The background of the slide is a soft-focus, reddish-orange field filled with numerous red blood cells. The cells are depicted as biconcave discs, with some appearing more prominent and in focus than others, creating a sense of depth and movement. The overall color palette is warm and monochromatic, centered around shades of red and orange.

# **Anemia in Primary Care**

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**UCLA Family Medicine Grand Rounds**

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# Objectives:

- Define it
- Identify it
- Work it up based on DDx – *common things are common!*
  - IDA
  - ACD
- Manage it
- Refer when needed
- Cases

# Anemia: *Define it* *Easier said than done...*

- Low blood Hg concentration or Hct
- Children 6-59 mo : 11 g/dL
- Children 5-11 yo: 11.5 g/dL
- Children 12-14yo: 12 g/dL
- Non-pregnant women 15yo+: 12 g/dL
- Pregnant women: 11 g/dL
- Men 15yo+: 13 g/dL

# Anemia: Prevalence

- Based on data from five National Health and Nutrition Examination Surveys between 2003-2012, 5.6% of U.S. population had anemia, 40% of children <5yo and 40% women of reproductive age **WORLDWIDE** based on WHO's criteria
- Highest risk populations:
  - Pregnant women
  - Women of reproductive age
  - Elderly
  - Non-Hispanic Blacks
  - Hispanics

# Anemia: *Define it*

## *Special Considerations*

- Elderly: 30-50% with “undiagnosed anemia of elderly”
- Higher altitudes Hg > Sea level Hg
- Smokers
- Endurance athletes
  - Increased plasma volume
  - GI bleeds
  - Chronic inflammation
  - Hemolysis
  - Hematuria
  - Sweating
- Expanded plasma volume (CHF)
- Hemoconcentration (dehydration)

# Anemia: *Define it*

- Context, context, context
- Past value??
- “Normal” may actually be *abnormal*
  - Acute vs chronic

# Anemia:

## *Classify It*

- Size
  - Microcytic
  - Normocytic
  - Macrocytic
- Cause
  - RBC underproduction
  - RBC destruction
  - RBC loss

# Anemia: *Identify It*

- Symptoms?



# Anemia:

## *Symptoms*

- fatigue
- weakness
- decreased exercise tolerance
- dizziness
- headache
- tinnitus
- palpitations
- syncope
- impaired concentration
- restless leg syndrome (RLS)
- abdominal discomfort, nausea, and bowel irregularity
- cold intolerance
- Children: impaired cognitive or psychomotor development.
- Patients with preexisting vascular disease: exacerbations of angina, claudication, or cerebral ischemia

# Anemia: *Identify It*

- What affects severity of symptoms?
- Historical clues (Family hx, PMH, meds)
- Physical Exam findings
- Labs

# Anemia: *Identify It*

- Important Labs
  - CBC
  - MCV
  - RDW

# CBC

- Hg!!!!
- WBC
- Platelets

# Mean Corpuscular Volume (MCV):

- microcytic <82 fl
- normocytic 82-98 fl
- macrocytic >98 fl

# Red Cell Distribution Width (RDW)

- Normal < 14.5%
- Abnormal RDW can make MCV unreliable

# Mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC)

- Generally mirror MCV
- Hypochromia (MCHC <28 g/dL)  
    IDA > thalassemias
- Hyperchromia (MCHC >41 g/dL)  
    hereditary spherocytosis  
    SCA

# What about the rest of the CBC?

- **Leukocytosis?** Infection, burns, obesity
- **Leukopenia?** BM suppression, malignancy, hypersplenism, infection
- **Thrombocytosis?** Infection, IDA, trauma
- **Thrombocytopenia?** BM suppression, malignancy, hypersplenism, infection
- **Pancytopenia?** Aplastic anemia, hematologic malignancy, chemo/XRT side effects, cirrhosis



# Corrected Reticulocyte Percentage (Reticulocyte Index)

$$\text{Retic index} = \text{retic \%} \times [\text{Hct}/\text{nl Hct}]$$

- Normal = 1%
- >1% = appropriate bone marrow response to anemia
- < 1% = possible hypoproliferative bone marrow
- Can also use ***absolute retic count*** (normal = 50,000-75,000/mm<sup>3</sup>)

