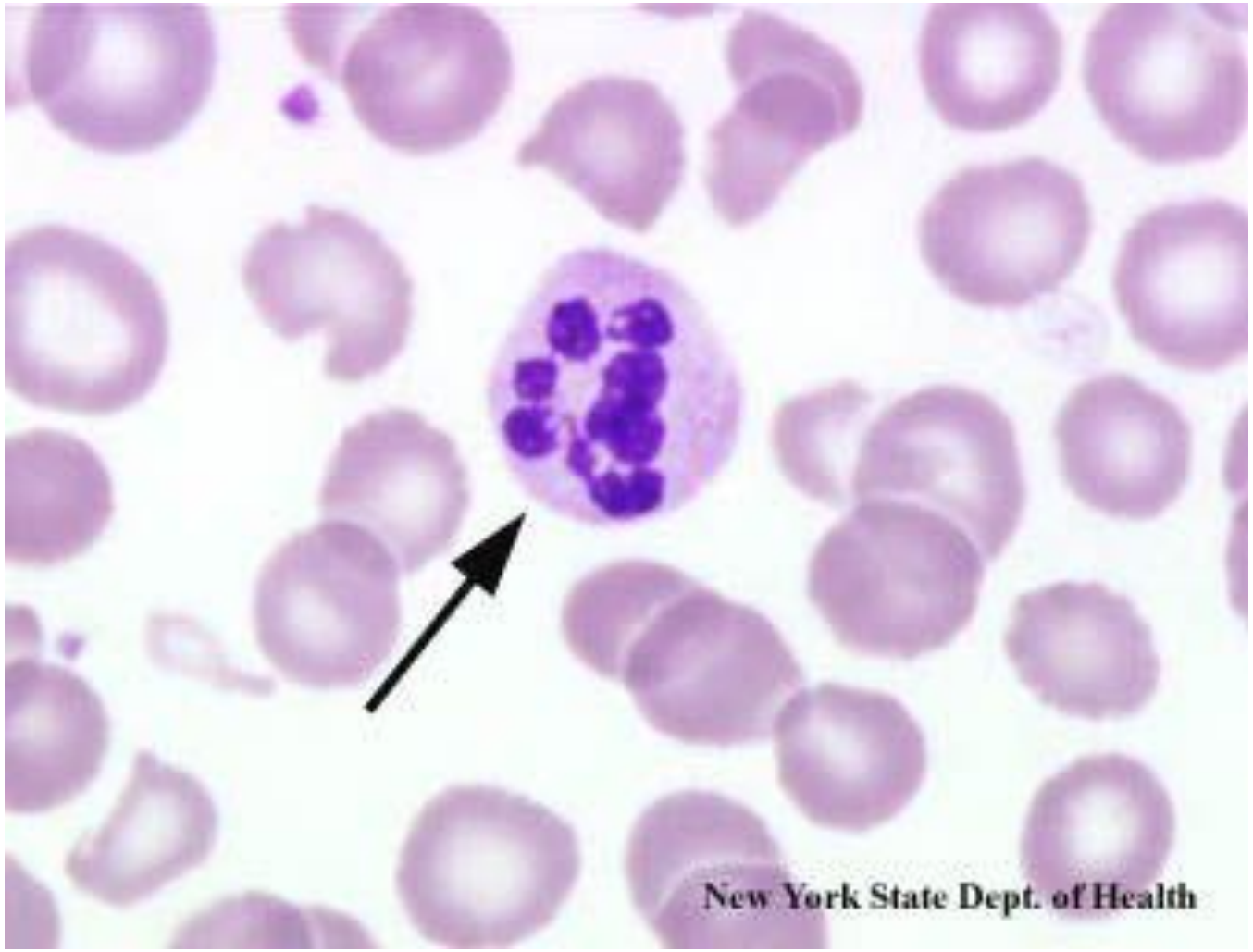


Adapted with modifications from Wintrobe's Clinical Hematology, 9th ed., 1993.

Macrocytosis, Hyperchromia with or without anemia

- Reticulocyte increased?

