

Common Abnormalities of the Hemogram

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Disclosures

- No Financial Disclosures
- No Conflicts of Interest

Most CBC Abnormalities Fall Somewhere... in Between



Key Questions to Consider for the CBC:

Not so much a matter of memorizing profiles as much as pursuing a process:

1. How many abnormalities are present?
2. How severe are the abnormalities?
3. How long have the abnormalities been present?
4. What is the overall context?

Bottom Line Goal: To be useful to primary care and midlevel providers

How Many Abnormalities Are Present?

- One blood count abnormality is often a “coincidence,” i.e., secondary to some other issue.
- 2+ blood count abnormalities are “a pattern,” i.e., often a primary heme issue (but: thrombocytosis can be reactive).
- Isolated leukopenia or leukocytosis: Often from infection.
- Isolated anemia: often vitamin deficiency, or chronic dz.
- Isolated erythrocytosis: Often secondary (e.g., OSA, meds).
- Isolated thrombocytopenia: Infection (or EtOH, or ITP!).
- Isolated thrombocytosis: Inflammation, acute phase reactant.

How Severe Are the Abnormalities?

Rough cut-offs of serious versus less urgent:

- Absolute neutrophil count <500 to 1000/mcL: infection risk.
- Total WBCs 100,000/mcL or higher (blasts): Leukostasis risk.
- Hemoglobin: Transfusion thresholds
 - Substantially symptomatic: Transfuse if less than 10 g/dL.
 - CAD/ACS: 8 g/dL.
 - ICU or GIB: 7 g/dL.
- Erythrocytosis: If from Polycythemia Vera, therapeutic phlebotomy threshold: Hct 45% for men, 42% for women.

How Severe Are the Abnormalities?

Rough cut-offs of serious versus less urgent (continued):

- Thrombocytopenia: $<10 - 20,000/\text{mCL}$: spontaneous bleeding.
- Thrombocytosis: 1 million/ mCL : clotting or bleeding.

How Long Have The Abnormalities Been Present?

Trend out the hemogram: when was it last 'normal-ish'?

Helps to recall the lifespan of blood cell types:

- WBCs live hours to 2-3 weeks, depending on type, location.
- RBCs live ~120 days (4 months).
- Platelets live ~8-9 days (1 to 2 weeks).

Helps to recall the immature forms (if present, marrow is awake):

- Neuts: Myeloblasts $\rightarrow$ Promyelocytes $\rightarrow$ Myelocytes
 $\rightarrow$ Metamyelocytes $\rightarrow$ Bands (only the latter 2 seen normally).
- RBCs: Reticulocytes (can cause macrocytosis).
- Platelets: Giant Platelets.

The Patient Can Help



Inquire About Context:

- Age
- Family History
- Pregnancy
- Infection
- Surgery
- Medications... and Supplements!
- Diet... including gastric surgery, and antacids!
- Environmental exposures: work, travel, camping/outdoors.

General Approach to CBC Abnormalities

- Most CBC abnormalities are secondary to another process.
- Question becomes: is there time to evaluate this as outpt?

The process— Key questions regarding the complete blood count:

1. How many abnormalities are present?
2. How severe are the abnormalities?
3. How long have the abnormalities been present?
4. What is the overall context?

- If time & acuity allow, re-check CBC with smear, retics, vitamins (B12, RBC Folate, MMA, iron studies), CMP, LDH, TSH, +/- ESR, +/- SPEP w/ IFE.

Case #1

84 yo man with PMHx of HTN, CAD, CKD, elevated cholesterol, here for annual exam with no new complaints and found to have:
 WBC 2.5 k/mCL , with unremarkable diff; Hgb 12 g/dL ; Platelets 130 k/mCL ;
 MCV 112 (high). CMP is normal, except for creatinine of 1.3 (at baseline).
 Last year's CBC + differential was within normal limits.

The most likely diagnosis is:

- A. Acute Myelogenous Leukemia (AML)
- B. Chronic Lymphocytic Leukemia (CLL)
- C. B12 Deficiency
- D. Myelodysplastic Syndrome (MDS)
- E. Iron Deficiency

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- D. Myelodysplastic Syndrome (MDS): Check smear, vitamins, refer to Heme
- E. Iron Deficiency

Case #2

65 yo woman s/p cholecystectomy 5 weeks ago, complicated by pneumonia during 18-day hospitalization; spent 2 weeks in rehab, home as of 3 days ago, with anorexia, non-bloody diarrhea 8x/day, wt loss of 10 pounds in the last week:

Vitals: T 95 HR 102 BP 90/60 RR 24 O2 Sat 92% on RA.