# Peripheral Smear

- Burr cells (*renal failure*)
- Tear drop cells (*myelofibrosis*)
- Spherocytes (*hereditary spherocytosis, immune hemolytic anemia, trauma to RBCs*)

# Other Tests

- Bone Marrow Bx (*suspect malignancy, unclear etiology despite w/u, etc.*)

# Anemia: *Work it up*

- **SIZE** vs **CAUSE** Approach

# Microcytic Anemias (<82 fl):

## *Iron deficiency anemia (IDA)*

- Most common cause of anemia
- In the U.S., approximately 4% of children aged 5 months – 4 years old were found to be anemic between 2003-2012, with prevalence varying based on race/ethnicity.
- ***IDA accounts for approximately 40% of anemia in children with Hispanic children ages 1-3 years old twice as likely to have IDA compared to black and white children in this age group.***
- FT Breastfed infants may become iron deficient around 4-6 mos (before solids intake sufficient, can consider supplementation)
- American Academy of Pediatrics recommends screening for anemia in all infants around 12 months

of age

- Low iron content in milk (displaces iron-rich sources)
- Ca/Phos in cow's milk can interfere with iron absorption



# Microcytic Anemias (<82 fl): *Iron deficiency anemia (IDA)*

- Older children/adolescents
  - Grow rapidly
  - Menses
  - Poor diet

# Food Sources of Iron

- Recommended dietary allowance (RDA) for iron is 8 mg daily for men and 18 mg daily for women, increase during pregnancy, lactation, and adolescence



# More IDA:

## Special populations

- **Pregnancy:** placenta and baby, delivery
- **Obesity:** increased inflammation from adipose tissue and subsequent increased production of hepcidin (impairs absorption of iron and iron availability for erythropoiesis)
- **Bariatric surgery:** same as obesity, possible malabsorption
- **IBD, celiac disease, etc.**
- **Iatrogenic:** inpatient, blood donors



# More IDA...

- Most common cause of IDA in men and postmenopausal women?

# More IDA...

- Most common cause of IDA in men and postmenopausal women?

## GI BLEEDS

*\*In 1/3 of these pts with IDA, no source of bleed found and 2/3 resolved without recurrence\**

# IDA: *Si/Sx*

- Physical examination

- glossitis
- angular stomatitis
- esophageal webs
- splenomegaly
- koilonychias (spoon-shaped nails)
- RLS



# IDA: *Labs*

- **FERRITIN**
- Serum iron
- Total iron binding capacity
- Transferrin saturation (iron / TIBC)
- MCV
- RDW
- Soluble serum transferrin receptor (TfR)
- Transferrin receptor-ferritin index (ratio of sTfR to the logarithm of serum ferritin)

# IDA: *Labs*

- **FERRITIN** ↓
- Serum iron ↓
- Total iron binding capacity ↑
- Transferrin saturation (iron / TIBC) ↓
- MCV ↓ then nl
- RDW ↑
- Soluble serum transferrin receptor (TfR) ↑
- Transferrin receptor-ferritin index (ratio of sTfR to the logarithm of serum ferritin) ↑

# IDA: *Treatment*

- Response to iron supplements: retic increases within 1 week, Hg/Hct within 1 month
- PO iron for majority of patients, otherwise iron dextran
- Forms of PO iron: **ferrous** vs **ferric**
  - Ferrous = better absorption (ferrous sulfate = cheapest, gluconate, and fumarate)
  - 325 mg = 65 mg elemental iron
- Duration: until ferritin 50 ug/L or at least 4-6 months
- Side effects?
- Vitamin C? Liquid?
- Interference?

# Microcytic Anemias (continued): *Thalassemias*

- Inherited disorders of hemoglobin synthesis
- More common in people from the Mediterranean, Asia, and Africa
- Thalassemia major = severe
- Thalassemia trait (thalassemia minor) = more common

# *Thalassemiias (cont'd)*

- When to suspect it?



