Laboratory Evaluation of Anemia in Adults
Washington State Clinical Laboratory Advisory Council

Establish that anemia is present after correlation with history and physical exam:

<table>
<thead>
<tr>
<th></th>
<th>Hemoglobin</th>
<th>Hematocrit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>&lt;12 gm/dl</td>
<td>&lt;35 L/L</td>
</tr>
<tr>
<td>Male</td>
<td>&lt;13 gm/dl</td>
<td>&lt;40 L/L</td>
</tr>
</tbody>
</table>

If peripheral smear is not available OR No specific definitive diagnostic findings present:

Peripheral Smear Review

Erythrocyte Indicies

Specific definitive diagnostic findings/clues present, e.g. HgbS, C crystals, schistocytes, evidence of myeloproliferative disorders, myelofibrosis, early release of reticulocytes.

Perform appropriate confirmatory tests

<table>
<thead>
<tr>
<th>MCV</th>
<th>Ferritin</th>
<th>Serum Iron</th>
<th>TIBC</th>
<th>% Saturation</th>
<th>FEP (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;80 fl</td>
<td>normal/high</td>
<td>normal/high</td>
<td>low</td>
<td>normal</td>
<td>normal/high</td>
</tr>
<tr>
<td>80 - 100 fl</td>
<td>normal/high</td>
<td>low</td>
<td>normal/low</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>&gt;100 fl</td>
<td>normal</td>
<td>low</td>
<td>low</td>
<td>normal</td>
<td>high</td>
</tr>
</tbody>
</table>

Heterozygous Thalassemia (perform hemoglobin electrophoresis, BCB & Hgb A2)

Suspect inflammation - corroborate by patient history

Iron deficiency anemia (look for source of bleeding)

Sideroblastic anemia

Consider bone marrow examination

Hemoglobinopathy or Thalassemia (perform hemoglobin electrophoresis, BCB & Hgb A2)

MCV <80 fl

Hemolytic Anemia

Post-hemorrhagic Anemia

Screen for renal, hepatic and endocrine disease

Endocrine Disease

Anemia of Renal Disease

Anemia of Liver Disease

Negative Screens

Normal or High

Low

Bone Marrow Aspiration & Biopsy

Anemia of chronic disorders

Early iron deficiency

Hypoplastic Anemia

Infiltration

Dyserythropoietic Anemia

‘Masked’ Megaloblastic Anemia

Myelodysplastic Anemia

- Leukemia

- Myeloma

- Myelofibrosis

- Metastases

FOR EDUCATIONAL PURPOSES ONLY

The individual clinician is in the best position to determine which tests are most appropriate for a particular patient.
Artifactual macrocytosis, determined by automated counters, may be caused by cold agglutinins, hyperglycemia, marked leukocytosis, RBC clumping, intracellular hypersensitivity.

Some drugs that may cause macrocytosis: alcohol, chemotherapy drugs, zidovudine, anticonvulsants, oral contraceptives, triamterene, sulfasalazine, sulfamethoxazole, trimethoprim, colchicine, PASA, neomycin, nitrous oxide

Reticulocyte Count

Rule out drug exposure***

- Normal or Increased
  - Suspect early release of reticulocytes as in hemolysis, bleeding or hematologic malignancy.

- Normal or Decreased
  - B12 / Folate
    - Normal
      - Consider bone marrow aspirate / biopsy, cytogenetics
      - Primary marrow disorders - Myelodysplasia, Aplastic Anemia
    - Low
      - Evaluate appropriately
        - Consider:
          - Alcoholism
          - Hypothyroidism
          - Pernicious Anemia
          - Dietary Deficiency
          - Malabsorption
          - Pregnancy
          - Drugs

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Abbreviations:
- FEP: Free Erythrocyte Protoporphyrin
- MCV: Mean Corpuscular Volume
- BCB: Brilliant Cresyl Blue

References:

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