WBC 66 k/mL, hemoglobin 10 g/dL, platelets 90 k/mL, with diff showing 2% blasts, 40% bands, 40% neut, 10 lymphs, 8% monos, MCV normal. CMP pending. CBC + Diff had been normal on day of admission for surgery 5 weeks ago.

The most appropriate next step is:

- A. Give 1 L NS iv and refer to Heme-Onc Clinic re: possible AML.
- B. Start iv NS, give 500 mg metronidazole po, EMS to Emergency Department.
- C. Advise increased po intake and re-check CBC in 1 week, with vitamin levels.
- D. Direct admit to hospital for Heme consult and emergent leukapheresis.
- E. Assuming CMP results are ok, send her home on levofloxacin x 14 days.

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Case #3

48 yo woman with a history of obesity, high cholesterol, G2P2, IUD in place, LMP 1 year ago, presents with fatigue, occasional dyspnea on exertion over the past month. Vitals and exam are normal. CMP is normal.

WBC 6 k/mL, hgb 8.2 g/dL, platelets 250 k/mL, normal differential, MCV 72. CBC at Gyn office 10 months ago showed hgb 9.3, MCV normal at 84.

CBC at PCP wellness exam 2 years ago was completely normal.

The most appropriate next step is:

- A. Check iron indices and refer to GI for endoscopy.
- B. Check smear, LDH, vitamin levels, refer to Hematology Clinic.
- C. Send by EMS to Emergency Department for PRBCs.
- D. Check iron, start ferrous sulfate 325 mg TID, re-check CBC in 2 months.
- E. Check UA and HCG, refer to OB-GYN.

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Case #4

63 yo man with minimal medical history returns regarding a 6-month history of headaches and fatigue. A sleep study last month showed no apnea. He has worked as a mechanic for 35 years. No recent travel or altitude exposure. WBC 4 k/mL, hgb 19 g/dL (Hct 57%), platelet count 650 k/mL, MCV normal, CMP normal. Exam shows ruddy complexion but otherwise is normal.

A CBC 1 month ago showed WBC 4.5 k/mL, hgb 18.5 g/dL, platelets 550 k/mL. A CBC 4 years ago was normal.

The most appropriate next step is:

- A. Recommend a CO/CO2 monitor for the patient's well-ventilated garage.
- B. Advise increased hydration: Drink ½ gallon of water per day.
- C. Advise he donate blood 6x/year.
- D. Start enteric-coated Aspirin 325 mg po daily.
- E. Refer to Hematology Clinic.

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- E. **Refer to Hematology Clinic. Can ask about erythromelalgia, check spleen.**

Case #5

50 yo woman presents with a painless, non-pruritic "rash" at the tibias, waning over the last 3 days, having 10 days ago completed a course of Trimethoprim-Sulfamethoxazole for treatment of a UTI, from which she has recovered. Exam shows normal vitals, with petechiae at the lower extremities and abdomen. WBC 5.5 k/mL, hemoglobin 13 g/dL, platelets 35 k/mL, MCV normal. Smear confirms plt count and shows occasional giant platelets. UA and CMP are normal.

The most appropriate next step is:

- A. Initiation of dexamethasone 40 mg po daily for 4 days.
- B. Prednisone 1 mg/kg per day for 1 week, followed by a taper.
- C. Initiation of IVIg.
- D. Referral to the Emergency Department for platelet transfusion.
- E. **Observation: re-check CBC + Differential in 3 to 7 days.**

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Case #6

58 yo man brought by wife for annual wellness visit after an absence of 3 years. He has a h/o HTN, obesity, and CAD, and he presents with no complaints. Used to drink ~24 beers/week, but now down to 2 gin & tonics with dinner. Quit smoking 6 months ago. Vitals normal except for obesity. Exam unrevealing. CBC shows WBC 3.1 k/mL, Hgb 12.2 g/dL, Plts 21 k/mL, MCV & CMP normal. CBC 3 years ago was normal. Hematology obtains bone marrow: suboptimal hematopoiesis and early fibrosis; no malignancy.

Which of the following interventions is most likely to help sustain his counts?:

- A. Verify that he really did quit smoking, and inquire about vaping.
- B. Suggest he curtail his EtOH consumption to 1 G&T/night.
- C. Counsel him on EtOH cessation and avoidance of tonic water/quinine.
- D. Counsel him on weight loss via changes in diet and exercise.
- E. **Initiation of ferrous sulfate 325 mg po TID.**

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- E. **Initiation of ferrous sulfate 325 mg po TID.**

'Medicinal' Intake, Prescribed and Otherwise:



Questions?