# *Thalassemiias (cont'd)*

- When to suspect it?
  - Mild, very microcytic anemia [MCV (56-74 fl)]
  - RDW normal
  - RBC count normal or up 10-20%
  - Iron studies normal (unless concomitant IDA)
  - Peripheral smear: target cells, ovalocytes, basophilic stippling
  - Hg electrophoresis:
    - B thal: elevated Hgb A2 +/- Hgb F
    - A thal: nl



# Microcytic Anemias (continued):

## *Others*

- Hgb E
  - 5-30% in certain groups from Southeast Asia
  - heterozygote = mild microcytosis and normal Hct
  - homozygotes = marked microcytosis (MCV 60-70 fl) and mild anemia
  - Dx: target cells on peripheral smear, Hgb E on electrophoresis
  - Hgb E + beta thal = bad combo
- Sideroblastic anemia = ringed sideroblasts on BM staining
  - X-linked, toxins/meds (lead, EtOH, isoniazid, chemo), neoplastic, endo or inflammatory disease, myelodysplastic syndrome
  - MCV usually low
  - Treat underlying cause

# Normocytic Anemias (82-98 fl):

## *To retic or not retic...*

- Elevated Retic
  - Acute blood loss
  - Pregnancy
  - Hemolysis
    - ↑ LDH
    - ↑ Indirect bili
    - ↓ Haptoglobin
    - Peripheral smear: schistocytes (mechanical), spherocytes (autoimmune, hereditary spherocytosis)
- Decreased Retic
  - ACD (ACI)
  - Chronic liver disease
  - Endocrine diseases
  - Aplastic Anemia, myelodysplastic syndromes, etc.

# Anemia of Chronic Disease

- *AKA Anemia of Chronic Inflammation (ACI)*
- 2<sup>nd</sup> most common cause of anemia in USA
- Most common cause of anemia in the elderly
- Pathogenesis multifactorial and not fully understood (decreased RBC life span?, impaired utilization of iron stores?, relative erythropoietin deficiency?)
- Can be microcytic in 30-50% of cases
- Serum iron, TIBC, and transferrin saturation are usually low and not helpful in distinguishing ACD from IDA
- Ferritin level = most useful (normal or high)

# Anemia of Chronic Disease: *Treatment?*

# Anemia of Chronic Disease: *Treatment?*

- Treat underlying disease

# Anemia of CKD

- Kidney's inability to secrete erythropoietin
- Creatinine  $>3$  mg/dl or eGFR  $< 30$
- Peripheral smear is usually normal, burr cells can be seen
- Ferritin usually high
- “functional iron deficiency” of ESRD (ferritin  $<500$ )
- ***Treatment?***

# Anemia of CKD

## *Treatment?*

- Treat kidney disease
- Erythropoiesis-stimulating agents
- Iron



# Macrocytic (>98 fl)

- Megaloblastic (MCV usually >120 fl, macroovalocytes)
  - Vit B12 deficiency
  - Folate deficiency
- Non-megaloblastic (majority of macrocytic anemias)
  - Drugs (>50%)
  - Alcoholism

# Megaloblastic Anemias: *Vitamin B12 Deficiency*

- B12 (cobalamin) = ANIMALS
- RDA 2.4 ug daily for adults
- NOT usually from diet
- Typical Western diet provides 5-30 ug/day
  - Pernicious anemia
  - H/o gastric or ileal surgery
  - *H. pylori* infections
  - Zollinger-Ellison syndrome
  - Malabsorption  
(Crohn's, Celiac dz, PPIs,  
H2 blockers, tapeworm)



# Megaloblastic Anemias:

## *Vitamin B12 Deficiency*

- DDX: Pernicious Anemia
- Intrinsic factor Abs (highly specific but present in only about 50% of cases)
- Gastric parietal cell Abs (85% of cases of pernicious anemia but also in 3-10% of healthy persons)

# Megaloblastic Anemias: *Vitamin B12 Deficiency*

- Dx: low B12 (<200 pg/ml), high MMA and homocysteine
- Tx:
  - 1,000 ug vitamin B12 IM daily for one week, then weekly for one month, then every one to three months
  - daily oral B12 1,000-2,000 ug

# Megaloblastic Anemias:

## *Folate Deficiency*

- Sources: green leafy vegetables, citrus fruits, liver, and certain beans and nuts
- RDA for folate is about 200 ug daily, 400 ug in pregnancy
- Typical Western diet = 200-300 ug of folate daily
- USUALLY 2/2 inadequate dietary intake
- Impaired absorption 2/2 meds; cirrhosis or dialysis complications

# Megaloblastic Anemias:

## *Folate Deficiency*

- Dx: low folate, high homocysteine, nl MMA
- Tx: 1 mg folic acid PO daily, treat underlying cause