- -prior hemorrage
- -hemolysis
- -treated B12/folate def.
- -others


New York State Dept. of Health

Macrocytosis, Hyperchromia with or without anemia

- Reticulocyte Low/Normal
- Megaloblastic?
- >>B12 def. Folic def.

Non-Megaloblastic?

- >>liver disease
- >>MDS
- >>Hypothyroid, others

Microcytosis, hypochromia w or wo anemia

- Ferritin nl or increased?

- >Thalassemia
- >Anemia of chronic disease
- >Sideroblastic anemia
- >others

Microcytosis, hypochromia w or wo anemia

- Ferritin low
- > Iron def. anemia

normal indices with anemia

- Reticulocyte low/normal

- >>renal
- >>bone marrow infiltration
- >>anemia of chronic disease
- >>MDS
- >>combined anemia
- >>others

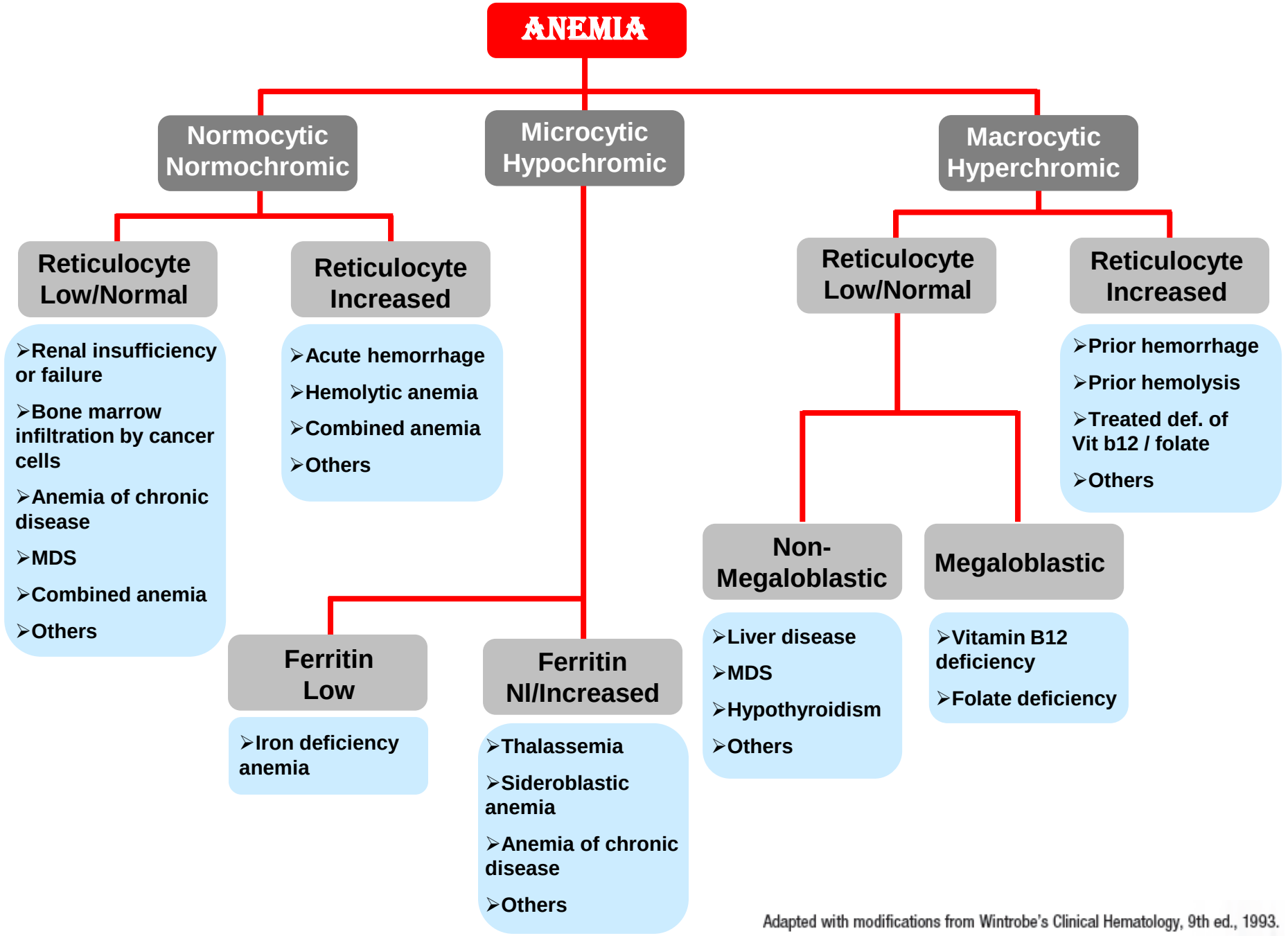
Normal Indices With Anemia

- Reticulocyte Increased

- > Acute bleeding
- >hemolysis
- >Combined anemia
- >others

Are iron studies indicated with nl MCV?

- Not uncommon to see patients with documented iron deficiency to be replaced and MCV go from 80 to 93 (both normal) and RDW fall from 16 to 13
- Reticulocyte count will start rise in 2 weeks
- Iron studies help with suspicion of chronic disease: low iron, low TIBC, normal or low iron saturation and normal or high ferritin