# Non-megaloblastic Anemias:

- Alcoholism
- Alcoholism
- Alcoholism
- Hypothyroidism
- Chronic liver disease
- Medications

# Why Alcohol Sucks:

- Alcohol suppresses erythropoiesis and decreases folate absorption
- Alcoholics can lose blood from varices and ulcers
- Possible liver failure
- Alcoholics are at increased risk for developing infections that can lead to ACD



# Anemia:

## *Refer it*

- Things we can't do:
  - Suspected GIB
  - Menorrhagia refractory to medical Rx
  - Possible malignancy
  - Transfusions/infusions
- Pts don't respond/tolerate therapy
  - Can't absorb or tolerate po iron -> IV iron
  - Incorrect Dx?

# Case 1

- 27 y.o. female with h/o anemia here presents for urgent blood work after she went into ENT office for rhinoplasty this morning where POCT Hg was checked and she was told it was too low to have surgery (7s). Pt states she has always had anemia 2/2 heavy menses. Pt denies CP, SOB, palpitations. Just finished her period. Would like blood checked today (POCT and venous draw) so that she can reschedule surgery ASAP. Would also like note saying that she always has anemia and baseline values from her chart given to surgeon.

# Case 1: Physical Exam

- BP: 114/70
- Pulse: 100
- Temp: 97.8 °F (36.6 °C)
- RR: 17
  
- Gen - NAD, WDWN
- HEENT - MMM, EOMi
- CV - RRR, no m/g/r
- Resp - CTAB, no w/r/r
- Neuro - non-focal

# Case 1: Chart Review

Component	9/19/2013
Latest Ref Rng	
White Blood Cell Count 4.16 - 9.95 x10E3/uL	7.65
Red Blood Cell Count 3.96 - 5.09 x10E6/uL	5.56 (H)
Hemoglobin 11.6 - 15.2 g/dL	10.6 (L)
Hematocrit 34.9 - 45.2 %	34.9
Mean Corpuscular Volume 79.3 - 98.6 fL	62.8 (L)
Mean Corpuscular Hemoglobin 26.4 - 33.4 pg	19.1 (L)
MCH Concentration 31.5 - 35.5 g/dL	30.4 (L)
Red Cell Distribution Width-SD 36.9 - 48.3 fL	37.1
Red Cell Distribution Width-CV 11.1 - 15.5 %	16.8 (H)
Platelet Count, Auto 143 - 398 x10E3/uL	316
Mean Platelet Volume 9.3 - 13.0 fL	Test Not Performed
Nucleated RBC%, automated 0.0 - 0.0 %	0.0
Absolute Nucleated RBC Count 0.0 - 0.0 x10E3/uL	0.0

# Case 1

*What do you do/order?*

# Case 1: New Labs

- POCT Hg 9.3

Component	5/5/2008
Latest Ref Rng	
IRON	94
23 - 182 mcg/dL	
Iron Binding Cap.	340
240 - 520 mcg/dL	
% Saturation	28
Ferritin	29
8 - 150 ng/mL	

Component	1/8/2014
Latest Ref Rng	
White Blood Cell Count	7.39
4.16 - 9.95 x10E3/uL	
Red Blood Cell Count	5.24 (H)
3.96 - 5.09 x10E6/uL	
Hemoglobin	10.3 (L)
11.6 - 15.2 g/dL	
Hematocrit	32.8 (L)
34.9 - 45.2 %	
Mean Corpuscular Volume	62.6 (L)
79.3 - 98.6 fL	
Mean Corpuscular Hemoglobin	19.7 (L)
26.4 - 33.4 pg	
MCH Concentration	31.4 (L)
31.5 - 35.5 g/dL	
Red Cell Distribution Width-SD	36.1 (L)
36.9 - 48.3 fL	
Red Cell Distribution Width-CV	16.3 (H)
11.1 - 15.5 %	
Platelet Count, Auto	298
143 - 398 x10E3/uL	
Mean Platelet Volume	Test Not Performed
9.3 - 13.0 fL	
Nucleated RBC%, automated	0.0
0.0 - 0.0 %	
Absolute Nucleated RBC Count	0.0
0.0 - 0.0 x10E3/uL	

# Case 1: Additional Labs

Component <i>Latest Ref Rng</i>	2/24/2015
Reticulocyte Count, Auto	2.17
Absolute Retic # <i>0.02 - 0.08 x10E6/uL</i>	0.12 (H)
Immature Retic Fraction <i>1.5 - 14.1 %</i>	9.0

Component <i>Latest Ref Rng</i>	3/30/2011
IRON 41 - 179 mcg/dL	53
Iron Binding Cap. 262 - 502 mcg/dL	308
% Saturation	17

Component <i>Latest Ref Rng</i>	12/5/201
Ferritin 8 - 180 ng/mL	4 28

# Case 1: Additional Labs

Component	Latest Ref Rng	5/5/2008
Hemoglobinopathy Screen		...
Hemoglobin A	95 - 98 %	91.0 (@)
Hemoglobin A2	2.3 - 3.5 %	5.6 (@)
Hemoglobin F	0.0 - 1.8 %	2.6 (@)
Hb Fractionation Interpret		



# Case 1:

*Final Diagnosis?*

## Case 2

- 36yo M with no significant PMH presents after feeling faint while playing basketball. ROS + for palpitations, 10 pound intentional weight loss over past year, and intermittent BRBPR which he attributed to his h/o hemorrhoids.

– *What do you do next?*

# Case 2

- Rectal exam shows +internal hemorrhoids
- CBC shows nl WBC and plts, Hg 7.2, MCV 70
- CMP wnl
- TSH wnl

*-Now what?*

# Case 2

- Iron studies
- Repeat CBC
- Consider CRP, ESR, celiac panel
- GI referral

- *DDx?*

## Case 2

- EGD wnl, maybe small area of inflammation in duodenum; bx H pylori neg
- Colonoscopy +internal hemorrhoids, band x2
- Capsule endoscopy given normal

– *Likely Dx?*

– *Treatment?*

# Case 2:

## *Treatment*

- Start iron supplements
- Bowel regimen

# Case 2:

## *Response*


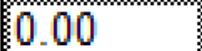
- Hg 7->11
- BRBPR improved

# Case 3

- 56yo M with ESRD on HD q MWF, DM, glaucoma presents for f/u DM. Mentions that his nephrologist recently put him on an “iron-containing supplement”.
- On chart review patient comes in for problem visits only, no continuity. CBC from one month prior shows:




# Case 3

Component	Latest Ref Rng	4/8/2016
White Blood Cell Count	4.16-9.95 x10E3/uL	8.54
Red Blood Cell Count	4.41-5.95 x10E6/uL	<b>3.21 (L)</b>
Hemoglobin	13.5-17.1 g/dL	<b>10.4 (L)</b>
Hematocrit	38.5-52.0 %	<b>31.5 (L)</b>
Mean Corpuscular Volume	79.3-98.6 fL	98.1
Mean Corpuscular Hemoglobin	26.4-33.4 pg	32.4
MCH Concentration	31.5-35.5 g/dL	33.0
Red Cell Distribution Width-SD	36.9-48.3 fL	44.5
Red Cell Distribution Width-CV	11.1-15.5 %	12.8
Platelet Count, Auto	143-398 x10E3/uL	291
Mean Platelet Volume	9.3-13.0 fL	10.8
Nucleated RBC%, automated	No Ref. Range %	0.0 
Absolute Nucleated RBC Count	0.00-0.00 x10E3/uL	0.00 

# Case 3

- Likely Dx?
- Further recommended w/u?

# Case 3

Component	Latest Ref Rng	5/10/2016 
Reticulocyte Count, Auto	No Ref. Range %	1.93
Absolute Retic #	0.03-0.08 x10E6/uL	0.07
Immature Retic Fraction	1.5-14.1 %	8.0
Retic Hemoglobin Content	27.0-40.9 pg	33.1
IRON	41-179 mcg/dL	117
Iron Binding Cap.	262-502 mcg/dL	<b>161 (L)</b>
% Saturation		73
Ferritin	8-350 ng/mL	<b>1293 (H)</b>

# Case 4


- 66yo M with h/o decompensated HCV cirrhosis, homelessness, DM, GERD, OA presents to ED for weakness.