- Discordance of ferritin and Fe/TIBC
- Treatment with iron replacement may not be effective



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Patient 1

- 48 y/o F presents with fatigue and exertional dyspnea for 2 months
- Hgb 8.7
- MCV normal, MCHC 34, RDW 17.1 (nl<15.6)
- WBC 3.6 with normal differential
- Platelet count 498 (nl: 140-415)
- Lab data:

  Stool guaiac: negative

  Iron studies: iron 24, TIBC 411, iron saturation 9%, and ferritin 11

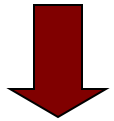
  Vitamin B12 193 (nl>193), Folate mid normal

Management of patient 1

- Mixed deficiency of iron and vitamin B12, which presents with normocytic normochromic anemia
- Hypersegmented neutrophils suggest vitamin B12 deficiency
- Thrombocytosis could occur when iron deficient
- Leukopenia happens when vitamin B12 deficient
- Patient was treated with both iron and vitamin B12 supplements with partial improvement of her cell counts.

Lab work for patient 1 in two months

- Hgb 9.5
- MCV 78, MCH 23, MCHC 27
- WBC 4.5 and normal differential
- Platelet count 480 (nl: 140-415)
- Iron studies: iron 44, TIBC 411, iron saturation 17%, and ferritin 21
- Vitamin B12: 433; folate remains normal