# Case 4: Labs

- CMP: CKD 3, at baseline

Component	Latest Ref Rng	5/14/2014
White Blood Cell Count	4.16 - 9.95 x10E3/uL	6.89
Red Blood Cell Count	4.41 - 5.95 x10E6/uL	4.80
Hemoglobin	13.5 - 17.1 g/dL	<b>13.4 (L)</b>
Hematocrit	38.5 - 52.0 %	39.6
Mean Corpuscular Volume	79.3 - 98.6 fL	82.5
Mean Corpuscular Hemoglobin	26.4 - 33.4 pg	27.9
MCH Concentration	31.5 - 35.5 g/dL	33.8
Red Cell Distribution Width-SD	36.9 - 48.3 fL	<b>52.6 (H)</b>
Red Cell Distribution Width-CV	11.1 - 15.5 %	<b>17.3 (H)</b>
Platelet Count, Auto	143 - 398 x10E3/uL	<b>64 (L)</b>
Mean Platelet Volume	9.3 - 13.0 fL	10.9
Nucleated RBC%, automated	0.0 - 0.0 %	0.0
Absolute Nucleated RBC Count	0.0 - 0.0 x10E3/uL	0.0

## Case 4: continued

Component	Latest Ref Rng	6/2/2014 
IRON	23 - 202 mcg/dL	86
Iron Binding Cap.	240 - 520 mcg/dL	338
% Saturation		25
Reticulocyte Count, Auto	0.58 - 1.58 %	1.09
Absolute Retic #	0.03 - 0.08 x10E6/uL	0.05
Immature Retic Fraction	1.5 - 14.1 %	11.5
Ferritin	8 - 350 ng/mL	36
Vitamin B12	254 - 1060 pg/mL	441
Folate, Serum	8.1 - 30.4 ng/mL	13.9

# Case 4: two days later

Component	Latest Ref Rng	6/3/2014
White Blood Cell Count	4.16 - 9.95 x10E3/uL	5.93
Red Blood Cell Count	4.41 - 5.95 x10E6/uL	<b>4.14 (L)</b>
Hemoglobin	13.5 - 17.1 g/dL	<b>11.7 (L)</b>
Hematocrit	38.5 - 52.0 %	<b>34.6 (L)</b>
Mean Corpuscular Volume	79.3 - 98.6 fL	83.6
Mean Corpuscular Hemoglobin	26.4 - 33.4 pg	28.3
MCH Concentration	31.5 - 35.5 g/dL	33.8
Red Cell Distribution Width-SD	36.9 - 48.3 fL	<b>52.1 (H)</b>
Red Cell Distribution Width-CV	11.1 - 15.5 %	<b>17.0 (H)</b>
Platelet Count, Auto	143 - 398 x10E3/uL	<b>53 (L)</b>
Mean Platelet Volume	9.3 - 13.0 fL	10.0
Nucleated RBC%, automated	0.0 - 0.0 %	0.0
Absolute Nucleated RBC Count	0.0 - 0.0 x10E3/uL	0.0

# Case 5

- 15 mo Latino male presents with mom for WCC. H/o expressive speech delay otherwise nl (born FT via NSVD, pregnancy uncomplicated). You note that pt did not have Hg checked at 12 mo WCC, lead level wnl at 12 mo WCC visit.
- POCT Hg 6.7
  - *What do you do/order next?*



# Case 5

Component	Latest Ref Rng & Units	7/10/2018
White Blood Cell Count	6.0 - 17.0 Thousand/uL	16.1
Red Blood Cell Count	3.90 - 5.50 Million/uL	<b>5.64 (H)</b>
Hemoglobin	11.3 - 14.1 g/dL	<b>10.8 (L)</b>
Hematocrit	31.0 - 41.0 %	35.7
Mean Corpuscular Volume	70.0 - 86.0 fL	<b>63.3 (L)</b>
Mean Corpuscular Hemoglobin	23.0 - 31.0 pg	<b>19.1 (L)</b>
MCH Concentration	30.0 - 36.0 g/dL	30.3
Red Cell Distribution Width-CV	11.0 - 15.0 %	<b>17.9 (H)</b>
Platelet Count, Auto	140 - 400 Thousand/uL	396
Mean Platelet Volume	7.5 - 12.5 fL	10.3

Component	Latest Ref Rng & Units	7/10/2018
Ferritin (Quest)	5 - 100 ng/mL	25

# Case 5

- You speak to mom and she says that she has always been diagnosed with anemia, menses are not too heavy.

– *Now what do you do next?*

# Case 5

- You and mom decide to increase iron-rich foods in pt's diet and repeat labs with Hg electrophoresis at 18 mo WCC.

# Case 5:

## 18 mo WCC

Component	Latest Ref Rng & Units	10/1/2018
Red Blood Cell Count	3.90 - 5.50 Million/uL	6.17 (H)
Hemoglobin	11.3 - 14.1 g/dL	11.6
Hematocrit	31.0 - 41.0 %	38.0
Mean Corpuscular Volume	70.0 - 86.0 fL	61.6 (L)
Mean Corpuscular Hemoglobin	23.0 - 31.0 pg	18.8 (L)
Red Cell Distribution Width-CV	11.0 - 15.0 %	18.8 (H)
Hemoglobin A (Quest)	>96.0 %	89.2 (L)
Hemoglobin F (Quest)	<2.0 %	6.0 (H)
Hemoglobin A2 (Quant) (Quest)	1.8 - 3.5 %	4.8 (H)
Interpretation (Quest)		

Interpretation  
(Quest)

Final

Evaluation is consistent with beta thalassemia trait.

# Case 5:

## 18 mo WCC

Component	Latest Ref Rng & Units	10/1/2018
White Blood Cell Count	6.0 - 17.0 Thousand/uL	10.9
Red Blood Cell Count	3.90 - 5.50 Million/uL	<b>6.17 (H)</b>
Hemoglobin	11.3 - 14.1 g/dL	11.6
Hematocrit	31.0 - 41.0 %	38.0
Mean Corpuscular Volume	70.0 - 86.0 fL	<b>61.6 (L)</b>
Mean Corpuscular Hemoglobin	23.0 - 31.0 pg	<b>18.8 (L)</b>
MCH Concentration	30.0 - 36.0 g/dL	30.5
Red Cell Distribution Width-CV	11.0 - 15.0 %	<b>18.8 (H)</b>
Platelet Count, Auto	140 - 400 Thousand/uL	<b>478 (H)</b>
Mean Platelet Volume	7.5 - 12.5 fL	9.6

Component	Latest Ref Rng & Units	10/1/2018
Ferritin (Quest)	5 - 100 ng/mL	13



# Case 5:

## F/u telephone call

- Discussed beta thal trait with mom, advised her that she may consider testing with her PCP.
- Decision to continue with iron rich diet for now, f/u at 2 yo WCC to determine if po iron supplement needed

# Case 5:

## 2 yo WCC

Component	Latest Ref Rng & Units	10/1/2019 
White Blood Cell Count	6.0 - 17.0 Thousand/uL	7.7
Red Blood Cell Count	3.90 - 5.50 Million/uL	<b>5.57 (H)</b>
Hemoglobin	11.3 - 14.1 g/dL	<b>10.7 (L)</b>
Hematocrit	31.0 - 41.0 %	34.4
Mean Corpuscular Volume	70.0 - 86.0 fL	<b>61.8 (L)</b>
Mean Corpuscular Hemoglobin	23.0 - 31.0 pg	<b>19.2 (L)</b>
MCH Concentration	30.0 - 36.0 g/dL	31.1
Red Cell Distribution Width-CV	11.0 - 15.0 %	<b>17.0 (H)</b>
Platelet Count, Auto	140 - 400 Thousand/uL	318
Mean Platelet Volume	7.5 - 12.5 fL	9.9
Lead, Blood (Quest)	mcg/dL	<1 
Lead(B) Collection Sample (Quest)		VENOUS
Ferritin (Quest)	5 - 100 ng/mL	15

# Case 5:

## F/u telephone calls

- Mom agrees to start po iron after 18 mo WCC labs discussed.
- 6 mo later you have a telephone visit for f/u clavicular fx s/p fall from bed. Mom states patient has been taking iron supplements. Mom denies constipation but state his teeth are a little stained. Wonders if she can stop po iron at this time?
  - *What do you do?*



# Conclusion

- Use the whole CBC
- Know your audience - Tailor your w/u to suspected causes (history, age, symptoms)
- Remember that anemia can be multifactorial
- Know when to ask for help

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Questions?