IRON DEFICIENCY ANEMIA

- *What we should do now?*

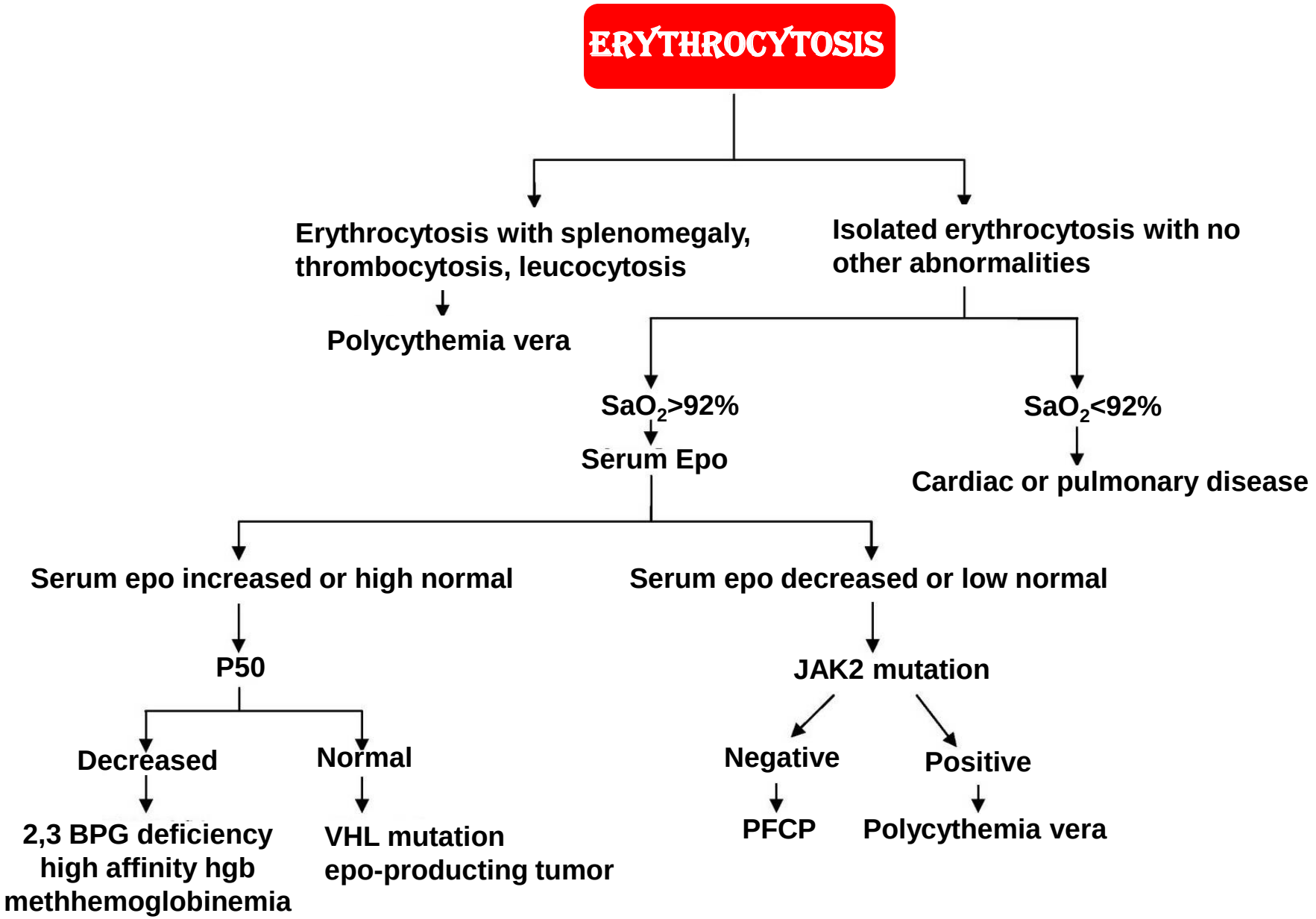
Management of iron deficiency anemia not responding to oral iron

- Patient not taking oral iron (eg, due to side effects)
- Reduced absorption of oral iron
- Blood loss exceeds iron intake
- Incorrect initial diagnosis
- More than one diagnosis (especially relevant in older adults)
- Inflammatory with block in intestinal iron regulation
- Therapy was effective but bleeding recurred

Stein J, et al. Eur J Gastroenterol Hepatol. 2013,25:1456.

Management

- Could check auto abs:
  anti-tissue transglutaminase (tTG) antibodies.
  endomysial antibodies (EMA)
  deamidated gliadin peptide (DGP) antibodies
- Patient was referred to GI for evaluation
- EGD with biopsy confirmed as celiac disease
- Patient received IV iron sucrose with Hgb improved to 11.8 now.


ERYTHROCYTOSIS
Erythrocytosis with splenomegaly, thrombocytosis, leucocytosis
Polycythemia vera
Isolated erythrocytosis with no other abnormalities
SaO2>92%
Serum Epo
SaO2<92%
Cardiac or pulmonary disease
Serum epo increased or high normal
Serum epo decreased or low normal
P50
Decreased
Normal
2,3 BPG deficiency high affinity hgb methhemoglobinemia
VHL mutation epo-producting tumor
JAK2 mutation
Negative
Positive
PFCP
Polycythemia vera

Begin with the end in mind

- If the abnormalities are not only hemoglobin, but WBC and platelet counts, this will likely suggest a bone marrow problem. Referral is required.
- If the abnormality is only hemoglobin level, with normal MCV: the older the patient, the more likely this is a chronic disease
- Even younger patients could present with anemia of chronic illness/inflammatory anemia

> Reticulocyte count, ESR, CRP, and SPEP, Cr, Epo level, LDH usually not helpful

- Thank you!
- Have a good day!